

Sustainable Legal Framework for Transboundary Movement of Electronic Waste

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ABSTRACT

The quest for sustainable development has always involved the complex task of reconciling the need for socio-economic development with public health and environmental protection. This challenge has often emerged in the trade and environment debate but has most recently been evident in international trade in used electrical and electronic equipment (UEEE) in developing countries. While international trade in UEEE provides means for socio-economic development in the developing world, it also serves as a conduit for transboundary dumping of waste electrical and electronic equipment (WEEE) also referred to as electronic waste or e-waste. This transboundary movement of WEEE into developing countries has given rise to serious health and environmental concerns arising from unsustainable patterns of electronic waste management in the region. This trend, if not properly addressed, has the capacity to erase any socio-economic benefit that developing countries stand to gain from international trade in UEEE.

To achieve sustainable development, there is need for a policy framework that would enable developing countries to benefit maximally from international trade in UEEE while at the same time minimizing the health and environmental impacts that arises therefrom.

This research investigates the socio-economic as well as health and environmental impacts of international trade in UEEE in two developing countries – Nigeria and Ghana. The research identifies a major loophole in the existing international legal framework as the primary factor responsible for e-waste dumping in the developing world. This loophole relates to the absence of a legal framework for differentiating between functional UEEE and junk e-waste. This has resulted in both functional UEEE and junk e-waste being concurrently shipped to the developing world as “used electrical and electronic equipment”.

In addressing the problem relating to transboundary movement and management of e-waste in developing countries, the research proffers two policy frameworks. On the part of developing countries, the research proposes a trade policy framework crafted in line with WTO trade rules. This policy framework will entail the development of an international certification system which will serve to differentiate functional used electronics from junk e-waste. While the former may be eligible for import in developing countries, the research proposes an import ban on the latter. Considering the fact that import bans are generally prohibited under the WTO trade regime, the research seeks to bring the proposed framework within the exceptions to the WTO rules. This policy framework, it is argued, would maximise the socio-economic benefits associated with UEEE while at same time minimizing the adverse health and environmental impacts associated with WEEE.

On the part of developed countries, the research proposes the development and application of a policy framework which regulates the toxic and hazardous substances that go into the production of electrical and electronic equipment as well as enhance their reusability and recyclability at end-of-life. Such framework which should be based on the broader concept of design for the environment (DfE) should take into consideration the entire life cycle of the equipment beginning from the design stage to end-of-life. It is believed that the implementation of this design framework will go a long way in reducing the health and environmental impacts of such equipment when subsequently shipped to the developing world at end-of-life.

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Gideon Christian

Ottawa, January 2014

DEDICATION

Dino - My son, My best friend

ABBREVIATIONS

BAN	Basel Action Network
BFR	Brominated Flame Retardants
CAPDAN	Computer and Allied Products Association of Nigeria
CCME	Canadian Council of Ministers of the Environment
CFC	Chlorofluorocarbon
CIGI	Center for International Governance Innovation
COP-3	Third Conference of the Parties
CPR	Collective Producer Responsibility
CRT	Cathode Ray Tube
DfE	Design for the Environment
DfRe	Design for Reuse
DfTR	Design for Toxic Reduction
EC	European Community
EEE	Electrical and Electronic Equipment
EPA	Environmental Protection Agency
EPD	Environmental Product Declaration
EPR	Extended Producer Responsibility
EU	European Union
GATT	General Agreement on Tariffs and Trade
GIIC	Global Information Infrastructure Commission
IC	Integrated Circuit

ICJ	International Court of Justice
ICT	Information and Communication Technologies
IDRC	International Development Research Center
ILC	International Law Commission
IPR	Individual Producer Responsibility
ISO	International Organization for Standardization
ISP	Internet service provider
IUCN	World Conservation Union
LCA	Life-cycle assessment
LCD	Liquid-Crystal Display
MDG	Millennium Development Goals
NGO	Non-Governmental Organisation
OECD	Organisation for Economic Co-operation and Development
OEM	Original Equipment Manufacturer
OTA	Office of Technology Assessment
PAHs	Polycyclic aromatic hydrocarbons
PBBs	polybrominated biphenyls
PBDEs	Polybrominated Diphenyl Ethers
PC	Personal Computers
PCB	Printed Circuit Boards
PCBs	polychlorinated biphenyls
PCDD	Polychlorinated dibenzo-p-dioxins
PCIJ	Permanent Court of International Justice

PCTs	polychlorinated terphenyls
PCTs	Polychlorinated Terphenyls
PDA	Portable Digital Assistants
PRO	Producer Responsibility Organization
PVC	Polyvinyl Chloride
PWB	Printed wire boards
RCRA	Resource Conservation and Recovery Act
REACH	Registration, Evaluation, Authorization and Restriction of Chemicals (REACH) Directives
RoHS	Reduction of Hazardous Substances (RoHS) Directive
SME	Small and Medium Enterprise
TBT	Agreement on Technical Barriers to Trade
UEEE	Used Electrical and Electronic Equipment
UNCED	United Nations Conference on Environment and Development
UNEP	United Nations Environment Program
USEPA	United States Environmental Protection Agency
WEEE	Waste Electrical and Electronic Equipment
WHO	World Health Organisation
WTO	World Trade Organization

Chapter One

1. INTRODUCTION

The last few decades have witnessed dramatic technological transformation across the world - a transformation driven largely by the global dispersal of information and communication technologies (ICTs).¹ The Internet, the mobile networks, and other ICT systems are having significant economic, social as well as ecological effects all over the globe. Rapid and increasing ICT penetration is boosting economic, socio-political and technological transformation. ICT holds the key to socio-economic development especially in emerging economies.² Effective information and communication technologies are a prerequisite for any modern economy, and are essential for both economic growth and poverty reduction.

The ICT revolution has brought about an increased standard of living as well as economic prosperity to people around the globe.³ ICT devices such as cell phones, computers, fax machines, television and other electronic technologies have found their way into virtually every corner of the world. Crisscrossing the divide between developed and developing countries, ICT

¹ Information and Communication Technology consists of hardware, software, networks and other media for collection, storage, processing, transmission and presentation of information and related services. ICT Infrastructure includes the Internet, computers and other digital or electronic devices used for communication and accessing information.

² Waverman, Meschi, and Fuss estimated that increases in the penetration of mobile telephony in a sample of developing countries have been accompanied by considerable increases in Gross National Product per capita. Their study found that a 10 percent difference in mobile penetration levels over the entire sample period correlated to a 0.6 percent difference in annual growth rates between otherwise identical developing nations. See Leonard Waverman, Meloria Meschi, and Melvyn Fuss, "The Impact of Telecoms on Economic Growth in Developing Countries", The Vodafone Policy Paper Series, (2), pp. 10–23; Also a survey by the World Bank published in 2009 shows that a 10 percent increase in mobile communication penetration corresponds to a 0.6 percent increase in GDP per capita in high income countries, but a 0.8 percent increase in developing countries. See Qiang, Christine Zhen-Wei, and Carlo M. Rossotto, "Economic Impacts of Broadband" in *Information and Communications for Development 2009: Extending Reach and Increasing Impact*, 35–50. (Washington, DC: World Bank, 2009).

³ Soumitra Dutta and Irene Mia (ed.), "The Global Information Technology Report 2010–2011: Transformations 2.0" 10th Anniversary Edition. 2011 World Economic Forum.

has become part of life for many and its pervasiveness is perhaps most apparent in the massive proliferation in the production and disposal of electrical and electronic equipment.⁴

The developing world has witnessed tremendous growth in Internet and ICT penetration over the last few years. In some cases (such as mobile telephony), the rate of growth in the developing world has even outpaced the rate in industrialized societies. This trend has been celebrated as a step in the right direction especially with regards to its effect in bridging the digital gulf between the two regions. Hence, it has been asserted (and rightly so) that increasing ICT penetration is ‘providing forceful leverage for socio-economic, technological growth’ in the developing world.⁵

ICT penetration in the developing world has also resulted in increased international trade in used ICT equipment and other used electrical and electronic equipment along with consequential socio-economic benefits. This fact was noted in the West African countries of Ghana and Nigeria during the field research for this thesis. Interview with research participants revealed that the number of Internet cafes in the city of Lagos, Nigeria (as well as many other parts of the country) has continued to multiply with the cost of Internet access declining simultaneously. Internet cafes were common sights not only in the cities, but also in the suburbs thus providing opportunities for even the most average people in this society to interact with a global community they had hitherto been completely shut off from. The average cost of Internet access in these cafes is about \$0.75 for an hour of access. Some five years ago, the cost was about three times more, and the Internet cafes were so scarcely located that patrons would have to travel far to find one, and

⁴ Elizabeth Grossman, *High tech trash: digital devices, hidden toxics, and human health* (Washington: Island Press, 2006) at 5 [Grossman, “High tech trash”].

⁵ Kurian Joseph, “Electronic Waste Management in India-Issues and Strategies”, *Proceedings of Sardinia 2007, Eleventh International Waste Management and Landfill Symposium, Sardinia, Italy* <<http://www.swlf.ait.ac.th/UpdData/International/NRIs/Electronic%20waste%20management%20in%20India.pdf>>.

even then, the cafes were crowded with people waiting for hours to find a computer station to use due to the limited number of computers in those few cafes.

Many factors account for the growth of ICT access in Nigeria. First, the deregulation in the telecommunication sector has resulted in competition among the telecommunication and Internet service providers (ISPs) and consequential fall in the price of Internet services. Secondly (and most importantly), the importation of cost efficient used electrical and electronic equipment like computers, printers, scanners etc has resulted in the reduced cost of establishing Internet cafes while those already in existence can now conveniently afford to procure more used computers to expand their business to meet the growing demand for Internet access from diverse sectors of the population. A visit to some of these cafes revealed that they basically operate on used computers imported from developed countries in North America and Europe.⁶ These used computers were bought at a fraction of the cost of new computers, thus providing huge financial savings for these small-scale business entrepreneurs.

The benefits provided by these cafes are immense and their impact is felt by diverse people - the high school graduate who spent time at the cafe filling out online forms for his university admission process; the final year university student searching the online database for research materials for his final year research project, as well as his graduate friend next to him uploading his resume for a job application; the semi computer literate trader who beckons on the café attendant for help in attaching a requisition document to an email to his suppliers in Asia; the medical practitioner from a nearby hospital conducting an online search in a PubMed repository

⁶ As a matter of fact, some of the computers still bear tags of private and government institutions in North America and Europe that originally owned them. No new computer was observed in any of the 10 Internet cafes visited though a staff member at one of the cafes confirmed that the last and only brand new computers they ever owned were the two they bought when they started business some eight years ago. This particular cafe now owns about 15 used computers.

for information on the treatment of a patient in his hospital. One thing common with all the people in the various cafes visited is the fact that they are working from computers that have been discarded by some wealthier individuals or organizations in industrialized societies. But for international trade in used electrical and electronic equipment, these computers would have been dead and buried in some landfill in North America or ended up in some incinerators in Europe. The social and economic benefits of used ICT devices in these low-income societies are quite remarkable and warrant a comprehensive study.

Outside the ICT arena, international trade in used electrical and electronic equipment is also boosting economic leverage for many in the developing world - from the busy commercial streets in major Nigerian cities to reprography centers in higher institutions in the country, small scale entrepreneurs (mostly women) in makeshift shops make a living by providing services such as word processing and photocopying at affordable rates to the public. These small businesses thrive on cheap used computers, printers and photocopy machines imported from developed countries. Without access to this used equipment, it is highly unlikely that most of these people would have been in business in the first place as they would not have been able to afford the purchase of new equipment to set up their business.

Finding from the field research reveals that the greatest beneficiaries (financially) in the UEEE trade are the importers and dealers who import this used equipment into the country.⁷ Research finding reveals that net profit made from the importation and sale of a container of used electrical and electronic equipment could be as high as 30%. Other beneficiaries include the used electrical and electronic equipment retailers who make a living buying from wholesale importers and

⁷ *Infra* --- Chapter three.

selling to the final consumers, the technicians and repairers who display extraordinary ingenuity fixing and refurbishing non-functional equipment. Undoubtedly, international trade in used electrical and electronic equipment is providing wealth and opportunities to people in developing countries like Nigeria and Ghana.

However, extending beyond the cloud of superficial wealth and opportunities created in developing countries by the international trade in used electrical and electronic equipment appears a gloomy reality than runs counter to the fundamental principles and philosophies of sustainable development and environmental justice.⁸ International trade in used electrical and electronic equipment now serves as a conduit for transboundary dumping of junk electrical and electronic equipment from rich, developed countries to poor, developing countries. For each container of used electrical and electronic equipment arriving at the Tin Can Island Port in Lagos or the Tema Sea Port in Ghana, about 30 percent of its content is filled with junk electronics.⁹ While the functional electronics are sold in the various used electronic markets or outlets in each of the countries, it was observed during the course of the field research that the junk electronics are disposed in the dumpsites where they are dismantled by an army of scavengers composed mainly of teenage boys. This dismantling process is carried out under the most unhealthy conditions, without due regard to the health of the dismantlers or the neighbouring communities. As will be seen in subsequent discussions in this thesis, the transboundary dumping of waste electrical and electronic equipment in the guise of international trade in used electrical and

⁸ See Jim Puckett & Ted Smith, *Exporting Harm: The High-Tech Trashing of Asia* (Seattle: Diane Pub Co, 2002) <<http://www.ban.org/E-waste/technotrashfinalcomp.pdf>>. [Puckett and Smith “Exporting Harm”].

⁹ Statistics based on data obtained from interview of used electronic importers and retailers in Lagos, Nigeria and Accra, Ghana in January 2011 and July 2012 respectively.

electronic equipment constitute health, environmental and occupational hazards to people and communities in developing countries.

Management of waste electrical and electronic equipment otherwise known as WEEE, electronic waste or e-waste is a complex environmental and social problem in both developed and developing countries. If not properly disposed, waste electronic products could constitute a public health and environmental hazard. Expectedly, this issue is more alarming in developing countries that lack the capacity and resources to effectively deal with the problem. In addition, developing countries are characterized by the absence of effective legal frameworks for regulating or restricting the transboundary flow of waste electrical and electronic equipment into their region. In the absence of this framework, developing countries like Ghana and Nigeria have become a typical dumpsite and haven for global waste electronics.

As will be seen, unregulated international trade in used electrical and electronic equipment has become a channel for unscrupulous recyclers and waste collectors in developed countries to dump waste electrical and electronics equipment in developing countries. Surprisingly, not much is being done by governments in industrialized countries, especially in North America, to halt this transboundary dumping of waste which is being carried out in violation of rules of international law such as the Basel Convention^{*}, and especially the Basel Ban, which prohibits transboundary movement of hazardous waste from developed to developing countries. Whatever might be the reason for the tacit inaction by the developed world, the result is that the developing

^{*} Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, 1673 UNTS 126; 28 ILM 657 (1989).

world is being saddled with a disproportionate environmental burden arising from increasing global electronic waste generation.

Hence, for developing countries like Nigeria and Ghana, the window of socio-economic opportunity that was opened by the ICT revolution and international trade in used electrical and electronic equipment is gradually turning into a floodgate of health and environmental abuse. While international trade is vital for developing countries, however, to achieve *real* development, economic benefits arising from international trade must be balanced with health and environmental protection of people and communities in developing countries. In essence, the economic gain made by the used electronic importer in Lagos or Accra must be balanced against the health and environmental impacts suffered by people and communities within and around the e-waste dumpsites across the countries, including the young teenagers engaged in unhealthy dismantling of e-waste products in the dumpsites. The concept of sustainable development provides the framework for balancing these diverse interests.

1.1 The Concept of Sustainable Development

The concept of sustainable development has dominated international environmental and development policy since the 1992 United Nations Conference on Environment and Development (UNCED).¹⁰ The Conference, also known as the Rio Earth Summit, was unprecedented both in terms of size as well as the scope of concerns discussed. It sent out a clear message to the effect that excessive consumption by industrialized nations as well as poverty on

¹⁰ United Nations Conference on Environment and Development (UNCED), Rio de Janeiro, 3-14 June 1992
<<http://www.un.org/geninfo/bp/enviro.html>>

the part of developing nations is placing a damaging strain on the natural environment. The Earth Summit provided an opportunity for governments in both developed and developing countries to rethink their economic development policies in relation to the environment thus highlighting the need for all economic development policies to fully consider possible environmental impact.

The groundwork for the Rio Earth Summit was laid in the publication of *The Brundtland Report*.¹¹ The Summit was especially crucial to the developing world where efforts towards poverty eradication have resulted in a race to the bottom – a situation where most developing countries have relaxed environmental regulation in an effort to achieve economic development and poverty eradication.

A study of the Brundtland Report highlights two significant normative elements of sustainable development. First, development must be channelled towards meeting basic human needs such as poverty eradication. Secondly, economic and social development efforts should be subject to public health and environmental limitations. Hence the obvious gap between existing environmental and economic development efforts, such as that noted above in relation to international trade in used electrical and electronic equipment, calls for gap filling measures. The concept of sustainable development necessitates that ‘the adverse impacts on the quality of air, water, and other natural elements are minimized so as to sustain the ecosystem's overall integrity’,¹² and to protect the rights of present and future generations to a healthy environment.

¹¹ See *The Brundtland Report* known as *Our Common Future*. Published in 1987 United Nations World Commission on Environment and Development (WCED).

¹² Ibid.

Although industrialized nations bear greater responsibility for current environmental degradation which has resulted from their unsustainable pattern of resource use, consumption and disposal, increasing attention is now being paid to less industrialized, developing countries, whose quest for economic development has in many cases resulted in lax environmental regulation. Hence these countries are now faced with the challenge of sustainable development namely formulating sound development framework or policy that will ensure economic development and poverty eradication without inflicting irreparable harm on human health and the natural environment. A UN report has identified poverty as ‘a major obstacle to achieving sustainable development and environmental protection’.¹³ It then follows logically that sustainable development must serve to balance the scale of poverty eradication and environmental protection.

Poverty eradication has always been an issue of vital concern in development literature. Atapattu saw poverty eradication as a yardstick for measuring the performance of international institutions. According to the author, ‘the success of international economic and environmental institutions will be judged by whether they increase or reduce poverty’.¹⁴ The subject of poverty and economic marginalization is of importance in this research because of the close connection between poverty and environmental degradation.

Many economists have theorized the cause of and failure to eradicate poverty in the developing world, as well as offered ideas on poverty eradication in the region.¹⁵ For example, Collier drew

¹³ UN High Commission for Human Right and the United Nations Environmental Programme, *Meeting of Expert on Human Rights and the Environment, 14-15 Jan. 2002: Conclusion*, online <<http://www2.ohchr.org/english/issues/environment/enviro/conclusions.htm>>.

¹⁴ Sumudu Atapattu, “International Human Rights and Poverty Law in Sustainable Development” in Cordonier Segger, Marie-Claire (ed.) *Sustainable Development Law - Principles, Practices, & Prospects* (Oxford: Oxford University Press, 2004) 311- 312.

¹⁵ Paul Collier, *The bottom billion: Why the poorest countries are falling apart and what can be done about it* (Oxford: Oxford University Press, 2007); Jeffrey Sachs, *End of Poverty - Economic Possibilities for Our Time* (New York: Penguin Press, 2005); Williams Easterly, *The White Man's Burden. Why the West's Efforts to Aid the Rest*

attention to the so-called “bottom billion” - a group of developing countries in Africa and Central Asia with a combined population of about 1 billion people, who in contrast to most other developing countries are not just lagging behind in terms of development but are “falling apart”.¹⁶ These countries are falling apart because they are stuck in what he termed as the conflict trap, the natural resources trap, the trap of being landlocked with bad neighbours as well as the trap of bad governance.¹⁷ The majority of the people in these countries lack access to employment and wages, and are left without an adequate means of subsistence.

Sachs on the other hand associates failed economic growth in developing countries with a combination of factors he listed to include: physical geography, the fiscal trap, failed governance, cultural barriers, geopolitics, lack of innovation and the demographic trap.¹⁸ Sachs

Have Done So Much Ill and So Little Good (Oxford: Oxford University Press, 2006); Hernando de Soto, *The Mystery of Capital: Why Capitalism Triumphs in the West and Fails Everywhere Else* (New York: Basic Books, 2000), at p. 52.

¹⁶ Ibid.

¹⁷ Collier went further to discuss these traps in detail – the conflict trap according to him refers to internal political conflicts evident in violent internal changes to government as well as prolonged civil wars. According to Collier, all societies - developed or developing - have conflicts but what makes the conflicts in the bottom billion distinctive is the form which such conflicts take. The forms of political conflict in the bottom billion can be both costly and repetitive. He noted that seventy three percent of people in the bottom billion countries have recently been through a civil war or are still in one. Unlike countries like the United States, Russia and Britain where ghastly civil wars were fought fairly quickly and never repeated, civil wars in the bottom billion societies are prolonged and repetitive thus trapping such societies in a vicious circle of poverty. Collier associated the effect of the natural resource trap to the so-called “Dutch disease” so named after the effect of the North Sea gas on the Dutch economy. The problem with the natural resource trap is that the discovery of valuable natural resources in a country, rather than serve as a catalyst for prosperity, contributes to the conflict trap as various factions battle for the control of such resources. This is the case in countries like Congo, Angola and Uganda where illegal mining of natural resources has continued to prolong the civil wars in these countries. But even in politically stable societies, the natural resources trap may result in diversion of attention from the production of other export commodities as was the case in Nigeria when the discovery of natural gas and subsequent boom in oil exports gradually led to the demise of the agricultural economy. Collier also noted that landlocked and bad neighbor trap is very evident in the bottom billion countries in Africa. The situation is further made worse where such landlocked countries have little or scarce natural resources. Hence being resource-scarce and landlocked, such countries must depend on their neighbors for growth. Where the neighbour(s) do not have opportunity for growth, the landlocked country is pretty well condemned to poverty. He concluded that good governance and sound economic policies are essential to shape a country’s economic performance and enhance the growth process as well as eradicate poverty. On the other hand, bad governance and policies can destroy an economy with alarming speed as could be seen in most African countries, notably Zimbabwe.

¹⁸ Jeffrey Sachs, *supra* note 15.

strongly believes that foreign aid and the implementation of the United Nations Millennium Development Goals (MDGs) are vital in the eradication of extreme poverty. While Sachs advocates foreign aid as a tool in poverty eradication, Easterly on the other hand pessimistically denies the effectiveness of foreign aid in poverty eradication.¹⁹ In between these extreme views fits the argument of Collier who, as much as he agrees with Sachs on the need for foreign aid in poverty eradication, also thinks that Sachs overplays the importance of foreign aid. Foreign aid alone can not solve the problem of the bottom billions, rather, Collier believes what is needed is a wider range of policies such as market policies as a means of reversing the bottom billion marginalisation.

De Soto was of the view that the ideals of capitalism are essential in poverty eradication.²⁰ He thus tried to identify the factors responsible for the failure of capitalism in non-western societies. According to him, one of the reasons why capitalism has triumphed in the West but failed in the rest of the world is because the property system in Western nations has been ‘integrated into one formal representation system’.²¹ Without this formal property system, no matter how much property individuals accumulate, ‘no matter how hard they work, they will not be able to prosper in a capitalist society’.²² The obvious reason is because they will have limited or no access to the protection or social security provided by the formal property system. Such individuals will always remain outside the ‘range of policymakers, of the reach of official records, and thus economically invisible.’²³

¹⁹ Williams Easterly *supra* note 15.

²⁰ Hernando de Soto, *Supra* note 15 at p. 52.

²¹ *Ibid* at p. 52.

²² *Ibid* at p. 159.

²³ *Ibid*.

Quite unlike the economists who have sought to explain poverty from the economic perspective, Sen took a closer look at the role of technology in poverty eradication.²⁴ He was of the view that skills in the use of computer and the Internet and similar facilities transform not only economic possibilities, ‘but also the lives of the people influenced by such technological change’.²⁵ Such technological change fuels global trade and commerce, and centuries earlier, Adam Smith foresaw global trade and commerce as bringing with it greater economic prosperity to nations.²⁶ The applicability of the concept of sustainable development in relation to international trade in used ICT as well as other electrical and electronic equipment would require the development of a framework which enables us to achieve maximum benefits from the opportunities provided by the ICT revolution while at the same time minimizing the environmental hazards emanating from same. This research aims to develop the policy basis for this framework.

1.1.1 Sustainable Development and the Law

Environmental legislation could have significant influence on sustainable development, just as sustainable development principles could greatly influence environmental legislation. The concept of sustainable development aims to limit the adverse environmental impact resulting from the quest for social and economic development.²⁷ While environmental legislation is instrumental in achieving sustainable development, various environmental principles have emerged to guide policy and legislative decisions. One such principle encapsulated in the Rio Declaration captures the basic idea of the precautionary principle. Principle 15 of the Declaration

²⁴ Amartya Sen, *Development as Freedom* (Oxford: Oxford Press, 1999).

²⁵ *Ibid* at p.24.

²⁶ *Ibid* at 240.

²⁷ See *The Brunthland Report*, *Supra* note 11 chapt. 2 at para 14.

mandates that ‘where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation’.²⁸ Traditionally, precautionary principle has been discussed from the perspective of risks that comes with policy decisions where there is lack of substantial scientific evidence to support the existence of a perceived risk or hazard.²⁹

Steele has noted that precaution does not resolve the problems associated with uncertainty, but rather draws attention to them. The principle implies that lack of certainty should not serve as a basis for inaction. It acknowledges the fact that in some cases, effects can only become evident after the act, and to satisfy empirical requirements of ‘proof’, it may take a long time from the supposition of potential damage to establishing a definite link between cause and effect.³⁰ Given the fact that the effect of some human activities may be irreversible (especially where such effect could be adverse to the environment), the precautionary principle recommends a decision-making approach based on preventive actions before risks are conclusively established.³¹

Hilty tried to relate the precautionary principle to technological development. He expressed the view that there is now increasing awareness that while advancement in technology results in development, such development comes with a potential risk of damage to human health and the environment.³² Cameron and Abouchar for their part opined that the precautionary principle

²⁸ Report Of The United Nations Conference On Environment And Development A/CONF.151/26 (Vol. I).

²⁹ Marco Martuzzi and Joel Tickner (eds), *The Precautionary Principle: Protecting Public Health, the Environment and the Future of Our Children* (Denmark: WHO, 2004) at pg 8.

³⁰ Jenny Steele, *Risks and Legal Theory* (Oregon: Hart Publishing, 2004).

³¹ Benjamin J. Richardson and Stepan Wood, *Environmental Law for Sustainability* (Oregon: Hart Publishing, 2006) p. 15.

³² Lorenz M. Hilty, *Information Technology and Sustainability: Essays on the Relationship between Technology and Sustainable Development* (Norderstedt [Germany]: Books on Demand GmbH, 2008) [Hilty, “Information Technology and Sustainability”].

recommends taking preventive action before risks are conclusively ascertained,³³ while Ellis and Wood noted that the principle serves to guide policy-makers in decisions-making process where there is absence of scientific evidence as to the potential environmental impacts of the activity under consideration.³⁴

Notwithstanding the plethora of literature and emerging jurisprudence, the precautionary principle is perhaps one of those principles related to sustainable development that has yet to attract consensus over its meaning and implementation. Nonetheless, an examination of the academic literature and legal jurisprudence discussing various European Union legislation relating to electronic waste such as the Waste Electrical and Electronic Equipment (WEEE) Directive,³⁵ the Reduction of Hazardous Substances (RoHS) Directive,³⁶ and the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH) Directive³⁷ reveal a unanimity

³³ James Cameron and Juli Abouchar, "The Precautionary Principle" (1991) 14 Boston College International & Comparative Law Review 1; Daniel Bodansky, "Scientific Uncertainty and the Precautionary Principle" (1991) 33 Environment 4.

³⁴ See Jaye Ellis and Stepan Wood, "International Environmental Law" in Benjamin J. Richardson and Stepan Wood eds., *Environmental Law for Sustainability* (Oregon: Hart Publishing, 2006) 343-380.

³⁵ European Union, 2003. Directive 2003/ 108/EC of the European Parliament and of the Council of 8 December 2003 amending Directive 2002/96/EC on waste electrical and electronic equipment (WEEE), Article 14 <<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CONSLEG:2002L0096:20090112:EN:PDF>> [Hereafter WEEE Directive]. The WEEE Directive is a 2002 European Community directive on waste electrical and electronic equipment (WEEE) which became European Law in February 2003. The Directive set collection, recycling and recovery targets for all types of electrical goods, with a minimum rate of 4 kilograms per head of population per annum recovered for recycling by 2009.

³⁶ The Restriction of Hazardous Substances Directive (RoHS) 2002/95/EC [RoHS Directive]. The directive which came into force in 1 July 2006 restricts the use of six hazardous substances in the production of various types of electronic and electrical equipment. It is closely linked with the Waste Electrical and Electronic Equipment Directive.

³⁷ Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC. [REACH Directive]. The Directive requires all companies manufacturing or importing chemical substances into the European Union to register the substances with the European Chemicals Agency (ECHA) in Helsinki, Finland.

among scholars to the effect that the precautionary principle was at the heart of these pieces of legislation.³⁸

The polluter pays principle has also been proposed as a strong environmental law principle for attaining sustainable development.³⁹ Luppi et al wrote that the principle was originally applied to polluters discharging harmful substances into the natural environment, but with time it came to be extended to other activities that contribute to environmental degradation.⁴⁰ According to Lucia and Reibstein, the principle finds implementation under two different policy approaches vis: command and control and market-based approaches. While the former includes performance and technical standards, the latter includes pollution taxes, pollution permit and product labelling. The duo was also unanimous on the fact that elimination of subsidies is also an important part of application of the principle.⁴¹

The polluter pays principle has become a fundamental policy framework for environmental regulation in OECD countries and the European Union. It is also an international environmental law principle having found expression in the Rio Declaration. In 1975, the Swedish government introduced a modified polluter pays principle known as extended producer responsibility (EPR).⁴² The concept was aimed at compelling polluting entities to internalize the environmental externalities of their economic activities. Hence the normative scope of the polluter pays

³⁸ Henrik Selin and Stacy D. VanDeveer, "Raising Global Standards: Hazardous Substances and E-Waste Management in the European Union" (2006) 48:10 Environment 6–17.

³⁹ Barbara Luppi, Francesco Parisi and Shruti Rajagopalan "Environmental Protection for Developing Countries: The Polluter-Does-Not-Pay Principle" (February 6, 2009). *Minnesota Legal Studies Research Paper No. 09-08*. p. 1-40. Available at SSRN: <http://ssrn.com/abstract=1339063>.

⁴⁰ Ibid.

⁴¹ Vito De Lucia and Richard Reibstein, "Polluter pays principle." in Cutler J. Cleveland eds. *Encyclopedia of Earth*. (Washington, D.C.: Environmental Information Coalition, National Council for Science and the Environment, 2008). [First published in the Encyclopedia of Earth January 28, 2007; Last revised August 22, 2008; Retrieved July 13, 2010]<http://www.eoearth.org/article/Polluter_pays_principle>.

⁴² Kevin Wehr, Paul Robbins, eds. *Green Culture - An A-to-Z Guide* (Sage: London, 2011) at 255.

principle has continued to evolve and expand over time so that attempts have been made in recent times under various environmental policies laws to apply the principle in management of electronic wastes.⁴³ This development is evident in the concept of producer responsibility found in many e-waste statutes in Europe, Asia and North America. According to Goosey, “Producer Responsibility is an extension of the 'polluter pays' principle and it places responsibility for end-of-life management on the original producer”.⁴⁴

Hence this research seeks among other things to examine ways in which the polluter pays principle as a policy tool could be used to achieve innovative solutions to electronics waste management especially in relation to extended producer responsibility. Specifically, the research will examine how the principle could be used to influence design, manufacture and marketing of electronic products so as to ensure their sustainable use and end-of-life management.

The principle of common but differentiated responsibility is another important element of sustainable development relevant to this research. The principle, which is encapsulated in the Rio Declaration* is founded on principles of equity. Lucia and Reibstein identified two aspects of this principle:

The first is the common responsibility, which arises from the concept of common heritage and common concern of humankind, and reflects the duty of States of equally sharing the burden of environmental protection for common resources; the second is the differentiated responsibility, which addresses substantive equality: unequal material, social and economic situations across States; different historical contributions to global

⁴³ See Articles 8 and 9 WEEE Directive.

⁴⁴ Martin Goosey, “Introduction and Overview” in Ronald E. Hester and Roy M. Harrison eds *Electronic Waste Management - Design, Analysis and Application* (Cambridge: RSC Publishing, 2009) at 3.

* Principle 7.

environmental problems; and financial, technological and structural capacity to tackle those global problems.⁴⁵

Hence the principle helps us to better understand the historical responsibilities for environmental degradation and serves as a policy tool in the allocation of responsibilities for environmental protection along the North-South axis.

As will be argued in this thesis, the implementation of the principle of common but differentiated responsibility is very crucial in the development of a sustainable framework to address the problems associated with transboundary movement and management of electronic waste. Based on this principle, the research will examine different policy frameworks that could be variously undertaken by developed and developing countries in the management of adverse health and environmental impacts associated with electronic wastes.

1.1.2 Sustainable Development and International Law

The concept of sustainable development is important in the field of international environmental law to the extent that it serves to keep in check the adverse social and environmental impacts of economic development activities. It plays the crucial role of balancing the competing demands of economic development and environmental protection. In this way, it helps to curb the worst social and environmental impacts of economic development.⁴⁶ Hence sustainable development embraces fields of international environmental law, international economic law and international

⁴⁵ Vito De Lucia and Richard Reibstein, "Common but differentiated responsibility" in: Cutler J. Cleveland eds *Encyclopedia of Earth* (Washington, D.C.: Environmental Information Coalition, National Council for Science and the Environment). [First published in the *Encyclopedia of Earth* January 28, 2007; Last revised January 27, 2007; Retrieved July 15, 2010] <http://www.eoearth.org/article/Common_but_differentiated_responsibility>.

⁴⁶ Michael Decker, *The Law of Sustainable Development: General Principles*, A Report for the European Commission (Brussels: European Commission, 2000) 40. Ashfaq Khalfan and Marie-Claire Cordonier Segger, *Sustainable Development Law: Principles, Practices, & Prospects* (Oxford : Oxford University Press, 2004) at 45.

social law. The concept has found expression in many international treaties,⁴⁷ foundation documents of international organisations,⁴⁸ international declarations,⁴⁹ the practices of international financial institutions,⁵⁰ regional declarations and planning documents,⁵¹ international tribunal decisions⁵² as well as state practice. The concept of sustainable development is now an undoubtedly accepted global policy, and this 'notoriety' has thus given rise to legal debate as to the legal status of sustainable development in international law.

First, there is the argument to the effect that sustainable development is too imprecise in meaning and too vague a concept to acquire a normative status in international law.⁵³ Citing Gunther Handl, Freestone and Boyle noted that '[n]ormative uncertainty, coupled with the absence of justiciable standard for review, strongly suggest that there is as yet no international legal obligation that development must be sustainable, and that decisions on what constitutes

⁴⁷ See the United Nations Convention to Combat Desertification (The United Nations Convention to Combat Desertification in those Countries Experiencing Serious Droughts and or Desertification, Particularly in Africa). 1994, Preamble, Art. 9 (1); the United Nations Framework Convention on Climate Change, 1992 (ILM, 1992, Vol. XXXI, p. 849. Arts. 2 and 3); and the Convention on Biological Diversity (ILM, 1992. Vol. XXXI, p. 818, Preamble, Arts. I and 10 - "sustainable use of biodiversity").

⁴⁸ See the North American Free Trade Agreement (Canada, Mexico, United States) (NAFTA, Preamble, ILM, 1993. Vol. XXXII, p. 289); the World Trade Organization (WTO) (paragraph 1 of the Preamble of the Marrakesh Agreement of 15 April 1994, establishing the World Trade Organization, speaks of the "optimal use of the world's resources in accordance with the objective of sustainable development" - ILM, 1994. Vol. XXXIII. pp. 1143-1144); and the European Union (Art. 2 of the ECT).

⁴⁹ See the Rio Declaration on Environment and Development, 1992, which emphasizes sustainable development in several of its Principles (e.g., Principles 4, 5, 7, 8, 9, 20, 21, 22. Principles 24 and 27 refer expressly to "sustainable development" which can be described as the central concept of the entire document); and the Copenhagen Declaration, 1995 (paras. 6 and 8) following on the Copenhagen World Summit for Social Development, 1995.

⁵⁰ The World Bank Group, the Asian Development Bank, the African Development Bank, the Inter-American Development Bank, and the European Bank for Reconstruction and Development all endorsed the principle of sustainable development.

⁵¹ See for example the Langkawi Declaration on the Environment, 1989, adopted by the "Heads of Government of the Commonwealth representing a quarter of the world's population" which adopted "sustainable development" as its central theme; Ministerial Declaration on Environmentally Sound and Sustainable Development in Asia and the Pacific, Bangkok, 1990 (doc. 38a. p. 567); and Action Plan for the Protection and Management of the Marine and Coastal Environment of the South Asian Seas Region. 1983 (para. 10: "sustainable, environmentally sound development").

⁵² The Case Concerning Gabcikovo-Nagymaros (Hungary/Slovakia) ICJ Reps. (1997).

⁵³ Patricia W. Birnie, Alan E. Boyle and Catherine Redgwell, *International Law and the Environment*, 3rd edition (Oxford: Oxford Univ. Press 2002), at 265.

sustainability rest primarily with individual governments.’⁵⁴ They noted that it is unlikely that sustainable development has acquired the status of a customary norm in international law. Although international legal obligation may have been assumed in certain economic development sectors, regional declarations and planning documents, international treaties and practice, these scholars argue that a careful assessment of significant developments to date including the World Summit on Sustainable Development does not reveal sufficient *opinio juris* and state practice to support a proposition that states generally feel bound to develop sustainably. Reasoning along this line, Lowe noted that ‘the argument that sustainable development is a norm of customary international law, bidding on and directing the conduct of states, and which can be applied by tribunals, is not sustainable.’⁵⁵ Handl further argues that although legally significant expectations regarding environmental conduct have begun to crystallize around the concept of sustainable development and that it might eventually evolve into a *jus cogens* norm, he still sees the concept as being fraught with fundamental definitional problems which might render it unworkable.⁵⁶

While the reasoning so far has hinged on the absence of legal normativity in the concept of sustainable development, it might not be entirely accurate to classify sustainable development as a vague concept void of legal normativity. This is substantiated by the separate opinion of Vice-President Weeramantry of the International Court of Justice in the *Case Concerning Gabčíkovo-*

⁵⁴ Alan Boyle and David Freestone *International Law and Sustainable Development: Past Achievements and Future Challenges* (Oxford: Oxford University Press, 1999) at 16.

⁵⁵ Vaughan Lowe “Sustainable Development and Unsustainable Arguments” in Alan Boyle and David Freestone eds. *International Law and Sustainable Development: Past Achievements and Future Challenges* (Oxford: Oxford University Press, 1999) at 30.

⁵⁶ Günther Handl “Environmental Security and Global Change: The Challenge to International Law” 1 (1990) YBIL 3, at 25-26.

Nagymaros (Hungary/Slovakia).⁵⁷ Judge Weeramantry was of the view that the case before the court relates to the operation of two principles of international law which are at conflict - the right to development on the one hand, and the right to environmental protection on the other. In the context of his judgment, Weeramantry saw sustainable development as a principle that provides the basis for reconciling these potentially conflicting rights. He noted that the concept of sustainable development is a principle accepted not merely by developing countries, but one which rests on the basis of worldwide acceptance. Accordingly:

The principle of sustainable development is thus a part of modern international law by reason not only of its inescapable logical necessity, but also by reason of its wide and general acceptance by the global community...the concept has a significant role to play in the resolution of environmentally related disputes. The components of the principle come from well established areas of international law - human rights, State responsibility, environmental law, economic and industrial law, equity, territorial sovereignty, abuse of rights, good neighbourliness - to mention a few. It has also been expressly incorporated into a number of binding and far-reaching international agreements, *thus giving it binding force in the context of those agreements* [emphasis added]. It offers an important principle for the resolution of tensions between two established rights. It reaffirms in the arena of international law that there must be both development and environmental protection, and that neither of these rights can be neglected.⁵⁸

Although the general support of the international community is essential for an emerging principle to acquire a binding status in international law, there is no requirement that every member nation in the international community must expressly and specifically endorse it as such. Undoubtedly, there is ample evidence of state practice as well as incorporation of the concept of sustainable development in international instruments.⁵⁹ This 'wide and general acceptance by the

⁵⁷ *Supra* note 52.

⁵⁸ *Ibid* at 92.

⁵⁹ *Supra* notes 47, 48, 49 and 29.

global community' must have influenced Judge Weeramantry's assertion that sustainable development is not a vague concept but rather "a principle with normative value"⁶⁰.

Article 38 of the Statute of the International Court of Justice lists the major sources of international law to include treaties, custom, and general principles of law, while judicial decisions and the teachings of the most highly qualified publicists are listed as subsidiary sources.⁶¹ While it can not be said for certain that the concept of sustainable development has acquired a legally binding status in international law, it should be noted that where it finds expression or is incorporated into a legally binding treaty, then it becomes binding on the parties to the treaty by virtue of the binding nature of the treaty, and in the context of that particular treaty.

Outside this situation, there is still serious difficulty in attempting to establish the binding status of sustainable development in international law. Undoubtedly, there is evidence of state practice in support of the concept, however it is difficult to link such state practice to belief by such states that they are bound by law to act as they do. For example, Marong noted that "despite broad consensus on the principle of common but differentiated responsibility as a means of implementing sustainable development commitments at the international level, many industrialized countries have failed to live up to the commitments reached at the Millennium Summit and at the Monterrey Conference on Financing for Development."⁶² Hence, in light of the current state of international law, the concept of sustainable development can be seen as a strong guidance norm or principle, which states in the international community follow, though

⁶⁰ *Ibid* at 88.

⁶¹ Statute of the International Court of Justice, 59 Stat. 1055, T.S. No. 993.

⁶² Alhagi B.M. Marong "The Role of Law in Sustainable Development: A Case Study of the Petroleum Industry in Nigeria" (2003) Institute of Comparative Law, McGill University, Montreal.

not as a result of legal obligation on their part. Moreover, the status of sustainable development in international law is constantly evolving.⁶³ Hence it may be safe to predict an evolution in status (in the not-too-distant future) whereby sustainable development eventually acquires the status of a binding principle in international law. This, though, will require greater evidence of state practice and *opinio juris* than is currently obtainable.

1.1.3 Sustainable Development and Environmental Justice

Another area where the concept of sustainable development has generated considerable attention, is the transboundary movement of waste.⁶⁴ When we follow the trail of the transboundary movement of waste, what we observe is a dirty waste track commencing in rich developed countries in Europe and North America and (not by coincidence) always terminating in poorer developing countries in Africa, Asia or the Caribbean.⁶⁵ This trend is not new. Historically, the transboundary flow of waste has often followed the “path of least resistance” – the path of poverty and economic marginalization. This gives rise to equity concerns related to environmental justice. A study of the environmental justice movement shows that poor and marginalized communities have always been singled out as dumping sites for the rich’s waste.⁶⁶

⁶³ The Case Concerning Gabcikovo-Nagymaros (Hungary/Slovakia) ICJ Reps. (1997).

⁶⁴ Zada Lipman, “Economic Growth and Ecological Integrity – the Impact of Hazardous Waste Trade on the Economy and Environment of Developing Countries” 2006 (18) *Environmental Law and Management* 232 - 239

⁶⁵ Lawrence Summers, Chief Economist and Vice President of the World Bank (as he then was) in a leaked internal memo justified the migration of dirty industries to poor developing countries in Africa on the ground that these countries are vastly UNDER-polluted. See *The Economist*, February 8, 1998 page 66.

⁶⁶ Robert D. Bullard, “Poverty, Pollution And Environmental Racism: Strategies For Building Healthy And Sustainable Communities”, *A Discussion Paper prepared for the National Black Environmental Justice Network (NBEJN) Environmental Racism Forum World Summit on Sustainable Development (WSSD) Global Forum Johannesburg, South Africa July 2, 2002.*

If we perceive sustainable development as a process for balancing the scale between economic development and environmental protection, it becomes less problematic trying to establish the link between sustainable development and environmental justice. This is clearly reflected in the Brundtland definition of sustainable development as development that “meets the needs of the present without compromising the ability of the future generations to meet their own needs.”⁶⁷ While highlighting the need for tightened control over the dumping of hazardous wastes, the Brundtland Report stresses the need for ‘recognition by states of their responsibility to ensure an adequate environment for the present as well as future generations’ as an important step towards sustainable development. It further highlighted two essential elements of the concept of sustainable development: intergenerational and intragenerational equity or justice. Equity is about fairness and relates to the concept of social justice. “It represents a belief that there are some things which people should have, that there are basic needs that should be fulfilled, that burdens and rewards should not be spread too divergently across the community, and that policy should be directed with impartiality, fairness and justice towards these ends.”⁶⁸ With regards to the environment, the idea of equity implies that no individuals or groups of people should be made to bear greater environmental burden than the rest of the community.⁶⁹

Intergenerational equity advocates the notion of justice for future generations. It is based on the idea that justice spans past, present and future generations and hence obliges the present generation to ensure that the prosperity of the environment is maintained and enhanced for the benefit of posterity.

⁶⁷ *Supra* note 11.

⁶⁸ Jim Falk, Greg Hampton, Ann Hodgkinson, Kevin Parker, and Arthur Rorris, 1993, *Social Equity and the Urban Environment*, Report to the Commonwealth Environment Protection Agency, AGPS, Canberra, p.2.

⁶⁹ Sharon Beder, “Costing the Earth: Equity, Sustainable Development and Environmental Economics”, 4, 2000 *New Zealand Journal of Environmental Law*, pp. 227-243.

Intragenerational equity is concerned with equity between people of the same generation - the consideration of what is fair between people of the same nation as well as between nations. Intragenerational equity deals with all social and minority groups who are made to assume disproportionate environmental burdens by virtue of their social or economic situations. As noted by Bosselmann, the environmental ‘conflicts between rich and poor, white and non-white, Western lifestyle and indigenous cultures and North and South belong here’.⁷⁰ Bosselmann traced the environmental justice movement in the United States to these conflicts. Hence the concept of intragenerational justice serves to ensure equitable allocation of environmental burdens among the various segments of any given society at any given time. It is based on the notion that a particular segment of society should not be made to bear disproportionate environmental burdens by virtue of their race, class or economic position in life.⁷¹

In his classic work on race, class and environmental justice, Hofrichter saw environmental justice as a ‘social transformation directed toward meeting human needs and enhancing the quality of life— economic equality, health care, shelter, human rights, ... and democracy—using resources sustainably’.⁷² He attributed the continued failure to meet these basic needs to institutional decisions, marketing practices, discrimination, and an endless desire for economic growth.⁷³ The concept of environmental justice has thus come to be defined as:

⁷⁰ Klaus Bosselmann, “Ecological Justice and Law” in Richardson, Benjamin J., and Wood, Stepan (eds.) *Environmental Law and Sustainability*, (Oregon: Hart Publishing, 2006) *supra* note 31 at 150.

⁷¹ Robert D. Bullard, “Poverty, Pollution And Environmental Racism: Strategies For Building Healthy And Sustainable Communities”, *A Discussion Paper prepared for the National Black Environmental Justice Network (NBEJN) Environmental Racism Forum World Summit on Sustainable Development (WSSD) Global Forum Johannesburg, South Africa July 2, 2002.*

⁷² Richard Hofrichter, *Toxic Struggles: The Theory and Practice of Environmental Justice* (Salt Lake City: University of Utah Press 2002).

⁷³ *Ibid* at 4.

fair treatment and meaningful involvement of all people regardless of race, color, national origin or income with respect to the development, implementation and enforcement of environmental laws, regulations and policies. Fair treatment means that no group of people, including racial, ethnic or socio-economic groups, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal and commercial operations or the execution of federal, state, local and tribal programs and policies.⁷⁴

Environmental degradation is interwoven with other social injustices such as poverty, racism, unemployment, and other diminishing quality of life factors resulting from national as well as transnational corporate activities. The concept of environmental justice gained greater attention with the rise of the environmental justice movement in the United States. The rise of this movement has been attributed to the practice of dumping hazardous waste as well as location of hazardous waste facilities such as incinerators and landfills in neighborhoods or communities characterized by race and class. The movement was thus a response to the disproportionate burden suffered by African-American and Latino communities which were targeted as prime site for hazardous waste dumps, hazardous facilities, and polluting industries. As Pellow argues, ‘racism and class inequalities reinforce each other and become more visible when vulnerable communities confront environmental harm.’⁷⁵

The connection between poverty and environmental degradation is now well-recognized and acknowledged in jurisprudence and international instruments. Poverty deprives people of the choice about whether or not to be environmentally sound in their activities.⁷⁶ *The Brundtland Report* noted that those who are poor and hungry would often destroy their immediate

⁷⁴ Bullard et. al. “Toxic Wastes and Race at Twenty: 1987-2007: Grassroots Struggles to Dismantle Environmental Racism in the United States” (2007) A Report Prepared for the United Church of Christ Justice and Witness Ministries. Available online at <<http://www.ejnet.org/ej/twart.pdf>>.

⁷⁵ See David Naguib Pellow, *Resisting Global Toxics: Transnational Movements for Environmental Justice* (Cambridge, Mass. : MIT Press, 2007) at p. 6.

⁷⁶ *Supra* note 69.

environment in order to survive.⁷⁷ According to Atapattu, poverty is among the most significant polluters. The greater the number of people who live in poverty, the worse for the environment as poor people are left with ‘no choice but to resort to unsustainable practices in order to eke out a meagre living’.⁷⁸ This fact is evident in the activities of e-waste scavengers and recyclers in developing countries who engage in unsustainable waste recycling activities with little or no regard to human health and the environment.

Although the environmental justice movement did not completely eradicate the marginalisation of minority communities in the United States, the movement was very instrumental in drawing attention to the environmental racism that was prevalent in American society. In many cases, series of protests by organized groups in minority communities resulted in the closure of existing hazardous waste facilities or refusals of regulatory permits to locate new facilities in their communities.⁷⁹ The consciousness created by the movement subsequently translated into tougher policy frameworks and environmental legislation relating to the disposal of hazardous waste. The U.S. Environmental Protection Agency (EPA) began to introduce tougher regulation relating to hazardous waste disposal in the United States.⁸⁰ The new move by the EPA resulted in higher costs of disposal of toxic wastes unaccompanied by any corresponding effort to reduce tons of toxic waste being generated from industries. As long as these industries continue to generate more wastes, it must go somewhere and few communities are prepared to welcome these poisons within their borders. Some companies in industrialized countries, exasperated by the shortage of

⁷⁷ *Supra* note 11 at 72.

⁷⁸ *Supra* note 14 at 313 – 314.

⁷⁹ Tony Allen-Mills, "Louisiana blacks win nuclear war" *London Sunday Times*, May 11, 1997; See also United Church of Christ Commission for Racial Justice, *Toxic Waste and Race in the United States: A National Report on the Racial and Socioeconomic Characteristics of Communities Surrounding Hazardous Waste Sites*, New York, 1987.

⁸⁰ See Resource Conservation and Recovery Act 42 U.S.C. §6901 et seq. (1976).

legitimate hazardous waste hauling and disposal services, began to look beyond their borders and this has proved especially damaging to developing countries with weak environmental protection.⁸¹

Marbury noted that the environmental inequity or racism in the United States may be viewed as a microcosm of the problem of waste export to developing countries. Waste export, he noted, is just environmental racism on a global scale. He argued that:

The main similarity between the two is who shoulders the burden of living near and with the hazardous waste. Under each regime, the poor are forced to shoulder a disproportionate amount of national and global burdens... the targets of hazardous waste exporting have been poor and developing nations, primarily because disposal in these developing nations is less expensive as a result of less stringent, or non-existent, environmental regulations.⁸²

Building on the works of scholars of environmental justice studies, environmental sociology, and social movement theory, Pellow argues that “the practice of waste dumping across national borders is a form of transnational environmental inequality and is reflective of unequal, and deeply racialized, relations between and within the global North and South communities.”⁸³ Pellow identified four principal reasons for the shift in hazardous waste disposal from minority communities in developed countries to developing countries. These reasons also give us an insight into some of the underlying factors that sustain the current transboundary dumping of e-waste in developing countries.

⁸¹ Daniel Faber, “The Political Ecology of American Capitalism - New Challenges for the Environmental Justice Movement” in Daniel Faber, (ed.), *The Struggle for Ecological Democracy: Environmental Justice Movements in the United States*, (New York, Guilford Press, 1998).

⁸² Hugh J. Marbury “Hazardous Waste Exportation: The Global Manifestation of Environmental Racism” *Vanderbilt Journal of Transnational Law*, (1995) 28 p. 251 - 296 at 291.

⁸³ *Supra* note 75 at 2.

The first reason, according to Pellow, is the massive increase in hazardous waste generation in industrialized societies, coupled with strict regulations relating to waste disposal thus resulting in exponential increase in the cost of waste treatment and disposal in these nations. The strict regulation in industrialized societies is due partly to the success of the environmental justice movement, which has resulted in a regulatory structure that provides minimal tolerance for violation. The downside of this environmental justice “success” in developed countries is to provide incentive for hazardous waste generators to seek disposal sites beyond their national borders - in most cases in developing countries characterized by lax regulatory regimes which allows for dumping at a fraction of the cost of disposal in developed countries.⁸⁴

Pellow identified class as the second reason for the transboundary movement of hazardous waste to developing countries. He argued that most of the wastes importing states are states on geopolitical and economic periphery, states with past history of colonization that are sometimes left with a difficult choice of accepting financial compensation or debt cancellation in return for permission to dump hazardous waste in their national borders.⁸⁵ This has often been referred to as garbage imperialism or toxic colonialism.*

⁸⁴ This is not to imply that hazardous waste is not transported between developed countries legally. As a matter of fact, much of the hazardous waste produced by countries in North America and Europe are exchanged between those countries in a legalized trade system. In the 1980s, about 90% of hazardous waste shipped from the US went to Canada. However, this transboundary movement of hazardous waste was sustainable for many reasons. First, the waste is often transported for the purpose of treatment or recycling and never for the purpose of dumping (as is always the case in developing countries). Secondly, the receiving nation will often have the technology to manage and treat such waste, and thirdly the receiving nation has the political and economic leverage to negotiate for what it views as a fair price exchange.

⁸⁵ Pellow went further to cite as an example the African nation of Benin Republic which was colonized by France. Since its independence in 1960, the country has remained heavily indebted to France and other international institutions. French traders had offered to pay up a large portion of the debt in exchange for the country accepting their toxic cargo. Pellow, Weinberg, Schnaiberg reported in 2001 that Benin’s motivation to accept such payment stemmed largely from its desire to repay its mounting debt to France. *Supra* note 75 at 11.

· Ibid

The third driving force behind the transboundary movement of hazardous waste to developing countries is the seemingly inexorable power of economic globalization which compels corporations to believe that the best and only viable strategy is to cut cost and increase profit. This ideology has not only compelled transnational corporations to scour the globe for cheap labour and resources, but also to trade and dump their wastes in nations and communities where, as a result of unstable states and vulnerable economies, the cost of such practice seems to be profitable.

The fourth reason, according to Pellow, is founded on the racist and classist culture prevalent among communities and institutions in developed countries to the effect that waste dumping in poor communities is not only acceptable but an economically prudent thing to do.⁸⁶ Charles W. Mills, referencing philosophy and historical texts, connects white racism to a psychological, cultural, and legal framework that links images of people of African descent with barbarism, filth, dirt, and pollution.⁸⁷ According to Mills, many whites view people of African descent as a form of pollution, thus giving rise to the view that it is very more sensible to dump industrial

⁸⁶ This ideology was evident in a leaked memo authored by Lawrence Summers, Chief Economist and Vice President of the World Bank (as he then was). In his infamous memo, Summers gave three reasons why his institution (the World Bank) should encourage MORE migration of dirty industries to developing countries:

“1) The measurements of the costs of health impairing pollution depends on the foregone earnings from increased morbidity and mortality. From this point of view a given amount of health impairing pollution should be done in the country with the lowest cost, which will be the country with the lowest wages. I think the economic logic behind dumping a load of toxic waste in the lowest wage country is impeccable and we should face up to that.

2) The costs of pollution are likely to be non-linear as the initial increments of pollution probably have very low cost. I've always thought that under-populated countries in Africa are vastly UNDER-polluted, their air quality is probably vastly inefficiently low compared to Los Angeles or Mexico City. Only the lamentable facts that so much pollution is generated by non-tradable industries (transport, electrical generation) and that the unit transport costs of solid waste are so high prevent world welfare enhancing trade in air pollution and waste.

3) The demand for a clean environment for aesthetic and health reasons is likely to have very high income elasticity. The concern over an agent that causes a one in a million change in the odds of prostate[sic] cancer is obviously going to be much higher in a country where people survive to get prostate[sic] cancer than in a country where under 5 mortality is 200 per thousand. Also, much of the concern over industrial atmosphere discharge is about visibility impairing particulates. These discharges may have very little direct health impact. Clearly trade in goods that embody aesthetic pollution concerns could be welfare enhancing. While production is mobile the consumption of pretty air is a non-tradable.” *Supra* note 65.

⁸⁷ *Supra* note 75 at 97.

waste and factory pollution in their nations and neighbourhoods. Environmental philosopher Robert Higgins also identifies the cultural sources of meaning of racial and social pollution, in that minority environments are seen as “appropriately polluted” spaces.⁸⁸ He argues that environmental injustice is a product of the social deployment of power in the “mastery of nature”*. Pellow further noted that Mills and Higgins provide a framework for understanding why environmental injustice is so prevalent.

That poverty in developing countries is connected to international environmental injustice is evident in the transboundary movement of waste to these countries as well as the resulting environmental degradation in these societies. Attapatu opined that poverty and environmental degradation constitutes a vicious cycle – ‘poverty leads to environmental degradation which, in turn, leads to more poverty which leads to even more environmental degradation’.⁸⁹ While the situation in most developing countries in Africa seems to provide strong basis for her argument, to what extent this argument is accurate in other cases remains debatable. South Korea, for example was a poor country that overexploited its resources, and yet it was able to break out from the vicious cycle of poverty.

That notwithstanding, the *Bruntland Report* suggested that since poverty is a major cause and effect of global environmental problems, “it is futile to attempt to deal with environmental problems without a broader perspective that encompasses the factors underlying world poverty and international inequality.”⁹⁰ Thus the concepts of sustainable development and environmental

⁸⁸ *Ibid* at 98.

* *Ibid*.

⁸⁹ *Supra* note 14 at 313 – 314.

⁹⁰ See *The Brundtland Report* *supra* note 11 at 8.

justice align to assert that the rich should not develop at the expense of the poor. Although environmental degradation is a global problem, the issue of poverty in relation to transboundary movement of e-waste is one-sided. While wealth and affluence fuel the consumption and discarding of e-waste in industrialized societies, the poverty in the industrializing societies attracts such waste. Hence the issue of poverty in this case is a causal factor at the receiving end of the e-waste stream.

The quest for economic development in industrializing societies must be balanced with the need for health and environmental protection. Thus, the concepts of sustainable development and environmental justice aim to limit the adverse environmental impacts resulting from the quest for social and economic development as well as equitable allocation of environmental burden resulting from such developments. The current practice in transboundary movement of waste electrical and electronic equipment to developing countries breaches the very concepts of sustainable development and environmental justice. Although these concepts are not binding principles in international law, they provide a strong moral foundation for change in the current practice. Hence, in line with the concepts of environmental justice and sustainable development, this research seeks to develop a framework that will prevent the inequitable dumping of waste electrical and electronic equipment in developing countries in the guise of international trade in used electronics. The research also seeks to maximize the ability of developing countries to benefit from international trade in used electronics while at the same time minimizing the adverse health and environmental impacts that arise from it. Since the issue of transboundary movement of e-waste involves both developed and developing countries, this research takes the view that a sustainable solution to the problem will equally involve both sides - each acting in differing capacities.

1.1.4 ICT, E-waste and Sustainable Development

The rapid growth in ICT penetration around the globe appears to be taking place at a pace much faster than the pace at which political decision makers react to the changes. The Internet, the mobile networks, and other ICT systems have a massive economic, social and ecological effect on a global scale.⁹¹ On the positive side, ICTs are making astounding progress in technical efficiency, while on the negative side, it has been difficult for society to transform this technical efficiency in terms of sustainable development, which according to Hilty entails “providing a quality of life to all people without overusing the ecosystem.”⁹²

In its Tokyo Declaration in 2008, the Global Information Infrastructure Commission (GIIC) noted that “ICT has historically been viewed as a tool to advance productivity, to change the behaviour of businesses and consumers, and through these changes, ICT can help the environment without sacrificing economic output”.⁹³ Grossman noted that the endless flow of information communication technology leaves behind not just environmental degradation but also enormous quantity of waste which results from the extraction of raw materials utilized in the production of ICT equipment as well as the disposal of same equipment at the end of its short productive life.⁹⁴

While consumers in developed countries continue to feed the ever-increasing surge of ICT equipment, they have become oblivious to the negative impacts arising from raw material

⁹¹ Hilty, “Information Technology and Sustainability” *supra* note 32.

⁹² *Ibid*.

⁹³ Global Information Infrastructure Commission (GIIC), “The GIIC Tokyo Declaration” April 25, 2008, P. 2

⁹⁴ Elizabeth Grossman, *High tech trash: digital devices, hidden toxics, and human health* (Washington: Island Press, 2006) at 5 [Grossman, “High tech trash”].

extraction, as well as production and consumption of this equipment.⁹⁵ Goosey has noted the growing concerns over the negative impact the electronics industry and its outputs are having on both society and the environment.⁹⁶ This growing concern is thus shifting attention to the concept of sustainability and the need to produce and consume in a more sustainable manner. Goosey thus defined the concept of sustainable development in relation to the electronic industry as “*Adopting strategies and activities that meet the needs of the enterprise and its stakeholders today while protecting, sustaining and enhancing the human and natural resources that will be needed in the future.*”⁹⁷ He noted that one of the areas in which lack of sustainability has been very evident is in the manufacture, use and disposal of ICT equipment. While the ICT industry has been very instrumental in providing us with products and devices that are very essential in maintaining our modern way of life, the industry also represents an area where opportunity to operate sustainably is yet to be realized.

The main issues relating to sustainability in the electronic industry arise at various stages including material extraction, production and disposal at the end of useful life. For example, over half of the material component of a typical computer is made up of metals. While these metals are extracted and refined at great cost, most of the metals that go into electronics production eventually end up in landfills, incinerators or other waste dumps. Such practice represents an unsustainable consumption pattern.⁹⁸ According to Grossman:

We’re producing and discarding more electronics than ever while reusing only a small fraction of their materials. This pattern of consumption means more mining,

⁹⁵ For example, the mining of Coltan, a raw material used in the production of capacitors in electronic products has continued to fuel civil unrest in countries like Democratic Republic of Congo.

⁹⁶ Martin Goosey, “Introduction and Overview” in Ronald E. Hester and Roy M. Harrison (eds.) *Electronic Waste Management - Design, Analysis and Application* (Cambridge: RSC Publishing, 2009).

⁹⁷ *Ibid* at 1.

⁹⁸ Grossman, “High tech trash” *Supra* note 94 at 2 and 3.

more fossil fuel extraction, and more refining, with all of the direct and secondary environmental and health impacts that come with these processes.⁹⁹

Another area of growing concern in relation to the unsustainable practice in the electronics industry is the unethical practice of transboundary movement to or disposal of waste electrical and electronic equipment in poor developing countries with insufficient technical capacity to manage such waste thus giving rise to health and environmental concerns. This is an aspect of the electronic waste problem which has been referred to as “the world’s fastest growing and potentially most dangerous waste problem.”¹⁰⁰

Jain noted that there are more than 1000 hazardous and non-hazardous substances in e-waste consisting of ferrous and non-ferrous metals, plastics, glass, wood and plywood, printed circuit boards, concrete and ceramics, rubber, and other items.¹⁰¹ Grossman also noted the distinctive peculiarity of e-waste as compared to other wastes. While waste from other manufactured products such as soda cans, bottles, and newspapers are made of one or few materials, electronic products on the other hand are composed of dozens of toxic substances. These electronic products by themselves do not constitute any hazard to health and the environment except in the event of exposure which could occur when they are physically damaged, improperly disposed of or dismantled, resulting in these hazardous substances being released into the environment and their toxicity becoming evident.¹⁰²

⁹⁹ *Ibid* at 21.

¹⁰⁰ Cris Prystay, “Recycling E-waste”, *Wall Street Journal*, September 23, 2004, B1.

¹⁰¹ Amit Jain, “Global e-waste growth” in Rakesh Johri, eds. *E-waste: Implications, regulations, and management in India and current global best practices* (New Delhi: Energy and Resources Institute, 2008) at 6. Other toxic substances found in e-waste include: Cadmium and cadmium compounds, mercury and mercury compounds, lead and lead compounds, chromium, polychlorinated biphenyls, arsenic, asbestos, barium, chlorine, copper, polychlorinated and polybrominated dibenzodioxins and dibenzofurans, zinc, antimony etc.

¹⁰² Grossman, “High tech trash” *Supra* note 94 at 6.

Many of these substances are hazardous to human health. For example, dioxins and furans, which are emitted during the incineration of plastic components in electronic devices, are known to have adverse effects on the endocrine and nervous systems. Other chemical substances such as lead, mercury and cadmium have been associated with behavioral, developmental, and neurological disorders, as well as autoimmune and other chronic diseases. Some have been shown to be so toxic that even very small doses could be fatal to embryonic cell development.¹⁰³

The inability to manage the production, consumption and disposal of electronic products has great potential to affect sustainability as well as sustainable development, especially in developing countries.

In the face of the serious global challenge in relation to management of waste electrical and electronic equipment, legislation in many developed countries has adopted strict measures regulating domestic disposal and recycling of electronic waste.¹⁰⁴ While doing much to regulate domestic e-waste disposal and recycling, very little seems to have been done by industrialized countries like United States and Canada to regulate the transboundary shipment and hence disposal of such electronic wastes in developing countries in the guise of recycling or exportation of used electronics. Although such shipment may be legal under the domestic laws in such countries (which in some cases have even been deliberately modified to tacitly encourage e-waste dumping abroad), often they are illegal under international laws which these countries have partially or deliberately refused to ratify.¹⁰⁵ This results in a significant amount of e-waste

¹⁰³ See National Academy of Sciences, *Toxicological Effects of Methyl Mercury*, (National Academy Press, Washington DC., 2000) <<http://www.nap.edu/openbook.php?isbn=0309071402>>.

¹⁰⁴ Wendy Koch, "More states ban disposal of electronics in landfills" *USA Today*, December 18, 2011.

¹⁰⁵ While Canada has ratified the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, a treaty that restricts the transboundary movement of hazardous waste, it has refused to

from these countries being sent to developing countries that have few (if any) protections for the environment and the workers engaged in the processing of the e-waste.¹⁰⁶

The combination of highly toxic substances found in electronic wastes and zero or lax regulation in developing countries raises a serious concern about the shipment and treatment of e-waste in developing countries which lack the capacity for safe and proper dismantling or recycling of such equipment.

The ICT revolution has fueled globalization, but globalization can be viewed as a double-edged sword in that aside from its negative impact especially on industrializing societies around the world, it also offers an opportunity to develop a new international corporate responsibility structure, as well as an opportunity to engage people, governments and the electronic industry around the world in positive efforts to manage the negative impact of electronic products. This will require on the part of the industrialized world, the development of policies that will provide incentive for the electronics industry to produce environmentally-friendly products, and on the part of the industrializing world, to adopt trade policies that would allow for the importation of functional used electrical and electronic products while at same time restricting the flow of junk e-waste.

ratify the Basel Ban - an amendment to the Basel Convention which bans movement of hazardous wastes to developing countries. The US has ratified neither the Convention nor the amendment.

¹⁰⁶ See Linda Luther, "Managing Electronic Waste: Issues with Exporting E-Waste" (2009) Congressional Research Services online <<http://www.fas.org/sgp/crs/misc/R40850.pdf>>.

1.2 Objective

This thesis aims at conducting detailed research into the beneficial and adverse impacts of international trade in used electrical and electronic equipment from developed to developing countries. The beneficial impacts investigated include the socio-economic gains and opportunities arising from international trade in used electronics as well as increased access to ICT infrastructure which is essential for poverty eradication and economic development in low-income economies. On the other hand, the thesis also investigates the adverse effects of this trade in the form of health and environmental impacts arising from clandestine dumping of junk e-waste in developing countries in the guise of international trade in used electrical and electronic equipment. Thereon, the thesis seeks to develop a legal framework aimed at reconciling these diverse impacts so as to achieve sustainable development in industrializing societies.

The thesis also aims to develop a framework that could be adopted by developed countries in mitigating the adverse health and environmental impacts that arise from end-of-life management of electrical and electronic equipment. On the part of developing countries, the thesis seeks to proffer trade measures that could be implemented to regulate the transboundary flow of e-waste into the region without unnecessarily interfering with legitimate trade in functional used electrical and electronic equipment. Such policy, it is argued, will also help in mitigating the health and environmental impacts of e-waste in the region.

In the pursuit of this objective, the thesis seeks to develop best practices in terms of end-of-life management of electrical and electronic equipment by examining various frameworks that have been applied in the end-of-life management of electrical and electronic equipment, and by evaluating the advantages and disadvantages of such frameworks. Thus the objective of this research is two-fold – to identify the best practice for end-of-life management of e-waste in

developed countries, and to develop a WTO/GATT compliant trade measure that could be applied by developing countries in regulating the transboundary flow of e-waste into their jurisdiction.

1.3 Methodology

This research adopts legal methodology and qualitative comparative analysis which was complemented by field research in the West African countries of Ghana and Nigeria. The legal methodology entails detailed analysis of WTO case law, jurisprudence, and review of existing literature related to the framework proposed in this research. The research also undertook a comparative analysis of the e-waste regulatory framework in Europe especially under the European Union's Waste Electrical and Electronic Equipment (WEEE) Directive¹⁰⁷ vis-à-vis the frameworks in North America.

The choice of Ghana and Nigeria for the field research is based on the high volume of transboundary movement e-waste into these countries. Nigeria currently receives the largest share of e-waste flow in Africa. The field research in Nigeria was funded by the International Development Research Center (IDRC), Canada and covered a period of 12 weeks (January to March 2011) in Lagos and Ibadan in Western Nigeria. The field research was done in collaboration with the Basel Convention Regional Center at the University of Ibadan, Nigeria. The field research took the form of visits to used electronics markets, as well as e-waste dumpsites, Internet cafes, a formal e-waste recycling plant in Lagos, and a reprography market at

¹⁰⁷ European Union, 2003. Directive 2003/108/EC of the European Parliament and of the Council of 8 December 2003 amending Directive 2002/96/EC on waste electrical and electronic equipment (WEEE), Article 14 <<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CONSLEG:2002L0096:20090112:EN:PDF>>.

the University of Ibadan. The results from the field research were obtained using observation techniques as well as interviews. Unstructured interviews were conducted with proprietors of small-scale business establishments operating on used electrical and electronic equipment such as Internet cafes and reprography centers. Since Nigeria has the highest volume of UEEE imports in Africa, the field research in the country was designed with the primary purpose of identifying the economic impacts of the used electrical and electronic equipment trade. Additional information was also gathered from meetings with stakeholders at the Lagos E-waste Summit which was organized by the Lagos State Government in collaboration with the Basel Convention Regional Center in Nigeria and the Environmental Law Research Institute.¹⁰⁸ The Summit provided an opportunity to meet with different stakeholders in the transboundary flow of e-waste into Nigeria. Also at the meeting, some of the challenges of e-waste management in Nigeria were discussed thus providing further insight into the e-waste situation in the country.

Some difficulties though were encountered in the course of the field research. Prior to the conduct of the field research, the e-waste dumping in Nigeria had generated a series of negative national and international news coverage. As a result, most of the used electrical and electronic equipment sellers as well as scavengers in the major used electronic markets and e-waste dumpsites in Lagos viewed this trend as a threat to their business and livelihood. Expectedly, this group was very apprehensive and hostile to “foreigners” inquiring about the details of their business. This affected the ability to gather information, as some of the interviewees were not too willing to give out much information. To overcome this obstacle, information was gathered by observation of the operation of the markets and dumpsites as well as detailed interviews with one UEEE importer, two used electronic retailers, a repair technician and a scavenger.

¹⁰⁸ Eko E-Waste International Summit, February 24 – 25, 2011. <<http://www.elri-ng.org/ewaste/>>.

Information was also obtained via interviews with some public officials - a custom officer from the Nigeria Customs, an officer from the Lagos State Waste Management of Authority. Also interviewed was a proprietor of a formal e-waste recycling plant in Lagos. The recycling plant is the first of its kind in Nigeria, and was the product of a public-private partnership between the proprietor and the Lagos State Government. Additionally, at the time of the fieldwork for this thesis, the Basel Convention Center was also engaged in another project - the E-waste Africa Project. While the E-waste Africa Project focused on environmentally sound management of e-waste and capacity building in the informal sector in Nigeria, this research on the other hand, focused on the regulation of transboundary movement of used electrical and electronic equipment into Nigeria. Notwithstanding the focal difference, some of the data generated by the E-waste Africa Project are very much relevant to this research and are incorporated here.

The field research in Ghana was funded by the Center for International Governance Innovation (CIGI), Canada, and covered a period of 12 weeks (mid-June to mid-September 2012). The research was conducted in collaboration with Green Advocacy - a Ghana based NGO that conducts research into e-waste in Ghana. The field research took the form of visits to used electrical and electronic equipment sales outlets in the Greater Accra Region, as well as a visit to the Agbogbloshie e-waste dismantling and dumpsite. The results from the field research were obtained using observation techniques as well as interviews. Unstructured interviews were conducted with two UEEE importers, two UEEE retailers in various sales outlets, one e-waste dismantler and two scavengers at the Agbogbloshie dumpsite.

The Agbogbloshie dumpsite is the largest e-waste dumpsite in Africa. In view of the nature of the dumpsite, the field research in Ghana was designed with the primary purpose of identifying the health and environmental impact of UEEE trade in Ghana. Additional information was also

gathered from interview with an official from the Ghana Environmental Protection Agency (EPA). Unlike the field research in Nigeria which encountered a measure of difficulty in collecting information from research subjects, the case in Ghana was very different as the interview and research subjects were very cooperative and forthcoming with information about their activities.

The field research in Ghana and Nigeria provided among others an opportunity to study the conflicting socio-economic, health and environmental impacts of international trade in used electrical and electronic equipment in developing countries. The findings from the field research are discussed in detail in chapter three, with the aim of comparing the benefits of international trade in used electronics vis-à-vis the harm resulting from the trade. The findings from the field research will assist in developing a sustainable solution aimed at addressing the harm arising from the trade without unnecessarily interfering with or restricting its socio-economic benefits.

1.4 Summary of Argument Developed in the Thesis

The thesis argues that the current regulatory framework relating to transboundary movement of e-waste runs contrary to the principle of environmental justice and fails to enhance or ensure sustainable development in developing countries. It is argued that the principle of common but differentiated responsibilities could be applied in addressing the environmental injustice and lack of sustainability evident in the current framework relating to transboundary movement of e-waste to developing countries. The application of this principle on the part of developed countries will require development of and adoption of an environmental and regulatory policy framework that will enhance the design and manufacture of environmentally-friendly electrical and electronic

products as well as sustainable end-of-life management of such products through an effective and efficient take-back system.

Such policy should seek to regulate or control the toxic substances that go into the production of electrical and electronic equipment as well as enhance their reusability and recyclability and in turn, reduce resource consumption. It should also take into consideration the entire life cycle of the equipment beginning from the design stage to end-of-life. The framework should develop along the broader concept of design for the environment (DfE).¹⁰⁹ DfE is founded on the principle that product design plays a very crucial role in the impact of electronic products on human health and the environment as well as the management of such products at the end of their useful life. Hence it encompasses all aspects of product design aimed at reducing risks and enhancing environmental product performance. Thus, in relation to e-waste control and management, three different design frameworks will be discussed vis - toxic reduction, reuse, and recycling. It is argued that effective implementation of these frameworks in developed countries will either reduce or eliminate hazardous toxic contents in electrical and electronic products so that when such products are eventually shipped to developing countries towards their end of life, their impact on human health and the environment in the region would have been substantially reduced.

The research will further explore how developed countries can effectively influence design change in electrical and electronic equipment taking into consideration the fact that major electrical and electronic equipment manufacturers are multinational corporations domiciled in these developed countries and hence amenable to their regulatory jurisdiction. Additionally,

¹⁰⁹ Five Winds International, Design for Environment (DfE) Best Practices Lessons for British Columbia's Ministry of Environment, (2009).

developed countries have the technical and legal resources to make and enforce such policy regulations.

On the part of developing countries, it is the argument of the thesis, that the application of common but differentiated responsibilities will entail adoption by such countries of an international labelling or certification system for used electrical and electronic equipment along with international trade policies which will impose import bans for used electrical and electronic equipment not complying with the said certification standard. Such a certification system could be developed in collaboration with environmental NGOs and other relevant certification organizations.

Such an international certification system will serve to differentiate functional used electronics from junk e-waste. While the former may be eligible for export to developing countries, the research proposes an import ban on the later. Although trade restriction is generally frowned upon under WTO arrangements as can be seen in the provision of *Article 2* of the *Technical Barriers to Trade* (TBT) Agreement and *Article XX* of GATT, the research will go further (within the context of WTO jurisprudence) to develop arguments to provide legal justification for the proposed policy.

1.5 Research Questions

This research thesis seeks to examine the following questions:

1. What are the socio-economic and health/environmental impacts of the transboundary movement of used electrical and electronic equipment to developing countries and how can these diverse impacts be reconciled to enhance sustainable development in the region?
2. What existing legal frameworks regulate the transboundary movement and management of e-waste and to what extent have these frameworks been effective or ineffective in attaining the desired objectives?
3. The concept of environmental protection is based among others on the principle of common but differentiated responsibilities. What are the differentiated responsibilities of developed and developing countries in relation to sustainable management and transboundary movement of e-waste to developing countries?
4. In the light of the WTO framework and emerging jurisprudence, what trade measures can be applied by developing countries to effectively regulate the importation of e-waste?

1.6 Structure of the Thesis

This research thesis is divided into six chapters. Chapter one is a general introduction to the research topic of the thesis, its research objective, methodology and general overview of the research argument. Chapter two is an attempt at conceptualization of e-waste. It starts with a theoretical discussion on the concept of waste, examining the key factors in the definition of waste under various legal frameworks such as the OECD, Basel Convention and EU frameworks. Proceeding further, an attempt is made to define the concept and boundary of e-waste and subsequently introduce the reader to a theoretical discussion of e-waste and factors responsible for the growing volume of e-waste that is currently being generated in developed countries.

Chapter three of the thesis will introduce the reader to the nature of international trade in used electrical and electronic equipment in developing countries. It will examine the socio-economic benefits of the trade as compared to its health and environmental impacts. This chapter incorporates the results from field research in Nigeria and Ghana to further highlight these conflicting impacts and the need for resolution of these impacts in order to achieve sustainable development. Chapter four seeks to examine current legal frameworks relating to transboundary movement of e-waste and their regulatory implication. For this purpose, relevant principles of international environmental law will be examined. The chapter will also consider legal frameworks under the auspices of the Basel Convention, the OECD and EU aimed at regulating the transboundary movement of e-waste. Rather than relying on developed countries' structured framework to regulate transboundary movement to developing countries, the research takes the view that such a task is best undertaken by developing countries themselves.

Chapter five will examine the possible development of trade restrictive measures that could be applied by developing countries in regulating the transboundary flow of e-waste into their jurisdiction. The research is not oblivious to the fact that WTO rules generally frown upon trade restrictive policies. However, since international trade generally tends to impact non-trade related issues, WTO Agreements usually contain exceptions to their 'pro-trade' rules and so often provide a mechanism for balancing trade against other legitimate policy goals such as those related to the protection of human health and the environment. In view of this, chapter five seeks to provide justification for the proposed trade measure by examining same in the light of WTO Agreements, particularly the GATT and TBT Agreements.

Chapter six will undertake a detailed examination of policy frameworks that could be applied by developed countries in the management of waste electrical and electronic equipment. The

chapter proposes a design-for-the-environment framework which aims to minimize the adverse impacts associated with electrical and electronic equipment. The chapter argues that such a design framework is important in e-waste management because of its tendency to deal with the e-waste problem by eliminating its adverse impact at source. The chapter will also examine the concept of extended producer responsibility (EPR) and how it could be used to achieve the design-for-the-environment framework proposed in the thesis.

Chapter Two

2. CONCEPTUALIZING ELECTRONIC WASTE

Waste lies in the eyes of the beholder

A primary step in a study of the transboundary movement of e-waste is to define and conceptualize the subject matter of the study. In conceptualizing the subject matter of e-waste, it is important to develop a comprehensive insight into the much broader concept of waste. This is important because the notion of “waste” is difficult to conceptualize.¹¹⁰ It is even more difficult to attempt a universal definition of the term “waste”. This difficulty stems from the fact that what is deemed waste for some, might be valuable to others, hence the general saying that ‘one person’s waste is another person’s wealth’. Thus as will be seen later in this chapter, in most cases it is not the nature of a product that necessarily determines whether it is waste; the action or intention of the holder may be the determining factor.

2.1 The Concept of Waste

Viewed from a lay perspective, the concept of waste is associated with ‘valueless and useless, unwanted and discarded by-products of daily life; the leftovers of individual, collective and industrial production and consumption, often characterized as dirty, smelly or unhygienic’.¹¹¹ Waste has become synonymous with terminologies such as rubbish, garbage, trash, residue, junk,

¹¹⁰ Mirina Grosz, *Sustainable Waste Trade under WTO Law: Chances and Risks of the Legal Frameworks’ Regulation of Transboundary Movements of Wastes*, (Boston: Martinus Nijhoff Publishers, 2011) at 7 [Grosz, “Sustainable Waste Trade”].

¹¹¹ *Ibid* at 7.

pollution etc. These terminologies are based on ‘perception of waste as a material or an assembly of materials with a negative value; supposedly often accompanied by their generators’...feeling of profligacy, indifference or disgust’.¹¹²

From a technical perspective, the notion is relative in two main respects. First, an article becomes waste when it loses its primary function for the user or the owner, though it may still retain some value to someone other than the original user or owner. Thus someone’s waste output might also be someone’s raw material or even valuable goods. Secondly, the notion of waste is also coloured by the level of technological development as well as the locality where the waste is generated.¹¹³ In this case, a product that is still capable of performing its original function could become waste merely on the basis of technological obsolescence, or the standard of living in the locality where it is generated.

Thus waste is often perceived in terms of an object or substance of which its owner or user has ‘disposed, intends to dispose or is required by law to dispose/discard’.¹¹⁴ Various reasons exist for disposing or intending to dispose of certain objects or materials. It might be that the object is outdated, obsolete, no longer functional (junk), no longer needed, cannot be fixed (or the cost of fixing is worth more than the cost of replacement) etc. Though the perception of waste could be determined by the nature of the object or material, in most cases, a regulatory definition of waste tends to focus on the action or intention of the waste generator.

Perceiving waste as rubbish or a worthless substance is superficial and inaccurate. Grosz observed that waste rather constitutes the establishing pillars of an industry that is based on the

¹¹² *Ibid* at 8.

¹¹³ Eva Pongrácz, “Re-defining the concepts of waste and waste management. Evolving the Theory of Waste Management”, (Dissertation, 2002) University of Oulu, Finland.

¹¹⁴ *Ibid*.

extraction of resources from end-of-life materials and their re-use and recycling.¹¹⁵ Against this background, waste has been described as a source of raw material, leading to a notion of the recycling industry as being in the rather “alchemistic” – with the capacity to provide a substitution for virgin raw materials in production processes.¹¹⁶ More so, functional electrical and electronic equipment discarded as waste (due to obsolescence) in developed countries are meeting a growing demand in low-income developing countries, thus providing socio-economic benefits. This perspective of waste is in line with the theory of circular flow of value in the economy.

Grosz noted that the negative connotation of waste as ‘useless and unwanted results of modern production and consumption’ is now being overcome by the more refined view of waste material as economic goods.¹¹⁷ According to Grosz:

What is referred to as “waste” is not a specific material object but depends on the valuation of the substance in question. In other words, depending on their valuation, materials will either be regarded as worthless residues, partly dropping out of the economic system through their disposal, or they will remain a part of the economic cycle on the basis of their intrinsic characteristics and values. Independently of whether discarded materials are disposed of as “dirt” or recovered as valuable resources, however, such a distinction does not hide the fact that such material does not “disappear” completely and, often enough, cannot be “cleaned-up” entirely.¹¹⁸

Thus with the growing conception of waste as constituting a veritable source of value, it is not surprising to observe a growing transboundary movement of waste materials across national borders - from societies where such materials are treated as waste to societies where they are accorded material value. In most cases, such transboundary flow has given rise to health and

¹¹⁵ Grosz, “Sustainable Waste Trade” *Supra* note 110 at 16.

¹¹⁶ *Ibid* at 15.

¹¹⁷ *Ibid* at 18.

¹¹⁸ *Ibid*.

environmental concerns arising from the nature and management of such waste in their final destination. These concerns arise from the fact that waste could imply potential risks to the environment as well as to human health: from an environmental perspective, toxic substances in waste (depending on their nature) could result in environmental contamination.¹¹⁹ Impacts of waste on the environment may also lead to adverse effects on human health. In light of the latter situation, waste management efforts to regulate the impact of waste on human health and the environment are now an essential aspect of public health policy.

2.2 Legal Conceptualizations of Waste

Definition is most obviously an effective method for characterizing a concept. Definition may be descriptive or stipulative i.e. it may state or describe the accepted meaning, or meanings, of a term already in use; or assign, by stipulation, a special meaning to a given term. An effective definition of a core concept has several important characteristics which include among others providing ‘an epistemologically well-bounded theoretical construct of the concept’.¹²⁰

Definition is particularly important in a system of regulatory control, as it is necessary to define what can and cannot be controlled. Such definition should be extensive to cover the various activities to be controlled, while at the same time not so broad that it results in over-regulation.¹²¹

Legal definition of waste is important because in most cases, waste is often subject to regulatory

¹¹⁹ Ibid.

¹²⁰ Terence Love, “Constructing a coherent cross disciplinary body of theory about designing and designs: some philosophical issues”, (2002) *Design Studies* Vol. 23 No. 3, 345 – 361 at 355.

¹²¹ Ilona Cheyne and; Michael Purdue, “Fitting definition to purpose: The search for a satisfactory definition of waste”, *Journal of Environmental Law* (1995) 7(2):149.168.

control. Thus the success or failure of such regulatory control is often subsistent on the appropriate definition of the subject matter of the regulatory control.

There are various approaches adopted in legislative drafting in defining the subject matters or terms in a statute. A piece of legislation could adopt a descriptive or stipulative definition of a subject matter. Another approach is to define the subject matter by reference to the purpose of the legislation. In some cases, a subject matter could be defined by reference to a list(s). The implication is that any item falling within the items on the referenced list(s) comes within the context of the subject matter in the regulation. One problem with the list approach is that it is rigid and inflexible in nature especially where the subject matter is dynamic in nature or where, for example, new items emerge which have similar characteristics to those on the list but are not expressly identified in the list. This makes regulatory effort very difficult if not impossible as it may create loopholes for circumventing the regulation. To overcome this problem, provision is often made for the possibility of the list to be updated with the passage of time or with increasing knowledge and to prevent any exploitation of loopholes.¹²²

Opinions diverge sharply on the definition of waste. This is not surprising considering the fact that ‘waste’ is a very subjective issue. That notwithstanding, the effectiveness of waste control or management legislation is to a greater extent dependent on the proper definition or conceptualization of the subject matter of waste, otherwise legislative gaps or conceptual flaws or defects may undermine the efficacy of the regulatory framework. Different approaches applied in some legal frameworks in conceptualizing or defining waste will be considered below.

¹²² For example, *Article 4(3)* and *Article 6* of the European Union’s Directive on Reduction of Hazardous Substances (RoHS) require the periodic review of new scientific evidence to consider whether other hazardous substances should be added to the list of prohibited substances in the Directive.

2.2.1 Basel Convention

The *Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and their Disposal* is the only international legal framework that regulates the transboundary movement of hazardous waste.¹²³ Article 2.1 of the Convention defines waste in terms of the destination of the waste evident from the action or intention of the waste holder, or requirement of the law. According to the said provision, “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”. Thus, actual disposal, intention to dispose, or requirement of the law to dispose of the substance or object constitutes the core elements in the waste definition under the framework.

It will be seen from the above that the Basel Convention links the definition of waste to disposal operations. Disposal operation in the context of the Basel Convention is very broad and encompasses operations that will do away with or result in the destruction of the substance or object such as landfilling, incineration etc. to other operations likely to result in the possibility of resource recovery, recycling, reclamation and reuse.¹²⁴

The Basel Convention went a step further in conceptualizing waste into two categories - “hazardous” and “other wastes”. For the purpose of the Convention, hazardous waste was defined by reference to a list of substances, articles and constituents in Annex I of the Convention which includes among others, waste substances and articles containing polychlorinated biphenyls (PCBs) and/or polychlorinated terphenyls (PCTs) and/or

¹²³ Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, 1673 UNTS 126; 28 ILM 657 (1989).

¹²⁴ See Annex IV, Basel Convention.

polybrominated biphenyls (PBBs), copper compounds, zinc compounds, arsenic, cadmium, mercury, lead etc.¹²⁵ Thus the Convention adopts a unique approach in this respect - rather than providing a general definition of hazardous waste, it resorted to referencing a list which indicates what substances should be treated as hazardous waste.

Thus if the characteristics or constituent(s) of an object can be related to the lists in Annex I, then its classification as hazardous waste is in line with Article 1(a) of the Convention. In addition, the Convention makes provision for the possibility of other substances or objects outside the Convention to be classified as waste under the domestic legislation of a party of export, import or transit.¹²⁶ “Other wastes” are defined by reference to Annex II to the Convention to include ‘wastes collected from households and residues arising from the incineration of household wastes which are not defined as hazardous wastes but are also included in the scope of the Convention’.¹²⁷

The Basel Convention’s conceptualization of hazardous wastes and hazardous characteristics by reference to technical annexes has been subject to criticism.¹²⁸ Kummer considered the reference lists (of hazardous substances) to be too wide, allowing a disproportionate range of substances to be included. Another shortcoming identified by Kummer relates to the fact that the reference list system adopted by the Convention does not establish minimum values of concentration, so that a substance with a quantitatively insignificant hazardous component may be considered a

¹²⁵ See Article 1 and Annex I. It should be noted that radioactive wastes and waste arising from normal operations of a ship, are excluded from the scope of the Basel Convention. See *Article 1(3) and (4)*.

¹²⁶ Article 1(1)(b).

¹²⁷ Article 1(2).

¹²⁸ Katharina Kummer, *International Management of Hazardous Wastes: The Basel Convention and Related Legal Rules* (Oxford: Oxford University Press, 1995) 50.

hazardous waste.¹²⁹ This shortcoming, though, seems to have been addressed albeit indirectly by Annex III which makes reference to the need for further research into testing methods to determine the hazardous potential of the wastes in question.

2.2.2 OECD Legal Framework

The OECD Framework is contained in the Decision of the Council C(2001)107/Final.¹³⁰ The OECD adopts an approach identical with the Basel Convention's conceptualization of waste.¹³¹ The OECD Council Decision defines "waste" as

substances or objects, other than radioactive materials covered by other international agreements, which: (i) are disposed of or are being recovered; or (ii) are intended to be disposed of or recovered; or (iii) are required, by the provisions of national law, to be disposed of or recovered.¹³²

Just like the Basel Convention, the intended destination of the substance or object is a decisive factor in waste definition under the OECD framework. Also, wastes not included in the OECD Decision but which are classified as hazardous by the domestic legal definitions of member countries of export, import or transit are recognized as such under the OECD framework.¹³³

The slight difference between the two frameworks lies in the fact that while the notion of disposal under the Basel Convention relates to both disposal and recovery, the OECD framework

¹²⁹ *Ibid* at 50.

¹³⁰ See Decision of the Council C(2001)107/Final Concerning the Control of Transboundary Movement of Wastes Destined for Recovery Operations, as amended by C(2004)20 [Hereafter OECD Council Decision].

¹³¹ See Generally "See OECD Guidance Manual for the Implementation of Council Decision C(2001)107/Final, as amended, on the Control of Transboundary Movement of Wastes Destined for Recovery Operations".

¹³² See Chapter II.A.1. of OECD Council Decision.

¹³³ See Chapter II.A.2(ii) of OECD Council Decision.

is characterized by a marked difference between “disposal” and “recovery”.¹³⁴ While disposal was defined to encompass all disposal operations that occur in practice including landfill, incineration and deep injections into naturally occurring repositories, recovery, on the other hand, was defined to encompass recycling/reclamation, operations resulting in the use of waste as fuel, as well as land treatment of waste for agricultural or ecological purposes.¹³⁵ Another slight difference between the Basel Convention and the OECD framework as has been noted by Grosz lies in the fact that the OECD Council Decision applies to both hazardous and non-hazardous waste.¹³⁶

2.2.3 EU Legal Framework

The EU framework definition of waste has attracted more legal commentaries and analysis than any other regional or international framework.¹³⁷ This notoriety or popularity stems from the difference between two terms, namely - “dispose” which was used in the previous EU framework definition of waste, and the subsequent change in framework definition which resorted to the use of “discard” instead of “dispose”. That notwithstanding, waste regulatory frameworks in the EU attempt to define waste in very similar fashion as those stated above.¹³⁸

¹³⁴ See Appendix 5.A and 5.B of OECD Council Decision.

¹³⁵ Ibid.

¹³⁶ Grosz, “Sustainable Waste Trade” *Supra* note 110 at 27.

¹³⁷ Laurent Bontoux and Fabio Leone, “The Legal Definition of Waste and its Impact on Waste Management in Europe”, A Report Prepared by Institute for Prospective Technological Studies for the Committee for Environment, Public Health and Consumer Protection of the European Parliament (1997) EUR 17716 EN; U.K Department for Environment, Food and Rural Affairs, “Guidance on the legal definition of waste and its application”, August 2012 <www.doeni.gov.uk/waste_legal_def_guide.pdf>.

¹³⁸ Directive 2006/12/EC of the European Parliament and of the Council of 5 April 2006 on waste (Hereafter Directive 2006/12/EC); Directive of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives (Hereafter Directive 2008/98/EC.); Regulation (EC) No 1013/2006 of the European

The EU Directive on Waste, which forms the legislative framework for handling and management of waste in the EU, defined waste in Article 1(1)(a) to mean “any substance or object in the categories set out in Annex I which the holder *discards* or intends or is required to *discard*.”¹³⁹ It is also important to note that the EU Regulation on Shipment of Waste defined waste by reference to the definition in Article 1(1)(a) of Directive 2006/12/EC. Thus Directive 2006/12/EC adopted the list approach in defining waste by relating the concept of waste to discarding activities associated with substances identified in Annex I of the Directive.

However, this experiment with the list approach did not last for long. In 2008, Directive 2008/98/EC was passed which repealed certain parts of Directive 2006/12/EC. The new Directive adopted the general approach to waste definition as opposed to the list approach. It thus defined waste generally as “*any substance or object which the holder discards or intends or is required to discard.*” While the list approach is good in the sense that it provides legal clarity and certainty as to what is considered waste, the approach also gave room for circumvention and exclusion of substances which may generally qualify as waste but cannot be legally classified as such due to their non-inclusion in the list.

In contrast to the definition under the Basel Convention as well as OECD frameworks which use the term “disposal”, the EU framework uses the term “discard”. Thus, from the EU perspective, the classification of a substance or object as waste is determined by the holder’s intention to discard, the actual act of discarding, or a requirement to discard the substance or object.¹⁴⁰ Unfortunately, both Directive 2006/12/EC and its successor Directive 2008/98/EC did not define

Parliament and of the Council of 14 June 2006 on shipments of waste. [Hereafter EU Regulation on Shipment of Waste].

¹³⁹ Article 1(1)(a) of Directive 2006/12/EC [emphasis supplied]. Though Directive 2006/12/EC was repealed by Directive 2008/98/EC, the latter still retained this definition.

¹⁴⁰ ECJ, Commission of the EC v. Italian Republic case - C-194/05, para 32.

the term “discard” notwithstanding the fact that the term “discard” represents a marked departure from the Basel and OECD framework.¹⁴¹

This thus prompts an inquiry as to the conceptual difference (if any) between “disposal” and “discard.” Although both terms could be used interchangeably in the context of ‘getting rid of’, they differ in some way. According to Grosz:

The notion of “discarding” can be perceived as an intermediate step between an object’s or substance’s life as a product (i.e. as “non-waste”) and a waste treatment or management operation. The verb “to discard” allows objects or substances to become wastes both with regard to materials which one wants to get rid of as well as in cases where the wastes in question may have a perpetual value and are thus suitable for recovery and recycling operations. In other words, regardless of whether wastes are disposed of or recovered, they are nevertheless termed “waste” as a consequence of their discarding.¹⁴²

It has been suggested that the use of ‘discard’ in the EU framework was undertaken to avoid the impression that the EU framework was only applicable to waste meant for disposal.¹⁴³ The European Court of Justice in *Vessoso and Zanetti*,¹⁴⁴ noted that such narrow perception of waste would result in the exclusion of materials destined for recovery from waste legislation. This was not intended by the framework in the light of its objective of protecting human health and safeguarding the environment, as set out in the Preamble to the Directive. More so, it would be seen from the framework’s definition of waste as any substance or object “which the holder discards or intends or is required to discard”, that the operative moment is not just limited to when the substance or object was actually discarded, but begins at a much earlier moment when

¹⁴¹ See also Article 19(a) of Council Directive 75/442/EEC of 15 July 1975 on waste.

¹⁴² Grosz, “Sustainable Waste Trade” *Supra* note 110 at 35.

¹⁴³ *Ibid.*

¹⁴⁴ ECJ, *Vessoso and Zanetti* (1990) ECR 1461. paras. 11– 12. (Now Court of Justice of the European Union).

the holder developed the subjective intention to discard the material or object, or when he was required (e.g. by law) to do so. Grosz further noted that:

The utilization of the term “to discard” was thus aimed at establishing a broad definition of wastes that also particularly covers waste with an economic value. The holder does not have to exclude any possibility of recovery and does not have to presuppose that an object is released to a third party or that the holder of the waste abandons the title to it for an object or substance to fall under EU waste legislation.¹⁴⁵

The Court of Justice of the European Union has always maintained the position that what constitutes waste “must be determined in the light of all circumstances, regard being had to the aim of the directive and the need to ensure that its effectiveness is not undermined.”¹⁴⁶ In the *Tombesi case* which came before the Court, attempt was made to frame the term “discard” as referring to both “disposal” and “recovery”. Advocate General Jacobs in that case refrained from defining “discard” but shifted attention to determining whether the substance or material in question is destined for a disposal or recovery operation. In his view, a substance is rendered “waste” subject to EU waste legislation if it is discarded, is intended or required to be discarded, and if it is disposed of, or is subject to a recovery operation. Thus “discarding” was perceived as encompassing both disposal and recovery operations.¹⁴⁷

As can be seen from the above analysis, the definition of waste both from a general and a legal perspective is not an easy task. However, from a legal perspective and for the purpose of waste management, the definition of waste is important so as to distinguish “waste” from “goods”. This is most especially important in the field of international trade law. While goods are freely traded

¹⁴⁵ Grosz, “Sustainable Waste Trade” *Supra* note 110 at 35.

¹⁴⁶ *ARCO Chemie Nederland Ltd etc.* (Joined Cases C-418/97 and C-419/97), 2000 ECR I-4475 (ECJ, ARCO case) para 88 and 97.

¹⁴⁷ It should be noted that the Advocate General’s interpretation did not make it to the final judgment in the case. See *Euro Tombesi and Others* [1997] ECR I.

in the international market pursuant to WTO trade rules, this is not always the case with waste (especially hazardous waste). Because of the health and environmental impact of waste, international trade or transboundary movement of waste is stringently regulated by various regional and international agreements and regulations outside the WTO framework.¹⁴⁸

2.3 Conceptualizing Electronic Waste

Electronic waste or e-waste is a relatively new concept in the waste management lexicon. Notwithstanding its novelty, it is gradually gaining notoriety in policy as well as academic research circles. This growing attention is a result of the unique health and environmental impact associated with this category of solid waste. The term “e-waste” is now used as a generic term to refer to various electrical and electronic products that have been discarded by their previous owners or users. The term applies to a broad range of goods, including big and small household appliances and information and communication technology (ICT) equipment such as computers and peripherals, fax machines, mobile phones, portable electronic devices, portable digital assistants (PDAs), video and audio equipment, refrigerators, washers, dryers etc.¹⁴⁹

Once these products have reached the end of their useful life, they are often classified as e-waste. But this classification might not always be as easy as it sounds. There are situations where electrical or electronic products might not have reached the end of their useful life, but they are still discarded by their owners notwithstanding. Will such equipment still be accurately classified

¹⁴⁸ e.g. Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal 1673 UNTS 126; 28 ILM 657 (1989); Bamako Convention on the ban on the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa.

¹⁴⁹ Elizabeth Noble, “E-waste Think Tank Review and Synthesis”, (2008) Canberra Environment and Sustainability Resource Centre.

as e-waste? The problem that arises here is not new; it is related to the problem that was discussed earlier in relation to the conceptualization of waste in general. Thus what might be an e-waste to one person might actually be a useful electrical or electronic device to another.

In our analysis of waste definition above, it was noted that characterization of an object or substance as waste could be inferred from the subjective intention of the holder (where the intention can be ascertained), or from the objective act of its disposal/discarding or a legal requirement to that effect. This analysis is also of important relevance in conceptual analysis of e-waste. Defining e-waste is as difficult as defining waste itself. Hence there is yet no standard definition of e-waste. Most available definitions tend to look at the concept from a particular perspective such as value perspective, end of life or obsolescence perspective, or from the act and/or intention of the holder. It is necessary to examine these definitions in order to identify factors or elements that should constitute a standard definition of e-waste.

2.3.1 Defining E-waste

The original draft of the Basel Convention did not define e-waste, however subsequent amendment to the original Convention, specifically Decision IV/9, which entered into force in 1998, made changes to Annex VIII and added Annex IX to the Convention. Annex VIII contain lists of specific materials that shall constitute hazardous waste and the list includes materials which come within the ambit of e-waste such as waste electrical and electronic assemblies or scrap containing components such as accumulators and other batteries, mercury-switches, glass from cathode-ray tubes and other activated glass and PCB-capacitors, or contaminated with

constituents such as cadmium, mercury, lead, polychlorinated biphenyls.¹⁵⁰ The Basel Convention is primarily concerned with hazardous waste. Hence the aspect of the Convention that touches on e-waste tends to focus on the hazardous waste components of e-waste. Thus the Basel Convention framework focuses on the characterization of e-waste as hazardous waste rather than on providing a working definition of e-waste.

For their part, Puckett and Smith define e-waste to encompass “a broad and growing range of electronic devices ranging from large household appliances such as refrigerators, air conditioners, [to] hand-held cellular phones, personal stereos, and consumer electronics to computers.”¹⁵¹ Various facts emerge from this definition. First, the range of e-waste is “broad and growing”. Thus a definition of e-waste which suffices for the current state of technology may soon need revising to accommodate new and emerging technologies. Further, Puckett and Smith also made reference to e-waste as electronic devices “which have been discarded by their users.”^{*} This concept of e-waste is very limited in that it tends to focus on the objective aspect of waste conceptualization. We saw earlier from our definition of waste that there are both subjective and objective elements in waste definition. While the objective aspect relates to the act of the waste holder in discarding the waste, or a requirement by law to that effect, the subjective aspect of the definition relates to the intention of the waste holder to get rid of the waste (although he or she has yet to do that). Thus from the subjective perspective, a substance or object becomes waste once the holder develops the intention to discard. This is an important element that is missing from the definition by Puckett and Smith.

¹⁵⁰ See Annex VIII, para A1180.

¹⁵¹ Puckett and Smith “Exporting Harm” *Supra* note 8.

* Ibid

Another definition of e-waste is found in the OECD framework. The OECD framework defines e-waste as “any appliance using an electric power supply that has reached its end-of-life”.¹⁵² The OECD defines e-waste from the functional state of the subject matter - its end-of-life. The OECD definition underlies the public perception of e-waste which is often restricted in a very narrow sense to end-of-life information. The fact that a product has reached its end of life may be strong evidence to classify it as waste or e-waste. However, electrical and electronic equipment need not have reached end of life to become waste or e-waste. Psychological and technological obsolescence has been applied by the electronic industry to render products obsolete even before they reach their end of life thus resulting in consumers discarding or wanting to discard their products even while such products are still functional and capable of re-use. Thus functional electrical and electronic equipment which is no longer needed by their owner(s) would hardly come within the context of the OECD definition.

Widmer et. al. developed an e-waste definition that is based on the subjective value perspective of the waste holder. Accordingly, the authors defined e-waste as “a generic term embracing various forms of electrical and electronic equipment that have ceased to be of any value to their owners.”¹⁵³ Viewed from this perspective, an electrical or electronic product need not necessarily have been discarded by its owner or user to qualify as e-waste (as was suggested by Puckett and Smith), nor need it to have reached its end of life (from the view of the OECD). From the point of view of Widmer et. al., electrical or electronic products become e-waste once they “have ceased to be of any value to their owner.” Electrical and electronic products could cease to be of

¹⁵² OECD, Extended producer responsibility: a guidance manual for governments, OECD, Paris (2001).

¹⁵³ Rolf Widmer, Heidi Oswald-Krapf, Deepali Sinha-Khetriwal, Max Schnellmann, Heinz Böni “Global perspectives on e-waste,” 25 (2005) *Environmental Impact Assessment Review* 436 – 458 <<http://www.sciencedirect.com/science/article/pii/S0195925505000466>>.

any value to their owner for many reasons, few of which includes the fact that the product has reached its end of life, or as a result of technological or psychological obsolescence. It could also be that the product is damaged, or in some bad state of repair. The list is not exhaustive.

Having said that, the use of the phrase “ceased to be of any value to their owner” is also problematic. The definition reflects the general perception of waste or e-waste as rubbish, trash, or junk with negative value. Thus “value” in the context of the definition could imply economic or aesthetic value or both. An electronic product could cease to be of any aesthetic value to its owner due to psychological obsolescence, but that does not necessarily imply that it has also ceased to be of economic value. Electrical and electronic products which have ceased to be of any aesthetic value to their owner(s) could still be traded for economic value. There are increasing markets today especially on the Internet which provide avenues for people to dispose of their unwanted electrical and electronic products which have ceased to be of aesthetic value to them.

The above analysis or critique of existing e-waste definitions is aimed at highlighting the difficulty in defining waste which also extends to defining e-waste. In fact, when it comes to waste or e-waste, it is much easier to identify than to define. Thus the definitions above attempt to conceptualize e-waste from diverse perspectives. These definitions are indeed right when viewed from the perspectives of the author(s), however, there are basic factors that should be evident in a standard definition of e-waste. We consider this further by examining the definition under the EU framework.

The European Union's Waste Electrical and Electronic Equipment (WEEE) Directive¹⁵⁴ does not use the term e-waste. It rather utilizes the term waste electrical and electronic equipment or WEEE. The Directive defines WEEE to mean “electrical or electronic equipment which is waste within the meaning of Article 1(a) of Directive 75/442/EEC, including all components, subassemblies and consumables which are part of the product at the time of discarding.”*

The definition of WEEE under the EU Directive requires an understanding of the term ‘electrical and electronic’. To what extent must a waste product or equipment be ‘electrical’ or ‘electronic’ in nature to come within the context of WEEE or e-waste when discarded or at end of life. It may be suggested that a simple way to look at the issue is to ask whether the product or equipment connects with a power plug or a battery or both, although this might not be absolutely right. There are many products that connect through batteries or electric plugs but which might not reasonably be classified as WEEE or e-waste when discarded or at end of life. Examples here include heavy printing equipment and power generating sets. To overcome this problem, the WEEE Directive went further to define “electrical and electronic equipment” to mean

equipment which is dependent on electric currents or electromagnetic fields in order to work properly and equipment for the generation, transfer and measurement of such currents and fields falling under the categories set out in Annex IA and designed for use with a voltage rating not exceeding 1 000 Volt for alternating current and 1 500 Volt for direct current.¹⁵⁵

¹⁵⁴ EU, 2002a EU, Directive 2002/96/EC of the European Parliament and of the Council of 27 January 2003 on waste electrical and electronic equipment (WEEE) — joint declaration of the European Parliament, the Council and the Commission relating to article 9, . *Official Journal L037:0024-39 [13/02/2003, (2002) <http://europa.eu.int/eur-lex/en/>* [Hereafter WEEE Directive].

* Ibid.

¹⁵⁵ See Article 3, WEEE Directive. The categories of electrical and electronic equipment set out in Annex IA include: large household appliances, small household appliances; IT and telecommunications equipment, consumer equipment, lighting equipment, electrical and electronic tools (with the exception of large-scale stationary industrial

The definition sets the maximum voltage for equipment that falls into the Directive's classification of "electrical and electronic equipment". Stating the maximum voltage ensures that equipment that falls outside the set limit does not come within the scope of the Directive.¹⁵⁶ It also ensures that large industrial equipment (as opposed to household equipment) with design features that place them in the category of electrical and electronic equipment do not come within this categorization.

Thus within the context of the WEEE Directive definition, WEEE includes all electrical and electronic equipment which is waste within the meaning of Article 1(a) of Directive 75/442/EEC. This thus takes us back to revisit the definition of waste in Article 1(a) of Directive 75/442/EEC. It might be recalled that Article 1(a) of Directive 75/442/EEC defined waste as "any substance or object [...] which the holder discards or intends or is required to discard." Thus borrowing from the idea of the WEEE Directive and for the purpose of this thesis, e-waste or WEEE will be defined as:

electrical or electronic equipment which the holder discards or intends or is required to discard, including all components, subassemblies and consumables which are part of the product at the time of discarding.

This definition thus takes into account both the subjective and objective elements in waste definition. Moreover, it avoids the attempt to define e-waste in relation to the value (or non value) perspective. Avoiding the value concept in definition of e-waste is necessary because of

tools), toys, leisure and sports equipment, medical devices (with the exception of all implanted and infected products), monitoring and control instruments, and automatic dispensers.

¹⁵⁶ The voltages stated refer to electrical input and output voltages, not to the voltage levels that might occur within the equipment itself. See EU Commission, *Justification for the Proposal for a Directive of the European Parliament and of the Council on waste electrical and electronic equipment* (COM (2000) 347 final, p. 30).

the too wide and dynamic nature of the concept of value.¹⁵⁷ Thus a standard definition of e-waste should focus on the intention as well as the act of the waste holder rather than the value or state of the subject matter discarded. Hence, if a consumer replaces his CRT computer monitor with a flat screen monitor, and intends to discard the CRT monitor, his intention alone suffices for the classification of the product as e-waste. It is immaterial that he has not actually discarded the monitor, neither is it relevant that the monitor has not yet reached its end of life. However, where he does indeed discard it, then there emerges sufficient evidence beyond doubt to classify the CRT as e-waste. In addition, the definition makes reference to ‘requirement to discard’. This may apply in the case of procurement policies in government departments or private or business organizations. Where such policies require that certain electrical and electronic product be replaced on the expiration of a particular duration of time, on the expiration of the set time, a requirement to discard arises and such electronic products could be considered as e-waste.

Another important feature of this definition arises from the fact that it refrains from the usual practice of associating e-waste with end of life equipment. The conception of e-waste in terms of end of life equipment is right but not absolutely. Although electrical and electronic products that have reached their end of life will generally qualify as e-waste, there may be exceptional cases. This is especially so where the holder for any reason has the intention to keep rather than dispose of the equipment.¹⁵⁸ Moreover, the term e-waste or WEEE is not a term within the exclusive

¹⁵⁷ Value could carry the idea of aesthetic, economic or material value. A definition of e-waste which incorporate the concept of value may have to go further to define value as used. This would thus result in a definition within a definition. For example, a definition of e-waste as a ‘electrical and electronic equipment that have ceased to be of value to their owners’ leaves us in the dark as to the concept of value as used i.e. whether it is aesthetic or economic value.

¹⁵⁸ For example, the first computer that I owned might have reached its end of life and not even be functional any more, but I may not be willing to discard it because of the sentimental value I attached to it as my first computer ever. I may even desire to keep in my collection of archives for future generations to see. Such a product will hardly qualify as e-waste, in fact it is a historic object to me.

reserve of end of life electrical and electronic products, as the term could also apply to functional electrical and electronic equipment that has not yet reached its end of life but which its “holder discards or intends or is required to discard”. Thus the operative idea in the e-waste definition should revolve around the intention and act of the holder of the product, or a requirement on his/her part to that effect.

In the definition above, reference was made to components and subassemblies. This underlies the fact that while some components of discarded electrical and electronic products on their own might not necessarily qualify as WEEE, when they form a constituent part of the product, they should not be treated as separate from the whole. For example, a discarded printer cartridge on its own might not come within the definition of e-waste; however, a discarded printer obviously comes within the context of the definition. Thus, this implies that if an ink cartridge is attached to a discarded printer, the cartridge becomes part of the e-waste because it is a component or constituent part of the printer at the time of discarding.

2.3.2 Categorizing E-waste

Various frameworks have been adopted for categorizing e-waste. One of the widely accepted standards is that utilized in the EU WEEE Directive. According to the Directive, WEEE consists of ten categories of electrical and electronic equipment listed below:¹⁵⁹

¹⁵⁹ See Annex 1A of WEEE Directive

No	Category	Label
1	Large household appliances	Large HH
2	Small household appliances	Small HH
3	IT and telecommunications equipment	ICT
4	Consumer equipment	CE
5	Lighting equipment	Lighting
6	Electrical and electronic tools (with the exception of large-scale stationary industrial tools)	E & E tools
7	Toys, leisure and sports equipment	Toys
8	Medical devices (with the exception of all implanted and infected products)	Medical equipment
9	Monitoring and control instruments	M & C
10	Automatic dispensers	Dispensers

Of the ten categories of WEEE listed in the Directive, categories 1 - 4 account for about 95% of e-waste generated in Western Europe.¹⁶⁰ WEEE that comes within the context of categories 1 - 4 includes refrigerators, washing machines and dryers, air conditioners, vacuum cleaners, grinders, coffee machines, computers, copying equipment, telephones, televisions etc.

2.5 E-waste: The Good and The Bad

From the discussion above, we have defined e-waste as ‘electrical or electronic equipment which the holder discards or intends or is required to discard.’ This definition is sufficiently broad to

¹⁶⁰ *Supra* note 153 at 440.

cover all kinds of e-waste. Thus, the definition covers both functional used electrical and electronic equipment as well as junk or waste electrical and electronic equipment. When the owner of an electrical and electronic product discards the product, it might be due to the fact that the product is not functional - having reached its end of life, or due to a part of it not functioning properly. In the latter case, if the product is repaired and resold to another user, it can rightly be classified as used goods. Discarding of a used product can also be caused by a desire on the part of the owner for a newer or more advanced product even though the discarded product is still functional. The discarded product in this case, where it is made available for resale to another user, should also be classified as used goods rather than waste.

As will be highlighted in this research, functional used electrical and electronic equipment (UEEE) is of great economic importance in developing countries where they are traded as used goods. The high demand for UEEE in developing countries arises from the fact that a large part of the population can barely afford new electrical and electronic products. International trade in UEEE helps to make inexpensive electrical and electronic equipment available to low income people in developing countries. The high demand for UEEE in this part of the world has led to a booming international trade in these products.

Unfortunately, international trade in UEEE is now being used as a conduit for transboundary dumping of waste electrical and electronic equipment in developing countries. Thus from a lay perspective, the term e-waste is now used primarily in a negative connotation to refer to non-functional electrical and electronic equipment, even though from the definition above, the term also applies to functional UEEE which have been discarded by their owners. Hence for the purpose of clarity and for the avoidance of ambiguity in usage, this research uses the terms “junk e-waste” or “WEEE” to refer to non-functional electrical and electronic products, while the term

“UEEE” will be used to refer to functional used electrical and electronic equipment. The term “e-waste” where used may refer to either or both depending on the context.

2.6 Material Composition of E-waste

It is difficult to give a generalized material composition of the e-waste stream. This is because e-waste consists of a diverse range of materials. However, some studies have tended to categorize materials commonly found in the e-waste stream into five different categories namely: ferrous metals, non-ferrous metals, glass, plastics and “other”.¹⁶¹ Metals such as iron, copper, aluminium and gold make up about 66% of e-waste by weight.¹⁶² Ferrous metals like iron and steel are the most common materials found in electrical and electronic equipment. Data from Ireland shows that iron and steel account for almost half of its total national WEEE stock.¹⁶³ Non-ferrous metals such as aluminium, copper, and some precious metals make up about 13% of the national e-waste stream.¹⁶⁴ Plastics are the second largest component and represent 21% of the e-waste population.¹⁶⁵ Glass accounts for an estimated 5.4% of the total weight of waste from electrical and electronic equipment every year.¹⁶⁶

¹⁶¹ *Supra* note 149 at 70.

¹⁶² Balakrishnan Ramesh Babu, Anand Kuber Parande, and Chiya Ahmed Basha, “Electrical and electronic waste: a global environmental problem”, (2007) 25 *Waste Management Research* 307-318.

¹⁶³ WEEE, (2001) Waste Electronic and Electrical Equipment (WEEE) Survey, Ireland.

¹⁶⁴ See European Topic Centre on Resource and Waste Management (ETC/RWM; Topic Centre of the European Environment Agency) (2003) part of the European Environment Information and Observation Network (EIONET).

¹⁶⁵ Wilkinson et. al. “Waste from Electrical & Electronic Equipment”, Environmental Protection Agency, Ireland, May 2001.

¹⁶⁶ Hilary Theisen, “Collection of solid waste” in George Tchobanoglous, and Frank Kreith, eds: *Handbook of Solid Waste Management*, 2nd edn. McGraw- Hill, New York, 2002.

2.7 The Rise and Rise of E-waste

E-waste has been identified as the fastest growing portion of the municipal waste stream in developed countries. A study by the US Environmental Protection Agency (EPA) shows that e-waste already makes up about 1% of the known municipal solid waste stream in the US. The EPA report estimates that 29.9 million laptops were discarded in the US in 2007 - that amounts to over 112,000 computers discarded per day.¹⁶⁷ E-waste generation in the US in 2009 stood at about 3.19 million tons.¹⁶⁸ Each year in the UK alone, 2 million working personal computers (PCs) are dumped in landfill sites, while in the US a staggering 14 to 20 million obsolete PCs, many still in working conditions, are discarded as e-waste.¹⁶⁹

Though e-waste does not constitute a large part of the US waste stream, it has become a growing source of concern to policy makers and environmentalists because e-waste tends to show a much higher growth rate than any other category of waste in the municipal waste stream.¹⁷⁰ Research completed in Europe also showed that e-waste is an epidemic growing at an astronomical three times the rate of other municipal waste. Some 20 to 50 million tonnes of e-waste are generated annually, worldwide, representing more than 5% of all municipal solid waste.¹⁷¹ Below, this research will discuss two basic factors responsible for the increasing generation of e-waste worldwide, especially in developed countries.

¹⁶⁷ Electronics TakeBack Coalition, "E-Waste Facts and Figures on E-waste and Recycling", <www.electronicstakeback.com/wp-content/.../Facts_and_Figures>.

¹⁶⁸ US EPA, "Municipal Solid Waste in the United States: 2009 Facts and Figures," (December 2010) <<http://www.epa.gov/epawaste/nonhaz/municipal/pubs/msw2009rpt.pdf>>.

¹⁶⁹ See Miles Park, "Defying Obsolescence" in Tim Cooper (ed) *Longer Lasting Products - Alternatives to the Throwaway Society*, Surrey: Gower Publishing, 2010 page 79.

¹⁷⁰ US EPA, "Fact Sheet: Management Of Electronic Waste In The United States" EPA530-F-08-014, April 2007 (revised July 2008).

¹⁷¹ UNEP (United Nations Environmental Program) (2006) Press Release "Nairobi Conference on Basel Convention to Address the Growing Challenge of Electronic Wastes" Nairobi, 27 November 2006 <<http://www.unep.org/Documents.Multilingual/Default.asp?DocumentID=485&ArticleID=5431&l=en>>.

2.7.1 *The Rise of Electronics*

Electronic devices are now one of the most fascinating inventions of science and technology. The past twenty years or so have witnessed a massive unleashing of new technological products. Park noted that electronics have migrated into new product areas that were traditionally populated by manual or mechanical devices, including kitchen appliances (such as bread makers), personal hygiene devices (electric toothbrushes) and children's toys (electronic games).¹⁷² Electronic devices rule the market and the electronic industry has become one of the fastest growing industries in the modern era. Human society has evolved from a world with no cell phones, personal computers, ipods, electronic games etc - a world where television was a luxury in few elite households to a world where these articles are seen as basic necessities that can be afforded at a fraction of their cost years before. Consumer electronics have also been subject to incessant price decline over many years. Park noted that the number of days required to earn the cost of a television (based upon average gross weekly earnings in developed countries) has dropped from 44 in 1962 to just 2.5 in 2000. This deflationary trend, he argued, has brought new material benefits to those who could not previously afford such 'luxuries', thus democratizing consumption.¹⁷³

The wonders of electronic gadgets today are so evident among all age groups that neither adults can escape from them nor can children resist them. From early on in life, human beings grow up in a society characterized by a desire to own as many electronic devices as the industry can produce. An online survey in 2009 noted that between 2005 and 2009, the number of young

¹⁷² *Supra* note 169 at page 80.

¹⁷³ *Ibid* at 81.

adults using personal music devices grew from 6 percent to 37 percent.¹⁷⁴ A research study in the United States has noted that between 2005 and 2010, the proportion of 8 to 18 year olds who own their own cell phone has grown from about four in ten (39%) to about two-thirds (66%). It was also noted that the proportion with iPods or other MP3 players increased even more dramatically, jumping from 18% to 76% among all 8 to 18 year olds.¹⁷⁵

While the statistics above among the younger generation are astounding, the same applies even among older generations. The United States Consumer Electronic Association predicted that US consumers would buy 34.5 million digital TVs in 2009. This represents a 26.8% increase from 2008 sales. US consumers in total were expected to spend \$165 billion on consumer electronics in 2010.¹⁷⁶ Similarly, 96 million computers (including desktops, laptops, and servers) were sold in the US market alone in 2009.¹⁷⁷

In the European Union, the total number of electronic devices placed on the market in 2009 was more than 3.8 billion units, including 265 million computers, roughly 245 million in home consumer electronics, and 197 million consumer appliances.¹⁷⁸ Similarly, in China, about 20 million refrigerators and 48 million TVs were sold in 2001, while about 40 million personal

¹⁷⁴ David M. Riley, "Kids' use of consumer electronics devices such as cell phone, personal computers and video game platforms continue to rise: Recent report from NPDD shows emergence of new trends in the kids and CE space", (2009) Retrieved from The NPD Group website: <https://www.npd.com/press/releases/press_090609a.html>.

¹⁷⁵ Victoria J. Rideout, Ulla G. Foehr, and Donald F. Roberts "Generation M2: Media in the Lives of 8- to 18-Year-Olds" A Kaiser Family Foundation Study January, 2010. <www.kff.org/entmedia/upload/8010.pdf>.

¹⁷⁶ Consumer Electronics Association, Press Release, January 7, 2010. <http://www.ce.org/Press/CurrentNews/press_release_detail.asp?id=11861>.

¹⁷⁷ "Gartner Says Worldwide PC Shipments in Fourth Quarter of 2009 Posted Strongest Growth Rate in Seven Years," January 13, 2010, <<http://www.gartner.com/it/page.jsp?id=1279215>>.

¹⁷⁸ Khurram S. Bhutta, Adnan Omar, and Xiaozhe Yang "Electronic Waste: A Growing Concern in Today's Environment", (2011) *Economics Research International*, 1 – 8.

computers were sold in 2009.¹⁷⁹ Perhaps one aspect of electronic devices that has witnessed the greatest rise both in terms of production and sale is cell phones. The end of 2008 witnessed an important milestone in the ICT revolution - over 4 billion mobile cell phone subscriptions were recorded worldwide. In the year that followed (2009), 1.2 billion mobile phones were sold in the world market.¹⁸⁰

The increasing surge in demand for electronic devices in industrialized societies has been linked to many factors.¹⁸¹ Peiry summarized these factors to include ‘rapid technological innovation, powerful consumer marketing, and market forces and prices providing a convincing idea that it is easier to discard and replace ICT and other electronic and electrical equipment, than to repair and reuse it’.¹⁸² Thus with regards to electrical and electronic equipment, the repair culture seems to have gradually dissipated in Western societies. The repair culture has rather been substituted by a “replacement culture” (and not surprisingly so) since it is now easier and also more cost efficient to replace than to repair damaged electronic gadgets in such societies. Grossman has noted that technological evolution brings with it a system of production that keeps cost relatively low. As a result, any financial incentive that may exist for most consumers in industrialized societies to repair or otherwise extend the life of high-tech electronics disappears. She argues that “unless this equation changes, we will continue to acquire newer and newer models, tossing more as we go along.”¹⁸³ She further identifies reasons for the e-waste pile-up in industrialized societies to

¹⁷⁹ Jonathan Watts, “China orders PC makers to install blocking software,” *The Guardian* (UK), Monday 8 June 2009. < <http://www.guardian.co.uk/world/2009/jun/08/web-blocking-software-china>>.

¹⁸⁰ “Measuring the Information Society.” A report from the International Telecommunication Union, 2009, Page 3. <http://www.itu.int/ITU-D/ict/publications/idi/2009/material/IDI2009_w5.pdf>.

¹⁸¹ Katharina Kummer Peiry, “Environmental Requirement and Market Access: Turning Challenges into Opportunities” (2007) CBTF International Symposium.

¹⁸² Ibid.

¹⁸³ Grossman, “High tech trash” *Supra* note 94 at 144; The following statistics give further insight into the level of e-waste being generated in North America. In 2001 the state of Oregon with a population of less than 3.5 million (in

include the act tactfully abdicating responsibilities for e-waste management to consumers and communities, and the pressure the electronic industry exert over public policy. Goosey, for his part, has listed the characteristics of electrical and electronic equipment to include improved performance and reduced cost in each new generation of product - a trend that encourages unsustainable behaviour.¹⁸⁴

The growth of e-waste has also been attributed to public ignorance of the fate and impact of discarded electronics. According to a report prepared by the EPA, it noted that:

[t]he awareness among most computer and electronics buyers as to the scope of the e-waste problem is low to none. Even most sophisticated technology users do not understand the nature of the waste problem, or the fact that many of the materials used in computer/CRT manufacturing are considered hazardous.¹⁸⁵

Technological change and market systems are other factors that have been adopted by the electronic industry to keep consumers in a perpetual state of purchasing. When new devices are purchased, it becomes imperative that the consumer will have to discard the previous ones owned. This vicious circle of purchase and discard prompted by product obsolescence has created mountains of e-waste in industrialized countries and has also fuelled transboundary movement of such waste products to low-income economies. Thus a picture of the e-waste

that year) discarded about half a million computers, or 10,000 tons' worth. In the same year, it was estimated that 6000 computers became obsolete each day in the state of California with a population of about 35 million. The state's waste management board estimated that about 6 million old computer monitors and televisions is now gathering dust. The state of Maine with about 1.3 million residents was abandoning some 100,000 computers and TVs each year, while in Massachusetts, it was estimated in 2003 that the state was generating about 75,000 tons of obsolete electronics a year. The volume was expected to rise to 300,000 per year in 2005. In Canada, the annual estimate for Canada's e-waste disposal in 2005 was more than 70,000 metric tons. Environment Canada had earlier reported in 1999 that personal computers in the waste stream were responsible for 13.5 tonnes of lead, 2 tonnes of mercury and 0.5 tonne of cadmium. *Ibid* at 149-150.

¹⁸⁴ Martin Goosey, "Introduction and Overview" in Ronald E. Hester and Roy M. Harrison eds *Electronic Waste Management - Design, Analysis and Application* (Cambridge: RSC Publishing, 2009) at 2.

¹⁸⁵ Tachi Kiuchi et. al., "Computers, E-Waste, and Product Stewardship: Is California Ready for the Challenge," Report for the U.S. Environmental Protection Agency Region IX (2001), available at <<http://future500.org/documents/e-waste.pdf>>, [Tachi Kiuchi et. al. "Product Stewardship"].

situation would be hazy without an examination of the theory of obsolescence and its use by the electronic industry in perpetuating consumer addiction to newer and newer electrical and electronic products.

2.7.2 The Concept of Obsolescence

The theory of obsolescence in relation to consumer product describes a deliberate strategy aimed at reducing a product's life span, either in its functional life or in the mind of the consumer. As a marketing strategy, its object is to engage the consumer in a repetitive purchase. The practice of deliberately encouraging product obsolescence grew out of the fierce competition between Ford and General Motors in the 1920's.¹⁸⁶ However, it was after the World II that the concept became a widely acceptable marketing strategy amongst product designers and marketers. Vance Packard popularized planned product obsolescence in 1963. Packard dissected product obsolescence into three different forms: obsolescence of function - where an existing product becomes outmoded when a product is introduced that performs the function better; obsolescence of quality - a product breaks down or wears out at a given time, usually not too distant; obsolescence of desirability - a product that is still sound in terms of quality or performance becomes "worn out" in the minds of its user or owner because a styling or other change makes it seem less desirable.¹⁸⁷ Packard observed that the conditioning of a consumer's mind can be manipulated to perceive a product as obsolete and in need of replacement notwithstanding the fact that the product is still functional.

¹⁸⁶ Giles Slade, *Made to Break - Technology and Obsolescence in America*, (Cambridge: Harvard University Press, 2006), p 29.

¹⁸⁷ Vance Packard, *The Waste Makers* (New York: David McKay, 1960), pp 54-55.

Jack Waldheim noted that planned obsolescence is utilized as a deliberate attempt to have a product break down or become out-dated long before it has lost its usefulness - its utility - or its value.¹⁸⁸ Its aim is to keep the consumer in a vicious circle of repetitive product purchase and disposal, thus increasing producer profit and competitiveness. According to Waldheim “its danger to the customer is that it cheats him out of his hard earned money though he may not realize it in the beginning.”¹⁸⁹ Mazur theorized that the rationale for having the product made obsolete in the mind of the consumer is based on the fact that physical wear alone is too slow to stimulate purchase, thus the faster the products purchased by the consumer are made obsolete in the mind of the consumer, the faster the market is made available for new products.¹⁹⁰

Slade noted that as competition for consumers’ money intensified, manufacturers utilized every means at their disposal to stimulate consumer purchase of their product. Hence design competition became the standard business strategy, and style and obsolescence took over corporate thinking about products as diverse as radios, cameras, kitchen appliances etc.¹⁹¹ According to Brook Stevens, the acclaimed “crown prince of obsolescence,” planned obsolescence was not product death-dating but rather a psychological obsolescence which grew out of “the desire to own something a little newer, a little better, a little sooner than necessary.”¹⁹² He stated:

Our whole economy is based on planned obsolescence and everybody who can read without moving his lips should know it by now. We make good products, we induce people to buy them, and then next year we deliberately introduce something that will

¹⁸⁸ Jack Waldheim, “Lollipops and Faucets,” 4, no 3 (February 2, 1959) *Design News*, 3.

¹⁸⁹ Ibid.

¹⁹⁰ Paul M. Mazur, *American Prosperity: Its Causes and Consequences*, (London, Jonathan Cape, 1928), p.98

¹⁹¹ *Supra* note 186 at 64.

¹⁹² Brooks Stevens Associates, untitled brochure, 1953. Brooks Stevens Archive cited in Heskett, “*The Desire for the New*,” p.4.

make those products old-fashioned, out of date, obsolete. We do that for the soundest reason: to make money.¹⁹³

Steven's ideology accurately reflects the electronic industry's position with regards to product obsolescence. Thus industry profit comes ahead of any other objective including the health and environmental effect of the industry's products.

The new phase of obsolescence that eventually led to the current massive generation of e-waste began with the emergence of increasingly powerful miniaturized circuitry or chip technology. Early in 1965, Gordon Moore published a classical observation that later came to be known as "Moore's Law".¹⁹⁴ Moore predicted that electronic designers could double processor speed every 18 months. He noted that the level of an integrated circuit's (IC) complexity increases in relation to its minimum cost at a rate of roughly a factor of two per year. According to Moore, "over the short term this rate can be expected to continue, if not increase. Over the longer term, the rate of increase is a bit more uncertain, although there is no reason to believe it will not remain nearly constant for at least 10 years."¹⁹⁵

Although Moore's law was intended to emphasize the increasing power of integrated circuits vis-à-vis diminishing costs, Slade noted that it also provides an index into the study of the steady rate of technological obsolescence resulting from the increasing capacity of integrated circuits.¹⁹⁶ In 1965 when Moore was writing, integrated circuits were doubling in their capacity and dwindling in their prices. The effect of this trend was that it took only a short time for ICs, and corresponding electronic devices to become obsolete, thus resulting in speedy obsolescence.

¹⁹³ Karl Prentiss, "Brooks Stevens: He Designs on Your Dough," *True: The Magazine*, April 1958, cited in Haskett, "The Desire for the New," p.4.

¹⁹⁴ Gordon E. Moore "Cramming More Components onto Integrated Circuits," April 19, 1965 *Electronics*, p. 119.

¹⁹⁵ Ibid.

¹⁹⁶ *Supra* note 186 at 196.

With time, the design of more and more electrical devices came to incorporate ICs or microchips, and by the time these devices leave the assembly line, it was as if their days or life span were already numbered. Subsequent devices leaving the assembly line in the not too distant future would probably contain much higher capacity microchips that would render the previous devices obsolete, and not surprisingly, these later devices would enter the market with a much faster processing capacity and lower price. Thus even when the product breaks down, there is little incentive to repair because of the increasing cost of repair as compared to decreasing cost of much newer version of same product.¹⁹⁷ Thus Moore's Law was a big part of the bigger picture of the rise of electronics, and the forces driving the speed of obsolescence and e-waste.

2.7.3 Confronting the Scourge of E-waste

Logically, the rise in the consumption of a product would result in a rise in the generation of wastes associated with such product. In a similar vein, the rise in the demand for electrical and electronic equipment should expectedly result in the rise in e-waste generation thus necessitating the need for management of such waste.

At the onset, e-waste management in developed countries took the form of disposal in municipal landfills.¹⁹⁸ But it was soon discovered that this was not an environmentally sound disposal

¹⁹⁷ Park has noted that the ratio between the cost of repair and cost of replacement for electronic devices has dramatically reversed in recent years. He cited a Scandinavian study which found that over a 10-year period the cost of repair work for a television and a washing machine increased by 150 per cent and 165 per cent respectively. This trend has the effect of promoting product discard and purchase and consequently increasing e-waste generation. *Supra* note 169.

¹⁹⁸ The U.S. Environmental Protection Agency (EPA) estimated that, in 1997, more than 3.2 million tons of electronic waste went into U.S. landfills and experts estimated that the number rose to about 12 million tons in 2005; See Federal Electronics Challenge "Promoting Sustainable Environmental Stewardship of Federal Electronic Assets" <<http://www.federalectronicchallenge.net/resources/docs/memorand.pdf>>. It should be noted that only household and small businesses were allowed to dispose of their obsolete electronic devices at landfills.

method. Puckett & Smith observed that when disposed in a landfill, e-waste becomes a conglomeration of plastic and steel casings, circuit boards, glass tubes, wires, resistors, capacitors, and other assorted parts and materials.¹⁹⁹ The hazardous chemical content in electronic devices like computers and television sets could leak into aquifers when disposed in a landfill thus causing underground water contamination.²⁰⁰ Disposal in landfill is thus a potential source of health and environmental hazard.

Conscious of this hazard as well as the need to avert future liability for pollution resulting from polluting landfills, governments in industrialized societies began enacting rigid e-waste management legislation, including but not limited to an outright ban on the disposal of CRT technology devices in municipal wastes.²⁰¹ Thus having been caught in a web of unattainable situation, consumers, businesses and governments in industrialized countries exemplified by such countries as the U.S. were left with few feasible moral choices as to what to do with their ever-increasing piles of electronic wastes.

Realization of the hazards associated with the disposal of electronics waste in landfills lead to the emergence of the practice of diversion of e-waste from landfills to recycling. Electronic devices contain various elements some of which are valuable, some hazardous or both. Disposal of electronic devices in landfills results in the loss of precious materials imbedded in the waste. Grossman noted that electronic devices are currently the major industrial consumer of gold and

¹⁹⁹ Puckett and Smith “Exporting Harm” *Supra* note 8 at 7.

²⁰⁰ Computer monitors and television set based on the CRT technology contains about 4-8 pounds of lead. According to a Report prepared for the U.S. Environmental Protection Agency, about “70 percent of the heavy metals (including mercury and cadmium) found in landfills come from electronic equipment discards. These heavy metals and other hazardous substances found in electronics can contaminate groundwater and pose other environmental and public health risks.” *Supra* note 185.

²⁰¹ Nineteen states and the City of New York in the US have some form of e-waste management law. While the states of California and Maine has imposed a ban on disposal of CRTs in municipal wastes.

silver, accounting on the average for about 10% of the world's annual gold production and 15% in the case of silver.²⁰² The good sense in electronic recycling is that when properly undertaken, it could lead to the recovery of about 99% of the gold in a typical desktop computer.²⁰³ Hence the concept of recycling presents a good opportunity to reclaim these valuable materials as well as decrease resource consumption and hazards posed to the environment.

The emergence of the practice of diversion of e-waste from landfills to recycling in industrialized societies lead to the proliferation of many small and medium scale 'recycling' businesses engaged in the collection of e-waste from individuals, household and even big corporations for the purpose of recycling.²⁰⁴ With the increased interest of private enterprises in e-waste recycling, municipal authorities in developed countries that have been traditionally responsible for waste collection (including e-waste) have simultaneously abdicated their responsibility for e-waste management to these new businesses. Puckett & Smith noted that this practice of diversion of waste from landfill to recycling became 'a holy grail for solid waste officials despite the fact that many of them have not really investigated what or where they are diverting the waste to'.²⁰⁵

Eugster et al. noted that the new trend in the use of commercial companies for e-waste collection and recycling developed without any adequate framework by the municipal authorities to track the e-waste from collection to recycling.²⁰⁶ These authorities have, like far too many, held a blind faith in the word "recycling" while oblivious to the fact that these businesses are not really

²⁰² Grossman, "High tech trash" *Supra* note 94 at 29 and 33.

²⁰³ *Ibid* at 31.

²⁰⁴ A typical recycling process will normally involve the separation of the collected devices. Some of the devices may be resold and reused "as is" or may undergo additional degree of repair and refurbishing. The devices that cannot be reused or refurbished are either dismantled or shredded. The resulting materials are separated into secondary material streams. *See* Linda Luther, "Managing Electronic Waste: Issues with Exporting E-Waste" (2009) Congressional Research Services online <<http://www.fas.org/sgp/crs/misc/R40850.pdf>>.

²⁰⁵ Puckett and Smith "Exporting Harm" *Supra* note 8 at 35.

²⁰⁶ *See* Eugster et al "Sustainable Electronics and Electrical Equipment for China and the World" (2008) *IISD @ 49* – 50. <http://www.iisd.org/pdf/2008/china_sd_eproducts.pdf>.

engaged in as much recycling as they claim. A series of investigations revealed that these so-called recyclers function more as brokers collecting e-waste from organizations, businesses and households in developed countries and shipping same (in most cases illegally) to developing countries.²⁰⁷ This gave rise to international trade in e-waste. This research will proceed with a discussion on the nature and impacts of this trade in developing countries.

2.8 Conclusion

The discussion in this chapter has noted the difficulty in the definition of waste, a problem that also extends to definition of e-waste. In seeking to overcome this difficulty, the research examined various framework definitions of waste as well as e-waste. It also noted subjective and objective elements that should constitute a standard e-waste definition. Thus a proper definition of e-waste is fundamental to this research since e-waste is the subject matter of the research.

This chapter also examined factors responsible for the growth of e-waste in developed countries as well as various attempts to deal with the e-waste problem through landfilling, recycling and the transboundary movement of e-waste. While recycling is a much more environmentally friendly alternative to landfilling, recycling functional used electrical and electronic equipment is not an eco-friendly initiative either. Hence, international trade in used electrical and electronic equipment for the purpose of reuse could suffice as an effective mechanism for dealing with the e-waste problem. At the same time, international trade in used electrical and electronic

²⁰⁷ In a television documentary that featured on *CBS 60 Minutes*, a Colorado recycling company under a recycling contract with the city of Denver was collecting e-waste from individuals and businesses giving the impression that it recycles the waste in-house. However, containers leaving the company premises were traced 7,459 miles to Victoria Harbor, Hong Kong. The company was actually collecting e-waste from individuals and businesses and shipping the e-waste to Asia for unsafe recycling. See *CBS News*, "Following The Trail Of Toxic E-Waste", *60 Minutes* Nov. 9, 2008 Online <<http://www.cbsnews.com/video/watch/?id=5274959n>>.

equipment could present serious health and environmental impacts in the importing country. Thus before endorsing or denouncing the effectiveness or ineffectiveness of international trade in used electrical and electronic equipment in dealing with the e-waste problem, this research will examine the nature of this trade including its socio-economic as well as health and environmental impact in developing countries.

Chapter Three

3. INTERNATIONAL TRADE IN USED ELECTRICAL AND ELECTRONIC EQUIPMENT (UEEE) - NATURE AND IMPACT

The recent years have witnessed rapid increase in international trade in UEEE from developed to developing countries.²⁰⁸ The rapid and increasing penetration of information and communication technology in developing countries is providing a growing market for UEEE in the region. In addition, rapid economic growth as well as low income among the majority of the populace in many developing countries has also fuelled the demand for UEEE. International trade in UEEE affords low-income individuals, households as well as small-scale businesses in developing countries an opportunity to purchase electrical and electronic products at much lower cost thus generating savings and further contributing to economic development. Products which are subject matter of international trade in UEEE includes used laptop computers, personal computers, monitors, printers, fax, telephones, television, air conditioners, washing machines, dryers, pressing irons, microwaves, photocopiers, scanners etc.

From a socio-economic perspective, markets for UEEE play a vital role in developing countries' economies by providing broader access to ICT, as well as creating economic opportunities such as trading in UEEE, reducing the capital needed for the start-up or establishing of businesses that require electrical and electronic equipment as fixed capitals. Since electrical and electronic

²⁰⁸ Accurate statistics in relation to the quantity of UEEE imported by developing countries are hard to tabulate. In some cases, the trade in UEEE is carried out surreptitiously especially where it involved illegal transboundary movement of e-waste while in some other cases, used electronics imports are declared as "used goods" in custom document. However, it has been estimated that about 180 containers of used electrical and electronic products enter the Lagos ports daily. Whether all these products are meant for local consumers or some are on transit to other neighboring countries is not certain. See Ola Oresanya, "e-Waste Management in Lagos State - The LAWMA Experience" Paper presented at the 2-Day International Summit on Regulations & Management of e-Waste in Nigeria (24th February, 2011).

devices are very expensive for many in developing countries to purchase anew, the significantly lower price for a used version of these products makes a great difference between accessibility and non-accessibility to these devices as well as the services which they provide.²⁰⁹ The high demand for UEEE in developing countries is being sustained by increasing discard of UEEE in developed countries especially in Europe and North America. While international trade in UEEE helps to make inexpensive UEEE like computers available to low-income individuals and communities in developing countries, there are also negative health and environmental impacts that have trailed the success stories associated with this trade in developing countries.

Two opposing schools of thought have emerged regarding the transboundary movement of UEEE to developing countries.²¹⁰ One school views international trade in UEEE to developing countries as beneficial so long as the products are reusable, while the other frowns at the trade because of the potentially adverse environmental burden associated with waste electrical and electronic equipment.²¹¹ This chapter will examine the conflicting socio-economic as well as health and environmental impacts of international trade in UEEE in developing countries. The chapter will focus on the analysis of findings and observations from field research on the used electronics trade in Nigeria and Ghana.

²⁰⁹ Williams et. al. "Environmental, Social, and Economic Implication of Global Reuse and Recycling of Personal Computers", (2008) 42, *Environmental Science & Technology*, 6446 - 6454.

²¹⁰ Aya Yoshida and Atsushi Terazono "Reuse of secondhand TVs exported from Japan to the Philippines" *Waste Management* 30 (2010) 1063 - 1072.

²¹¹ Ibid

3.1 The Nature of International Trade in UEEE

The transboundary movement of UEEE to developing countries usually commences with the discard or disposal of such equipment by their original owner(s) which could range from households, businesses, and organizations to government departments in developed countries. The discard or disposal of such equipment is strictly regulated in many developed countries because of their health and environmental impacts.

In many developed countries in Europe and North America, waste management activities are generally the responsibility of local authorities such as counties or municipalities.²¹² Some municipalities, for example in Canada, have laws prohibiting the disposal of UEEE or e-waste in municipal landfills.²¹³ Individuals and organizations wishing to dispose of their electronic wastes could do so either by returning them back to the brand retailer or electronic retail outlet where such products were purchased (if the products are eligible under a take back scheme) or they could deposit them with recyclers and pay the applicable recycling fee. Electronic retail outlets also employ the services of recycling companies for the purpose of recycling electronic wastes collected under their take back schemes. Business organizations as well as government departments also contract with recycling companies for the purpose of collection and safe management of their generated e-wastes.

In addition, some municipalities establish drop-off centers where individuals and households on set days could drop off their waste electrical and electronic equipment. The municipalities also contract with recycling businesses for the purpose of collection and environmentally sound

²¹² There are exceptional situations whereby certain waste substances such as toxic or nuclear wastes are managed by federal regulatory bodies.

²¹³ For example, the City of Ottawa in Ontario, Canada does not collect electronic waste as part of its curb-side garbage collection. Hence individual household, businesses and government departments are responsible for disposing of their electronic waste products.

management of electronic wastes deposited at the drop-off centers. Ideally, it would be expected that electronic wastes collected at the drop-off centers by the recyclers would undergo a process of sorting, inspection and testing. Products that are in a functional state should be separated from non-functional electronics. While the functional products may be resold domestically or exported to developing countries as used electronics, the non-functional devices may undergo additional inspection to determine if they are repairable or salvageable. The salvageable portion of the waste stock might be repaired or refurbished and then added to the stock of functional products meant for resale or export while the non-salvageable products or obsolete e-waste may be processed for parts or components, or they may ultimately be recycled for raw materials. The recycling process for obsolete e-waste will usually involve a number of steps, including some or all of the following: de-manufacturing into subassemblies and components, depollution, materials separation, mechanical processing of similar materials, mechanical processing of mixed materials, and refining/smelting of metals.²¹⁴

The processes above represent an ideal e-waste management framework because of the opportunity to minimize the adverse health and environmental impacts associated with e-waste management. However, the recycling process is quite complex and complicated. While some aspects of the recycling process would have to be done manually, other aspects may require the use of complex technologies and machineries. This makes formal e-waste recycling labor intensive and a costly operation.²¹⁵ As a result of the cost-intensive nature of formal e-waste

²¹⁴ See Wayne Rifer et. al. "Closing the Loop: Electronics Design to Enhance Reuse/Recycling Value," a study conducted by the Green Electronics Council and funded through a cooperative agreement with EPA's Office of Solid Waste and Emergency Response Innovations Pilot Projects, pp. 5-7, January 2009. >http://www.greenelectronicscouncil.org/documents/0000/0007/Design_for_End_of_Life_Final_Report_090208.pdf.

²¹⁵ To cover the cost of these operation, e-waste recyclers usually charge processing fees when individuals drop-off their e-waste for processing. In a similar vein, some retail electronic outlets that operate take-back schemes collect

recycling in developed countries, most recyclers find it profitable to simply export these wastes to developing countries abroad where cost of labour is low, and where there is a growing demand for the products in the informal recycling sector.

Apart from the health and environmental impacts of such waste shipments to developing countries, the practice has also given rise to ethical concerns. When consumers are charged environmental fee on new electronics by retail outlets, or recycling fee by recyclers on return of old electrical and electronic devices, a representation is made to the effect that these fees will go towards the cost of environmentally sound recycling of such waste. However, rather than safely and environmentally recycling these products, some recyclers sell them to importers in developing countries knowing full well that these products will not be subject to environmentally sound recycling and disposal.²¹⁶

Thus some companies that operate as “recyclers” in developed countries are actually e-waste collectors and consolidators engaged in the business of e-waste collection from households and businesses and subsequent shipping of same to developing countries. This fact was evident in a television documentary titled “Track My Trash” which aired on 16th May, 2011 on the BBC One program *Panorama*, a tracking device was deliberately placed inside two broken CRT television sets which were subsequently dropped off at a municipal e-waste collection center in London, UK. The components inside the television sets were deliberately destroyed to make them non-

an end-of-life management fee e.g. an environmental fee from consumers when new electrical and electronic equipment is purchased. The fee serves to offset the cost of recycling such products when they are returned under the take-back scheme at the end of life.

²¹⁶ Some electronic manufacturers who contract with recyclers to safely manage their end-of-life electronics collected under their take-back programs have been surprised to find out that their “recyclers” actually ship e-waste products under the scheme to developing countries rather than recycle them domestically. In the light of this practice, companies like Hewlett-Packard (HP) and Dell have adopted internal policies which prohibit their contract recyclers from exporting non-functional electronic products to developing countries. *Supra* note 106 at 9.

functional and hence unfit for export. With the aid of tracking technology, one of the television sets was located in Alaba International Market, a used electronics market in Lagos Nigeria, the second television set was not located, however, the tracking device was traced to a man in Tamale, Ghana. The television set was bought by the man in the used electronics market. When the buyer discovered that the television set was not functional, he dismantled the set to recover valuable components including the tracking device that was surreptitiously placed inside the set.²¹⁷

It is acceptable if such equipment is put into a functional or reusable state and exported abroad for reuse. In fact, that is an environmentally sound action that should be encouraged. However, shipping junk e-waste to developing countries for recycling or dumping in the guise of international trade raises some serious moral, ethical and legal issues.

The nature of international trade in used electrical and electronic equipment may differ depending on the countries involved. Asian countries like China and India have a large informal e-waste processing market hence the demand for non-functional electronics or junk e-waste is very high in the region. Bulk of the e-waste shipments to this part of the world usually consists of non-functional electrical and electronic equipment meant for informal recycling. Jain opined that since recycling is considered hazardous and expensive in developed countries, such waste finds its way 'through transit points, into developing countries, where cost of recycling, recovery, and disposal is much cheaper than in developed countries'.²¹⁸ He predicted that this

²¹⁷ See BBC One "Track My Trash" available online at <<http://www.bbc.co.uk/programmes/b0116gw0>>.

²¹⁸ *Supra* note 101 at 6.

trend will continue to grow considering the ever-increasing global e-waste generation rate and the growing informal recycling market in the developing world.*

Describing the situation in India, Sinha noted that while it costs about \$20 to recycle a personal computer in the United States, it would cost about \$2 to recycle same computer in the informal sector in India. This provides a US recycler with motivation to consider shipping his stock of junk electronics to India rather than recycle them in the US. Sinha identified ‘lack of stringent environmental regulations, weak enforcement mechanisms, cheap raw materials, ill-informed population, and the unorganized nature of the sector’ in India as contributory factors responsible for the rising e-waste import from developed countries into India.²¹⁹

On the other hand, in developing countries in Africa, the bulk of the demand in the region consists of demand for functional used electrical and electronic devices (as opposed to junk e-waste for recycling), and the bulk of the shipment to this part of the world usually consists of functional used electrical and electronic equipment commingled with junk e-waste. Hence while it is common to see dealers in Asia ordering and importing container loads of junk e-waste (illegally though) usually for informal recycling, this is very uncommon in developing countries in Sub-Saharan Africa like Nigeria and Ghana where the market demand is for functional UEEE.²²⁰

Obsolete e-waste that finds its way into the UEEE market in Nigeria and Ghana are usually those intermixed with functional UEEE. This mixture of functional and non-functional UEEE

* Ibid

²¹⁹ See Satish Sinha, “Dark Shadows of Digitization in Indian Horizon” in Johri, Rakesh eds. *E-waste: Implications, regulations, and management in India and current global best practices* (New Delhi: Energy and Resources Institute, 2008) at 32 and 33.

²²⁰ The informal e-waste recycling market in Africa is very minuscule when compare to Asia. In fact, its very rare to see dealers in Africa placing orders for obsolete electronics for the purpose of recycling.

shipments to developing countries in Africa arises from the fact that e-waste recyclers cum exporters in developed countries do not necessarily sort e-waste collected to determine their state of repair or disrepair before exporting them to developing countries. Rather, once the e-waste products are picked up from collection centers, they are simply loaded onto shipping containers and exported abroad.²²¹

For recyclers in developed countries, finding a market for used electronics abroad is a relatively easy task especially in the age of the Internet. A 2008 United States Government and Accountability Office report noted a high demand for used electronics in developing countries. In particular, the report noted that:

In a search of one Internet e-commerce site, we observed brokers from around the world place 2,234 requests to purchase liquid-crystal display (LCD) screens. On the same site, we found 430 requests for central processing units and 665 requests for used computers. In an extensive search of two Internet e-commerce sites over a 3-month period, we observed brokers in developing countries make 230 requests for about 7.5 million used CRTs. Brokers in developing countries represented over 60 percent of all requests we observed.²²²

The report further noted that the high demand for used electronics in developing countries has resulted in many brokers and businesses springing up for the purpose of shipment of used electrical and electronic devices from developed to developing countries.²²³ These brokers and businesses in developing countries get their supplies from the recyclers/collectors in developed countries and then sell them in the domestic markets in their countries.

²²¹ This is not to imply that all recyclers in developed countries are engaged in this unethical practice. In fact, some recyclers have joined the e-steward certification program thus undertaking not to ship non-functional e-waste to developing countries.

²²² See United States Government Accountability Office, "Electronic Waste: EPA Needs to Better Control Harmful U.S. Exports through Stronger Enforcement and More Comprehensive Regulation," GAO-08-1044, Aug 28, 2008 p. 16. <<http://www.gao.gov/products/GAO-08-1044>>.

²²³ *Ibid.* See also Puckett and Smith "Exporting Harm" *Supra* note 8.

To understand the true nature and details of international trade in used electrical and electronic equipment from a developing country perspective, field research was undertaken in Nigeria and another in Ghana. Nigeria as a country now ranks as the highest importer of UEEE in Africa.*

Efforts were made during the course of the field research to study the trading activities in the major used electronics markets in Lagos. This was not an easy task. Prior to the field research, the used electronics business in Nigeria as well as most other developing countries has generated intense negative media coverage both locally and internationally.²²⁴ As a result, the used electronics traders' association as well as individual traders in Nigeria were apprehensive about discussing the details of the trade. However, a few traders agreed to an informal interview, other details relating to the trade were obtained by observing the operation of the market.

3.2 Nature of Used Electronics Trade in Nigeria

With a population estimated at over 150 million and strategically located south on the Gulf of Guinea on the Atlantic Ocean, Nigeria is the commercial heartbeat of Africa. The Lagos seaports provide an entry point for foreign goods seeking patronage in the competitive and ever-expanding Nigerian market. Its enormous population provides massive demand for both local and foreign supply of consumer products. Among the commercial products that have found a booming market in Nigeria are used electrical and electronic products. It has been estimated that about 180 containers of used electrical and electronic products enter the Lagos ports daily.²²⁵ The

* *Supra* note 208.

²²⁴ See BBC Africa "Nigeria probes disappearance of 'toxic waste' ship" (20 October 2010) <<http://www.bbc.co.uk/news/world-africa-11589530>>.

²²⁵ *Supra* note 208.

Lagos seaport has developed into West Africa's main entry point for UEEE as well as obsolete e-waste. More than 90 percent of this UEEE and e-waste ends up in the four major used electronics markets in Lagos viz - Computer Village, Alaba International Market, Westminster Market and Lawanson. As will be highlighted below, each of these used electronics markets has unique characteristics as well as a unique role played in the used electronics business in Nigeria.

3.2.1 Computer Village

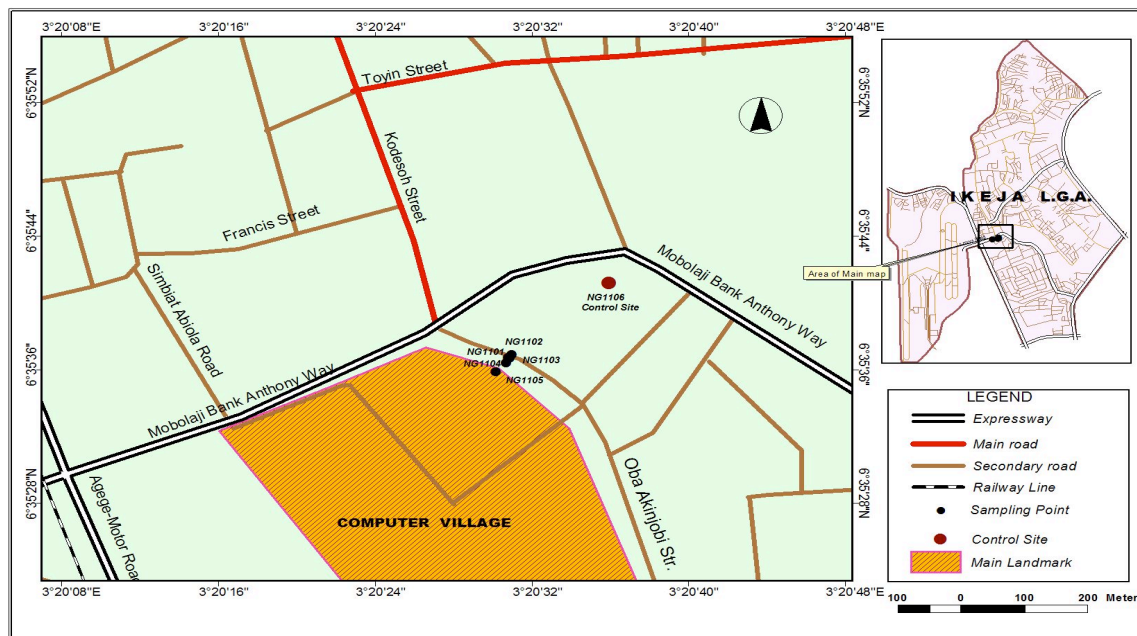
The so-called Computer Village (also known as Otigba Market) is a small area of roughly 1.1km² just three minutes drive from the domestic wing of the Lagos Airport. Until the mid-1990s, this locality was basically composed of residential buildings, law offices and some section of it was a market for books and office supplies. In the mid 1990s, some of the office supply businesses began marketing new computers, printers and other data processing and ICT equipment. With the increasing computer awareness as well as ICT penetration, a handful of the booksellers and office supply businesses began selling small quantities of used computers, printers and other ICT equipment. The turnover for the used equipment sale was very rapid and profitable. A handful of these traders gradually wound up their books and office supply businesses and commenced trading in used computers.²²⁶

As a result of the increasingly successful and profitable nature of the new venture, most of the other books and office supply businesses were forced to wind-up their businesses and enter into the used computers business. Those who refused to follow the trend were soon forced to

²²⁶ In 1997 there were about 10 used computer stores in the market. See Emmanuel Badejo "Tender calls for Lagos new computer village, business park projects" *The Guardian* (Nigeria) Monday March 7, 2011.

relinquish the lease for their shops as a result of skyrocketing tenancy rates which could only be afforded by those engaged in the more lucrative used computers business.²²⁷ Residents in the area were also forced to move out due mainly to increasing rent as well as increasing human and vehicular traffic which proved to be too much of a nuisance for a residential neighbourhood. As the residents move away, property owners systematically convert hitherto residential properties into commercial real estate for rent/use by UEEE traders. These previously relatively quiet neighbourhoods suddenly metamorphosed into a major business district as high-rise shopping malls gradually take over land spaces once occupied by low-rise residential buildings.²²⁸

Figure 3.1



²²⁷ At the time this market was visited in February 2011 during the course of the field research for this paper, no bookseller could be found in the vicinity of the market. The market has completely metamorphosed into a used electronics market.

²²⁸ Boladale Oluyomi Abiola, "The Otigba Computer Village Cluster in Nigeria" in Douglas Zhihua Zeng (ed.), *Knowledge, technology and cluster-based growth in Africa*, World Bank, New York 2008; Banji Oyelaran-Oyeyinka, "Learning in Local Systems and Global Links: The Otigba Computer Hardware Cluster in Nigeria" in Banji Oyelaran-Oyeyinka and McCormick (ed.) *Industrial clusters and innovation systems in Africa: Institutions, markets and policy* (United Nations University, Maastricht, The Netherlands, 2006).

The Computer Village is especially popular for wholesale and retail sale of new and used ICT equipment especially cell phones, computers and accessories, camcorders, and digital cameras.²²⁹ With about 3,000 business outlets in this relatively small piece of real estate, the Computer Village is now regarded as Africa's largest I.T. market both in terms of population of traders and customers as well as share volume of transactions that takes place there.²³⁰ The market serves Nigeria as well as other neighboring West African countries. The businesses in the Computer Village are organized under an umbrella trade association known as the Computer and Allied Products Association of Nigeria (CAPDAN). The location of the market has been a constant source of dispute between the Lagos State Government and the traders, with the government expressing dismay over the utter disregard of state planning laws in the development of the market, unplanned commercial activities in the area as well as the environmentally unsound manner in which traders in the market dispose of junk electronics in the area.²³¹

3.2.2 Alaba International Market

While the Computer Village is a popular site for ICT devices like computers, fax machines, cellphones and accessories, the Alaba Market is renowned for its wide range of used electrical and electronic equipment such as televisions, DVD players, refrigerators, washing machines, dryers, air conditioners, microwaves as well as communication and broadcasting equipment. The Market was founded in 1978 and was originally a market for sale of all sorts of brand new

²²⁹ The market is also notorious for sale of pirated software and DVDs.

²³⁰ *Supra* note 226.

²³¹ At the time this field research was being conducted, sources at CAPDAN confirmed that the Lagos State Government had reached an agreement with CAPDAN to relocate the market to a new ICT Village being developed by State Government through a Public Private Partnership framework.

electrical and electronics equipment until the advent of the UEEE trade which has taken over the major part of the market.

In terms of land size and structure, Alaba International Market is much bigger than the Computer Village and also its range of business outlets exceeds that of the Computer Village which is renowned for ICT devices. There are about 2,500 business outlets in the Market involved in wholesale and retail trade of all sorts of UEEE. There are also chains of other non-UEEE business outlets as well as financial institutions like banks within the vicinity of the market. The financial institutions provide local as well as international banking transactions for the traders especially in relation to money transfers to suppliers abroad. Trucks with container loads of UEEE enter the market on a daily basis to discharge imported UEEE for sale in the market. Wholesale and retail buyers from Lagos and other parts of Nigeria as well as international buyers from neighbouring countries like Niger, Chad, Benin, Togo and some Central African countries visit the market on a daily basis to make their purchases.

3.2.3 Westminster Market

The Westminster Market is strategically located close to the major seaport, the Tin Can Island Port in Lagos. What is known today as the Westminster Market was originally a commercial warehouse that was rented out to importers on a temporary basis for the purpose of storing their imported goods prior to onward movement to their shops in other parts of Lagos. However, with the emergence of the UEEE trade, some of the UEEE importers would sell their products to retailers in the major used electronics market by description and the retailers would go to the

warehouse to collect the goods. With time, the warehouse metamorphosed into a real market as opposed to a temporary storage facility.

The Westminster Market is relatively smaller compared to Computer Village and Alaba International Market. There are approximately 300 business outlets in the market selling all sorts of conceivable UEEE. The major clients here are retail UEEE traders in Computer Village, Alaba International Market, Lawanson and traders from other part of the country who buy products from the market for onward resell.

3.2.4 Lawanson

The Lawanson market is also another major UEEE market in Lagos. Its popularity lies in its stock of large household equipment such as refrigerators, air conditioners, washers and dryers as well as other small household equipment such as sound equipment, DVD players, blenders, electric kettles, pressing irons etc. The outlet is composed of 350 businesses housed in small shops attached to residential properties. The traders in the market are organised into a trade association.

These markets described above have all developed or metamorphosed in the last decade or so in response to the growing UEEE trade in Nigeria. Going further from here, this research will examine the factors responsible for the rise of the UEEE trade in Nigeria.

3.3 The Growth of the UEEE Trade in Nigeria

The growth in the used electronics business in Nigeria has been attributed to several factors. First is the growth in the information technology sector. Information and communication technologies such as cell phones, computers, televisions and other electronic technologies have found their way into virtually every segment of Nigerian society. Nigeria represents a classic example of the rapid and massive growth in the ICT sector evident in developing countries. There is an ever-increasing thirst among the populace in developing countries to keep up to date with technological development and to communicate effectively in an ever-globalizing world. Mobile and Internet technology has been warmly embraced in Nigeria, as in many developing countries. There is an ever-increasing rise in the number of Nigerians with access to mobile and Internet technologies.

According to the telecommunication regulatory body in Nigeria,²³² the emergence of GSM mobile technology has had a huge positive impact on Nigeria's economic development, and has become an essential culture in Nigerian society. In 1999, there were only 35,000 people with access to mobile technology, five years later, that number rose to 9.1million. Tella, Amaghionyeodiwe, and Adesoye noted that between 2000 and 2004, the total subscriber base for connected fixed and mobile lines in Nigeria rose at an average growth rate of 125% annually. Overall, 7,930,678 new telephone lines have been taken up between 2002 and 2007, an

²³² Nigeria Communication Commission: trends in the telecommunications markets in Nigeria 2003-2004.

exceptional increase of 249%.²³³ Mobile telecommunication runs deep in Nigerian social culture. It is very common for an average Nigerian to own more than one mobile phone.

Added to this is the ever-growing desire among the Nigerian populace to acquire and own state of the art household electrical and electronic gadgets. This desire has been fueled by a growing middle class striving to be identified with the few wealthy upper class citizens while at the same time struggling to differentiate itself from the impoverished low-income class. Nigerian society is a class-conscious society and the class an individual is associated with is to a great extent dependent on what he or she owns. For the middle-income class, perhaps the best way to identify with the wealthy class (or to be notionally associated with it) is to own what the latter owns, and when cost becomes an obstacle to this, especially in the case of electrical and electronic gadgets, the used electronics trade has provided a viable alternative.

Another factor that explains the expanding nature of the used electronics trade in Nigeria can be found in the economic circumstances of the consumers of these products. Because of the poor economic conditions among the populace, a majority of Nigerians could hardly afford brand new electrical and electronic equipment. As a result of the limited income generated by a greater percentage of the population, many of these embark on prolonged savings to purchase new electrical and electronic devices. However, the emergence of the used electronics trade has made it possible for them to purchase these electronics at much lower cost while at same time obtaining the same utility derivable from new electronic products. In fact, the used electronic trade has made it possible for many Nigerians to own electrical and electronics gadgets that they

²³³ Sherifdeen A. Tella, Lloyd A. Amaghionyeodiwe, and Bolaji A. Adesoye “Telecommunication Infrastructure and Economic Growth: Evidence From Nigeria”, (2007) <http://www.unidep.org/Release3/Conferences/Afea_2007/IDEP-AFEA-07-17.pdf>.

would never have dreamt of buying new thus resulting in greater satisfaction and an increased standard of living.

Thirdly, a curious but obvious factor that drives the used electronics trade in Nigeria lies in the durability of used electrical and electronic products imported into the country in comparison with their brand new counterparts. This may come as a surprise but it is illustrative of the lax enforcement of product standards evident in many developing countries. The majority of new electrical and electronic products imported into Nigeria are produced and imported from Asia. Although these products may carry the brand name of major appliance manufacturers, the fact is that their standards are much lower than their counterparts produced for sale in developed countries in Europe and North America. According to one of the UEEE retailers interviewed during the course of the field research, importers of new electrical and electronic products in Nigeria, motivated by the drive for profit, deliberately flood the market with sub-standard products. In order to minimize cost, the importers prescribe lower standards for the equipment manufacturers in Asia. Even though such products are below known national and international standards, they still find their way into the Nigerian market.²³⁴ Though sub-standard, these products are eventually marketed for the price of standard products. However, they rarely last in usage because the products can hardly withstand the constant power surges resulting from the epileptic power supply in the country.

The quality of these new electronics is in stark contrast with used electrical and electronic equipment sold in the used electronics markets. The majority of the used electronics sold in Nigeria are imported from Europe and North America. Coming from Europe and North America

²³⁴ Dele Ogbodo, "Nigeria Loses N1trn Annually to Sub-standard Imports" *Thisday Live*, Nov 23, 2012.

means that these products comply with the best international standards (and they do), thus they tend to outlast the more expensive new products imported from Asia. The durability of these UEEE increases their demand even outside the low and middle-income cycle.²³⁵ Hence it should not come as a surprise that few consumers with economic capability for new electrical and electronic gadgets would rather opt for the more durable UEEE than the substandard new electronics that will die in a hurry.

3.4 Nature of Used Electronics Trade in Ghana

Ghana is a developing country located in West Africa and is bordered by Cote d'Ivoire to the West, Burkina Faso to the North, Togo to the East and the Gulf of Guinea to the South. With a country population of about twenty-five million people, Ghana has in recent times witnessed rapid economic growth due mainly to the discovery of oil in the western part of the country, as well as its stable political system.

In its effort to achieve accelerated development, Ghana formulated its ICT policy in 2003. The ICT policy was founded on the premise that Ghana's economic development can be accelerated through ICT development and deployment of ICT infrastructures. In line with this policy objective, some electrical and electronic equipment such as computers and accessories enjoy a free-import duty regime. Due to the inability of many Ghanaians to afford brand new electrical and electronic products, large consignments of UEEE such as computers and other ICT equipment are imported into Ghana and some of these products enjoy duty-free import in line

²³⁵ One of the electronic retailers in Computer Village confirmed during the course of discussion that his customers include people with economic capability for new products but who rather opt for the UEEE because of their previous experience when on several occasions in the past they had bought brand new electrical and electronic equipment but lost them to damage within a short while as a result of their low standard and quality.

with Ghana's ICT policy. Ghana has an unregulated and unrestricted import regime for UEEE. Although the importation of some used household electrical equipment such as air conditioners, refrigerators, refrigerators-freezers and freezers is prohibited by Sections 2 and 3 of the *Energy Efficiency Regulations*, this prohibition is hardly (if ever) enforced. Thus consignments of UEEE, whether functional or not, prohibited or not, freely enter the country under the guise of second-hand electrical and electronic equipment with very minimal (if any) restriction. This makes it practically difficult to ascertain the amount waste electrical and electronic equipment that enter the country.²³⁶

Currently, most of the electrical and electronic equipment on sale or in use in Ghana (whether new or second-hand) is imported, though there are a few cases of IT companies within the country that assemble new computer electronics. The high demand for UEEE in Ghana has resulted in an influx of second-hand electrical and electronic equipment along with a consequential influx of e-waste into the country. The Tema seaport is the major entry point for UEEE into Ghana.

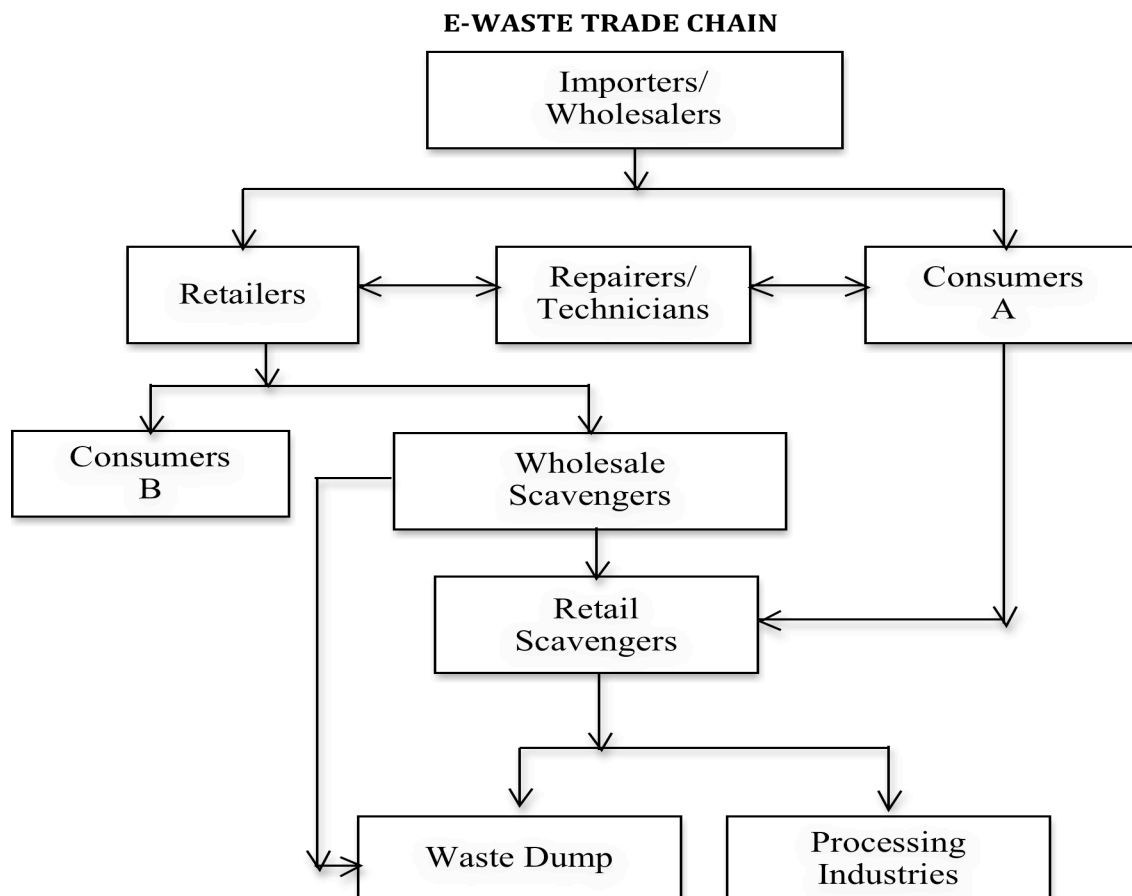
Unlike Nigeria where the nature of the UEEE trade is such that there are centralized markets for both wholesale and retail sale of UEEE, the UEEE market/distribution structure in Ghana is highly decentralized. The UEEE business outlets are sparsely situated in some major streets in the greater Accra region. In the area close to the Tema seaport, there is a high concentration of UEEE retailers, who sell products in makeshift, temporary stores on the streets.

²³⁶ Amoyaw-Osei, Y. et al. "Ghana e-Waste Country Assessment." SBC e-Waste Africa Project (March 2011) <http://ewasteguide.info/files/Amoyaw-Osei_2011_GreenAd-Empa.pdf>.

3.5 The Used Electronics/E-waste Trade Chain

The used electronics/e-waste trade in Nigeria and Ghana is well-organized and coordinated by various individuals in various hierarchies along the trade chain. At the top of the hierarchy are the importers/wholesalers; then the retailers, refurbishers/repairers, and finally the consumers. As will be seen later, at some point in the UEEE trade, a new branch emerges. This branch or aspect is referred to as the e-waste chain. This branch is composed of wholesale and retail scavengers whose trade or business is built on the collection and dismantling of junk e-waste that emerges from the UEEE trade chain. Each of the actors in the UEEE/e-waste trade chain occupies a unique position as can be seen below:

Figure 3.2: Used Electronics/E-waste Trade Chain



3.5.1 Importer/Wholesaler

At the top of the UEEE trade hierarchy is the importer. There are two different categories of importers identified in Nigeria as well as in Ghana. The first group in Nigeria is composed of importers who were formerly retailers in the UEEE trade. These have traded as retailers for some years and have become very familiar with the details of the business. With the passage of time and growth of their businesses, they acquire the needed experience and capital to expand the business into the field of importation. Their years of experience as retailers play a vital role in their success as UEEE importers. This experience helps in the development of a client base as well as the acquisition of in-depth knowledge about the needs of the market, i.e. what products or product specifications are in high demand. Thus the transition from retailer to importer is in essence a sort of business growth or expansion.

There is also another group of importers who are not resident in the country but rather are domiciled abroad. The group, though Nigerians by nationality, reside in North America, Europe and Asia from where they source for supplies and then ship the supplies back home. These categories of importers have business partners in Nigeria (usually relatives or friends) who receive and sell the UEEE consignments when they arrive in the country. When the consignments are sold, the partners deduct their share of profit or commission as well as other costs and remit the balance back to the importer abroad. The partners in the home country, based on their knowledge of the market, provide information relating to products in high demand as well as the prevailing market price so as to guide the importer when sourcing for UEEE supplies.

Although there are a few general importers who engage in the importation of diverse UEEE, trade specialization was very much evident among the importers. There are importers who specialize in the importation of ICT equipment such as cell phones and computer accessories; some specialize in the importation of large as well as small household UEEE.

An interview with one of the retail trader provided an insight into the apprenticeship scheme in the UEEE trade whereby some of the traders recruit their unemployed relatives as apprentices. The apprentices assist in running the business while at the same time learning the trade. Although they do not receive a fixed salary, they are provided with accommodations, feeding, and stipends to meet some other personal needs. The apprenticeship scheme could range from 3 - 5 years, after which the apprentice is “settled” with some capital to commence his own UEEE retail trade. The number of apprentices attached to a particular importer depends on the size of the business. However, an importer would normally have at minimum about 3 apprentices. The importers also employ the services of account clerks (usually females) to assist with book keeping.

Two categories of importers were also identified in the course of the field research in Ghana. First, there are importers engaged in both importation, wholesale and retail sale of UEEE. This group have fixed places of business in the cities which are run by employees who in most cases are close family members. This category of importers has a reputation for stocking UEEE in functional state. They usually sell their products in functional state to both retailers and end users. They employ the services of technicians/repairers who fix or refurbish non-functional electronics that arrive in their stocks. Most of the importers that fall into this category, it was learnt from the interview are Ghanaian citizens in countries in North America, Europe and Asia. They provide the financial resources for the business while their relatives in Ghana assist with

the day-to-day running of the business from within. Since their products are sold in a functional state and buyers are allowed to test the products before payment, the risks involved in buying UEEE from these importers is relatively low, although the price for the products on the other hand is higher than the average price in the market.

Another category of importers identified and studied by the research is located within the Tema port area and its surroundings. These importers do not have registered business premises. Rather they operate from shipping containers. After the containers carrying the UEEE consignments have undergone custom clearance from the Port, the containers are brought outside the Sea Port where they are opened within the environs and consignments are sold right on the spot to waiting retailers. This group of importers sells their stock mainly on a wholesale basis to UEEE retail traders and in some limited cases to final consumers. Interview with some of the buyers reveal that the products are bought untested without any warranty as to functionality. The sale is final and no item(s) purchased can be returned under any circumstances once the transaction has been completed and paid for. Hence the retailers buy the items at their own risk.

3.5.2 *Retailers*

The retailers occupy the position of middlemen in the UEEE/e-waste trade chain. They act as a link between the importers and the consumers in the case of functional UEEE (the importers and scavengers in the case of junk e-waste). Retail trade of UEEE is not as financially demanding as importation. Some of the retailers start with a very modest capital which could be as low as

\$300.²³⁷ They usually commence by buying a few UEEE and as their turnover improves, they tend to plough back their profit and expand their businesses. Some retailers also develop goodwill with the importers/wholesalers who may then be willing to sell some goods to retailers on credit. This trend was observed to be common where the retail trader is located in the same market (or locality) with the importer/wholesaler. Just like the importers, some retailers sell general UEEE while some specialize in the sale of a specific category of UEEE such computers, printers, cell phones, small household equipment, etc.

As will be highlighted later, the UEEE retail trade is very risky. The retailer usually buys untested UEEE from the importer.²³⁸ On the other hand, the retailer must sell the UEEE in a functional state as the consumers will always insist on having them tested to ensure their functionality before purchase. Thus, where the UEEE purchased from the importer is not functional, the retailer will incur additional cost for repairs, and if the UEEE is obsolete, the retailer will have to sell it to the e-waste scavengers at a cost which might be up to 95% less than his cost price. The quantity of junk UEEE in the retailers' stock of purchase will often determine profitability.

The retailers (in Nigeria) also run an apprenticeship scheme. The number of apprentices attached to the retailers varies depending on the size of business run by the retailer. However, it is very rare to observe a retail shop without an apprentice. There is usually an average of two apprentices per retail shop. In addition to the apprentices, some of the retail shops also employ the services of female clerks to assist with record keeping.

²³⁷ Fieldwork information collected from Lagos, Nigeria in February, 2011.

²³⁸ The importer actually does not permit the testing of the product before purchase. In this way he is able to sell both the functional and obsolete UEEE.

3.5.3 Refurbishers/Repairers

Refurbishers are known by various names including repairers, technicians etc. They play an important role in the UEEE trade. This is especially so in view of the fact that most of the UEEE is not tested for functionality before import. Since some of the UEEE imports include non-functional equipment, the refurbishers/repairers spend time trying to fix this non-functional equipment into a reusable state. Refurbishers also engage in the transformation of functional UEEE to make them more appealing and attractive to consumers.²³⁹

Interview with one of the repair technicians during the course of the field research in Nigeria, reveals that some of the technicians engaged in the repair of non-functional UEEE have diplomas in electronics and computer engineering related disciplines from Nigerian universities and polytechnics, and having been unable to secure employment in the formal sector, they set up makeshift tents in the Market and hence earn a living by fixing or refurbishing non-functional UEEE. Some other technicians acquired their skill via hands-on training through an apprenticeship scheme similar to that described above.

The technicians specialize in different fields of UEEE repairs and services. Some specialize in the repair and servicing of computers and accessories, others in televisions, refrigerators, and other household equipment. Although these technicians get their patronage mainly from the retailers, they also engage in the small scale purchase of non-functional UEEE from importers, some of which they repair and market in their makeshift workshops, while they dismantle the non-repairable UEEE for use as replacement parts. The client base for these technicians extends

²³⁹ The non-technical aspect of refurbishing such as cosmetic cleaning is usually undertaken by the retailers.

beyond the market. Individual households and businesses outside the market whose electrical and electronic equipment has broken down also come to these workshops to get their equipment fixed or repaired.

3.5.4 Consumers

Two classes of consumers of UEEE were identified in the course of the research. We will simply refer to them as ‘Consumer A’ and ‘Consumer B’.²⁴⁰ Consumer A buy untested UEEE directly from the importers. As in the case of the retailers, they are not allowed to test the UEEE for functionality before purchase. One advantage this group have is that they buy the equipment at a wholesale cost just like the retailer. Hence the price they pay is devoid of the retailer’s profit margin. However, they do this at great risk since they risk buying non-functional equipment. If the equipment purchased is found to be functional, then the risk has paid off. However, if the equipment is not functional, the risky consumer seeks the services of a repair technician. If the technician is able to fix the equipment, the cost of repairs adds to the original cost of the equipment and depending on the nature and extent of the repair, the total cost may be a little below or above the cost of buying the same equipment from the retailers. This consumer loses out completely if the equipment turns out to be non-repairable and hence junk e-waste.

Consumer B on the other hand do not buy untested products. The majority of the UEEE consumers fall into this group. This group would rather pay more to buy tested products from retailers since they have the assurance that the products are in a functional state. The retailer

²⁴⁰ Consumer A’s purchasing decision is characterized by willingness to assume greater risk in return for lower price for the products, while the Consumer B is more inclined to pay a higher price for the products in return for minimal or zero risk.

permits them to test the equipment and ensure that it is in functional state before payment. In some cases, the retailer may even provide a warranty for the products so that should they break down within a specified period, the buyer can return the UEEE for repair or exchange. Information obtained from interview with the retailers shows that the warranty period could range from three to six months. Disputes between consumers and retailers in the UEEE market in Nigeria in relation to warranty or other trade-related issues are submitted for arbitration to the retail traders' associations which usually has an office in the market.

Consumers of UEEE are predominantly low and middle-income individuals as well as small-scale businesses and more than majority of the population in Nigeria and Ghana fall within this class. Small-scale businesses such as Internet cafes, photocopy shops, business centers,²⁴¹ depend heavily on UEEE for their operational equipment.

3.5.5 Scavengers/Dismantlers

Notwithstanding the efforts of refurbishers/repair technicians to fix non-functional UEEE, the fact remains that some of this equipment cannot be salvaged. It is at this point in time that a new trade chain emerges - the e-waste chain. Two main contrasting features evident in this chain are increased health and environmental risks as well as decreased economic gain. The prominent actors in this chain are the scavengers/dismantlers. The scavengers engage in the collection of non-functional UEEE or e-waste from UEEE retailers and in the dismantling of the same at the dumpsites in order to liberate precious metals embedded in the equipment. It was observed during the course of the field research that among all the actors involved in the UEEE/e-waste

²⁴¹ This is the term used to refer to business offices that provide word processing services.

chain, the scavengers and dismantlers bear the most risk (health-wise) and at the same time derive the least economic benefit from the trade chain.

Wholesale scavengers were observed in the various used electronic markets in Lagos as they move about with small locally made handcarts buying obsolete e-waste from UEEE retailers. Such wastes are thereafter transported to the dumpsite where they are dismantled and useful parts are sold for profit to retail scavengers, who in turn make money by reselling the parts to end processors including local industries which utilizes same in production processes. In Ghana, the scavengers would usually transport the e-waste to the Agbogbloshie e-waste dumpsite where the scavengers either dismantle the e-waste or resell them to other dismantlers in the dumpsite. The dismantlers engage in manual dismantling of the e-waste in order to extract economically valuable parts such as circuit boards, copper/copper wires, aluminum and iron metals.

In both cases, it was observed that most of the scavengers are young teenagers who have no basic education. Substance abuse was common among these teenagers. It was also observed that although the retail scavengers engage in collection of other waste products such as car parts, when it comes to e-waste they tend to specialize in particular e-waste collection such as circuit boards, wire cables or metal. The wholesale scavengers are general waste collectors whose waste collection operation covers not just e-waste but also other categories of waste such as bottles, plastics and other scrap metals.²⁴²

²⁴² Most of the scavengers came from the Northern part of Nigeria. In the course of informal discussions with one of the scavengers, it was noted that scavenging was a seasonal occupation for the majority who usually returned to the North during the farming season to engage in farming and returned to Lagos after the farming season is over.

3.6 The Flow of UEEE in the Trade Chain

Evidence observed during the course of the field research as well as facts from interview with one of the UEEE importers shows that importation of used electronics is capital intensive and would require sufficient capital to cover the actual cost for ordering the used electronics from sellers abroad, the cost of shipping, custom clearance, as well as the cost of transporting the container load of the product from the port of entry to the importer's warehouse or store. Possible source of capital it was gathered from the interview includes savings and borrowings from relatives. Credit facilities from financial institutions are very hard to obtain due mainly to the inability of the traders to provide securities in the form of real estate properties. Even where the trader can provide such security, the lending rates from financial institutions could be so high (as high as 35%) thus making borrowing from such institutions very risky. Hence only a few traders who have the wherewithal usually undertake the importation of used electronics.

Once the capital base has been generated to enable the bulk purchase of UEEE abroad, the next step would require locating recyclers or bulk UEEE sellers abroad. This is usually done through online searches in Internet cafes, and some of the traders often embark on this 'search' at night after the close of their business hours. Once a bulk seller is located, negotiation begins through an exchange of correspondence via emails or telephone. The importer specifies the types of products he is willing to purchase as well as the quantity. If such quantity were not immediately available, the recycler or bulk seller would ask for time to enable him meet the order. When the order has been met, the importer will then have to travel to meet the seller(s) to inspect the order as well as make the necessary payment and arrange for shipping. It suffices to state though that the inspection here is not to ascertain the functionality of the equipment but rather to determine whether it conforms to the quantity and description. There are also situations whereby the

importer is a Nigerian citizen permanently based abroad but has relatives who manage the business in Nigeria. In this case, the importer abroad sources for the UEEE from recyclers, inspects them, makes the payment as well as arranges for shipping.

Depending on the quantity of the purchases made by the importer, the UEEE may be loaded into a 20' or 40' container. The cost of shipping will depend on the country of export. The cost of shipping a 40' container from North America (United States or Canada) to Lagos Port (Nigeria) or Tema Port (Ghana) would range from \$4,000 to \$5000 excluding the cost of loading the consignment into the container. Once the loading is completed, the container is transferred to the shipping company for onward transportation. In most cases, the importer deliberately refrains from identifying the consignment as used electrical and electronic equipment. Although there is no law restricting the importation of used electrical and electronic equipment in Nigeria, the recent spate of bad publicity arising from transboundary movement of e-waste to developing countries like Nigeria has put the Customs and other regulatory agencies at red alert. Hence consignments of used electrical and electronic equipment are now subjected to more rigorous administrative and procedural scrutiny at the Port of entry. To avoid this scrutiny, the UEEE importers resort to declaring their consignments as "used goods". This reduces the level of scrutiny they might be susceptible to at the hand of the Customs agents as well as other enforcement agents at the Port.

Consignments shipped from North America usually take an average of about 40 days to arrive in Ghana or Nigeria from the date of departure. On arrival, the importer hires the services of a licensed customs clearing agent who pays the relevant duties and fees to secure the release of the container from the custom warehouse. This process will usually involve visual inspection of the goods in the container by the Customs and other regulatory agencies to ensure that they are

goods eligible for importation. Since there is currently no law regulating or prohibiting the importation of UEEE into Nigeria, both functional and non-functional UEEE flow concurrently and make it past the customs and other enforcement agencies at the port. Based on the current state of the law, these UEEE are not subject to and are not required to be subjected to any functionality test to be eligible for import.

On completion of the custom process, the container is released to the agent who then makes delivery to the importer's warehouse which is usually located in the used electronics market or some other temporary rental warehouse facility. Before the arrival of the container into the market, the importer has already notified the retailers of the stock of products arriving, as well as the date and time the sealed container will be opened for sale of its contents. On the set date and time, the retailers and in some cases a few consumers would converge at the warehouse. The container is opened and the trading commences. The retailers select the products they wish to buy, and collect them together. As a rule, no one is allowed to test the equipment for functionality. In fact, in most cases, the power cables in the equipment are deliberately cut off prior to their being loaded into the container at the country of origin.

The idea behind this crafty act is based on the fact that not all the equipment is functional. Hence if the importer allows the retailers to test the electronics for functionality, they would eventually buy up only the functional electronics, thus leaving the importer with the junk e-waste. This restrictive rule makes it possible for the importer to effectively transfer both the functional and obsolete UEEE to the retailers and thus absolve himself of the responsibility of managing the junk e-waste while at the same time maximizing profit. The problem with this rule is that it makes the importer nonchalant about the functionality or non-functionality of UEEE being imported. This further compounds the e-waste problem in these countries. If the importer is to

some extent made to bear responsibility for the quantity of e-waste that flows along with the import, then he may exercise greater caution in ensuring the quality and functionality of the UEEE imports.

There are a few importers who are very meticulous about the quality of UEEE that they import. In fact these few diligently source for UEEE from reputable recyclers or collectors abroad. They make it a term of their contract with suppliers abroad that the UEEE supplied to meet their order must be in working condition. Hence the recyclers or suppliers abroad take the additional step in testing the products. The cost for these products is usually more than the untested electronics. The importers here may not make as much profit as the importers of untested UEEE but they have a good reputation in the local market place especially among some groups of risk-conscious retailers who are prepared to pay more for these importers' products than risk buying cheaper UEEE from importers who have a reputation for importing a high percentage of junk UEEE.

For the retailers, buying untested UEEE from the importers poses a risk since they are not sure of the functional state of the equipment at the time of purchase. Once the transaction has been completed, the retailer moves the UEEE that has been purchased to his store, where for the first time, he plugs them into a power outlet to determine their functionality. The UEEE that are in a functional state are separated from the non-functional equipment. For the latter, the retailer endeavours through a process of trial and error to fix the problem. The retailers might eventually fix those with minor defects, otherwise all non-functional UEEE are taken to the repairers or technicians.

The technician examines the equipment to determine the problem. If the problem requires changing a damaged part, the relevant part could be sourced from a previously dismantled

UEEE. Once the UEEE is fixed, the retailer would have to pay the technician for his workmanship. This too will depend on the nature and extent of the problem as well as the time spent in identifying and fixing the problem. In the case of electronics like a personal computer, the workmanship for fixing a crashed hard drive could be as low as \$2 (excluding the cost of buying a replacement hard drive).

If the repairman is successful in fixing the problem, he returns the UEEE to the retailer who adds same to the stock of UEEE available for sale to the final consumers. On the other hand, if the repairman is unable to fix the problem, he may opt (with the consent of the retailer) to salvage usable replacement parts from the waste electronic. He then pays the retailer for the replacement parts while returning the non-salvageable device which is now a confirmed junk e-waste stock.

The retailer separates the functional equipment into various groups categorized into grades A, B, C etc. The categorization is based on the cosmetic appearance of the product with grade A representing excellent condition, Grade B - Good, Grade C - Fair etc. The price the retailer fixes for the functional equipment is dependent on many factors including the grade classification, the average market price for similar products as well as the quantity of junk e-waste that results from his initial purchase from the importer/wholesaler, and the fee paid to the technician for repairing the non-functional equipment.

Based on the interview with the retailers, the net profit margin for the retailers usually ranges from 20% to 25%. While the retailer sells the functional UEEE to the final consumers, the junk e-waste emanating from this UEEE supply chain enters the e-waste supply chain. The retailer, still bent on mitigating the loss arising from the non-functional UEEE arising from his supplies

of equipment, will subsequently sell the final waste equipment to e-waste scavengers who come to the market to source for supply.

In Lagos, wholesale scavengers transport the e-waste to dumpsites near the market. On arrival, the e-waste is dismantled before an army of retail scavengers - each scavenger collects parts of the equipment that is of interest. While some may be interested in the printed circuit board, others might be interested in the copper wires, or metals in the equipment etc. The wholesale scavenger bills them accordingly, making some profit for his effort. The retail scavengers in turn sell the various components they have extracted from the e-waste to local metal processing industries outside the market area but within the Lagos metropolis. It was observed that plastic components of e-waste are not in demand. Hence plastic components from CRT monitors and televisions, having no material value to the scavengers, are subsequently dumped into the waste stream where they are incinerated along with other municipal waste thus emitting noxious fumes into the surrounding environment.

3.7 Socio-Economic Impact of UEEE Trade: A Case Study of Nigeria

There are many socio-economic benefits arising from the UEEE trade in Nigeria. Economic gain from sale of UEEE was noted as the major benefit arising from the UEEE trade in Nigeria. Based on facts from interviews and observations, economic gain can be described as the major driving force behind the massive growth in the UEEE sector in Nigeria. The UEEE trade in Nigeria provides economic opportunity to various actors involved in the trade including the importers, the retailers, the refurbishers, the consumers as well as the scavengers. Each of the actors at the

various stages of the UEEE/e-waste chain in Nigeria acquires economic gain from his/her activities thus providing an incentive that sustains the chain of activities.

Other socio-economic impact arising from the UEEE trade in Nigeria relates to the employment opportunities provided to other individuals directly or indirectly involved in the UEEE trade. Also worthy of note is the revenue derived by various levels of government from the economic activities surrounding the UEEE trade which further contributes to economic development in the country. Going further from here, we shall examine in detail the economic gains and contributions made by the various actors in the UEEE trade chain in Nigeria.

3.7.1 Importers/Wholesalers

Compared to other actors in the chain, UEEE importers make the most economic gain. This is not surprising considering the fact that the import process is financially demanding. Importers commit substantial financial resources and incur more risk (financially) than other actors in the chain. Hence it is only logical that they should also derive more economic gain than the other actors. The economic gain made by a UEEE importer is dependent on many factors which include the cost of UEEE purchase overseas, the cost of shipping and custom clearing. Also important is the reputation of the importer in the local market. The reputation of the importer in this case is dependent on retailers' feedback which in turn is subsistent on the quantity of junk e-waste that usually emanates from his supplies.

When importers negotiate for purchase of UEEE from recyclers abroad, representation is often made by the recyclers as to the percentage of functional devices in their stock of UEEE. For example, the representation could be to the effect that 20' container loads of UEEE supplied by

the recycler will contain a specified percentage (e.g. 70% or 80%) of functional equipment. The higher the estimated percentage of functional equipment, the higher the cost of the stock. Hence, importers who tend to buy stock of supplies with a lower percentage of functional equipment pay lower prices for their supplies. This group of importers derive more economic gain when they sell their products. The low price they pay for their supplies when compared to the price they eventually sell the same leaves them with a higher profit margin. These importers do not have a good reputation among the retailers who are often very careful before making purchases from them. The risk borne by retailers making purchases from these importers is usually high. Hence this class of importers is characterised by high profit margin and low turnover.

On the other hand, importers who go for stocks with a higher percentage of functional devices pay more for their stocks, and make profits lower than the other importers. However, they have a good reputation among the retailers and tend to make a more rapid turnover than the other group. It was noted from interviews during the course of the field research for this thesis that the net profit margins for UEEE importers could range from 28% to 35%. Since the importers mostly sell their import “as is”, and the retailers are not allowed to test the products for functionality before purchase, the only loss the importer may encounter relates to products with visible damage which the retailers may be unwilling to purchase because of the patent defect. Such damage may result from improper loading in the container. Hence, the importers are usually very careful when loading the products so as to minimize damage.

That notwithstanding, an importer of UEEE into the Nigerian electronic market is certain of making a profit no matter the market condition. How much profit s/he makes depends on the factors above. In addition to the economic gain made, the importer also contributes to economic development by providing employment opportunities. Importers who have shops or warehouses

located in any of the used electronics markets pay royalties to the indigenous communities that have traditional title to the land where the used electronic market is situated. Representatives of the communities usually charge the royalties when any container of UEEE enters the market.²⁴³ The import duties paid by the importers to the federal government as well as business taxes paid to various levels of government also contribute to economic development.

3.7.2 Retailers

The retailers are important middlemen in the UEEE trade. They connect the importers/wholesalers with the refurbishers, final consumers as well as the e-waste collectors. The UEEE trade provides economic and employment opportunities to the retailers. It is difficult to estimate the number of retailers engaged in the UEEE trade in Nigeria. This is because most of the retailers are unregistered sole proprietor type of business outlets. However, it has been estimated that there are about 2500 UEEE retail traders in the Alaba Market and 3000 in Computer Village alone.²⁴⁴ Based on information obtained from interview with the retailers, the net profit margin made by a UEEE retail trader in Lagos ranges from 15% to 25%.

In addition to the economic benefits the retailers derive from the trade, they also contribute to economic development in various other ways. The UEEE retailers pay royalties to indigenous communities that have indigenous title to the piece of land where the UEEE markets are situated.

²⁴³ The royalty paid for each container of UEEE ranges from \$200 - \$250. As a matter of fact, the indigenous communities yield more revenue from the operation of the markets than the state and local government combined. This is because the indigenous communities charge royalty per container while the local and state governments impose an annual tax per trader.

²⁴⁴ Manhart et al. "Informal e-waste management in Lagos, Nigeria - Socio-economic impacts and feasibility of international recycling co-operations", final report of component 3 of the UNEP SBC E-waste Africa Project, 2011 <www.oeko.de/oekodoc/1371/2011-008-en.pdf>.

In addition, they pay tax to local and the state governments in Lagos. Manhart et. al. noted that UEEE trade chain in Lagos generates about US\$ 50.8 million per year, which is about 0.015% of Nigeria's gross domestic product, while an estimated annual tax of about \$419,000 (US) is paid to the local and states governments.²⁴⁵

The operation of the retail trade also provides employment opportunity not just for the retailers but also for the salesclerks employed by the retailers for book-keeping and clerical duties. The UEEE retail trade provides the biggest employment opportunity in the UEEE trade chain. This is very much evident when we consider the retail trade apprenticeship scheme. Although it would be quite difficult to accurately estimate the number of apprentices employed under this scheme, a sample computation may give us an idea. Marhart estimated that there are 2,500 UEEE retailers in Alaba Market and 3,000 UEEE retailers in Computer Village. As was observed during the course of the field research, the UEEE retailers have an average of 2 apprentices. Based on this assumption, it can be estimated that the UEEE traders in these two markets employ about 11,000 apprentices. It should be noted that these apprentices are being groomed or trained to eventually commence UEEE trade, and when they do, they will also employ other salesclerks and more apprentices thus creating a chain of employment opportunities.

3.7.3 Refurbishers/Repairers

As in other sectors of the UEEE trade discussed above, economic gain is also a major impact among the refurbisher/repairer sector. The economic gain made by the repairmen is often dependent on their skill and the amount of non-functional equipment they are able to repair. It

²⁴⁵ Ibid.

was observed that highly skilled repairers tend to attract more patronage and they also tend to charge more for their services. Repairers who have formal education in universities or polytechnics tend to be more skilled than those who acquire their skills from hands-on training. Data obtained from interview with one of the repairers shows that some repairers who run their own repair business earn as much as \$600 a month. This exceeds the monthly remuneration made by some technicians in formal employment sector.

The repairers also contribute to economic development through an apprenticeship scheme. The scheme here is very similar to those in the sectors above. While the apprentices might not be entitled to fixed remuneration, they are often given some stipend for their daily upkeep. At the end of the apprenticeship program, some of these apprentices either set up their own repair businesses or they may be employed in the same workshop. In their new status, they may be entitled to a monthly income, and/or they will receive an agreed percentage of income from the service charge levied on any equipment they fix.

According to Manhart et al.,²⁴⁶ the UEEE sector in Lagos has developed into a regional hub that provides cheap UEEE not just for Lagos and Nigeria, but also for other West and Central African countries. The authors noted that the refurbishers in Computer Village and Alaba international market have skills and quality levels that are regarded as unique in sub-Saharan Africa. Other research works have substantiated this assertion.²⁴⁷ Manhart et. al. estimated that there are about

²⁴⁶ *Ibid* at 35.

²⁴⁷ A World Bank analysis of cluster-based economic activities in Africa emphasized the positive economic development of the Ikeja Computer Village. According to the study, the Computer Village was born out of the ingenuity of highly skilled but unemployed graduates with an entrepreneurial spirit, and this experience demonstrates that Nigerian manufacturing already can have a regional dimension to its activities. The study further noted that the Computer Village has established a foothold in skills-intensive computer repair and is an overwhelmingly positive example for a cluster-based economic development. See World Bank, Nigeria Employment and Growth Study, Report No. 51564-NG. (2009). See also Abiola, B.O., “The Otigba Computer Village Cluster in

8000 refurbishing enterprises operating in Lagos, providing employment to about 21,600 people. 35% of the jobs are filled with apprentices.²⁴⁸

3.7.4 Scavengers/Collectors

E-waste scavengers derive economic gain by buying obsolete e-waste from retail traders, dismantling the same and selling them to local processing industries or their agents. The economic importance of scavengers in relation to the UEEE trade is difficult to compute since these scavengers are not engaged in e-waste collection alone. They also engage in collection of other waste products such as car parts, furniture, bottles etc. However, it can be stated that e-waste scavenging provides additional income to these scavengers. It was noted from an interview with one of the scavengers that most of the scavengers engage in the activity on a seasonal basis - during the off-farming period. Thus e-waste scavenging provides an additional opportunity for the farmers/scavengers to be gainfully employed all year round. However, there are other undesirable aspects of e-waste scavenging which raises serious concern as to the cost/benefit of e-waste scavenging. The scavengers derive the lowest economic gain in the UEEE/e-waste chain and yet they bear the greatest risk because of their constant exposure to hazardous substances during the course of e-waste dismantling operations.

Nigeria”, in Zeng D.G. (ed) *Knowledge, technology and cluster-based growth in Africa* (World Bank Institute, Washington D.C. 2008).

²⁴⁸ *Ibid* at 37.

3.7.5 Consumers

Consumers of UEEE in Nigeria range from individual households to small-scale businesses. Considering the widespread poverty and low income among the majority of the Nigerian population, access to low cost UEEE presents an economic opportunity for people to acquire UEEE at a low cost thus enabling them to channel their income or saving to other economic activities. For example, while a new 15” CRT television sells for N20,000 (\$125), a used version of the same television could be purchased from the UEEE market for about N6,000 (\$38). This difference does not only represent a significant saving for an average Nigerian household but could also make a big difference in terms of access and lack of access to such electronic equipment. Thus the UEEE trade has enabled many households in the country to acquire basic electrical and electronic gadgets for their household needs.

The economic impact of the transboundary movement of UEEE into Nigeria is also evident in the growth and expansion of small-scale businesses that rely on electrical and electronic equipment such as Internet cafes, business centers, as well as reprography centers. These businesses rely on electrical and electronic equipment such as computers, fax machines, photocopy machines, scanners, printers etc. With the advent of the UEEE trade, the number of these businesses has been in constant increase while previously existing businesses have been able to expand. This has also resulted in increased competition in the businesses thus resulting in a decrease in price of services.

A visit to some of the Internet cafes in Lagos reveals that they basically operate on used computers imported from developed countries in North America and Europe. These used computers were bought at a fraction of the cost of new computers thus providing huge financial savings for the cafe entrepreneurs. Before the influx of UEEE, some of these Internet cafes

operated on very few computers bought anew at a high cost. However, as one of the café owner admitted in an interview, importation of UEEE has made it possible for these cafes to expand their businesses by providing more computer workstations to clients. New Internet cafes have also sprung up in both urban and sub-urban parts of Lagos, thus providing much needed socio-economic opportunities to the average people.

In the commercial streets of major Nigerian cities as well as in higher institutions, one will quickly observe the increasing number of makeshift shops run by small scale entrepreneurs, mostly women providing reprography services. At the University of Ibadan reprography center, about 150 entrepreneurs were observed in make-shift shops providing photocopying as well as word processing services to members of the university community especially students. Unlike students in developed countries, most students here do not have the “luxury” of owning personal computers or laptops, neither does the institution own a student computer lab easily accessible to the large number of the student community. Hence, the student community relies heavily on these small-scale businesses for word processing of their assignments and final year essay project as well as other reprography services. It was observed during the course of this research that more than 95% of the businesses at this center run on imported used computers, printers, as well as photocopy machines. Without these UEEE, most of these people would not have been in business, as they do not have the capability to finance the purchase of this equipment new. Thus this used equipment provides opportunities for these entrepreneurs to make basic income while at the same time providing much needed service to the student community in this institution.²⁴⁹

²⁴⁹ This trend was also observed at the University of Lagos, and it is common in all higher institutions in Nigeria.

What emerges from the above analysis is the fact that international trade in UEEE has had (and will continue to have) strong socio-economic impact on developing countries like Nigeria. Very few economic sectors in Nigeria have witnessed the rapid and sustained growth that is currently taking place in the UEEE sector in the country. A strong case can thus be made for transboundary movement of UEEE to developing countries. However, there is need to also examine the negative aspect of this trade. This latter examination is vital to the development of a sustainable policy framework for transboundary movement of UEEE into developing countries.

3.8 Health and Environmental Impacts of Transboundary Movement of UEEE to Developing Countries.

The discussions above have sought to highlight the immense socio-economic benefits that developing countries derive from international trade in UEEE. However, there is also another dimension to this trade. The downside trend to the economic boon from the UEEE trade is evident from the fact that importation of UEEE by industrializing nations like Nigeria has given rise to serious health and environmental hazards. International trade in UEEE now serves as a conduit for transboundary dumping of waste electrical and electronic equipment in developing countries. The unregulated nature of this trade has made it possible for recyclers in developed countries to mix functional and non-functional UEEE and export same to developing countries. Research studies in Nigeria and Ghana has estimated functional UEEE to constitute about 70%

of UEEE imported into both countries.²⁵⁰ Hence the remaining 30% represents junk e-waste that is shipped for the purpose of dumping.

The transboundary flow of e-waste has become a global health and environmental issue especially in developing countries like Nigeria characterized by lax regulatory frameworks for mitigating the adverse health and environmental impacts arising from the disposal of such waste. E-waste is physically and chemically distinct from other forms of municipal and industrial wastes in the sense that it contains both valuable as well as hazardous materials which require special handling or processing in order to forestall environmental contamination and damaging effects on human health.²⁵¹

E-waste contains a witches' brew of heavy metals and organic chemicals. Heavy metals found in e-waste include lead, mercury, cadmium etc, while its organic chemical contents include among others polychlorinated biphenyls and brominated flame-retardants.²⁵² Due to the presence of these substances, e-waste is generally considered a hazardous waste. Thus improper handling or disposal of e-waste will naturally result in these substances escaping into the environment and constituting serious health and environmental hazard to people and communities, especially in developing countries where these junk electronics are now increasingly being dumped.²⁵³ The health and environmental impacts of some of the heavy metals and organic chemicals in e-waste are highlighted below.

²⁵⁰ See Ogungbuiyi et. al. *Nigeria e-Waste Country Assessment* (Draft Version). Basel Convention Coordinating Center for Africa (BCCC-Nigeria) 2011; Odeyingbo Olusegun Ayodeji, "Assessment of the Flow and Driving Forces of Used Electrical and Electronic Equipment into and within Nigeria" (April, 2011).

²⁵¹ Brett H. Robinson, "E-Waste: An assessment of global production and environmental impacts," *Science of the Total Environment*, 408 (2009) 183-191 at 184.

²⁵² Puckett and Smith "Exporting Harm" *Supra* note 8.

²⁵³ Staffan Lundstedt "Recycling and disposal of electronic waste - Health hazards and environmental impacts" Swedish Environmental Protection Agency Report 6417 (March 2011) [Lundstedt "Recycling and disposal of electronic waste"].

Lead: Lead is the element most likely to cause discarded electronic devices to be characterized as hazardous waste. Lead is a highly toxic metal used in the production of electrical and electronic equipment. Lead can increase blood pressure and cause fertility problems, nerve disorders, muscle and joint pain, irritability, and memory or concentration problems in adults. The situation is even worse in the case of children who are particularly vulnerable for a variety of reasons, including the fact that their body and brain are still developing. Lead poisoning has been linked to lower IQ scores in children exposed to even low levels of lead.²⁵⁴

The most significant use of lead in electrical and electronic equipment is in cathode ray tube (CRT) displays and monitors. It is used in CRT monitors and displays as a radiation shield and to lower the melting temperature of the display glass. Lead is also found in prominent quantity on soldering which connects many components in the circuit boards in electronic devices. Its choice in this capacity stems from its good conductivity, high corrosion resistance, cost-effectiveness, and low melting point.

Old generation CRT monitors and television sets contain between three to five pounds of lead. At the tail end of a CRT is a coil of precious copper metal. Recovering the copper coil would usually involve cracking the CRT resulting in escape of lead substance contained therein. Of the many heavy metals, lead is the most widely used chemical substance in electronic devices with consequential health and environmental hazards resulting from improper management of e-waste. Research studies have noted a significantly high lead level among informal e-waste

²⁵⁴ U.S. National Institute of Environmental Health Sciences “Lead and Your Health” April 2005 <www.niehs.nih.gov/health/materials/lead_and_your_health_508.pdf>.

recyclers as well as communities around informal e-waste recycling facilities.²⁵⁵ For example a research study of workers in an e-waste dumpsite in Accra, Ghana found high lead levels in serum of e-waste exposed workers. The research noted that while the mean serum level for non-exposed population was 0.19 ppm, the mean serum level for the e-waste workers was 0.44 ppm.²⁵⁶ Given the amount of historical research on the toxicity of lead on human health and the environment, it is not surprising that many studies have been conducted on lead as a hazardous component in electrical and electronic devices.

Human exposure to lead can cause severe health impacts including brain damage, nervous damage, blood disorders, kidney damage and developmental disorders.²⁵⁷ Lead is arguably the most-researched developmental neurotoxicant and unfortunately is also a predominant toxicant in e-waste. The effect of lead exposure on children's brain development has been well-documented.²⁵⁸ High lead exposure in childhood has been associated with attention deficit disorder²⁵⁹, low IQ²⁶⁰, as well as delinquent behavior and criminal activities in adolescents and young adults.²⁶¹ Children are particularly more susceptible to lead exposure, as they tend to absorb more lead from the environment than adults do. Lead accumulation in the environment

²⁵⁵ Zheng et al "Heavy Metal in Hair of Residents in an E-Waste Recycling Area, South China: Contents and Assessment of Bodily State," *Archives of Environmental Contamination and Toxicology* (2011) online <<http://www.ncbi.nlm.nih.gov/pubmed/21360078>>.

²⁵⁶ Ditte Maria Frandsen, Jakob Rasmussen and Maren Urban Swart, "What a waste - how your computer causes health problems in Ghana", (November, 2011) <makeitfair.org/en/the-facts/reports/what-a-waste>.

²⁵⁷ Anna Leung et al. "Heavy Metals Concentrations of Surface Dust from E-waste Recycling and its Human Health Implications in Southeast China." *Environmental Science and Technology* (2008) 42(7) 2674-2680 [Leung et al. "Heavy Metals Concentrations"].

²⁵⁸ Xia Huo et al. "Elevated Blood Lead Levels of Children in Guiyu, an Electronic Waste Recycling Town in China." *Environmental Health Perspectives* (2007).vol. 115 No. 7.

²⁵⁹ Joe M. Braun, Robert S. Kahn, Tanya Froehlich, Peggy Auinger, Bruce P. Lanphear, Exposure to environmental toxicants and attention deficit hyperactivity disorder in U.S. children. *Environmental Health Perspective* 114 (2006)1904–1909.

²⁶⁰ Stuart J Pocock, Marjorie Smith, Peter Baghurst, "Environmental lead and children's intelligence: a systematic review of the epidemiological evidence", *BMJ* 309 (1994) 1189.

²⁶¹ Herbert L. Needleman, Christine McFarland, Roberta B. Ness, Stephen E. Fienberg, Michael J. Tobin, Bone lead levels in adjudicated delinquents. A case control study, *Neurotoxicol Teratol* 24 (2002)711–717.

also has high acute and chronic effects on plants, animals and micro-organism.²⁶² Due to the hazardous impact of lead on human health and the environment, its use in the production of electrical and electronic equipment is now restricted in Europe by virtue of the Reduction of Hazardous Substances (RoHS) Directive – a Directive which restricts the use of six hazardous materials in the manufacture of various types of electrical and electronic equipment.²⁶³

Mercury: Mercury is a metallic element that occurs naturally in the environment. It is estimated that 22% of the yearly world consumption of mercury is used in electrical and electronic equipment.²⁶⁴ Mercury is used for lightings in liquid crystal displays in a variety of electronic devices including computers, flat screen televisions, photocopiers, fax machines. It is also used in switches and sensors. High level exposure to mercury can cause damage to various human organs such as the brain, kidney and even developing fetus in a pregnant woman.²⁶⁵

Mercury could exist in organic or inorganic form. Methylated mercury is the most common organic mercury compound and poses the greatest threat to humans and the environment. Exposure to mercury could occur through inhalation or bodily contact with elemental mercury, or through consumption of water or food (mostly fish) contaminated with mercury. In relation to e-waste, exposure to mercury could result from disposal of e-waste in an environmentally unsound manner thus resulting in mercury contained in the e-waste being released into the environment. For example, manual dismantling of e-waste resulting in the breaking of

²⁶² Puckett and Smith “Exporting Harm” *Supra* note 8 at 9.

²⁶³ The Restriction of Hazardous Substances Directive (RoHS) 2002/95/EC [RoHS Directive].

²⁶⁴ Puckett & Smith *exporting harm*, *Supra* note 8.

²⁶⁵ In a 2000 report, the National Academy of Sciences estimated that over 60,000 babies are born each at risk for neurodevelopmental (nervous system) defects associated with high exposure to methylmercury in the womb. see National Academy of Sciences, *Toxicological Effects of Methyl Mercury*, (National Academy Press, Washington DC., 2000) <http://www.nap.edu/openbook.php?isbn=0309071402>.

fluorescent lamps could lead to the escape and inhaling of mercury vapour by the dismantlers.²⁶⁶

Likewise, escape of mercury substance could occur when mercury-containing electrical and electronic devices are landfilled or incinerated in an environmentally unsound manner.

Once mercury is released into the environment, it remains there permanently, changing its chemical forms depending on the environment.²⁶⁷ Approximately 80% of the mercury inhaled crosses the alveolar membrane and is rapidly absorbed into the blood system.²⁶⁸ The level of health impact that results from exposure to mercury usually depends on many factors such as the level and length of exposure as well as individual body response. However, the adverse effect of exposure could range from deformity, and dementia to death.²⁶⁹

The Minamata Convention on Mercury*, a global, legally binding treaty was signed in 2013. The Convention has as its objective the protection of human health and the environment from anthropogenic emissions and releases of mercury and mercury compounds.* The Convention

²⁶⁶ Treuesdale et al estimated that mercury emissions from a fluorescent lamp after breakage were about 6.8 percent of the total mercury content of each fluorescent lamp. See Truesdale, R. S., Beaulieu, S. M., Pierson, T.K. (1992). "Management of Used Fluorescent Lamps - Preliminary Risk Assessment", Available at: <infohouse.p2ric.org/ref/23/22634.pdf>; Another report describes mercury emissions from a fluorescent lamp after breakage to be from 1 to 1.2 per cent. See U. S. Environmental Protection Agency (US EPA) (1998). "Mercury Emissions from the Disposal of Fluorescent Lamps", Available at: <www.epa.gov/osw/hazard/wastetypes/universal/merc.../merc-rpt.pdf>.

²⁶⁷ Shunichi Honda and Jinhui Li, "Mercury in e-waste", Tech Monitor, Jul-Aug 2008, 16 - 22 at 18.

²⁶⁸ World Health Organization (WHO) (1991). "Environmental Health Criteria 118, Inorganic Mercury, International Programme on Chemical Safety", Available at: <<http://www.inchem.org/documents/ehc/ehc/ehc118.htm>>.

²⁶⁹ Sharon Guynup "Mercury: Sources in the Environment, Health Effects, and Politics" <blueocean.org/documents/2012/07/boi-mercury-report.pdf>.

* Signed on 10th October 2013. Available at <http://www.mercuryconvention.org/Portals/11/documents/conventionText/Minamata%20Convention%20on%20Mercury_e.pdf>.

* *Ibid* Article 1.

provide for controls and reductions across a range of products, processes and industries where mercury is used, released or emitted.*

Cadmium: Used in rechargeable computer batteries, semiconductor chips and contact switches in CRT monitors. Its use in electronic products is preferred because of its excellent corrosion resistance, low electrical resistance, good soldering qualities, and solubility in strong acids. When released into the environment, this toxic substance has the tendency to bio-accumulate. Exposure to cadmium could result in irreversible adverse health impacts affecting the kidneys and bones.²⁷⁰ The kidney is the critical organ in long-term, low-level exposure to cadmium. The critical effect is a decrease in the tubular reabsorption of proteins and an increased excretion of low molecular weight proteins, tubular proteinuria.²⁷¹

Brominated Flame Retardants (BFRs): BFRs are used in printed circuit boards, motherboards, keyboards, cables, and plastic casing of electrical and electronic equipment to reduce flammability in the event of an inferno. There are two particular types of BFRs - the polybrominated biphenyls (PBBs) and polybrominated diphenyl ethers (PBDEs). BFRs are also found in semiconductor encapsulants, cables and connectors.²⁷² BFRs are additives hence they are not chemically bound to a plastic component but rather added to it. This also implies that they are capable of leaching into the environment. BFRs are particularly likely to be persistent

* *Ibid*, Articles 4 and 5.

²⁷⁰ Alfred Bernard, "Cadmium & its adverse effects on human health" (2008) *Indian Journal of Medical Research* 128, 557-564.

²⁷¹ Magnus Piscator, "Dietary exposure to cadmium and health effects: impact of environmental changes", *Environmental Health Perspective*, 1985 November; 63: 127-132 at 129.

²⁷² Ronald E. Hester and Roy M. Harrison (eds.) *Electronic Waste Management - Design, Analysis and Application* (Cambridge: RSC Publishing, 2009) at 44 - 45 [Hester and Harrison "Electronic Waste Management"].

and bio-accumulative thus having the tendency to stay in the environment for a long time and accumulate in humans and animals.

In developing countries, the impacts related to BFRs arises from improper e-waste management. Incineration of plastic casings of waste electrical and electronic equipment containing BFRs in open landfills produces secondary emissions that are not chemicals in e-waste but reaction products from the incineration process. Polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/PCDFs) are examples of hazardous substances produced as a result of open burning of e-waste plastic casings and wire cables. Polychlorinated dibenzo-p-dioxins and dibenzofurans (dioxins and furans) are some of the most hazardous chemicals with severe health impacts ranging from cancer, neurological damage, endocrine disruption and even birth defects. The burning of insulated cables in informal e-waste processing generates 100 times more dioxins than the burning of domestic waste.²⁷³ The table below shows lists of some of the hazardous substances contained in e-waste.

²⁷³ Brian K. Gullett et. al., “Characterization of air emissions and residual ash from open burning of electronic waste during simulated rudimentary recycling operation,” *Journal of Material Cycles and Waste Management*, Volume 9, Number 1, 69-79 [Gullett et. al., “Characterization of air emissions”].

Table 1. Potential hazardous substances found in e-waste

Hazardous Substance	Relationship with e-waste	Typical E-waste Concentration (mg/kg)
Polybrominated diphenyl ethers (PBDEs) polybrominated biphenyls (PBBs) tetrabromobisphenol-A (TBBPA)	Flame retardants	
Polychlorinated biphenyls (PCB)	Condensers, transformers	14
Chlorofluorocarbon (CFC)	Cooling units, insulation foam	
Polycyclic aromatic hydrocarbons (PAHs)	Product of combustion	
Polyhalogenated aromatic hydrocarbons (PHAHs)	Product of low-temperature combustion	
Polychlorinated dibenzo- <i>p</i> -dioxins (PCDDs), polychlorinated dibenzofurans (PCDFs)	Product of low-temperature combustion of PVCs and other plastics	
Americium (Am)	Smoke detectors	
Antimony	Flame retardants, plastics	1700
Arsenic (As)	Doping material for Si	
Barium (Ba)	Getters in cathode ray tubes (CRTs)	
Beryllium (Be)	Silicon-controlled rectifiers	
Cadmium (Cd)	Batteries, toners, plastics	180
Chromium (Cr)	Data tapes and floppy disks	9900
Copper (Cu)	Wiring	41,000
Lead (Pb)	Solder, CRTs, batteries	2900
Lithium (Li)	Batteries	
Mercury (Hg)	Fluorescent lamps, batteries, switches	0.68

Adapted from Robinson (2009)

3.9 Hazardous Impacts of E-waste

The presence of these hazardous chemical substances in electrical and electronic products links the transboundary movement of e-waste to developing countries (where they are subjected to environmentally unsound treatment) with potential risks to human health and environment. Before now, China has been at the center of investigative reports and documentaries relating to health and environmental hazards arising from transboundary movement of e-waste.²⁷⁴ Attention has recently turned to countries like Ghana and Nigeria due to the increasing flow of e-waste to these countries.²⁷⁵ In developing countries like Nigeria and Ghana, most risks relating to e-waste arise during informal e-waste recycling activities undertaken by scavengers in local dumpsites. These scavengers employ archaic recycling methods including manual breaking and disassembly of electrical and electronic components of e-waste, open burning of plastic cables to extract copper wires, as well as open incineration of unwanted plastics components. It would be noted from the analysis above that these unconventional processing methods result in the escape of/and exposure to all the hazardous substances listed above and even more.

It was observed during the field research in Ghana that scavengers and dismantlers at the Agbogbloshie e-waste dumpsites would generally employ the use of heavy objects like hammers in dismantling obsolete electronics e.g. a CRT television set. This process of dismantling would usually result in the immediate exposure of these scavengers to lead, mercury, cadmium and

²⁷⁴ Puckett and Smith “Exporting Harm” *Supra* note 8; CBS News “Following The Trail Of Toxic E-Waste” <<http://www.cbsnews.com/stories/2008/11/06/60minutes/main4579229.shtml>>; CBS News “The Electronic Wasteland” <<http://www.cbsnews.com/video/watch/?id=4586903n&tag=segmentExtraScroller;housing>>.

²⁷⁵ See Jim Puckett, *The digital dump: exporting re-use and abuse to Africa*, Basel Action Network, 2004. p. 35. Available at <<http://www.ban.org/Library/TheDigitalDump.pdf>>; Public Broadcasting Service, “Ghana: Digital Dumping Ground” <http://www.pbs.org/frontlineworld/stories/ghana804/video/video_index.html>.

other hazardous substances. While the scavengers inhale a dose of this toxic substance, some of these substances also mix with the air and could travel far beyond the vicinity of these dumpsites thus affecting communities within and beyond the dumpsites. In addition, during the raining season, these particles are washed by rainfalls into the water system thus resulting in water contamination as well as contamination of food chain.

The practice of incinerating cable wires and unwanted plastic components of electronic equipment like CRT monitors and television casings was a common sight in all the e-waste dumpsites visited in Ghana and Nigeria (with the exclusion of Computer Village in Lagos, Nigeria). The incineration of plastic components containing BFRs results in the formation of dioxins and furans which are inhaled by the scavengers as well as communities around the dumpsites. Dioxins and furans are recognised as some of the most hazardous anthropogenic pollutants. It is evident that the e-waste scavengers in the dumpsites as well as the nearby communities are particularly exposed to health risks arising from dust particles, fumes and smoke generated during the informal processing of these wastes. Processes involving e-waste incineration release a wide variety of hazardous compounds into the air through smoke and exhaust gases.²⁷⁶ Thus communities outside the e-waste dumpsites can also suffer from indirect environmental contamination as a result of the ability of these hazardous substances to travel beyond the vicinity of their point of discharge.

Although, there is a dearth of scientific studies in relation to the adverse health and environmental impacts of e-waste processing and dumping in Nigeria, such impacts have been extensively investigated and documented by the mainstream media, environmental organizations

²⁷⁶ Lundstedt "Recycling and disposal of electronic waste" *Supra* note 253.

as well as academic researchers in some other countries. For example, research studies in Ghana have revealed high toxic levels in e-waste dumpsites in Accra, Ghana.²⁷⁷ A research study by Brigden found contamination due to lead, cadmium and other health-threatening pollutants over 50 times higher than risk-free levels.²⁷⁸ Another research study by Caravanos in 2010 found the lead level in an e-waste dumpsite in Accra, Ghana to be as high as 18,125 ppm. This is far above the United States Environmental Protection Agency's standard for lead which is 400 ppm by weight for bare soil in play areas and 1200 ppm for non-play areas.²⁷⁹

A research study in Guiyu, China also noted widespread electronic waste recycling in the semi-formal and informal sector using archaic techniques such as acid leaching and open air burning posing severe health and environmental hazard.²⁸⁰ This was further corroborated by a research study in July 2009²⁸¹ which found that e-waste processing in Guiyu involved among other things metal recovery via open burning of wires to extract steel and copper, Cathode Ray Tubes (CRT) cracking to obtain copper-laden yokes, burning of printed circuit boards to remove chips, acid stripping to extract gold, plastic recycling through chipping and melting, as well as surface dumping of materials that cannot be further recycled and residue from recycling operations.

²⁷⁷ Caravanos et. al. "Assessing Worker and Environmental Chemical Exposure Risks at an e-Waste Recycling and Disposal Site in Accra, Ghana" *Blacksmith Institute Journal of Health & Pollution* Vol. 1, No. 1 — Feb 2011 [Caravanos et. al. "Chemical Exposure"]; Manukure et. al "Heavy Metals Contamination at a Waste Electrical and Electronic Equipment Recycling site in Ghana and the Environmental Impacts", presentation at StEP E-waste Summer School 2011 <http://files.step-initiative.org/download.php?sess=0&parent=342&expand=1&order=f_size&curview=0&id=1361>.

²⁷⁸ *Ibid.* Another research study on two major e-waste recycling sites in Accra vis Agbogbloshie and Koforidua found the concentrations of lead, copper, zinc and tin to be in the magnitude of over 100 times typical background levels. Particularly, the concentration of lead in soil and ash samples collected in these sites were found to be as high as 5,500mg/kg dry weight. See Brigden et. al., "Chemical contamination at e-waste recycling and disposal sites in Accra and Koforidua, Ghana" (August 2008) GreenPeace Research Laboratory Technical Note 10/2008 <www.greenpeace.org/...2/.../chemical-contamination-at-e-wa.pdf>.

²⁷⁹ Caravanos et. al. "Chemical Exposure" *Supra* note 277.

²⁸⁰ The area is so polluted that drinking water has to be fetched from a nearby city. Pregnancies are 6 times more likely to end in miscarriage and 7 out of 10 kids in the area have too much lead in their blood. Puckett and Smith "Exporting Harm" *Supra* note 8.

²⁸¹ Yan Guoa et al "Heavy Metals in the Environment: Heavy Metal Contamination from Electronic Waste Recycling at Guiyu, Southeastern China," *Journal of Environmental Quality*, vol. 38, pp 1617-1626, 2009.

Other research studies have analyzed human hair, blood, breast milk, soil, water and air dust samples from e-waste processing communities in Asia and have noted high levels of heavy metals and toxic chemicals in most cases.²⁸² Similar high level of heavy metal content were also observed in a research study of grain produced in a typical e-waste processing area in southeast China.²⁸³ The studies were unanimous in linking the high level of heavy metals and toxic substances in each case to the informal e-waste processing activities in the area under study. Inhalation and dust ingestion were suggested as possible routes of human exposure. In their study on assessment of risk from dust ingestion in informal e-waste processing sites in Guiyu, Leung et al. noted that ingestion of lead and copper contaminated dust may pose serious health risks to workers and local residents.²⁸⁴

Thus the scientific studies are unanimous to the effect that informal e-waste disposal and recycling activities involving the dismantling, open burning of plastics and cables result in emissions of significant levels of heavy metals and persistent organic pollutants to the soil, water systems as well as air. The scavengers in developing countries are ignorant of the health and environmental impact of their activities, and their ignorance is further compounded by the fact that the impact on their health is not immediately evident.

²⁸² *Supra* note 255 (Zheng) et al; Xia Huo et al “Elevated Blood Lead Levels of Children in Guiyu, an Electronic Waste Recycling Town in China,” *Environmental Health Perspectives* (2007) vol. 115 No. 7 pp. 1113 - 1117; Tue et al “Accumulation of Polychlorinated biphenyls and brominated flame retardants in breast milk women living in Vietnamese e-waste recycling sites,” *Science of the Total Environment* (2008) vol. 408 No. 9 pp. 2155-2162; F. Wang et al “Chemical and ecotoxicological analysis of sediments and elutriates of contaminated rivers due to e-waste recycling activities using a diverse battery of bioassays,” *Environmental Pollution* (2009) vol. 157. No. 7 pp. 2082-2090; S.C. Wong et al “Trace metal contamination of sediments in an e-waste processing village in China,” *Environmental Pollution* (2007) vol. 145 No. 2. pp. 434 - 442.

²⁸³ Jianjie Fu et. al. “High levels of heavy metal in rice (*Oryza sativa* L.) from a typical E-waste recycling area in southeast China and its potential risk to human health,” *Chemosphere* (2008) Vol. 71 No. 7. pp 1269-1275.

²⁸⁴ Leung et al. “Heavy Metals Concentrations” *Supra* note 255.

Though there is currently limited scientific study into the health impact on the e-waste scavengers as well as on the people living near e-waste dumpsites in Lagos, such limited information should not distract from the fact that e-waste poses serious health threats to both the scavengers and communities around the dumpsite. International trade in UEEE could serve as a tool for poverty eradication as well as socio-economic empowerment of the poor in developing countries, to ensure their meaningful participation in the development process, however it is now emerging that to achieve sustainable trade in UEEE, there is the need for a policy framework to mitigate the health and environmental harm arising from transboundary movement of e-waste to developing countries.

3.10 Health and Environmental Impacts of E-waste: A Case Study of the Agbogbloshie E-Waste Dumpsite in Accra, Ghana

The Agbogbloshie dumpsite is about 6.2 hectare (15 acres) and located on the west side of the Odaw River in Accra, Ghana. On one side of the river is a popular food market, while on the other side across the Odaw River is the Agbogbloshie slum - a squatter community of about forty-thousand people. Agbogbloshie dumpsite could be conveniently divided into three sections - the dismantling section, the burning section and the waste dumpsite. Although the dismantling section serves as a major outlet in Ghana for scavengers and dismantlers of all sorts of e-waste, it also accommodates traders dealing in all kinds of scrap metal products. Agbogbloshie is the place where old electrical and electronic equipment - material evidence of first world opulence and excesses finds their final resting place. This 6.2 hectare sized piece of real estate is now a popular local and international hub for informal e-waste recycling and dumping - a practice that comes with a great deal of health and environmental impact.

E-waste scavengers scout the Greater Accra Area in search of obsolete electrical and electronic equipment to buy from UEEE importers, retailers, repairers and individual households. These e-waste products collected across the city are subsequently transported by the scavengers to the Agbogbloshie dumpsite where they either do the dismantling themselves or sell the e-waste to the dismantlers who maintain makeshift stalls at the dumpsite. The dismantlers employ all sorts of archaic dismantling techniques such as manually breaking the components with hammers to retrieve the valuable materials in the waste products including circuit boards, copper, aluminum and iron metals. The informal process of e-waste dismantling at the Agbogbloshie dumpsite gives rise to serious health and environmental impact on the workers as well as surrounding communities.

To retrieve copper coils from Cathode Ray Tubes (CRT) monitors or television, the dismantlers would usually resort to cracking the tube with heavy metal objects like hammer. The breaking of the CRT would usually result in the release of hazardous toxics such as lead - a dose of which is inhaled by the dismantlers as the substances enter the natural environment. Apart from the dismantlers who are mainly adult, there is also another group of workers in the dumpsite. This group is composed of mainly teenagers (mostly below 16 years). These teenagers specialize in what appears to be the most dangerous aspect of informal e-waste processing - incineration of cable wires to retrieve the copper imbedded in them. These workers do not own the copper wires they incinerate, rather they work for the dismantlers who in return pay for their services.

The process employed in the incineration of cable wire to retrieve copper is very hazardous in nature. The process would usually involve collection and gathering of cable wires in a spot at the burning section. Automobile tires as well as styrofoam extracted from dismantled refrigerators

(both of which are in large supply in the dumpsite) are used to fuel the incineration process. This incineration process would result in the emission of dioxins and furans.

The health impact of this hazardous process is further compounded by the fact that the workers do not utilize any protective equipment such as nose masks. For a mere daily income of about \$4 per person, these workers inhale unhealthy doses of their hazardous emissions while a greater percentage of same escapes into the natural environment posing a health threat to surrounding communities around the dumpsite. Most of the teenagers engaged in the incineration process have little to no formal education and are completely ignorant of the health and environmental impact of their activities. On another section of the dumpsite, one would observe accumulated plastic casings from televisions and computer monitors. These plastic casings represent carcasses of dismantled televisions and monitors. Since these plastics have no economic value, they are dumped in the open landfill and are usually set ablaze at night resulting in discharge of toxic fumes that pollute the environment. Also evident at the dumpsites are glass tubes from CRT computers and television. Tubes from old generation monitors and television sets contain a great deal of lead and require special processing before disposal. However, it was observed at the dumpsite that once the copper coil in the tubes are extracted, the glass (which has no economic value) is manually crushed and dumped on the edge of the river. This archaic processing releases great quantities of lead into the water body. More so, the presence of these broken glasses on the dumpsite also pose some serious risks to the teenage workers on the site most of whom work barefoot or without adequate foot covering.

The location of the Agbogloboshie e-waste dumpsite also raises more concern as to the health and environmental impact of the e-waste activities at the dumpsite. As has been noted above, the dumpsite is located on the west side of the Odaw River. The dumping of non-valuable e-waste

components and other wastes into the Odaw River has severely restricted the water flow resulting in a semi-stagnant water body that serves as breeding ground for mosquitos. The fact of the informal e-waste dismantling and incineration activities taking place at this site inevitably results in discharge of hazardous substances into the river thus resulting in water contamination for communities both within and outside the location of the dumpsite. As a result of the public health concerns associated with e-waste dismantling and disposal in developing countries, such as Ghana, activities at the Agbogbloshie dumpsite have gained the attention of researchers and environmental NGOs.

Green Advocacy (GreenAd), a Ghana-based Environmental NGO which served as the host organization for the field research in Ghana, has over the years partnered with many foreign organizations and research institutions in conducting scientific research aimed at identifying the health and environmental impacts of the activities at the dumpsite. One such research project was conducted in 2010 in conjunction with the Blacksmith Institute.²⁸⁵ The research analyzed the lead content in soil samples extracted from five different locations in the dumpsite including the e-waste incineration fields as well as the dumping site along the river. The result was analyzed against the United States Environmental Protection Agency (USEPA) standard for lead in soil (400 mg/kg or ppm). The study revealed that over half of the soil samples were above the USEPA standard for lead in soil. The highest concentration of lead was found on the dumpsite along the river. The maximum level of lead in this area was about 18,125 ppm. The burning field which was located south of the dumpsite also revealed a very high level of lead. The maximum level of lead in this area was about 11,686 ppm. Soil samples from other parts of the dumpsite

²⁸⁵ Caravanos et. al. "Assessing Worker and Environmental Chemical Exposure Risks at an e-Waste Recycling and Disposal Site in Accra, Ghana" *Blacksmith Institute Journal of Health & Pollution* Vol. 1, No. 1 — Feb 2011.

revealed maximum level of lead above the USEPA guideline e.g. 2,537 ppm on the NW side and 3,741 ppm on the SW side. A close examination of the result reveals that there is far higher level of lead on those areas of the dumpsite where more hazardous e-waste activities occur such as burning or dumping.²⁸⁶

Another research study tested for heavy and trace metals in serum and urine assay of e-waste exposed-subjects at the Agbogbloshie dumpsite in comparison with samples from non e-waste exposed-subjects from a neighbouring community.²⁸⁷ To this effect, specimen samples were collected from 87 e-waste exposed-subjects at the dumpsite and 87 specimen samples from non e-waste exposed-subjects. An analyses of the serum and urine assay for heavy and trace metals showed significantly elevated levels of cobalt, chromium, copper, iron and lead in the exposed compared to the non-exposed in both serum and urine. For example, while the mean serum level for the non-exposed population was 0.19 ppm, the mean serum level for the exposed population was 0.44 ppm. The research opined that the elevated heavy metal level could be attributable to exposure to the products of e-waste.²⁸⁸

Conclusion

This chapter has sought to address the first research question in the opening chapter to this thesis by highlighting two conflicting impacts associated with transboundary movement of e-waste to developing countries. First, the socio-economic benefits arising from international trade in

²⁸⁶ It suffices to state though that the soil samples in this study were only tested for lead. Hence the study does not provide information as to the level of contamination from other heavy metals. This is an area where further research study needs to be undertaken.

²⁸⁷ Ditte Maria Frandsen, Jakob Rasmussen and Maren Urban Swart, "What a waste - how your computer causes health problems in Ghana", (November, 2011) <makeitfair.org/en/the-facts/reports/what-a-waste>.

²⁸⁸ *Ibid* at 23.

UEEE, and secondly, the health and environmental impacts associated with transboundary dumping of waste electrical and electronic equipment to developing countries.

International trade in UEEE serves a dual (albeit conflicting) purpose in developing countries. On the positive side, it serves as a tool for poverty eradication as well as socio-economic empowerment of the poor in developing countries. On the negative side, it poses a serious threat to public health and the environment as a result of informal activities relating to dumping and management of junk e-waste. Hence, it is the argument of this research that achieving sustainable development in the area of international trade in UEEE in the developing world would require a framework capable of reconciling these conflicting impacts. Such framework should be able to maximize the socio-economic benefits arising from international trade in e-waste while at same time minimizing the health and environmental impacts of such trade in developing countries. To what extent can the existing legal frameworks in this area adequately address this problem? Going further from here, this research will closely examine the existing legal frameworks for the transboundary movement of e-waste. This examination is undertaken with the aim of ascertaining the extent to which these frameworks are capable of reconciling the conflicting impacts identified in this chapter. It is important to conduct this examination because if it reveals that the existing frameworks are capable of addressing this conflict, then there will be no need for further inquiry. However, if it emerges from the examination that the existing frameworks are incapable, ineffective or inadequate in reconciling these conflicts, then the need for a new legal framework for transboundary movement of e-waste would have been demonstrated.

Chapter Four

4. INTERNATIONAL REGULATORY REGIME AND TRANSBOUNDARY MOVEMENT OF E-WASTE

An examination of the international regulatory regime relating to the transboundary movement of e-waste is essential in determining the adequacy or otherwise of such a regime in dealing with the problems identified in the preceding chapters in relation to the transboundary movement of e-waste from developed to developing countries and its consequential impacts. This examination at the international level is important because the transboundary movement of e-waste has a transnational dimension, and to adequately address the problem, there is need for an appropriate legal regime at that level also. Perhaps a starting point in the examination of international law relating to the transboundary movement of e-waste should commence with the examination of the international law relating to transboundary movement of hazardous waste. The rationale for this argument lies in the fact that transboundary movement of e-waste follows the same trend or pattern as the transboundary movement of hazardous waste.

While it can be said that significant amounts of hazardous waste is being generated in developed countries, it is very difficult to estimate the quantity of hazardous waste generated. This is because numerous hazardous waste transactions are clandestinely perpetrated outside the control or knowledge of regulatory authorities and hence outside the official record of state authorities. More so, definitions of ‘waste’ or ‘hazardous waste’ differ widely so that states monitor different types of wastes in different ways and to different extents.²⁸⁹

²⁸⁹ See Kummer, *Supra* note 128 at 5.

In the absence of accurate data to indicate the exact amount of hazardous waste generated in developed countries, available figures must be treated with caution since they can only give a rough indication of the scope of the problem. Available data shows that in 2010 some 101.3 million tonnes of hazardous waste was generated in the European Union. This figure represents an increase from 88.7 million tonnes in 2004, and 97.4 million tonnes in 2008.²⁹⁰ While the industrialized nations are responsible for the greater percentage of the world's hazardous waste generation, how much of this hazardous waste is subsequently transported to developing countries is not statistically ascertainable due mainly to the clandestine nature of the trafficking.²⁹¹

The OECD noted in *The State of the Environment Report* that: "[A]s matters stand at present - it is impossible to justify sending waste from North to South, since in most developing countries neither a waste management policy nor facilities for treating waste exist. Nor have these countries the institutional authorities or the financial resources required."^{*} The Report went further to observe that "the risks involved are not negligible: poor waste disposal can be of significant cost to society -- 100 to 1,000 times as much as preventive waste management that does not damage the environment."^{*} The Report noted that in most cases the kinds of waste illegally dumped in developing countries are the most hazardous ones, those that in the country

²⁹⁰European Commission, Eurostat "Waste Statistics" Available at <http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Waste_statistics#Further_Eurostat_information>

²⁹¹ Floyd James Handley, "Hazardous Waste Exports: A Leak in the System of International Legal Controls" (1989) *19 Environmental Law Reports* 10171

^{*} Organization for Economic Co-operation and Development, *The State of the Environment* (OECD Publishing, 1991) at 152.

^{*} Ibid

of origin cost most to get rid of because of their toxic or corrosive nature and because they cannot legally be dumped at sea.

The 1989 *Report of the Secretary-General on Illegal Traffic in Toxic and Dangerous Products and Waste* documented illegal waste transfers worldwide and came to the conclusion that “[t]he foremost characteristics of illegal traffic in toxic and dangerous products and waste is the dominant movement of these substances from the industrial to the developing world.”²⁹² Hence the increasing transboundary dumping of hazardous waste to poorer countries as well as the environmental health impact on the receiving countries prompted the need for a regulatory control.

The OECD countries initiated the first step in this direction following the large-scale movement of hazardous waste from rich countries in Western Europe to poorer countries in Eastern Europe.²⁹³ Hence in 1984, the European Community (EC) adopted the *Directive on the Supervision and Control within the European Community of the Transfrontier Shipment of Hazardous Waste*.²⁹⁴ There was also the Organization for Economic Cooperation and Development (OECD) *Decision and Recommendation on Transfrontier Movements of Hazardous Wastes*.²⁹⁵ The Decision became the first international agreement that sought to regulate the export of hazardous waste.²⁹⁶ It introduced the concept of prior notification requiring

²⁹² Report of the Secretary-General on illegal Traffic in Toxic and Dangerous Products and Wastes. UN GA, 44th Sess., para. 115, UN Doc. A/44/362 (18 July 1989).

²⁹³ According to the OECD, *The State of the Environment* (Paris: OECD, 1991) at 15, in a one year period 200,000 to 300,000 tonnes of hazardous wastes were exported to Eastern Europe in over 10,000 shipments.

²⁹⁴ *Directive 84/631/EEC*, OJ No. L 326, 13 Dec. 1984, p.31, as amended by *Directive 86/279/EEC*, OJ No. L 181, 4 July 1986, p.13.

²⁹⁵ Reprinted in (1984) 23 I.L.M. 214.

²⁹⁶ Peter Vint, "The International Export of Hazardous Waste: European Economic Community, United States and International Law" (1990) 129 *Military Law Review* 107 at 130.

Member states to provide the relevant authorities in the countries concerned with adequate and timely information regarding any movement of hazardous waste into their territory.

Subsequently the OECD issued *the Decision-Recommendation on Exports of Hazardous Wastes from the OECD Area*.²⁹⁷ The Decision incorporated the concepts of prior consent, non-discrimination, and adequacy of disposal facilities as factors to be considered in transboundary movement of hazardous wastes.²⁹⁸ Member states agreed to: (1) monitor and control hazardous waste shipments to non-member states; (2) apply no less strict controls on movements to non-member countries than on movements within the OECD area; (3) prohibit hazardous waste exports to non-member countries without the prior consent of the importing country and without the prior notification of transit states; and (4) prohibit exports unless the wastes are directed to adequate disposal facilities in the importing nations.²⁹⁹

Unfortunately, the various efforts by the OECD to regulate transboundary movement of waste across member states as well as to non-member countries like developing countries did not achieve significant results. In the Spring of 1988, Nigeria became a focal point of international attention after reports emerged of the dumping of 18,000 drums of toxic waste by an Italian company in the Niger-Delta region of the country.³⁰⁰ In the same year, the toxic vessel *Khian Sea* illegally transported (and subsequently dumped) incinerator trash from the city of Philadelphia, United States (an OECD member state) to the impoverished country of Haiti. There were also

²⁹⁷ Reprinted in (1986) 25 I.L.M. 1010 (adopted 5 June 1986).

²⁹⁸ Organization for Economic Co-operation and Development, *The State of the Environment* (OECD Publishing, 1991) at 151-52.

²⁹⁹ art. 1.

³⁰⁰ An Italian businessman had contracted with an unsuspecting local landowner for a monthly rent of \$100 to enable his firm store some 'construction materials' on land near the Koko Port. The 'construction materials' were later found to be toxic drums containing dioxins, PCBs and asbestos. The international scandal that brewed from the publicity of this incident resulted in the Italian government (an OECD member) accepting to repatriate the waste back to Italy – its country of origin. About 3 years later, the toxic waste landlord died from cancer.

other toxic trade scandals in which corporations in developed countries were found to be dumping hazardous waste products in countries in Eastern Europe.

The international outcry that followed these well-publicized incidents of waste dumping in developing countries led to renewed efforts toward international regulation of transboundary movement of hazardous wastes. It prompted governments in both developed and developing countries to begin negotiations for an international environmental treaty to regulate the transboundary movement of hazardous waste.

4.1 The Basel Convention

The Basel Convention³⁰¹ is the primary international legal framework regulating the transboundary movement of hazardous wastes including municipal trash. The Convention was adopted at a diplomatic conference in 1989 and went into effect in 1992. The need for the Convention arose as a result of the increasing desire for the regulation or control of transboundary movement of hazardous waste and their disposal in developing countries. This control became even more necessary due to the limited capabilities of these developing countries to manage such wastes. The objectives of the Convention as stated in its preamble include, among others, minimization of hazardous waste generation as well as reduction in the risk of damage to human health and the environment caused by transboundary movement of hazardous and other waste.³⁰²

³⁰¹ Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, 1673 UNTS 126; 28 ILM 657 (1989).

³⁰² See Basel Convention, *supra* note 123 Preamble.

At the negotiation stage of the Convention, while some member states especially from the developing world advocated an outright ban on transboundary movement of hazardous waste from developed to developing countries, some OECD countries were in favour of a regulatory system founded on notification and consent. The final draft of the Convention adopted a regime founded on among other things, prior notification and informed consent,^{*} environmentally sound management^{*}, and respect for the right of member states to prohibit import of hazardous waste into their territory.^{*}

The Convention specifically prohibits the export of hazardous waste or other waste to a non-party or import from a non-party.³⁰³ Hence the Convention limits the transboundary movement of wastes (both import and export) to only states that are both parties to the Convention and who have not prohibited such transboundary movement under their domestic law. An exception to the above rule applies where parties to the Convention have entered into a bilateral, multilateral or regional agreement with non-Parties, and the agreement or arrangement provides for environmentally sound management of hazardous waste in accordance with Article 11 of the Convention.³⁰⁴

Thus the final draft of the Convention while failing to entirely prohibiting transboundary movement of hazardous waste, allows for such movement in limited circumstances. This notwithstanding, a party to the Convention still retains the right to prohibit the import of

^{*} Article 6

^{*} Article 4(2)(b)

^{*} Article 4(1)

³⁰³ Article 4(5).

³⁰⁴ 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.

hazardous waste into its territory. Where this right of prohibition is exercised, communication to that effect to other parties gives rise to an obligation on the Parties to the Convention to prohibit the exportation of hazardous waste to the territory of the member country which has communicated its import prohibition. In the case of a state of import which has not prohibited the import of such waste, the state of export must provide prior notification to the receiving state as well as all transit states prior to the commencement of the shipment. In fact, the shipment shall not commence until consent of the proposed state of import has been received in writing.³⁰⁵

Notwithstanding the consent, the exporting member-state has an obligation under the Convention to prohibit the shipment if there is reason to believe that the waste will not be managed in an environmentally sound manner in the country of import.³⁰⁶ This provision thus imposes an obligation of due diligence on the exporting state to satisfy itself of the capacity of the importing state with regards to sound management of hazardous waste before authorizing or permitting the shipping of hazardous wastes to such state under any bilateral or multilateral agreement. One good effect of the concepts of prior notification or prior informed consent (as introduced in the Convention) is the fact that they not only assist in regulating illegal flow of hazardous waste but also help in generating reliable statistical information relating to transboundary flow of hazardous waste.

To further reduce the transboundary movement of waste (both legal and illegal), the Convention seeks to ensure that hazardous wastes are, as far as it is compatible with environmentally sound and efficient management, disposed of in the state where they are generated. Wastes may be exported only under certain conditions, including the unavailability of environmentally sound

³⁰⁵ *Ibid* Article 4

³⁰⁶ *Ibid* Article 4(2)(e)(g)

disposal facilities in the country of generation and the need for wastes as a raw material for recycling or recovery operations in the state of import. Additionally, where a transaction relating to the movement of hazardous waste to which consent has been given cannot be completed in accordance with the terms of the export, the Convention articulates an obligation on the state of export to ensure that the shipments which cannot be completed are accepted back in its territory for re-import, if alternative arrangements cannot be made for their disposal in an environmentally sound manner.

The Convention considers illegal traffic in hazardous waste to be a criminal activity and obliges member states to put in place appropriate measures to prevent and punish such contravention of the Convention.³⁰⁷ Illegal traffic includes transboundary movement of hazardous and other wastes without prior notification to and consent of all states concerned as required by the Convention; or where such consent is obtained by falsification, misrepresentation or fraud, or does not conform in a material way with the documents; or the transboundary movement results in deliberate disposal (e.g dumping) of hazardous wastes or other wastes in contravention of the Convention and general principles of international law.³⁰⁸

Where the illegal traffic is as a result of the conduct of the exporter or generator of the waste, the exporting state has an obligation under the Convention to ensure that the wastes are repatriated by the exporter or the generator, or the state of export, or where impracticable, the state of export shall ensure that they are disposed of in an environmentally sound manner.³⁰⁹ Where on the other hand the illegal traffic is as a result of the conduct on the part of the importer or disposer, it becomes the responsibility of the state of import to ensure that the waste is disposed of in an

³⁰⁷ *Ibid* Article 4(3)(4).

³⁰⁸ *Ibid* Article 9.

³⁰⁹ *Ibid* Article 9(2).

environmentally sound manner, either by the importer or disposer or, if necessary by the importing state itself.

Cusack has criticized this provision of the Convention as giving rise to a double standard.³¹⁰

Where fault is attributable to the exporter, the state of export has the discretion of repatriating the waste or making alternative arrangement for its disposal. Thus the exporting state which in most cases will be an industrialized nation is given the discretion to avoid re-import. By contrast, where the fault is attributable to the importer, and the importing state cannot dispose of the waste in an environmentally sound manner, it cannot repatriate the waste to the exporting country and the latter is not bound under the Convention to accept re-import. This situation is especially disturbing where (as in many cases in developing countries) the importer is unilaterally acting in violation of the laws of the importing country.³¹¹

Another problem with the Convention is the fact that the prohibition under the Convention fell short of an outright ban on the export of hazardous waste as sought by many developing countries. Many representatives from developing countries saw the use of prior notification and consent system as being inadequate.³¹² This is further substantiated by the fact that the prior informed consent notification system which was in existence in the OECD countries even before

³¹⁰ Marguerite M. Cusack, "International Law and the Transboundary Shipment of Hazardous Waste to the Third World: Will the Basel Convention Make a Difference?" (1990) 5 *American University Journal of International Law and Policy* 393 at 409-414.

³¹¹ The importing state in this case may argue that the import was in violation of any of the conditions in Article 9

³¹² According to Wirth, "Even before the Basel Convention was adopted, there were pressures to strengthen the rigour and intensity with which this instrument controls international trade in wastes. African states expressed concern over the Basel Convention's failure fully to ban transboundary movements of hazardous and other wastes, and no sub-Saharan African country signed the convention at the time of its adoption." See David A. Wirth, "Hazardous Substances and Activities" *Boston College Law School Research Paper No. 120*; in Daniel Bodansky, Jutta Brunée, Ellen Hey, (eds.), *Oxford Handbook of International Environmental Law*, (Oxford: Oxford University Press, 2007). Available at SSRN: <<http://ssrn.com/abstract=962777>>.

the Basel Convention has not been effective in preventing illegal waste movement to developing nations.³¹³

The Basel Convention failed to achieve its objective of reducing the toxic flow of hazardous waste to developing countries. This failure is attributable to the exceptions in the Convention which allows for transboundary movement of hazardous waste for recycling or reuse. The exceptions provided a loophole as hazardous waste traders sought to classify almost all hazardous waste shipment as being meant for recycling or reuse. Thus 'recycling' and 'reuse' became a legal catch phrase for illegal transboundary dumping of hazardous waste in developing countries.

Facts relating to the transboundary dumping of hazardous waste in developing countries in the guise of transboundary movement for reuse or recycling further renewed the call for a complete ban on all hazardous waste export from developed to developing countries - be it for disposal, recycling or recovery. This culminated in the adoption of an amendment to the Basel Convention at the third Conference of the Parties (COP-3) in 1995.³¹⁴ The amendment is officially referred to as Decision III/1 and commonly referred to as the Basel Ban or Basel Ban Amendment.³¹⁵

The Basel Ban effectively banned all forms of hazardous waste export from OECD to non-OECD countries. The enforceability of the Basel Ban is still a matter of controversy especially in relation to the ambiguity arising from the interpretation of Art. 17.5 which relates to the number of signatories required before its entry into force. Two different schools of thought have emerged

³¹³ See Cristina L. Douglas, "Hazardous Waste Export: Recommendations for United States Legislation to Ratify the Basel Convention" (1991) 38 *Wayne Law Review* 289 at 308 – 309.

³¹⁴ 22 September 1995

³¹⁵ Decision III/1, in Report of the Third Meeting of the Conference of the Parties to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, UN Doc. UNEP/CHW.3/35 (1995).

with regard to the proper approach to the interpretation of Art. 17.5. The “fixed time” interpretation was adopted by pro-Basel group represented by the European Union and developing countries. According to this group, the number of ratifications required for the amendment to come into force is three-quarters of the original members, or 62 out of the original 82 parties.* The “current time” approach favoured by Canada and the United States requires ratification by three-quarters of the parties to the Convention at any given time.³¹⁶ Hence, if we accept the interpretation of the pro-Basel group, then it follows that the Basel Ban Amendment is currently in force and hence a binding rule of international law.

4.1.1 Applicability of the Basel Convention to the Transboundary Movement of E-Waste

As has been noted above, the Basel Convention as well as the Basel Ban apply strictly to transboundary movement of ‘hazardous waste’. Hence the applicability of the Convention to transboundary movement of e-waste will depend on whether or not electronic waste can be classified as ‘hazardous waste’ within the context of the Basel Convention. For the purpose of the Convention, hazardous waste was defined in Article 1, paragraph 1(a) by reference to a category list contained in Annex I of the Basel Convention. This includes “waste substances and articles containing or contaminated with polychlorinated biphenyls (PCBs) and/or polychlorinated terphenyls (PCTs) and/or polybrominated biphenyls (PBBs).”³¹⁷ Annex I also

* Basel Action Network, *The Basel Ban Amendment: Just Say Now*, Briefing Paper 4 (April 2013) <http://www.ban.org/wp-content/uploads/2013/04/BP4_April_2013_Final_Letter.pdf>.

³¹⁶ Submission by the United States Regarding Interpretation of Article 17(5) of the Basel Convention (April 16, 2007) <<http://archive.basel.int/legalmatters/article17%285%29/DecisionVIII30/us180407.doc>>

³¹⁷ See Annex I (Y10) of Basel Convention.

defined hazardous waste to include waste products containing constituents such as lead, cadmium, arsenic, beryllium, mercury etc.³¹⁸ Annex I (a) goes further to provide to the effect that “wastes listed in Annex VIII are characterized as hazardous pursuant to Article 1, paragraph 1 (a).” Annex VIII contains lists of hazardous waste which include among others:

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 ...

A1190 Waste metal cables coated or insulated with plastics containing or contaminated with coal tar, PCB, lead, cadmium, other organohalogen compounds or other Annex I constituents to an extent that they exhibit Annex III characteristics.

A2010 Glass waste from cathode-ray tubes and other activated glasses.

Some of the Article III characteristics relevant in this case include:

H11 Toxic (Delayed or chronic) - Substances or wastes which, if they are inhaled or ingested or if they penetrate the skin, may involve delayed or chronic effects, including carcinogenicity.

H12 Ecotoxic - Substances or wastes which if released present or may present immediate or delayed adverse impacts to the environment by means of bioaccumulation and/or toxic effects upon biotic systems.

H13 Capable, by any means, after disposal, of yielding another material, e.g., leachate, which possesses any 41 of the characteristics listed above.

Since the Basel Convention applies to transboundary movement of hazardous waste, it follows then that if electronic waste qualifies as hazardous waste within the framework of the Basel Convention, then its transboundary movement is subject to the provisions of the Basel Convention. However, this is a very contentious matter. Electronic products contains a variety of

³¹⁸ See generally Annex I (Y19 - Y45). It should be noted that the constituent listed here are constituent commonly found in electronic waste products.

toxic constituents such as lead, cadmium, arsenic, beryllium, mercury etc listed in Annex I. Hence once disposed of, they should ordinarily be classified as hazardous waste by virtue of the combined effect of Annex I, Annex III and Annex VIII and thus subject to the rigid transboundary movement procedure under the Basel Convention.

However, Annex IX of the Convention contains exception to Article 1, paragraph 1(a). The exception is to the effect that “*electrical and electronic assemblies (including printed circuit boards, electronic components and wires) destined for direct **reuse** and not for recycling or final disposal*” (emphasis added) are not considered as hazardous waste. Thus within the framework of the Basel Convention, transboundary movement of e-waste (in the sense of obsolete or junk electronics) for the purpose of recycling or disposal amounts to transboundary movement of hazardous waste and subject to the restrictions imposed by the Convention. On the other hand, transboundary movement of e-waste (in the sense of functional used electronics) for the purpose of direct reuse does not amount to transboundary movement of hazardous waste within the context the Basel Convention. Such products are not subject to any restriction under the Basel Convention.

It could be said thus that the Basel Convention does not prohibit neither does it seek to restrict transboundary movement or trade in functional used electrical and electronic equipment meant for *reuse*. This should not come as a surprise especially considering the fact that the Basel Convention aims among other things to reduce waste generation. Hence Kellner has noted that

reuse of electronic products extends the life of such products and delays the replacement.³¹⁹ In the long run, this has the effect of reduced waste generation.³²⁰

Thus reuse of discarded but functional used electrical and electronic equipment has many positive environmental impacts. In addition to reducing the demand for new products, it results in conservation of exhaustible natural resources used in production of electronics. It also reduces the environmental impacts and energy demands from mining and manufacturing processes for new electronics.

Notwithstanding the environmental benefits of the reuse exception, the fact though seems to suggest that the reuse exception in the Basel Convention was created without adequate framework for its practical implementation. This has resulted in the inadequacy and inefficiency of the Basel Convention framework in reducing transboundary movement of e-waste to developing countries. The circumvention of the framework is so easy that a mere documentary declaration to the effect that a consignment of used electronic export to a developing country is for reuse automatically takes it outside the framework of the Basel Convention. There is no requirement under the framework to verify if the shipment is in its actual state capable of reuse. The exemption thus provides ample opportunity to avoid the strict legal obligation related to transboundary movement of hazardous waste when in fact such shipments may and do turn out to consist of hazardous e-waste.

As was noted in Chapter three of this thesis, the socio-economic impact of used electrical and electronic equipment in developing countries is quite immense. International trade in UEEE

³¹⁹ Rod Kellner, “Integrated Approach to e-waste Recycling” in R. E. Hester and R. M. Harrison eds *Electronic Waste Management - Design, Analysis and Application*, Cambridge: RSC Publishing, 2009 at 153.

³²⁰ Special Report Series, “ICT and the Environment - Why reuse is better than recycling”, (August 2010)

should be promoted to enhance socio-economic development in the developing world. However, the tendency for abuse of this trade raises a serious challenge as to how to impose necessary restrictions to transboundary movement of used electrical and electronic equipment for the purpose of regulating adverse health and environmental impacts of the trade, and doing so without hurting the economic and technological advancement in developing countries, or unnecessarily restricting international trade in functional used electrical and electronic equipment.

Another factor that has affected the ability of the Basel Convention and Basel Ban to address the transboundary movement of e-waste to developing countries lies in the legal status of the treaty in some developed countries especially in North America. While Canada has ratified the Basel Convention, it has refused to ratify the Basel Ban Amendment which prohibits the transboundary movement of hazardous e-waste to developing countries.³²¹ Refusal to ratify the Basel Ban has left the doors of Canadian ports wide open for exportation of electronic wastes to developing countries that do not have the capacity to manage these wastes in an environmentally sound manner.

The position in United States is even worse. Although the United States has signed the Basel Convention, it is also the only developed country that has yet to ratify the Convention. It has also

³²¹ Canada's position with regards to the Basel Ban Amendment was evident in a statement made by Canada at the Third Conference of the Parties (COP3) following the adoption of the Basel Ban Amendment. The statement was to the effect that "Canada agrees that there exists sufficient evidence to warrant acceptance of the ban amendment related to hazardous wastes destined for final disposal...Canada is committed to the wise utilization of all resources. As such, Canada believes that environmentally sound recycling is required to ensure the availability of such resources for use by future generations. Environmentally sound recycling is a necessary and integral part of sustainable development. There will be a need for recycling of hazardous wastes today, tomorrow, and for many years to come. Canada finds that there is insufficient clarity as to which recyclable materials would be subject to the ban amendment. Therefore, it is premature to consider adoption of a legally binding amendment at this time." See Third Conference of the Parties to the Basel Convention, *Report of the Third Meeting of the Conference of the Parties to the Basel Convention*, Statement made by Canada (Annex II), UNEP/CHW.3/34 (Geneva, 17 October 1995) at 20.

refused to ratify the Basel Ban. Most items considered hazardous under the Basel Convention are surprisingly categorized as non-hazardous under U.S. domestic laws.³²² Hence under the U.S. federal legislative framework, not only is it legal to export certain items internationally recognized as hazardous e-waste, the Resource Conservation and Recovery Act (RCRA) has been amended over time to specifically allow e-waste export by exempting these hazardous wastes from export regulation. The RCRA is the primary federal legislation in the U.S. regulating hazardous waste and the Act will only apply where a material or substance has been classified as hazardous under the Act.

Though the RCRA was not meant to deal specifically with e-waste, the Act, by classifying many electronic waste materials as non-hazardous excluded them from the regulatory jurisdiction of the Act. For example, a U.S. Government Accountability Office report has noted that US law allows unfettered export of nearly all types of used electronic devices. The report went further to note that U.S. hazardous waste regulations do not consider most waste electronic products, such as computers, printers, and cell phone as hazardous notwithstanding the presence of evidence indicating that ‘they can be mismanaged overseas and can cause serious health and environmental problems.’³²³

If the US were to ratify the Basel Convention and the Basel Ban, it would be obliged under both treaties to ban or strengthen its laws relating to the export of hazardous wastes including e-waste to developing countries. The U.S. Congress would also have to amend its domestic legislation such as the *Resource Conservation and Recovery Act* to remove the exemptions in the Act which have the effect of permitting hazardous e-waste export (to developing countries) for the purpose

³²² “Electronic Waste and Organized Crime – Assessing the Link” Phase II Report for the Interpol Pollution Crime Working Group. (May 2009).

³²³ *Supra* note 222 at p. 6.

of recycling. Presently, the U.S. Congress appears to ignore the health and environmental impact of its e-waste export to developing countries especially in Asia. Hence the U.S. policy appears to be designed to promote sweeping the e-waste problem out the Asian back door.³²⁴ This is not to imply that the US does not comprehend the impact of its e-waste export to developing countries. The fact is that it is doing very little to forestall or prevent such negative impacts. Pellow has attributed this to the US White House and US-based trade organizations representing the electronic industry.³²⁵ According to him:

Not only are the US White House and Congress resisting progress on e-waste management, they have been hard at work hindering others from doing anything positive about the situation as well. For e.g, on behalf of the American Electronics Association, the US Trade Representatives office lobbied the EU aggressively, to put a stop to the WEEE and RoHS directives before they were passed. Thus, in an increasingly common role, the US worked to weaken another group of nations' law so as to benefit private corporations based in the US. In fact, the US threatened to take the WEEE issue up with the WTO if certain provisions were not omitted.³²⁶

The Basel Convention is an international treaty and under the rules of international law, a treaty cannot bind a state unless it has expressed intention or consent to be bound by the treaty. The consent of a State to be bound by a treaty may be expressed by signature, exchange of instruments constituting a treaty, ratification, acceptance, approval or accession, or by any other means if so agreed.³²⁷ Hence, the deliberate refusal by developed countries like the United States and Canada to submit to the Basel Ban framework prohibiting transboundary movement of e-waste to developing countries imply that the treaty obligation evident in the Basel Ban is generally not binding on these countries on the basis of the treaty provisions. However, this

³²⁴ *Supra* note 75 at p. 216.

³²⁵ *Ibid.*

³²⁶ *Ibid* 218.

³²⁷ Article 11, Vienna Convention of Law on the Law of Treaties.

position might be somewhat different when we consider the matter under the rules of customary international law. The latter case is noteworthy because consent of a state is not essential for it to be bound by these rules.

Going further from here, this research will examine the rule of customary international law relating to transboundary environmental pollution, and to what extent this customary rule apply to transboundary movement of e-waste. This examination will seek to ascertain (i) whether the rules of customary international law impose a binding obligation on states to prevent transboundary harm arising from environmental pollution, and (ii) whether rules of customary international law could apply in regulating transboundary movement of e-waste to developing countries and their adequacy as a legal framework.

4.2 Customary International Law and Transboundary Movement of Waste

The rules of customary international law relating to transboundary environmental pollution may be relevant in the consideration of the transboundary movement of e-waste. The hazardous impact of e-waste on the environment can be described by reference to the concept of pollution. The concept of pollution was subject to international policy and law long before the introduction of the more specific issue of transboundary waste traffic.³²⁸ Hence legal rules that have evolved to address transboundary pollution may be relevant in transboundary waste regulation.

An early definition of pollution can be found in *The Principles Concerning Transfrontier Pollution* adopted by the OECD in 1974: “Pollution means the introduction by man, directly or

³²⁸ See e.g. Principles 6, 7, 21 and 22 of the 1972 Stockholm Declaration; para. 12 of the 1982 World Charter for Nature (UNGA Resolution 37/7, 1982), and UNEP's Montevideo Programme of 1981.

indirectly, of substances or energy into the environment, resulting in deleterious effects of such a nature as to endanger human health, harm living resources and ecosystems, and impair or interfere with amenities and other legitimate uses of the environment.’³²⁹ A study by Springer outlines four key elements of pollution: (a) the source of pollution, defined as ‘the range of human activities that can give rise, directly or indirectly, to detrimental environmental effects’; (b) the polluting agent, defined as a ‘substance or energy that is created or displaced by the source and that produces the detrimental effect’; (c) the medium by which the polluting agent is transmitted, including natural media such as the atmosphere, the hydrosphere, and food chains within ecosystems, but also manmade media such as international trade; and (d) the detrimental effects of pollution on the environment, which must reach a certain level of gravity in order to be legally relevant.³³⁰

Applying this definition to e-waste, it can be said that activities constituting transboundary movement of e-waste conform to the notion of pollution. The disposal of e-waste by their original owners can lead to pollution, and can thus be viewed as a source of pollution. The junk e-waste itself can be described as a polluting agent. The medium of its transboundary pollution is primarily international trade, while the effects of the pollution are the health and environmental impacts in recipient countries. Thus transboundary movement of e-waste constitutes a form of transboundary pollution – a pollution originating from one state and migrating to another state.

Kummer noted that since transboundary pollution has been a subject of international policy and law longer than the issue of transboundary movement of hazardous wastes, rules of customary

³²⁹ Recommendation of the OECD Council on Principles Concerning Transfrontier Pollution, C 74(224), 14 November 1974.

³³⁰ Allen L. Springer, *The International Law of Pollution: Protecting the Global Environment in a World of Sovereign States* (Westport, Connecticut: Quorum Books, 1983).

international law addressing transboundary pollution are potentially applicable to the hazardous waste cycle.³³¹

The rule of customary international law relating to transboundary pollution was established in general terms in the *Trail Smelter Arbitration*.³³² The Trail smelter case occupies a special place in the history of international environmental law. It is considered to have laid the foundation of international environmental law in the field of transboundary pollution. It was the first among the few landmark cases that sought to address transboundary harm arising from environmentally harmful activities - in this case air pollution. The Arbitration was unique in the sense that it arose at a time when scientific evidence relating to the threat that human activities pose to the environment was still cloudy.³³³

The dispute (between the United States and Canada) culminating in the arbitration arose from the industrial activities of a private smelting company in Trail, British Columbia, Canada. The location of the smelting company was just about eleven miles away from the international border with the United States. The operation of the Trail smelter resulted in significant discharge of smoke cloud containing sulphur dioxide which crossed the boundary in sufficient quantity to cause damage to properties in the neighbouring State of Washington in the US. The nature of the dispute thus was an international nuisance committed by a private Canadian corporation which caused damage to US citizens and properties in the State of Washington. The dispute was centered on responsibility for transboundary flow of hazardous contaminants from one sovereign state to another. A determination of this case would require a balancing of two conflicting rights

³³¹ *Supra* note 128 at 15.

³³² *Trail Smelter Arbitration*, UN R. Int'l. Arb. Awards 1905, (1941); see also *Corfu Channel Case*, ICJ Rep. 4 (1949) 4-28.

³³³ Karin Mickleson, *Rereading Trail Smelter*, 31 Canadian Yearbook of International Law 219, 222-23.

- the right of one sovereign state to economic exploitation of its natural resources and the right of another sovereign state to environmental protection.

At the time this case came before the Trail Smelter arbitrators, there was no previous decision by either the then Permanent Court of International Justice (PCIJ), or any international tribunal closely or remotely analogous. More so, there was a dearth of international law and jurisprudence dealing with international nuisance. The arbitrators were thus presented with an empty slate (*tabula rasa*) to write on, and as will be seen, they inscribed on this empty slate a rule which has come to acquire a fundamental character in international law.

The Trail Smelter Arbitrators rightly acknowledged their difficult position when they declared: “No case of air pollution dealt with by an international tribunal has been brought to the attention of the Tribunal nor does the Tribunal know of any such case.”³³⁴ Faced with the dearth of international jurisprudence on the issue, the *Trail Smelter* Tribunal turned to the U.S. Supreme Court decisions relating to interstate rights in the American federal system which in the view of the Tribunal were in conformity with the general rules of international law.³³⁵ After a comprehensive study of the scanty ‘precedents’, the Tribunal reached a landmark conclusion to the effect that:

under the principles of international law, as well as the law of the United States, no State has the right to use or permit the use of its territory in such a manner as to cause injury by fumes in or to the territory of another or the properties or persons therein, when the case

³³⁴ at 714.

³³⁵ *State of Missouri v. State of Illinois*, 200 U.S. 496 (1906); *Kansas v. Colorado*, 185 U.S. 125 (1907); *New York v. New Jersey*, 256 U.S. 296 (1921); *New Jersey v. New York*, 283 U.S. 473 (1931); *State of Georgia v. Tennessee Copper Company and Ducktown Sulphur, Copper and Iron Company, Limited*, 206 U.S. 230 (1907). The Tribunal also relied on a decision of the Federal Court of Switzerland in a suit between two cantons involving transboundary risks of target practice, and what the tribunal referred to as “[a] great number of ...general pronouncements by leading authorities concerning the duty of states to respect other states and their territory.” at pg 713.

is of serious consequence and the injury is established by clear and convincing evidence.³³⁶

The Tribunal noted that the decisions of the Supreme Court of the United States which form the basis for its conclusions are “decisions based in equity and a solution inspired by them”. This primary rule established in *Trail Smelter* has set a strong persuasive precedent that has been followed in international courts³³⁷ and has been invoked in a variety of international legal instruments.³³⁸

Principle 21 of the Stockholm Declaration, adopted by the UN Conference on the Human Environment in 1972, codifies this rule in a way that specifically addresses environmental protection: ‘States have, in accordance with the Charter of the United Nations and principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental policies, and the responsibility to ensure that activities within their jurisdiction do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction.’³³⁹ Principle 21 of the Stockholm Declaration has become a standard clause in environmental treaties.

Thus the *Trail Smelter Arbitration* has been characterized as the *locus classicus* of international environmental law.³⁴⁰ McCaffrey has characterized it as ‘an important thread that has woven its

³³⁶ at 1965 – 66.

³³⁷ See *The Case Concerning Gabcikovo-Nagymaros* (Hungary/Slovakia) ICJ Reps. (1997).

³³⁸ See Principle 21 of Stockholm Declaration, adopted June 16, 1972, at the United Nations Conference on the Human Environment, Stockholm, Report of the U.N. Conference on the Human Environment, U.N. Doc. A/CONF.48/14/Rev. 1 at 3 (1973), U.N. Doc. A/CONF.48/14 at 2 and Corr.1 (1972), reprinted in 11 *International Legal Materials* 1416 (1972). <<http://www.unep.org/Documents/Multilingual/Default.asp?documentid=97&articleid=1503>>; Principle 2 of the Rio Declaration; See also Article 3 of ILC Draft Article on Prevention of Transboundary Harm from Hazardous Activities, 2001 I.L.C Rep. 370 (2001).

³³⁹ *Ibid.*

³⁴⁰ See Gunther Handl, “Territorial Sovereignty and the Problem of Transboundary Pollution”, 69 *American Journal of International Law* 50.

way into a number of diffuse corners of the tapestry of international law’.³⁴¹ The Trail Smelter Tribunal thus laid the foundation for the development of a general obligation on states to respect the environment of other States or of areas beyond their national control.

The International Court of Justice (ICJ) accepted this general obligation in its Advisory Opinion in *The Legality of the Threat or Use of Nuclear Weapons*,³⁴² as well as in a later judgment in the case concerning the *Gabcikovo-Nagymaros Project*.³⁴³ The latter case involving Hungary and Slovakia arose from a dispute relating to the construction of the Gabčíkovo–Nagymaros Dam. The nature of the undertaking by Slovakia was such that the project dramatically reduced the amount of water flowing into Hungary and had a significant impact on that nation's water supply and environment. In its decision on a case that was hailed as landmark – being the first time the court would rule over an environmental dispute, the ICJ restated that “the existence of the general obligation of States to ensure that activities within their jurisdiction and control respect the environment of other States or of areas beyond national control is now part of the corpus of international law relating to the environment.”³⁴⁴

Although the primary rule was developed with regards to transboundary pollution, the International Court of Justice has applied the rule in context quite distinct from that in which it was originally developed in the *Trail Smelter Arbitration*.³⁴⁵ This goes further to show the fundamental nature as well as utility of the principle established in the Trail Smelter case. Hence

³⁴¹ See Stephen McCaffrey, “Of Paradoxes, Precedents, and Progeny: The *Trail Smelter* Arbitration 65 Years Later” in Rebecca Bratspies and Russel Miller (eds.) *Transboundary Harm in International Law - Lessons from the Trail Smelter Arbitration* (New York, NY : Cambridge University Press, 2006) pgs 34 - 45.

³⁴² *Nuclear Weapons*, 1996 I.C.J. 226, at 241– 42, para. 29 (July 1996).

³⁴³ (Hungary v. Slovakia), 1997 I.C.J. 7, at 41, para. 53 (Sept. 25). See also *The Corfu Channel case*, wherein the I.C.J. referred to the duty of every state “not to allow knowingly its territory to be used for acts contrary to the rights of other states.” (U.K. v. Albania), 1949 I.C.J. 4 (April 1949).

³⁴⁴ *Supra* note 337 at 53.

³⁴⁵ *Supra* notes 342 and 343 [Nuclear weapons and international watercourse].

there is little doubt that the principle now constitutes part of customary international law. Further evidence as to the evolving status of the general obligation established in the *Trail Smelter* case can be gleaned from the works of the International Law Commission (ILC). In 2001, the ILC adopted the text of its draft article entitled *Prevention of Transboundary Harm from Hazardous Activities*.³⁴⁶ Article 3 of the text provides that “[t]he State of origin [of activities resulting in transboundary harm] shall take all appropriate measures to prevent significant transboundary harm or at any event to minimize the risk thereof”. Commenting on Article 3 of the ILC draft article, McCaffery noted that Article 3 of the ILC draft article is certainly a refinement of the *Trail Smelter* principle.³⁴⁷

Also worthy of note is the *International Covenant on Environment and Development*, prepared by the Commission on Environmental Law of the World Conservation Union (IUCN), in cooperation with the International Council of Environmental Law. The commentary to the Covenant explains that: “The Duty to prevent harm at the transboundary level has deep roots in customary international law and indeed it finds expression in nearly every provision of the draft Covenant. It is inherent in the *Trail Smelter* arbitral decision . . . ”³⁴⁸

The *Trail Smelter* principle has thus played an important role in the development of international law. It is a binding principle of customary international law. Although the principle was developed in relation to transboundary harm arising from environmental pollution by air, the principle could be used to make a strong case for the existence of a legal obligation on developed countries like the United States and Canada to take necessary steps to prevent transboundary

³⁴⁶ 2001 I.L.C Rep. 370 (2001).

³⁴⁷ See Stephen McCaffery, “Of Paradoxes, Precedents, and Progeny: The *Trail Smelter* Arbitration 65 Years Later” in Rebecca Bratspies and Russel Miller (eds.) *Transboundary Harm in International Law - Lessons from the Trail Smelter Arbitration* New York, NY : Cambridge University Press, 2006. pgs 34 - 45 at 43.

³⁴⁸ Ibid.

harm in developing countries arising from transboundary movement of their obsolete e-waste into developing countries. John Knox has pointed out that neither Canada nor the United States ever intended the *Trail Smelter* to become such a vital precedent.³⁴⁹ Suffice it to state that rarely (if ever) is it within the competence of parties to a dispute to determine the extent of the precedence that would or should develop from their litigation (or in this case arbitration). The metamorphosis of the rule in *Trail Smelter* - from an arbitral decision to a rule of customary international law is not subject to the intention of the original parties to that arbitration.

While the rule of customary international law discussed here does not directly regulate the transboundary movement of e-waste to developing countries, it is the argument here that the rule provides a legal principle applicable in transboundary movement of e-waste. Hence even though countries like the United States and Canada are not bound by the Basel Convention and/or Basel Ban, the principle from the rule of customary international law that emerged from the *Trail Smelter Arbitration* still applies in relation to harm arising from transboundary movement of e-waste. Thus developed countries (the United States and Canada inclusive) have an obligation in international law to take appropriate measures to prevent significant transboundary harm arising from the transboundary movement of e-waste from their jurisdiction or at any event to minimize the risk thereof.

³⁴⁹ See John H. Knox, "The Flawed *Trail Smelter* Procedure: The Wrong Tribunal, the Wrong Parties, and the Wrong Law" in Rebecca Bratspies and Russel Miller (eds.) *Transboundary Harm in International Law - Lessons from the Trail Smelter Arbitration* New York, NY : Cambridge University Press, 2006. pg. 66 - 78; See also David Hepburn Dinwoodie, "The Politics of International Pollution Control: the Trail Smelter Case," 27 *International Journal* 219, 224 (1972) (reporting that the Canadian government initially decided to refer the Trail Smelter controversy for investigation of injury and compensation as "a gesture of comity").

Various research studies and media reports have documented the growing export of obsolete and hazardous e-waste by recyclers from developed to developing countries.³⁵⁰ Unlike the European Union, where at least regional legislation has been enacted to prohibit export of obsolete e-waste to non-OECD countries, very little is being done by the United States and Canada to restrain the activities of private recyclers who export junk e-waste to developing countries.³⁵¹ The fact that private corporations or individuals (as opposed to government agencies) are perpetrating such acts is immaterial as long as their activities should and can be regulated by the state. The *Trail Smelter* case is also an authority for the assertion that states can be responsible in international law for the acts or conducts of private corporations within their jurisdiction and control. This would indeed extend to situations where such private actors are engaged in transboundary movement of hazardous e-waste contrary to rules of international law. Thus there is an obligation in international law on the part of the state to take appropriate measures to restrict the conduct of such private actors and also to ensure that their actions are in conformity with rules of international law binding on the state.

The above overview of the rule of customary international law on transboundary environmental harm establishes a guiding principle with regards to the regulation of transboundary movement of e-waste. However, this rule of customary international law is of limited importance. This is primarily because the rule does not establish a comprehensive framework to ensure effective regulation of transboundary movement of e-waste. Secondly, since the rules are founded in

³⁵⁰ *Supra* note 222 at p 16; *CBS News*, “Following The Trail Of Toxic E-Waste”, 60 Minutes Nov. 9, 2008 Online <<http://www.cbsnews.com/video/watch/?id=5274959n>>.

³⁵¹ In 2006, fifty containers loaded with about 500,000 kg of metal and plastic scrap destined for China and Hong Kong were intercepted in the Port of Vancouver, Canada. 27 companies implicated in the illegal waste export were assessed out-of-court administrative penalties of less than \$2,000 apiece. In addition to the minor penalty that was imposed, the government refused to make public the names of the companies involved in the act.

customary law, it is difficult to define the exact content of relevant customary law rules at any given time, and to draw a line between customary law and soft law.³⁵²

4.3 EU Framework for Regulation of Transboundary Movement of E-waste

The EU has one of the most comprehensive regional frameworks regulating transboundary movement of e-waste. The EU framework relating to transboundary movement of waste distinguishes between transboundary movement to OECD and non-OECD countries. In principle, it is legal to transport all kinds of waste within the EU irrespective of whether the waste is meant for reuse, disposal or recycling. However, certain restrictions apply with regards to transboundary movement of waste including e-waste to non-OECD countries.

The EU has been more progressive in the formulation and adoption of an adequate legislative framework to curtail the surge in electronic wastes as well as control their illegal shipment to developing countries. The EU framework relating to transboundary movement of e-waste to developing countries builds on the Basel framework. Although the Basel Convention applies in the EU by virtue of its ratification, the EU has also gone beyond the Basel Convention by adopting a framework which incorporates and enforces at a regional level, the provisions of the Basel Ban Amendment prohibiting the export of hazardous e-waste to non-OECD countries. This regional provision is provided for in the EC Regulation on Shipment of Waste.³⁵³ Article 36 of the Regulation prohibits the shipment of waste destined for recovery to non-OECD countries.

³⁵² See Kummer, *Supra* note 128 at 25.

³⁵³ Regulation (EC) No 1013/2006 of the European Parliament and of the Council of 14 June 2006 on the shipments of waste.

The provision of the Regulation when applied in conjunction with the Basel Convention (even in the absence of the Basel Ban Amendment) effectively prohibits the transboundary movement of e-waste for the purpose of dumping or recovery from EU member countries to non-OECD countries. The EU framework, just like the Basel framework, permits the transboundary movement of used electrical and electronic equipment to non-OECD countries for reuse purposes, and just like the Basel framework, the reuse exception in the EU framework exists in the absence of any mechanism for ensuring that the goods are actually in a reusable state. Going beyond the Basel framework though, the EU framework incorporates two unique legislative provisions that seek to address the health and environmental impacts of electrical and electronic equipment originating in the EU.

RoHS Directive: The Directive which was enacted in 2003 prohibits the use of hazardous substances such as lead, mercury, cadmium, hexavalent chromium, and certain brominated flame retardants (penta and octa-BDE) in most electronics products marketed in the European Union.³⁵⁴ The Directive sought to tackle the e-waste problem from the source by reducing or eliminating hazardous contents used in the production of electrical and electronic equipment. It has been observed that banning the use of these hazardous substances in electronic products sold in key world markets may eventually have a global impact on the way electronic products are designed for the global market.³⁵⁵

³⁵⁴ The Directive is based on the precautionary principle. The Directive is framed in such a way that the listing of hazardous substances in the Directive could be revisited every four years. Hence where health concerns arise with regards to substances not initially banned by the Directive, such substances could be added to the list of hazardous chemicals the use of which is prohibited by the Directive. In a similar vein, where a substance initially considered toxic and hence restricted by the Directive is subsequently determined to be less toxic or hazardous, the substance could be expunged from the Directive.

³⁵⁵ Joseph LaDou and Sandra Lovegrove, "Export of Electronics Equipment Waste" (2008) 14 *International Journal of Occupational and Environmental Health* 1–10.

Grossman observed that the application of the RoHS Directive to all electronics sold in the EU regardless of their country of manufacture, has resulted in U.S. and Japanese electronic companies designing their products meant for sale in the international market to comply with the Directive. Also Chinese high-tech companies which conduct a huge business export to Europe, as well as manufacture components for American and European electronic companies, are not only complying with the Directive but more so, China has gone a step further in preparing legislation similar to the RoHS Directive. Hence, it has been predicted that the EU Directive, though regional in nature, will eventually metamorphose into a global requirement.³⁵⁶

Although the RoHS Directive is not strictly concerned with transboundary movement of e-waste, the growing impact of the Directive inevitably helps in reducing the health and environmental impact associated with discarded electrical and electronic products. Hence when such products are eventually exported to developing countries (legally or illegally), the health and environmental impact associated with their end of life management would have been eventually curtailed.

WEEE Directive: While the RoHS Directive aims at tackling the e-waste problem from its root by reducing or eliminating the hazardous contents that go into the production of electronic devices sold in the European Union, the WEEE Directive aims at sustainable management of waste electrical and electronic equipment. The Directive (when transposed into national law) applies to all high tech manufacturers selling goods in the EU irrespective of their country of origin.

³⁵⁶ Grossman, “High tech trash” *Supra* note 94 at 244-245.

Article 4 of the Directive imposes an obligation on electronic manufacturers not to ‘prevent through specific design features or manufacturing processes, WEEE from being reused, unless such specific design features or manufacturing processes present overriding advantages, for example, with regards to the protection of the environment and/or safety requirements.’ The WEEE Directive also introduced an ambitious system of “Extended Producer Responsibility” (EPR) which requires manufacturers of electronic devices to assume responsibility for their products at the end of their consumer life.³⁵⁷ Hence the Directive imposed an obligation on the electronics industry for financing and organizing take-back and recycling programs for their products at the end of their useful life. The take-back provision of the WEEE Directive among others seeks to ensure that electrical and electronic products are recycled in the EU and thus prevents their transboundary dumping or recycling in developing countries where they are not subject to environmentally sound management.

4.4 Conclusion

This chapter has sought to answer the second research question raised at the beginning of this thesis, namely: What existing legal frameworks regulate the transboundary movement and management of e-waste and to what extent have these frameworks been effective or ineffective in attaining the desired objectives? From the above analyses of international and regional frameworks relating to the transboundary movement of e-waste, it appears that the current legal frameworks, while restricting the transboundary movement of e-waste to developing countries for the purpose of dumping, recycling or recovery, permit the transboundary movement for the purpose of reuse. The reuse exception to the transboundary movement of e-waste or used electrical and electronic equipment is important in that it provides immense socio-economic and

³⁵⁷ *Supra* note 154.

technological opportunities to developing countries. In addition, it serves a beneficial environmental purpose by delaying the exit of such used electrical and electronic equipment into the waste stream thus leading to resource conservation, reduced waste and pollution generation.

However, the reuse exemptions in the Basel as well as EU frameworks have also created a loophole and hence the inability of these legal frameworks to deal with the transboundary dumping of e-waste in developing countries. The loophole in these frameworks lies in the inability of the frameworks to provide a mechanism for distinguishing between e-waste being shipped for reuse and those shipped for dumping, recycling or recovery. Thus, it is practically impossible under the existing frameworks to determine when used electrical and electronic equipment is being shipped as a waste product or as second-hand equipment. Hence dealing with the transboundary movement of junk e-waste would require the development of a framework to deal with this legal loophole. Such a framework will be very vital in helping developing countries maximize the socio-economic benefits of international trade in UEEE while at the same time minimizing or preventing the adverse health and environmental impacts arising from the trade and thus enhancing sustainable development.

It emerges from the above examination that the current existing frameworks are incapable of reconciling the diverse impacts arising from international trade in UEEE. There arises the need for a new legal framework for sustainable transboundary movement of e-waste. Going further from here, this research will propose and examine two different frameworks that could be distinctively applied by developing and developed countries in sustainable transboundary movement and management of e-waste.

Chapter Five

5. TRADE MEASURES FOR REGULATING TRANSBOUNDARY MOVEMENT OF E-WASTE

One of the main objectives for which the General Agreement on Tariffs and Trade (GATT) and its successor the World Trade Organization (WTO) were established, was to promote international trade between countries. International trade is perceived as promoting prosperity among nations and to achieve this objective, the WTO system adopts a series of rules designed to achieve a reduction in trade barriers and promote a non-discriminatory trade system between countries. It seeks to limit, if not prohibit, import bans (or quotas) and other border restrictions (tariffs).³⁵⁸

The WTO rules bind all member states and the existence and binding nature of these rules imply that member countries are obliged to take them into consideration in designing their trade policies, to ensure that such policies are in line with their WTO obligations. Hence a WTO member state may be compelled to revisit a trade policy that contravenes WTO rules. Member states have to submit to jurisdiction with regards to the challenges that their laws or practices are inconsistent with their WTO obligations, and they are bound by the decision reached.³⁵⁹

Notwithstanding their obligations under the WTO, member states do have a sovereign right to protect their territory's environment as well as the health of their inhabitants.³⁶⁰ Thus free trade

³⁵⁸ Article XI:1 of the GATT.

³⁵⁹ Donald McRae, "Trade and the Environment: Competition, Cooperation or Confusion?" (2003) 41 *Alberta Law Review* 745.

³⁶⁰ The Doha Ministerial Declaration States "We recognize that under WTO rules no country should be prevented from taking measures for the protection of human, animal or plant life or health, or of the environment at the levels

without any sort of restriction whatsoever is outside the scope of objectives sought by the WTO frameworks, hence the WTO rules recognize the right of member states to adopt legitimate policy measures aimed at protecting human health and environment within their territorial jurisdiction. Such measures could take the form of import restrictions, and technical regulations and requirements that goods traded within their jurisdiction have to comply with.³⁶¹

Import restriction is a form of quantitative restriction and could take the form of express ban on the importation of certain goods into the state, or establishment of import quotas, or embargo on the issuance of import licenses. Reasons may vary for states' decision to restrict importation of certain products into their territory. A state may impose import restrictions on hazardous products which, in the view of the state, pose a serious threat to human health and the environment. A state's "sovereign" right to regulate imports and the necessity to protect its own territory from hazardous products can be interpreted as a general principle of customary international law in accordance with Article 38(1)(c) of the Statute of the ICJ. This right has been recognized in the Basel Convention, the EU Legislation on Waste Shipment,³⁶² as well as in WTO jurisprudence.³⁶³

Technical regulations could also be adopted by states to address particular safety and environmental concerns regarding specific products. Thus technical regulations could take the

it considers appropriate, subject to the requirement that they are not applied in a manner which would constitute a means of arbitrary or unjustifiable discrimination between countries where the same conditions prevail, or a disguised restriction on international trade, and are otherwise in accordance with the provisions of the WTO Agreements." Doha Ministerial Declaration, 14 November 2001, WT/MIN(01)/DEC/1, 41 ILM 746 (2002) para 6.

³⁶¹ Grosz, "Sustainable Waste Trade" *Supra* note 110 at 360.

³⁶² *Regulation (EC) No 1013/2006* of the European Parliament and of the Council of 14 June 2006 on *shipments of waste* - applicable since 12 July 2007. Preamble paragraph 6 and Article 4(1) of the Basel Convention, as well as recital 9 of the Waste Shipment Regulation, explicitly acknowledge the right of states to prohibit the importing of hazardous and other wastes into their territories.

³⁶³ See Panel Report, *Brazil – Measures Affecting Imports of Retreaded Tyres*, WT/DS332/R, adopted 17 December 2007, as modified by Appellate Body Report WT/DS332/AB/R, DSR 2007:V, 1649.

form of a state stipulating that a product has to meet certain environmentally beneficial characteristics before it could be legally imported into its territory. By applying technical regulations, a state can ensure that only products that meet defined regulatory requirements are imported into its territory. While import restrictions and technical regulations could be used to pursue legitimate state policy, it could also create unnecessary obstacles to international trade. This thus requires balancing a state's right to pursue legitimate policy objectives against the interest of the international community in preventing unnecessary interference to international trade.

This chapter proposes the use of technical regulations and import restrictions as a trade policy within the context of WTO framework to regulate the transboundary movement of e-waste from developed to developing countries. As was earlier stated, international trade in used electrical and electronic equipment is essential for socio-economic development in developing countries. However, junk e-waste which frequently passes through the tunnel of international trade in used electronics, constitutes serious risks to public health and environment in developing countries. Governments in developing countries have a legitimate responsibility to adopt policy measures to prevent or minimize the transboundary dumping of e-waste in developing countries in the guise of international trade in used electrical and electronic equipment. In doing so, they may chose to adopt preventive measures aimed at preventing or minimizing the accumulation of obsolete e-waste in their country, a measure that will inevitably entail import bans or restrictions. Alternatively, they may permit free trade in used electrical and electronic equipment while developing remedial measures for dealing with the consequential accumulation of obsolete e-waste. Such remedial measures may include but are not necessarily limited to the management and disposal of e-waste such as through landfilling, incineration or material recycling.

In designing a trade policy tailored along the framework of a trade ban or restriction, a WTO member country has an obligation to bring the policy within the context of WTO framework bearing in mind that generally, WTO rules seek to limit trade restrictive policies. A non-trade restrictive policy (if possible and feasible in dealing with the identified problem) will be less contentious and might represent the best possible option. Hence in developing a policy framework to regulate the transboundary harm arising from e-waste, a starting point should begin with an analysis of non-trade restrictive remedial measures, as well as the feasibility of such measures within the context of developing countries. If this analysis demonstrates that such non-trade restrictive measures do not provide a viable solution to the problem, then it becomes imperative to extend this analysis to other trade restrictive measures within the permissible context of WTO framework.

5.1 Non-Trade-Restrictive Frameworks

A non-trade restrictive framework open to developing countries in relation to management of health and environmental impacts arising from transboundary movement of obsolete e-waste could take the form of a framework for the disposal or management of obsolete e-waste that would naturally accumulate as a result of free trade in used electrical and electronic devices. Thus the framework could be structured in such a way as to allow for free trade in used electrical and electronic equipment, complemented by a domestic framework for the safe disposal and management of junk electronics or e-waste that will inevitably flow along with such used goods. The safe disposal or management framework will be necessary in order to curtail the health and environmental risks from such e-waste and this could take the form of incineration, landfilling or recycling.

Health and environmental protection are legitimate public policy goals, which states in the international community have the right to set and pursue. It has been noted that it is within the authority of a WTO Member state to set the public health objectives it seeks to achieve, as well as the level of protection that it wants to obtain, through the measure or the policy it chooses to adopt.³⁶⁴ Thus in developing policy measures to achieve their health and environmental objectives, states are obliged to adopt measures that do not unnecessarily interfere with international trade. It is only when such measures are not reasonably available that states are required (subject to WTO rules) to use measures “which entail the least degree of inconsistency with other GATT provisions”. This is known as the “least-trade-restrictive-approach”. Hence it is important to examine whether the non-trade-restrictive framework above (which does not entail any obstacle to international trade) is feasible in addressing health and environmental impacts arising from the transboundary movement of e-waste to developing countries. Should it emerge from our analysis that the non-trade-restrictive measure is not reasonably available or adequate in dealing with the problem, then it may be necessary to examine the “least-trade-restrictive-approach” in our search for a viable solution to the problem.

Thus for the purpose of emphasis, the non-trade-restrictive frameworks will entail a free trade in UEEE developed along with “remedial measures” for safe management of junk e-waste that will result from the free trade. This stage of our analysis will entail an examination of “remedial measures” for the safe disposal and management of obsolete e-waste in developing countries. These remedial measures include landfilling, incineration and recycling. Management of e-waste in developing countries presents a particularly challenging situation given the huge

³⁶⁴ Appellate Body Report, *European Communities – Measures Affecting Asbestos and Asbestos-Containing Products*, WT/DS135/AB/R, adopted 5 April 2001, DSR 2001:VII, 3243, para. 168. [EC-Asbestos Appellate Body].

environmental and economic costs involved. Examination of these remedial measures will also entail examination of the risks associated with the implementation of the measures as well as the availability of resources or technology for the implementation of the measures.

5.1.1 Landfilling

Risks associated with landfilling as an e-waste management strategy have been highlighted by various research studies.³⁶⁵ These research studies have drawn attention to the possibility of toxic chemicals used in the production of electronic equipment leaching from e-waste landfills and contaminating underground water systems. Toxic chemicals frequently used in the production of electronic devices include metals and metalloids such as arsenic, cadmium, chromium, copper, lead and mercury. The process also uses other organic chemicals such as brominated flame retardants (BFRs). Printed wire boards (PWB) (also referred to as printed circuit boards (PCB)) found in most electronic devices may contain arsenic, cadmium, chromium, copper, lead, and mercury.³⁶⁶ Cathode ray tubes (CRT) in computer monitors and television sets may contain barium, cadmium, copper, lead, zinc, and other metals. Lead has been noted as one heavy metal with known toxic properties that is found in large amounts in many electronic devices.³⁶⁷ Jang and Townsend in their research study noted that:

³⁶⁵ Yong-Chul Jang and Timothy G. Townsend, "Leaching of Lead from Computer Printed Wire Boards and Cathode Ray Tubes by Municipal Solid Waste Landfill Leachates" (2003) 37(20) *Environmental Science & Technology*, 4778 - 4784 [Jang and Townsend "Leaching of Lead from Computer Printed Wire Boards"]; Erik Spalvins, Brajesh Dubey and Timothy Townsend, "Impact of Electronic Waste Disposal on Lead Concentrations in Landfill Leachate", (2008) 42(19) *Environmental Science & Technology*, 7452 - 7458 [Spalvins, Dubey and Townsend, "Impact of Electronic Waste Disposal"].

³⁶⁶ Nordic Council of Ministers (NCM) "Waste from Electrical and Electronic Products: A survey of the contents of materials and hazardous substances in electric and electronic products"; Copenhagen, Denmark, 1995.

³⁶⁷ Jang and Townsend "Leaching of Lead from Computer Printed Wire Boards" *Supra* note 365.

Electronic devices, along with lead-acid batteries, are the major contributors of lead in the municipal solid waste stream. Lead-based solder (typically a 60:40 ratio of tin to lead), which is used to attach electrical components to PWBs, represents the major solder type used in most PWB applications. Typical PWBs have been reported to contain approximately 50 g of tin-lead solder/m² of PWB and approximately 0.7% of the total weight of a PWB. In CRTs, leaded glass provides shielding from X-rays generated during the picture projection process. Color CRTs contain 1.6-3.2 kg of lead on average.³⁶⁸

Data obtained from another research study in the U.S. appears to indicate that lead concentration may be somewhat greater in municipal waste landfill when e-waste is present.³⁶⁹ Possible impact of lead on human health and the environment has been well documented.³⁷⁰ In the United States, under the provisions of the *Resource Conservation and Recovery Act* (RCRA) solid wastes containing large amount of leachable leads are generally regulated as hazardous wastes.³⁷¹ According to a report prepared for the U.S. Environmental Protection Agency, about 70 percent of the heavy metals found in landfills come from electronic equipment discards. These heavy metals and other hazardous substances found in electronics can contaminate groundwater and pose other environmental and public health risks.³⁷²

Generally, the landfilling of e-waste carries with it the risk of underground water contamination and this is the case even in developed countries with state-of-the-art landfilling facilities. In the case of developing countries like Nigeria and Ghana, this problem is further complicated by the complete absence of state-of-the-art landfilling facilities; as a result e-wastes are indiscriminately disposed of in open landfills as well as stagnant water bodies resulting in underground water

³⁶⁸ *Ibid* at 4778.

³⁶⁹ Spalvins, Dubey and Townsend, "Impact of Electronic Waste Disposal" *Supra* note 365.

³⁷⁰ Harry Arthur Waldron, *Metals in the Environment*; Academic Press: New York, 1980; Robert E. Gosselin, Roger P. Smith and Harold Hodge, *Clinical Toxicology of Commercial Products*, 5th ed.; Williams and Wilkins: Baltimore, MD, 1984; Marshall Sittig, *Handbook of Toxic and Hazardous Chemicals and Carcinogens*, 2nd ed.; Noyes Data Corporation: Park Ridge, NJ, 1985.

³⁷¹ Resource Conservation and Recovery Act 1976, 42 U.S.C. §§ 6901 – 6991.

³⁷² Tachi Kiuchi et. al. "Product Stewardship" *Supra* note 185.

contamination as well as contamination of fresh water supplies. The technology and resources for development of state-of-the-art landfilling facilities is equally unavailable in developing countries. In addition, evidence suggests that landfilling, which was once a common form of e-waste disposal strategy in developed countries is now substantially declining as a result of perceived health and environmental risks associated with it.³⁷³

Although disposal of e-waste in uncontrolled landfills results in increased adverse health and environmental impacts, there is no guarantee either that controlled or state-of-the-art landfills completely eliminate such impacts. In addition, state-of-the-art landfills are expensive to construct and will impose significant cost beyond the resources of developing countries. Thus landfilling of e-waste in developing countries is not an effective measure to prevent or curtail the adverse health and environmental impacts arising from unrestricted trade in UEEE.

5.1.2 Incineration

Waste incineration involves the burning of waste products so as to reduce the waste volume and convert the organic substances into ash. The application of this process to e-waste will require the sorting or segregation of e-waste components otherwise the output from the combustion process will be composed of toxic stack emissions and ash containing heavy-metal residue.³⁷⁴

The most common form of e-waste incineration found in Nigeria and Ghana during the course of field research for this thesis is informal incineration in open landfills and dumpsites. In informal

³⁷³ As at January 2011 at total of 25 states in the US has passed legislations banning the disposal of electronic waste in landfills. see “NY joins 24 states banning electronic waste from landfills” <http://poststar.com/news/local/article_407399cc-1814-11e0-9d0e-001cc4c002e0.html>.

³⁷⁴ Ian Holmes “Dumping, Burning and Landfill” in Ronald E. Hester and Roy M. Harrison (eds.) *Electronic Waste Management - Design, Analysis and Application* (Cambridge: RSC Publishing, 2009) at 82 [Ian Holmes “Dumping, Burning and Landfill”].

dumpsites in Ghana and Nigeria, plastic components from junk e-waste are openly incinerated in dumpsites. This crude form of incineration results in uncontrolled discharge of heavy metals and organic chemicals into the atmosphere. Open burning of e-waste in landfills does not usually avail any precautionary measure to reduce toxic emissions. Consequently, emissions are usually higher. The poor and variable combustion conditions coupled with the complexity of the use of e-waste plastic components as a fuel, makes the conditions for formation and emission of a multitude of toxic pollutants such as dioxins and furans often optimal in such open fires.³⁷⁵

The incineration process produces several hazardous substances some of which have direct impact on human health, while others have indirect impact by damaging the local and global environment.³⁷⁶ For example, heavy metals which are commonly found in electrical and electronic equipment are emitted in combustion gases, while some heavy metal residue could be lodged in waste ash residue from incineration. These metals can affect human health in a variety of ways. It can result in malfunctioning of the mental and central nervous system, damage to blood composition, lungs, kidneys, liver and other vital organs.³⁷⁷

Various research studies have also noted the extremely high emission of toxins in open burning of e-waste.³⁷⁸ A research study by Gullett et al. revealed particularly high emission of toxins in open burning of insulated wires and PC-boards mainly due to high polyvinyl chloride (PVC) and

³⁷⁵ Evans C.S., Dellinger B. (2003) Mechanisms of dioxin formation from the hightemperature pyrolysis of 2-bromophenol. *Environmental Science & Technology* 37(24): 5574-5580; Gullett et. al., "Characterization of air emissions" *Supra* note 273.

³⁷⁶ Ian Holmes "Dumping, Burning and Landfill" *Supra* note 374 at 86.

³⁷⁷ *Ibid* at 87.

³⁷⁸ Zelinski V., Lorenz W., Bahadir M. (1993) Brominated flame retardants and resulting PBDD/F in accidental fire residues from private residences. *Chemosphere* 27(8): 1519-1528; See Leung A., Cai Z.W., Wong M.H. "Environmental contamination from electronic waste recycling at Guiyu" (2006) 8 *Southeast China. Journal of Material Cycles and Waste Management* 21-33.

brominated flame retardant (BFR) contents.³⁷⁹ In addition to dioxins, various other organic pollutants are generated and discharged in the course of the combustion process. This includes brominated and chlorinated compounds such as chlorinated and brominated benzenes and phenols, as well as a large number of non-halogenated compounds.³⁸⁰

It is possible to reduce the level of toxic emissions by incinerating e-waste in modern closed incineration facilities using the process of optimization and adequate flue gas treatment systems.³⁸¹ This process usually involves controlled combustion in which electronic waste materials are burned at a high temperature, resulting in hazardous substances being rendered less hazardous. Unlike open incineration, controlled incineration reduces the amount of hazardous substances being emitted into the atmosphere. However, formal incineration in state-of-the-art incinerators can only reduce harmful emissions, without totally eliminating them.

Hence the incineration of e-waste results in a large emission of hazardous substances that may constitute a threat to humans and the environment directly exposed to the emissions, and also contribute to the global spreading of such hazardous toxins.³⁸² Undoubtedly, risks exist with respect to both formal and informal incineration of e-waste. Although such a risk might be reduced through state-of-the-art recycling technology, such technology, it should be noted again,

³⁷⁹ Gullett et. al., "Characterization of air emissions" *Supra* note 379.

³⁸⁰ Lönnermark A., Blomqvist P. "Emissions from Fires in Electrical and Electronics Waste" SP Report 2005:42. SP Swedish National Testing and Research Institute, Borås Sweden; Cormier S.A., Lomnicki S., Backes W., Dellinger B. "Origin and health impacts of emissions of toxic by-products and fine particles from combustion and thermal treatment of hazardous wastes and materials" *Environmental Health Perspectives* (2006) 114(6) 810-817. A research study by Steward and Lemieux has noted substantial amounts of copper, lead and antimony, as well as lesser amounts of cadmium, manganese, nickel, barium, arsenic, chromium, cobalt and beryllium were emitted during incineration of chipped PC-boards in a rotary kiln incinerator. See Steward E.S., Lemieux P.M. "Emissions from the incineration of electronics industry waste". Proceedings of the 2003 IEEE International Symposium on Electronics and the Environment, May 19-22, Boston, MA, USA.

³⁸¹ Allsopp M., Santillo D., Johnston P. "Environmental and Human Health Concerns in the Processing of Electrical and Electronic Waste" (2006) Greenpeace Research Laboratories, Technical Note: 04/2006.

³⁸² Lundstedt "Recycling and disposal of electronic waste" *Supra* note 253.

is not readily available in developing countries due to limited resources. Private sector investment in this area is not readily available due to cost of investment, as well as the economic viability of such investment.³⁸³

5.1.3 Recycling

E-waste recycling entails breaking down of various components of electronic devices thus liberating valuable materials such as precious metals, ferrous metals, non-ferrous metals, integrated circuits, plastics etc and reusing same in the manufacturing process. Thus e-waste recycling involves incorporating materials that have previously been used in the manufacture of a product into the manufacture of new products.

E-waste recycling can be done under formal and informal processes. The formal process entails the utilization of state-of-the-art recycling processes characterized by safety regulations to verify the risks associated with the process. The informal e-waste recycling process incorporates the use of crude recycling processes such as use of raw acids to extract precious metals from printed circuit boards, open burning of insulated wires, breaking of CRT etc. Workers carry out most of these processes without any technical expertise thus resulting in exposure to dangerous and slow poisoning chemicals caused by breaking of components that exposes previously encapsulated materials. Various research studies have decried the extent of these practices in developing

³⁸³ Lundstedt has noted that “even if the results indicate that e-waste can be incinerated efficiently in modern incineration facilities, with relatively low emissions as a result, this is no longer an available option in many countries due to the regulations that demand recycling of materials. In EU, for example, the recycling and recovery quotas set by the WEEE directive, ranging from 50-75% for recycling and 70-80% for recovery, can not be achieved without including combustible fractions such as plastics into the recovery or recycling systems.” *Ibid* at 69

countries.³⁸⁴ The main goal of local e-waste recyclers in developing countries is to recover the valuable metals in the electronics, hence little or no regard is paid to the health and environmental impacts of their practices. This fact is further compounded by their lack of knowledge of the health impact of this practice as well as the time lag involved between exposure to risks and manifestation of the health effects.

The recycling of e-waste in developing countries presents greater risk to human health and the environment as a result of the exposure to large amount of fumes and dusts containing hazardous substances. It also presents an occupational hazard to workers involved in the processing of the waste. For example, workers engaged in the informal dismantling of CRTs may be exposed to phosphorous powder covering the inner surface of the front panel, the barium oxide in the electron gun and the lead present in the glass.³⁸⁵ Where broken CRTs are improperly disposed on surface ground, it may result in large amount of lead, zinc and other hazardous compound leaching into the environment.³⁸⁶ Indeed, research studies have reported high levels of heavy metals in the communities surrounding informal e-waste processing sites in China thus further illustrating the health and environmental risks associated with informal e-waste recycling in developing countries.³⁸⁷

Although controlled or formal e-waste recycling does not present as much danger as the informal processing in developing countries, the fact is that formal recycling still contains elements of risk to human health and the environment. The risks associated with the formal recycling of e-waste

³⁸⁴ *Supra* note 277.

³⁸⁵ Lundstedt “Recycling and disposal of electronic waste” *Supra* note 253 at 74.

³⁸⁶ Stephen E. Musson, Yong-Chul Jang, Townsend T. and Il-Hyun Chung “Characterization of lead leachability from cathode ray tubes using the toxicity characteristic leaching procedure” *Environmental Sciences & Technology* (2000) 34(20): 4376-4381.

³⁸⁷ Leung et al. “Heavy Metals Concentrations” *Supra* note 257.

arise in the process of collection and dismantling, mechanical shredding and separation, as well as pyrometallurgical and hydrometallurgical processing.³⁸⁸ Several studies have shown that hazardous substances are released into the environment during the mechanical processing of e-waste. Peters-Michaud noted high levels of lead and cadmium in the vicinity of the shredders in a modern US based e-waste recycling facility.³⁸⁹

Granted though, of all the three remedial measures discussed so far, namely - landfilling, incineration and recycling, the latter seems to be the most environmentally-friendly alternative. In essence, it is the ‘best of the worst alternatives’ as it extracts the greatest environmental benefit from e-waste. E-waste recycling results in the conservation of natural resources by reducing the amount of virgin resources that are utilized in the production of new electronics. These benefits, notwithstanding, its impact on human health and the environment especially in developing countries cannot be ignored. While state-of-art recycling technologies might help in reducing (but not eliminating) these impacts, such advanced technologies and know-how (as in other cases above) are not readily available in the developing world. The material recycling ‘technology’ obtainable in the developing world as was observed in Nigeria and Ghana is a very archaic technology that results in more health and environmental harm than good.

³⁸⁸ Lundstedt “Recycling and disposal of electronic waste” *Supra* note 253 at 70 – 73.

³⁸⁹ Peters- Michaud N., Katers J., Barry J. “Occupational risks associated with electronics demanufacturing and CRT glass processing operations and the impact of mitigation activities on employee health and safety”, Proceedings of the Electronics and the Environment, IEEE International Symposium, p. 323-328. May 19-22, 2003; Morf et al. in their study of a Swiss recycling plant engaged in mechanical treatment of e-waste, found milligrams per gram of various BFRs (particularly PBDEs) in the fine dust fraction recovered in the off-gas purification system of the plant. See Morf L.S., Tremp J., Gloor R., Huber Y., Stengele M., Zennegg M. (2005) “Brominated flame retardants in waste electrical and electronic equipment: Substance flows in a recycling plant” (2005) 39 *Environmental Science & Technology* 8691-8699; Similarly, Sjödin et al in their studies, found higher blood levels of PBDEs in workers of various e-waste recycling facilities in Europe. The levels were higher than those of other workers, and they concluded this was as a result of inhalation of contaminated dust. See Sjödin A., Carlsson H., Thuresson K., Sjölin S., Bergman Å., Östman C. “Flame retardants in indoor air at an electronic recycling plant and at other working environments” (2001) 35 *Environmental Science & Technology* 448-454; see also Alaei M., Arias P., Sjödin A., Bergman A. “An overview of commercially used brominated flame retardants, their applications, their use patterns in different countries/regions and possibly modes of release” (2003) 29 (6) *Environment International* 683-689.

Just like landfilling and incineration, material recycling is not currently an effective or feasible framework for management of e-waste in developing countries. It is also not a feasible framework for reducing risks to human health and the environment arising from the accumulation of e-waste so as to justify free trade in used electrical and electronic equipment in the region. The “remedial measures” discussed above carry their own risks and require the commitment of resources, technology and know-how not readily available in the developing world. The risk being addressed here encompasses what the WTO Appellate Body in *EC – Hormones* described as "risk in human societies as they actually exist, in other words, the actual potential for adverse effects on human health in the real world, where people live and work and die."³⁹⁰

However, assuming for the purpose of argument that landfilling, incineration and recycling are effective measures for the disposal and management of e-waste in developing countries, assuming further that developing countries have the resources and capacity for environmentally sound management or disposal of obsolete e-waste via landfilling, incineration and recycling, the argument could still be made against a trade regime which permits transboundary dumping of obsolete e-waste in developing countries. This argument will be founded on the fact that it is contrary to the rules of international law to permit free trade that allows for transboundary movement of hazardous e-waste to developing countries for disposal or recycling.

Junk e-waste as opposed to functional used electrical and electronic equipment comes within the definition of hazardous waste in the Basel Convention.³⁹¹ While the latter can be traded as goods

³⁹⁰ Appellate Body Report, *EC Measures Concerning Meat and Meat Products (Hormones)*, WT/DS26/AB/R, WT/DS48/AB/R, adopted 13 February 1998, DSR 1998:I, 135, at para. 187.

³⁹¹ Although the original draft of the Basel Convention did not provide a definition for e-waste, later amendment to the original Convention, particularly Decision IV/9, which came into force in 1998, made changes to Annex VIII

(or used goods), the former being waste in nature, and considering the risks associated with its constituents, is not classified as goods and its hazardous nature makes it the subject matter of a very rigorous regulatory regime. Transportation of obsolete e-waste across national borders for recycling or disposal comes under the rules for transboundary movement of hazardous wastes set forth in the Basel Convention and the Basel Ban Amendment. One of the fundamental principles and objectives of the Convention is that hazardous waste should be recycled or disposed of as close as possible to their source of generation.

Additionally, the Basel Amendment bans the transboundary movement of hazardous wastes from developed to developing countries. Even in limited situations where the transboundary movement of hazardous waste is possible (between developed countries), it has to be in line with the provisions of the treaty which requires among other things prior informed consent of the recipient nation. The facts presented above along with the thinking in international law evidenced in the Basel Conventions point towards the need for a rational application of trade restraint in international trade in UEEE especially where such trade obviously has the capacity to provide a conduit for transboundary dumping of obsolete e-waste to developing countries in violation of the Basel Convention - a treaty which has been ratified by almost all developing countries.³⁹²

The discussion of the remedial measures evident in the non-trade-restrictive framework above clearly show that this framework does not provide adequate safeguards against the health and

and went further to include additional Annex (Annex IX) to the Convention. Annex VIII lists specific materials which shall constitute hazardous waste and this list includes materials which comes within the class of e-waste such as waste electrical and electronic assemblies or scrap containing components such as accumulators and other batteries, mercury-switches, glass from cathode-ray tubes and other activated glass and PCB-capacitors, or contaminated with constituents such as cadmium, mercury, lead, polychlorinated biphenyl. See Annex VIII, para A1180.

³⁹² With the exception of Haiti and Afghanistan.

environmental impacts associated with international trade in UEEE in developing countries. Hence it cannot form a sound basis for a sustainable framework for management of the negative impacts arising from international trade in used electronic devices. Arguably, a preventive policy measure framed in line with WTO rules may offer a better approach to a sustainable solution. Hence going further from here, this paper shall propose the use of trade-restrictive frameworks in the form of technical regulation and an import ban as preventive measures for dealing with the transboundary harm arising from international trade in UEEE.

5.2 Trade-Restrictive Measures for Control of Transboundary Movement of E-waste

International trade in UEEE has had and will continue to have positive socio-economic benefits in the developing world as much as it has had and will continue to have negative health and environmental effects on the region. The developing world needs functional used electrical and electronic equipment which has been made possible by international trade. As has been noted above, the problem with international trade in used electronics lies in the absence of a framework for distinguishing between functional used electrical and electronic equipment, and obsolete waste electrical and electronic equipment. This gap has resulted in both functional and junk electronics flowing collectively to developing countries under the guise of international trade in used electronics.

The influx of obsolete e-waste in developing countries gives rise to environmental and public health concerns. Dealing with these public health and environmental concerns arising from the transboundary movement of e-waste to developing countries requires an effective regulation of international trade in UEEE in the region. This research proposes a combined framework

involving technical regulations and an import ban, which could be adopted by developing countries either at the regional, sub-regional or national level in addressing the problems associated with the transboundary movement of used electrical and electronic equipment. These measures, it is argued, will entail the adoption of compulsory certification and labelling system as well as the prohibition on the commercial importation of used electrical and electronic devices not complying with the said certification and labelling system.

5.2.1 Development of Certification and Labelling System

The first aspect of the proposed framework will require the development of an international certification system for used electrical and electronic equipment. Such a certification system will serve to set a standard that used electrical and electronic equipment must comply with before they can be fit for export to developing countries. The certification system should also incorporate the use of a certification mark or label which shall serve as prima facie evidence that products bearing the mark have complied with the set standard. The development of such a certification system should be accompanied by a regulatory regime in developing countries which should, among others, require compliance with the certification and labelling mark as a condition for import eligibility for UEEE.

The idea behind the certification system and mark proposed in this research draws from the concept of environmental labelling programs and environmental certification schemes - the two voluntary schemes that provides consumers with environmental information. Environmental labels provide consumers with useful information relating to the environmental impacts associated with a product both at the production and use phase. In this way, consumers are able

to take such environmental criteria into consideration in their decision making process. Rotherham noted that ‘labelling and certification programs help consumers to “vote through the market place” for more environmentally responsible products’.³⁹³

The International Organization for Standardization (ISO) has identified three different environmental labelling programs. The type I label consists of a logo that is awarded by a managing authority to business organizations that meet the criteria for the award.³⁹⁴ A type I label can address a single criterion, it is generally based on some kind of Life Cycle Analysis (LCA) which addresses a series of environmental impacts associated with the life cycle of a product.³⁹⁵ Based on the concept of “life cycle analysis,” the use of “end of life labels” has been suggested.³⁹⁶ The idea behind this concept is to inform consumers about the recycled content of a product or call to mind the products’ recoverability or recyclability. Three categories of such labels have been identified to this effect namely: (i) labels indicating that a material or item can be recycled, (ii) labels indicating the type of material that a product is made of, and (iii) labels indicating compliance with a recognized scheme.³⁹⁷ A good example of the first in the U+2672 universal recycling symbol.

A type II label consists ‘any kind of environmental declaration made by manufacturers, importers, distributors or anyone who is likely to benefit from the product’s environmental

³⁹³ Tom Rotherham, “Selling Sustainable Development: environmental labelling and certification programs” Meeting of Technical Specialists and Policy Experts on Environmentally-Sound Trade Expansion in the Americas, The Dante B. Fascell North-South Center, University of Miami, October 28-9, 1999 [Rotherham “Selling Sustainable Development”].

³⁹⁴ WTO, “Internationally Agreed Definitions of Environmental Labelling Within the International Organization for Standardization (ISO) and Related Work”. WT/CTE/W/114, 31 May 1999.

³⁹⁵ Douglas Jake Caldwell, “Environmental Labelling in the Trade & Environment Context”. Discussion Draft prepared for the Community Nutrition Institute for discussion at the Joint Policy Dialogue on Environment and Trade, October 1996.

³⁹⁶ Grosz, “Sustainable Waste Trade” *Supra* note 110 at 407.

³⁹⁷ *Ibid.*

claims.’^{*} An example is an inscription in a product packaging declaring the product to be “Environmentally Friendly”³⁹⁸ or a declaration to the effect that a product is ‘made from x% recycled material’. The declaration need not be independently verified, however in some legal jurisdictions where such declarations are found to be false, misleading or deceptive, it could incur penalties from trade regulatory bodies.

Type III labels provide ‘a comprehensive set of data lists that give environmental information on a product throughout its life-cycle.’^{*} Independent bodies set the standard and verify the data given leaving it up to the consumer to make the final decision with regards to the environmental benefit of the product. A good example of a Type III label is the Environmental Product Declaration or EPD. EPDs ‘are constituted in accordance with sets of standard Product Category Rules to ensure that EPDs of product produced by different organisations in the same functional use category use the same scope of data and metrics.’³⁹⁹ When developed by organisations, EPDs are subjected to stakeholder review processes. On the completion of the review process, they are published in the public domain by country-based registrars.^{*}

It should be noted though that the nature of the three environmental labels above is flexible and can be adapted to create a variety of different environmental labelling programs.⁴⁰⁰ Hence it is possible to create a single labelling program which is a hybrid of the elements of the various types of labels highlighted above.

^{*} *Supra* note 393.

³⁹⁸ See S.260.7 of the “Guides for the Use of Environmental Marketing Claims” issued by the U.S. Federal Trade Commission’s (FTC) pursuant to 15 U.S.C. §§ 41-58.

^{*} *Supra* note 393.

³⁹⁹ Ecospecifier Global, “Introduction to Ecolabels and Environmental Product Declarations” <<http://www.ecospecifier.com.au/knowledge-green/technical-guides/technical-guide-9-introduction-to-ecolabels-and-environmental-product-declarations.aspx>>.

^{*} *Ibid.*

⁴⁰⁰ Rotherham “Selling Sustainable Development” *Supra* note 393 at 5.

Labelling can in fact be a powerful tool for environmental policy advances, and it has been asserted within the context of international trade that labelling offers a useful “default” trade restriction.⁴⁰¹ Thus labelling (or in this case compulsory labelling) can prove to be an effective mechanism for states to address environmentally deficient imports. Rather than banning all imports of a particular product because of the health and environmental hazards associated with a few of such products, labelling programs permit relatively easy differentiation of environmentally sound products from environmentally hazardous products, thus providing a refined analysis of products being imported into any particular country.⁴⁰² The importing country could thus insist on accepting only certified products, while the exporting country on the other hand could ensure that only certified products are exported in line with the laws or requirements of the importing country.

But as Grosz argued, in some cases labelling schemes may have discriminatory effects and thus amount to a trade barrier limiting market access.⁴⁰³ This criticism has been particularly levied from a developing country point of view. Grosz argued in this respect that states which do not have the necessary technological facilities and standards in place to compete with eco-labelled products are denied market access. To substantiate her argument, Grosz cited a 1996 CTE report which particularly noted the difficulties developing countries could be confronted with in attaining eco-labels, and the discriminatory effects that such schemes could entail.⁴⁰⁴

While acknowledging this concern, it suffices to state that the application of a labelling program in the context of UEEE as proposed in this research does not give rise to the concerns raised by

⁴⁰¹ Daniel C. Esty, *Greening the GATT: Trade, Environment, and the Future*, (Washington, Institute for International Economics, 1994) 134.

⁴⁰² *Ibid* at 171.

⁴⁰³ Grosz, “Sustainable Waste Trade” *Supra* note 110 at 408.

⁴⁰⁴ *Ibid*. See also CTE, Report of the Committee on Trade and Environment, 12 November 1996, WT/CTE/1.

Grosz. International trade in used electrical and electronic equipment is a one-way trade - from developed to developing countries. Hence the application of the labelling program will only force changes in developed countries which undoubtedly have the resources and technology to effect the change. It will not amount to a barrier to market access by developing countries since they are not in the business of exporting used electronics to developed countries. Rather, such a proposed change will sanitize international trade in used electrical and electronic equipment by getting rid of health and environmentally damaging products, to the utmost benefit of developing countries.

While environmental labels give information relating to the environmental characteristics of a product, environmental certification programs deal with the policy and management of a business organization and its impact on the environment. Environmental certification programs could be generic or sector-specific. Generic programs are applicable in any industrial sector. The International Organization for Standardization's ISO 14001 is a good example of a generic environmental certification scheme. It enables companies to track, understand and reduce their environmental impacts. Sector-specific certification programs, as the name implies, apply within a specific industry. A certification is awarded to the company after an independent auditor has evaluated the company and certifies that it has complied with the standard stipulated for such a certification. In some cases, the company is granted the right to the use of a certification mark or label in its products. The mark or label serves as a prima facie evidence that the product has been produced in an environmentally-responsible manner.

Generally, the standards upon which a certification is based could be developed by the industry itself e.g. producers, by the actors further down the chain, e.g. consumers or consumer organizations, or by a third party independent body. The extent to which a certification standard

and label becomes generally accepted depends on many factors. Among these are public recognition or reputation of the body setting the standard, the interest of the standard setting body in relation to the subject matter, the process adopted in setting the standard including but not limited to consultations with stakeholders, the possibility of complying with the standard, as well as the extent to which the standards is publicized. In most cases, a third party certification is often preferable especially where the third party has no commercial interest or stake in the industry whose business or product is being certified. This adds to the credibility of the standard and the certification mark or label.

The use of certification labels in the electronics industry is not new. Over the years, regulatory and voluntary standards known as “ecolabels” have been designed and applied on various consumer products including electronic products. For example, Sweden’s TCO standards and Germany’s Blue Angel standard has quietly influenced product designs by high tech companies such as Dell and HP.⁴⁰⁵ More so, eco-labels like Japan’s PC Green Label, Scandinavia’s IT Eco Declaration, and Energy Star, as well as Canada’s Environmental Choice have been applied to consumer products and other products which meet standards making them less harmful to the environment. In many cases, a consumer’s choice of products has often been influenced by environmental standards where such exist, and there is at least one specific instance of a government procurement directive which stipulates government agencies’ purchase of high tech equipment which complies with an environmental certification standard.⁴⁰⁶ Thus the context of

⁴⁰⁵ Grossman, “High tech trash” *Supra* note 94 at 244.

⁴⁰⁶ During the Clinton era in the United States, the administration issued a directive specifying that the federal government would only buy Energy Star certified products. See Executive Order 13221 of July 31, 2001.

application of environmental labelling and certification systems is growing and is also changing in nature from hitherto voluntary standards to regulatory standards.⁴⁰⁷

The EU's WEEE and RoHS Directives represent successful attempts to apply environmentally sound product standards at a regional level. The RoHS and WEEE Directives could be seen as setting regulatory standards at a regional level for electronic products. The RoHS Directive specifically restricts the use of certain hazardous substances in the production of electrical and electronic equipment to be marketed in the European Union. The WEEE Directive among others stipulates recycling standards for same. Manufacturers are required to certify their product as complying with the standards before placing them for sale in the EU market. Compliance with the Directives in some cases is required to be evidenced by a design mark in the product e.g. the recycle logo. Non-compliance with the directive will result in the products being ineligible for sale in the EU.

This research makes the argument that the idea behind certification schemes and labels could also be applied in developing a certification framework for regulating the transboundary flow of e-waste into developing countries. The research argues for the development of a regulatory certification system and labels to provide information relating to the environmental impact of used electrical and electronic equipment meant for export to developing countries. To reduce the health and environmental impacts arising from transboundary movement of e-waste to developing countries, such a certification system should be developed with the objective of distinguishing functional used electronics meant for resale from junk e-waste devices transported

⁴⁰⁷ In the United States, the regulatory standard requires that all home appliances must comply with the Appliance Standards Program established by the US Department of Energy and the Federal Trade Commission. In addition, appliances that meet the rigorous energy efficiency standard set by the United States Environmental Protection Agency (EPA) are permitted to use the "Energy Star" certification label.

for the purpose of dumping. To qualify for classification as used electronics, the items must be in functional order (i.e. the items must have been evaluated and tested), and devoid of any outward or external appearance that reveals any waste characteristics. Products that meet the criteria could be identified by a certification mark or label. Such mark or label accordingly provides environmental information to the effect that the products are functional electronics and not waste electrical and electronic equipment. Hence, they do not constitute serious health and environmental risks in their country of destination. Trade in used electrical and electronics equipment is booming in the developing world and simultaneously presenting a serious environmental challenge to the region, hence the development and adoption of a certification and labelling scheme has become imperative in sanitizing international trade in used electrical and electronics equipment.

5.2.2 E-stewards Certification System

The use of a certification mechanism with regards to used electrical and electronic equipment has been applied to e-waste recycling and processing in some developed countries. The e-stewards certification program has been developed and utilized to this effect. The program was designed as a certification scheme for e-waste recyclers, refurbishers and processors in developed countries. The development of the scheme has made it possible for individuals and corporate organizations in developed countries who wish to dispose of their old electrical and electronic equipment in an environmentally sound manner, to easily identify recyclers that comply with the highest environmental standards with respect to recycling, refurbishing, processing and the disposal of such equipment. The e-stewards electronic recycling certification was developed by a coalition of electronics recyclers, environmentalists, industry leaders and health and safety and

technical experts working with the Basel Action Network (BAN), a non-governmental organization focused on halting the transboundary flow of e-waste to developing countries. The e-stewards certification system incorporates the following standards:

- Requires a certified ISO 14001 environmental management system that builds in occupational health and safety requirements specific to the electronics recycling industry, minimizing exposure of recycling workers to hazards;
- Prohibits all toxic waste from being disposed of in solid waste landfills and incinerators;
- Requires full compliance with existing international hazardous waste treaties for exports and imports of electronics, and specifically prohibits the export of hazardous waste from developed to developing countries;
- Prohibits the use of prison labor in the recycling of toxic electronics, which often have sensitive data embedded;
- Requires extensive baseline protections for and monitoring of recycling workers in every country, including developed nations where toxic exposures are routinely taking place;
- Is written for international use.⁴⁰⁸

The e-stewards certification process provides a high level of assurance that e-stewards certified recyclers consistently adhere to the set standards. Certification is carried out by accredited, independent and specially trained e-Stewards certification bodies, via rigorous, on-site audits that are performed at least once a year. Compared to other e-waste recycling certification programs such as the R2 developed by the US Environmental Protection Agency (EPA), the e-stewards certification stands out in many ways. The e-stewards standard precludes a certified recycler from exporting e-waste to developing countries for recycling, it also prohibit recyclers from exporting non-working electrical and electronic equipment to developing countries. Only

⁴⁰⁸ For further information on e-stewards certification visit <<http://e-stewards.org/certification-overview/>>.

electrical and electronic equipment which has been tested and is shown to be fully functional may be exported to developing countries. Hence if the equipment has not been tested or has been tested but does not seem to be functional, it does not meet the e-stewards standard and cannot be exported unless necessary repairs are carried out in the exporting country to put them in functional, working condition.

Thus we find in the e-stewards certification mechanism an essential element in dealing with the transboundary flow of obsolete e-waste to developing countries. The mechanism provides a measure of assurance that electronic equipment exported from e-steward certified recyclers/exporters conforms to the standard of functionality and a guarantee against obsolete e-waste export. This element of the e-stewards certification is very important as it serves to differentiate between functional used electrical and electronic equipment which is of great socio-economic importance to developing economies as opposed to junk e-waste which contributes to adverse health and environmental impact in the region. Thus there is a rebuttable presumption that electrical and electronic equipment exported by e-stewards certified recyclers are in functional, working condition and not a waste product.

Building on the e-stewards certification system, we can develop a framework that could be used to adequately restrict the transboundary flow of obsolete e-waste to developing countries. The current framework built on the e-steward certification mechanism could be further developed to incorporate the use of a product certification mark or label which shall be attached to used electrical and electronic equipment to serve as a physical evidence of compliance with the standard. Hence recyclers and/or used electrical and electronic equipment exporters in developed countries who meet and obtain the e-stewards certification or similar certification schemes

developed along that line could be permitted to apply the certification marks or labels with a unique identification code on their exports.

On the other hand, enforcement officers in ports of entry in developing countries could rely on these labels or marks as evidence of functionality of the products bearing them. To forestall the possibility of abuse, enforcement officers could carry out random tests on imported used electrical and electronic products at the port of entry. In cases where non-functional products are discovered to be carrying the certification mark or label, a necessary penalty could be imposed on the importer. In addition, a report to that effect could be filed with the certification body which is then obliged to trace the origin of the certification mark to a recycler or exporter using the unique code on the certification mark or label. The certification body may in turn impose the necessary sanction against the recycler or exporter responsible for the violation. Such sanction could include among others admonitions or warnings. Continuous breach or violation should ultimately result in a cancellation or withdrawal of certification of the recycler.

Although the e-stewards certification program has yet to develop to the stage proposed in this research, the program in its current stage operates in developed countries in North America and Europe - countries that have served as originating points for transboundary flow of e-wastes to developing countries. Suffice it to state though that since the initiation of the e-stewards certification program in 2008, various efforts have been made in developing and expanding the number of recyclers participating in the program. Unfortunately, these efforts have not been met by a corresponding reduction in the level of e-waste export from developed to developing countries. This paper argues that the reason for this is based on the fact that the e-stewards certification is voluntary. Developed countries have neither mandated compliance with the

scheme or similar schemes for used electronics export, neither have developing countries required it or similar schemes for used electronic imports.

More so, countries like the United States and Canada engaged in massive e-waste export to developing countries have no domestic laws against the export of obsolete e-waste to developing countries. The two countries have also refused to sign the Basel Ban, which prohibits developed countries from exporting hazardous wastes to developing countries. Thus, recyclers in North America who make a commercial profit exporting waste electrical and electronic equipment to developing countries in the guise of international trade in used electronics have little or no incentive to voluntarily submit to the rigorous e-stewards certification process or similar processes.

As long as the certification processes such as the e-stewards certification remains voluntary, it may not really exert much influence in halting the illicit transboundary movement of obsolete e-waste to developing countries. At same time, it will be difficult to foresee such a certification being made mandatory in North America. The electrical industry and trade associations will vigorously oppose such a move.⁴⁰⁹ In addition, governments in this part of the world have neither the political nor economic incentive to engage in serious reform in this area. In fact, maintaining the status quo will be more beneficial as it presents a cheap and cost effective means of getting rid of their dirty waste in the developing world's backyard. Even in Europe (where export of waste electrical and electronic equipment (WEEE) to developing countries is prohibited), there is still a significant flow of WEEE from the region to developing countries.

⁴⁰⁹ The Electrical industry was actually instrumental in developing the US EPA funded "Responsible Recycling" (R2). The R2 is also a voluntary e-recycling standard which among others permits export of hazardous waste to developing countries for recycling as well as export of non-functional electrical and electronic equipment for repairs. Additionally, the series of opposition from the electrical and electronic industry and its trade associations during the drafting of the WEEE and RoHS Directives further highlights this point.

If any serious reform has to be effected through the certification mechanism proposed here, then it must come from governments in the developing world. While such certification standards remain voluntary in developed countries, governments in developing countries could adopt them as mandatory requirements which must be complied with in relation to used electrical and electronic equipment being imported into their countries. This would and should take the form of: (1) a regulatory framework which mandates compliance with reputable certification standards and labelling requirements (developed along the framework proposed in this research) for UEEE import into the region; (2) a trade ban on the commercial importation of used electrical and electronic equipment not complying with the stipulated certification scheme and labelling requirement.

Therefore, this research takes the position that an international certification system offering a credible verification mechanism can be used by developing countries to check illicit transboundary movements of obsolete e-waste. Such a certification mechanism would provide a credible medium for distinguishing between international trade in functional used electrical and electronics equipment and transboundary dumping of obsolete e-waste.

However, one important analysis that has to be made relates to the applicability of the proposed certification and labelling scheme vis-à-vis WTO Agreements such as the Agreement on Technical Barriers to Trade (*TBT Agreement*)⁴¹⁰ and the General Agreement on Tariff and Trade (*GATT*). To be viable, a certification and labelling scheme must be designed to conform to the provisions of WTO Agreements otherwise they may invoke WTO dispute resolution mechanism. It is important at this stage of the research to consider the relevant WTO agreements and their

⁴¹⁰ Agreement on Technical Barriers to Trade, Apr. 15, 1994, Marrakesh Agreement Establishing the World Trade Organization, Annex 1A, Legal Instruments—Results of the Uruguay Round, 33 I.L.M. 81 (1994) [hereinafter *TBT Agreement*].

jurisprudence in relation to the applicability of certification schemes and marks in international trade.

5.3 Certification and Labelling Through the Lens of WTO Agreements

Within the context of WTO Agreements, the various labelling schemes available in international trade can be classified into two broad categories - mandatory or voluntary. A mandatory scheme is usually mandated by law or a regulatory instrument and enforced by regulatory mechanism. It could take the form of a “negative content” labelling or “content neutral” labelling.⁴¹¹ A mandatory “negative content” labelling warns consumers of the adverse health or environmental effect of a particular type of product. A good example of such label is found in regulations mandating the labelling of any product containing ozone depleting substances.⁴¹² A mandatory “negative content” labelling requires the disclosure of reliable product information that otherwise might not be disclosed. Such information disclosure has the dual effect of enabling the consumer to make an informed purchasing decision while at the same time providing incentive for manufacturers to improve their products to achieve higher environmental standards.⁴¹³

In considering the applicability of certification and labelling schemes under GATT/WTO agreements, it is important to determine first whether the scheme is mandatory or voluntary or to put it in a more technical parlance - whether it constitutes a “technical regulation” or “standard”.

⁴¹¹ Matthias Vogt “Environmental Labelling and Certification Schemes: A Modern Way to Green the World or GATT/WTO-Illegal Trade Barrier?” 33 ELR 10522 [Vogt “Environmental Labelling”].

⁴¹² Montreal Protocol on Substances That Deplete the Ozone Layer, Sept. 16, 1987, 26 I.L.M. 1541 [hereinafter Montreal Protocol].

⁴¹³ Vogt “Environmental Labelling” *Supra* note 411 at 10523.

The applicability of a certification and labelling scheme is specifically governed by the TBT Agreement and generally by the provisions of GATT.

5.3.1 Applicability of TBT Agreement

The TBT Agreement covers two possible technical barriers to trade namely - technical regulations and standards. The TBT Agreement defines “technical regulation” as:

Document which lays down product characteristics or their related processes and production methods, including the applicable administrative provisions, with which compliance is *mandatory*.⁴¹⁴

On the other hand, “standard” is defined as:

Document approved by a recognized body, that provides, for common and repeated use, rules, guidelines or characteristics for products or related processes and production methods, with which compliance is *not mandatory*.⁴¹⁵

While compliance is mandatory in relation to technical regulation, this is not the case with regards to standard. However, in both cases, the document may include or deal exclusively with terminology, symbols, packaging, marking or labelling requirements as they apply to a product, process or production method.⁴¹⁶ Since the certification mechanism and labelling scheme proposed in this research is intended to be mandatory, the framework will be analyzed in the context of a technical regulation.

In seeking to interpret the definition of “technical regulation” as contained in the TBT Agreement, recourse must be had to the general rule of interpretation contained in *Article 31.1 of*

⁴¹⁴ Annex 1:1 (emphasis added).

⁴¹⁵ Annex 1.2 (emphasis added).

⁴¹⁶ *Ibid.*

the Vienna Convention.⁴¹⁷ The said provision is to the effect that a “treaty shall be interpreted in good faith in accordance with the ordinary meaning to be given to the terms of the treaty in their context and in the light of its object and purpose.”⁴¹⁸ Hence the provisions of a treaty are to be interpreted based primarily on the treaty provision itself. The wordings are to be construed by the ordinary rules of construction, and in the light of the object and purpose of the treaty in question. The WTO Appellate Body in *US - Gasoline* noted that “[o]ne of the corollaries of the general rule of interpretation in the Vienna Convention is that interpretation must give meaning and effect to all the terms of a treaty”.⁴¹⁹

The interpretation as well as the meaning and applicability of “technical regulation” in international trade have been subject of in-depth analysis in WTO jurisprudence. In the *EC - Asbestos Case*,⁴²⁰ the panel formulated a three-pronged approach in the analysis of what trade measure constitutes a “technical regulation”. This approach was subsequently adopted in *EC - Sardines*⁴²¹ as well as *US - Tuna II*.⁴²² The approach provides a useful guide in the analysis of “technical regulation” in this research. According to the Appellate Body, a measure constitutes a “technical regulation” if three basic conditions are met: (i) the measure applies to an identifiable product or group of products; (ii) it lays down one or more characteristics of the product; and (iii) compliance with the product characteristics is mandatory. These basic conditions are further discussed below.

⁴¹⁷ Vienna Convention on Consular Relations 21 U.S.T. 77, Apr. 24, 1963, 596 U.N.T.S. 261.

⁴¹⁸ Emphasis supplied.

⁴¹⁹ Appellate Body Report, *United States – Standards for Reformulated and Conventional Gasoline*, WT/DS2/AB/R, adopted 20 May 1996, DSR 1996:I, 3 at 23.

⁴²⁰ Panel Report, *European Communities – Measures Affecting Asbestos and Asbestos-Containing Products*, WT/DS135/R and Add.1, adopted 5 April 2001, as modified by Appellate Body Report WT/DS135/AB/R, DSR 2001:VIII, 3305.

⁴²¹ Panel Report, *European Communities – Trade Description of Sardines*, WT/DS231/R and Corr.1, adopted 23 October 2002, as modified by Appellate Body Report WT/DS231/AB/R, DSR 2002:VIII, 3451.

⁴²² Panel Report, *United States - Measures Concerning the Importation, Marketing and Sale of Tuna and Tuna Products*, WT/DS381/R adopted on 15 September 2011.

(a) The measure applies to an identifiable product or group of products:

The TBT Agreement requires that technical regulation must relate to an identifiable product or group of products. However, this does not necessarily imply that the product or group of products must be expressly identified in the document containing the measure. This was the position taken by the Appellate Body in *EC - Asbestos*. In clarifying the Panel position on this issue, the Appellate Body noted that:

A "technical regulation" must, of course, be applicable to an identifiable product, or group of products. Otherwise, enforcement of the regulation will, in practical terms, be impossible... However, ... this does not mean that a "technical regulation" must apply to "given" products which are actually named, identified or specified in the regulation. Although the TBT Agreement clearly applies to "products" generally, nothing in the text of that Agreement suggests that those products need be named or otherwise expressly identified in a "technical regulation". Moreover, there may be perfectly sound administrative reasons for formulating a "technical regulation" in a way that does not expressly identify products by name, but simply makes them identifiable – for instance, through the "characteristic" that is the subject of regulation.⁴²³

As can be seen from the Appellate Body's line of reasoning, the requirement that "technical regulation" be applicable to an identifiable product, or group of products is important for the purpose of legal compliance and enforcement. It will be practically impossible for traders to comply with, as well as for regulatory agencies to enforce a "technical regulation" if it is not clear what identifiable product or group of products they relate to. Thus, this aspect of the definition calls for legal certainty which is an important element of any effective regulatory framework.

⁴²³ Appellate Body Report, *European Communities – Measures Affecting Asbestos and Asbestos-Containing Products*, WT/DS135/AB/R, adopted 5 April 2001, DSR 2001:VII, 3243 at para 70.

(b) Lays down one or more characteristics of the product:

The definition of ‘technical regulation’ in Annex 1.1 of the TBT Agreement shows clearly that the document must stipulate one or more of the product characteristics. To better comprehend this definition, we need to examine the ordinary meaning of the word “characteristics”. This has been defined as “a distinguishing trait, quality, or property”.⁴²⁴ Thus product characteristic within the context of the TBT Agreement refers to an objectively definable trait, attribute, quality, property etc which distinguishes a product from another or in essence a distinguishing mark. Annex 1.1 of TBT Agreement lists some of these characteristics to include “terminology, symbols, packaging, marking or labelling requirement.”

In *EC - Sardines*, the Appellate Body noted that “product characteristics” goes beyond features and intrinsic qualities of a product to include related characteristics such as a means of identification, the presentation and appearance of a product.⁴²⁵ The Appellate Body in *EC - Asbestos* noted that technical regulations may lay down or stipulate product characteristics in a positive form by requiring that a product or group of products (as the case may be) must possess certain characteristics, or in the alternative, it may prescribe the characteristics in negative form by requiring that a product or group of products must not possess certain characteristics. In both cases, the regulation “lays down” certain characteristics which are binding in nature - in one case it does so affirmatively, and in another case by negative implication.⁴²⁶ It differentiates this with

⁴²⁴ Merriam Webster online dictionary <http://www.merriam-webster.com/dictionary/characteristics>.

⁴²⁵ Appellate Body Report, *European Communities – Trade Description of Sardines*, WT/DS231/AB/R, adopted 23 October 2002, DSR 2002:VIII, 3359 at 189. The Appellate Body in *EC - Asbestos* noted that “the definition of a “technical regulation” provides that such a regulation “may also include or deal exclusively with terminology, symbols, packaging, marking or labelling requirements”. The use here of the word “exclusively” and the disjunctive word “or” indicates that a “technical regulation” may be confined to laying down only one or a few “product characteristics”.” at para 67.

⁴²⁶ *Supra* note 423 at para 69. In *US Clove Cigarette*, the Panel noted that the US measure in issue lays down product characteristics in negative form by requiring that “a cigarette ... shall not contain”. The Panel was of the

a situation where a regulatory measure imposes an outright ban on a product in its natural state without prescribing or imposing any characteristics to the product. In the latter case, the measure consists of a prohibition as opposed to a “technical regulation”.⁴²⁷ Thus a measure which consists of a prohibition as opposed to a “technical regulation” will fall outside the specific context of the TBT Agreement and will be governed by the more general context of the GATT.

Hence the product characteristics may be evidenced by “marking or labelling requirements”. The term “marking or labelling requirements” is used in the definition of “technical regulation” and “standard”, and obviously it carries the same meaning in both cases. The only difference is that in the case of a technical regulation, compliance with the marking or labelling is mandatory, while in the case of a standard, compliance is voluntary. Therefore, in the case of a technical regulation, marking or labelling requirements refers to set of criteria or conditions that must be fulfilled before a mark or label can be applied or used, or before the product can be marketable.

Applying this provision in the *US Tuna II*, the panel noted that:

the US dolphin-safe labelling provisions define the conditions that must be met in order to bear a "dolphin-safe" label. In so doing, they "convey criteria to be fulfilled" in order to qualify for such label. They therefore lay down "labelling requirements" within the meaning of Annex 1.1.⁴²⁸

The later part of Annex 1.1 refers to marking or labelling requirements “as they apply to a product, process or production method”. While the use of the term “as they apply to” implies that the marking and labelling requirement must be related to a “product, process or production

view that the negative form of the requirement does not alter the fact that the measure lays down product characteristics. Panel Report, *United States – Measures Affecting the Production and Sale of Clove Cigarettes*, WT/DS406/R, adopted 24 April 2012, as modified by Appellate Body Report WT/DS406/AB/R.

⁴²⁷ The Appellate Body ruled that the French Decree prohibiting asbestos fibres “does not, in itself, prescribe or impose any "characteristics" on asbestos fibres, but simply bans them in their natural state.” Hence the measure in the Decree consisted only of a prohibition on asbestos fibres, and does not constitute a “technical regulation”. at para 71.

⁴²⁸ *Supra* note 422 at para 7.76.

method”, the use of “or” in Annex 1.1 indicates a disjunctive connotation. In this sense, the subject matter of marking or labelling requirements must be confined to at least one of the items vis: a product, a process *or* production method.

The Panel in *US Tuna II* was satisfied that the US safe-dolphin label requirements “apply to” products vis - tuna products. Technically, this was sufficient for the Panel to rule that the measure falls within the scope of the second part of Annex 1.1. However, on further analysis, it would be observed that the criteria or condition for the use of the “dolphin-safe” label in tuna products is subsistent on the process or production method namely, the method utilized in harvesting the tuna products. Hence while the label is applied on the final product, the condition for the use of the label is complied with during the harvesting process for the tuna products. Thus a tuna product is only fit to use the label if the “tuna contained in the product were harvested using a method of fishing that is not harmful to dolphins”.⁴²⁹

It might be safe then to state that where a trade measure requires a particular process or production method be followed in the processing of a product, and compliance with the said method is mandatory in order for the product to be fit to bear a mark or label which is essential for marketing the product, then such technical regulation applies both to the product as well as to the process or production method. Such is just one example of a document that can be said to “lay down” or stipulate the product characteristics within the context of Annex 1.1.

(c) Compliance with the product characteristics is mandatory:

⁴²⁹ Subsection 1385(d)(1) Dolphin Protection Consumer Information Act (DPCIA), United States Code, Title 16, Section 1385 et seq.

The third and most important element of “technical regulation” is that compliance with the product characteristics laid down in the document is “mandatory”. Thus mandatory compliance distinguishes “technical regulation” from “standard”. The word “mandatory” conveys the idea of a command, something which is compulsory or obligatory and in relation to which the exercise of discretion is not permitted. It carries the idea of a legally binding requirement. The use of the phrase “with which compliance is mandatory” implies that compliance with the measure in question is obligatory, compulsory or required by law or regulation. To this effect, the Appellate Body in *EC - Asbestos* noted that:

The definition of a "technical regulation" in Annex 1.1 of the TBT Agreement also states that "compliance" with the "product characteristics" laid down in the "document" must be "*mandatory*". A "technical regulation" must, in other words, regulate the "characteristics" of products in a binding or compulsory fashion. It follows that, with respect to products, a "technical regulation" has the effect of prescribing or imposing one or more "characteristics" – "features", "qualities", "attributes", or other "*distinguishing mark*". (Emphasis supplied)⁴³⁰

Hence a trade measure which prescribes a marking or labelling requirement, and imposes compliance with the requirement as a compulsory condition which must be met before a product or group of products could be imported, distributed, sold, or otherwise marketed in a jurisdiction, qualifies as a “technical regulation”. Suffice it to state though that the mere fact that a trade measure specifies or prescribes marking or labelling requirement without more is not sufficient to qualify as a “technical regulation” otherwise any marking or labelling requirement would amount to a technical regulation. This is evident from the fact that “marking and labelling requirement” was used in Annex 1 in the definition of “technical regulation” as well as “standard” thus implying that “marking and labelling requirements” may be equally prescribed

⁴³⁰ *Supra* note 423 at para 68.

by both technical regulations and standards. The difference is evident from the phrase “*with which compliance is mandatory*” in Annex 1.1 in relation to technical regulation, and the phrase “*with which compliance is not mandatory*” in Annex 1.2 in relation to “standard”. The sole distinguishing factor in each case is whether compliance with the requirement is mandatory or voluntary. Thus the Panel in *US Tuna II* rightly noted that:

compliance with product characteristics or their related production methods or processes is "mandatory" within the meaning of Annex 1.1, if the document in which they are contained has the effect of regulating in a legally binding or compulsory fashion the characteristics at issue, and if it thus prescribes or imposes in a binding or compulsory fashion that certain product must or must not possess certain characteristics, terminology, symbols, packaging, marking or labels or that it must or must not be produced by using certain processes and production methods. By contrast, compliance with the characteristics or other features laid out in the document would not be "mandatory" if compliance with them was discretionary or "voluntary".⁴³¹

Thus the use of “marking and labelling requirements” as a measure in international trade would entail establishing conditions that a product needs to satisfy before being able to bear a designated mark or label. The mere fact that a trade measure incorporates this requirement does not imply that compliance is mandatory unless expressed or implied from the document. It must be evident that the document in which the trade measure is contained has the effect of regulating in a legally binding way the use (or non-use) of the mark or label. It must be able to impose or prescribe in a legally binding fashion that a product or group of products must possess certain markings or labels. Where the document prescribes a compulsory use of a label, it may also go further to state that the label may not be used unless the prescribed conditions are met.

The framework proposed in this research argues for the development of a certification scheme which will entail the application of a certification mark or label on used electrical and electronic

⁴³¹ *Supra* note 422 at para 7.111.

equipment which has passed the test of functionality. The research further proposes that developing countries should adopt such a framework, making it mandatory or a legal requirement for used electrical and electronic products which are imported into the region. The rationale behind the framework is to prevent the abuse of international trade in UEEE as conduit for transboundary movement of waste electrical and electronic products. It would thus appear from the language of the proposed framework that it qualifies as a “technical regulation” as opposed to a “standard”.

However, the mere fact that a trade measure qualifies as a “technical regulation” does not necessarily imply that it is inconsistent with the TBT Agreement. The implication lies in the fact that the measure must conform with certain binding requirements outlined in the TBT Agreement which apply to technical regulations. Going further from here, this research will examine these requirements vis-à-vis the proposed framework.

5.4 Legal Analysis of the Compatibility of Used Electronics Labelling Schemes with the TBT Agreement.

The analysis presented above leaves no doubt that the certification and labelling scheme proposed in this research qualifies as a technical regulation within the context of the TBT Agreement. However, certain legal implications will arise from imposition of certification and labelling requirements on used electrical and electronic equipment as proposed in this research. These legal implications become more evident considering the fact that similar certification and labelling requirements are not imposed on new electrical and electronic equipment. Imposition of such a requirement on new electrical and electronic equipment will not be necessary considering

the fact that transboundary movement of the latter does not pose serious threat of harm to health and environment as does the former. More so, the certification and labelling scheme proposed above is meant to segregate functional used electrical and electronic equipment from junk e-waste, and international trade in new electrical and electronic equipment does not give room for transboundary movement of junk e-waste - the very mischief the certification and labelling scheme was meant to address.

Hence there is need to examine the compatibility of the certification and labelling scheme within the context of the TBT Agreement and the WTO/GATT legal system, especially in the light of the WTO provisions relating to the application of technical regulation to “like products”, and its impact on international trade. Where a trade measure is classified as a technical regulation, a decision as to whether it constitutes a violation of international trade rules will depend on its consistency (or inconsistency) with the substantive requirement set out in Article 2 of the TBT Agreement. The Article provides in part:

2.1 Members shall ensure that in respect of technical regulations, products imported from the territory of any Member shall be accorded treatment *no less favourable* than that accorded to *like products* of national origin and to *like products* originating in any other country.

2.2 Members shall ensure that technical regulations are not prepared, adopted or applied with a view to or with the effect of creating *unnecessary obstacles to international trade*. For this purpose, technical regulations shall not be more trade-restrictive than necessary to fulfill a legitimate objective, taking account of the risks non-fulfillment would create. Such legitimate objectives are, *inter alia*: national security requirements; the prevention of deceptive practices; protection of human health or safety, animal or plant life or health, or the environment. In assessing such risks, relevant elements of consideration are, *inter alia*: available scientific and technical information, related processing technology or intended end-uses of products. [Emphasis added]

Analysis of Article 2.1 in the light of the proposed certification and labelling scheme will turn on determination of whether new and used electrical and electronic equipment are “like products” within the context of the TBT Agreement. An analysis of Article 2.2 will focus on determination

of the impact of the said certification and labelling scheme on international trade in used electrical and electronic equipment.⁴³² Going further from here, this research shall embark on a separate analysis of the two provisions.

5.4.1 Interpreting Article 2.1 of TBT Agreement

Before going into detailed analysis of the provision of Article 2.1, it is important to make some general observations. First, analysis of Article 2.1 could take different dimensions depending on the circumstances of the case or measure in question. It could entail an assessment of the effect of the measure in question as it relates to the products of the complaining member country vis-à-vis the domestic products of the member country subject to the complaint, or the effect of the measure in question in relation to the products of the complaining member country vis-à-vis “like products” of any other country in the domestic market of the member country subject to the complaint.⁴³³ It could also entail an assessment of the effect of the measure in question as it relates to the products of the complaining member country on the one hand and the domestic products of the member country subject to the complaint as well as “like products originating in any other country” on the other hand. Hence the relevant text in *Article 2.1* of the *TBT Agreement* is to the effect that “Members shall ensure that in respect of technical regulations, *products imported from the territory of any Member* shall be accorded treatment no less

⁴³² *Infra*.

⁴³³ The latter situation may arise where the country whose policy is the subject matter of the complaint does not have a domestic “like product” but its policy or measure accords discriminatory treatment in its domestic market to “like products” originating from other member countries.

favourable than that accorded to *like products of national origin* and to *like products originating in any other country*.⁴³⁴

Secondly, interpretation of Article 2.1 of the *TBT Agreement* should focus on the text of Article 2.1 read in the context of the *TBT Agreement*, including its preamble, as well as a consideration of the other contextual elements, such as Article III:4 of the GATT 1994.⁴³⁵ The Preamble to the *TBT Agreement* is as much part of the context of Article 2.1 and provides insight into the object and purposes of the Agreement which in turn serves as a useful guide in the interpretation of Article 2.1. Of particular importance to this effect are the second, fifth and sixth recitals of the Preamble which are briefly discussed below.

The second recital to the Preamble of the *TBT Agreement* provides thus:

Desiring to further the objectives of GATT 1994;

This recital seems to convey the idea that the *TBT Agreement* was designed to advance the objectives of GATT 1994. The Appellate Body in *US – Clove Cigarettes*⁴³⁶ was of the view that it also suggests that the *TBT* and *GATT* Agreements “overlap in scope and have similar objectives”. If this were the case, then it also implies that the two agreements should be interpreted in a coherent and consistent manner. It could also imply that separate WTO

⁴³⁴ In *US – Tuna II*, Mexico challenged certain legal instruments of the United States establishing the conditions for the use of a “dolphin-safe” label on tuna products. In examining the United States measure in the light of the Article 2.1 *TBT*, the Appellate Body noted that such examination should commence with assessing whether the measure at issue modifies the conditions in the US market to the detriment of Mexican tuna products as compared to US tuna products or tuna products originating in any other Member. See Appellate Body Report, *United States – Measures Concerning the Importation, Marketing and Sale of Tuna and Tuna Products*, WT/DS381/AB/R, adopted 13 June 2012.

⁴³⁵ See Appellate Body Report, *United States – Measures Affecting the Production and Sale of Clove Cigarettes*, WT/DS406/AB/R, adopted 24 April 2012 at para100.

⁴³⁶ *Ibid.*

jurisprudence from these agreements could be applied as a guide in the interpretation of each of the agreements.⁴³⁷

The fifth recital serves to further the trade-liberalization objective of both GATT and the TBT Agreements. The recital is to this effect:

Desiring however to ensure that technical regulations and standards, including packaging, marking and labelling requirements, and procedures for assessment of conformity with technical regulations and standards do not create unnecessary obstacles to international trade;

This recital seeks to advance the objective that technical regulation and standard in whatever form they may exist should not constitute unnecessary obstacles to international trade. This objective though does not take away the right of member countries to pursue legitimate trade measures necessary for the protection of, *inter alia*, human life or health as well as the environment. The sixth recital is to the effect that:

Recognizing that no country should be prevented from taking measures necessary to ensure the quality of its exports, or for the protection of human, animal or plant life or health, of the environment, or for the prevention of deceptive practices, at the levels it considers appropriate, subject to the requirement that they are not applied in a manner which would constitute a means of arbitrary or unjustifiable discrimination between countries where the same conditions prevail or a disguised restriction on international trade, and are otherwise in accordance with the provisions of this Agreement;

⁴³⁷ The similarity between the two agreement could also be gleaned from the language of the national treatment obligation of Article 2.1 of the *TBT Agreement* which closely resembles the language of Article III:4 of the GATT 1994. For example Article 2.1 of the *TBT Agreement* is to the effect that “Members shall ensure that in respect of technical regulations, products imported from the territory of any Member shall be accorded treatment no less favourable than that accorded to like products of national origin and to like products originating in any other country,” while Article III:4 of the GATT 1994 provides “The products of the territory of any contracting party imported into the territory of any other contracting party shall be accorded treatment no less favourable than that accorded to like products of national origin in respect of all laws, regulations and requirements affecting their internal sale, offering for sale, purchase, transportation, distribution or use.”

The Appellate Body in *US - Clove Cigarette* acknowledged in relation to the provision of the sixth recital that the right of Member states “to regulate should not be constrained if the measures taken are necessary to fulfill certain legitimate policy objectives, and provided that they are not applied in a manner that would constitute a means of arbitrary or unjustifiable discrimination or a disguised restriction on international trade, and are otherwise in accordance with the provisions of the Agreement.”⁴³⁸

The Appellate Body in that case faulted the technical measure adopted by the United States in relation to domestic restriction on the production and sale of clove cigarettes on the basis that it accords imported clove cigarettes less favourable treatment than that accorded to domestic menthol cigarettes.⁴³⁹ That notwithstanding, WTO Member states can legitimately apply technical regulations in the pursuit of legitimate state objectives, provided that such measures are even-handed and applied in a manner consistent with the provision of the *TBT Agreement*. With these general observations noted, we now turn to a detailed examination of the Article 2.1 of the *TBT Agreement*.

5.4.2 “Like Products” Analysis

The provision of Article 2.1 of the TBT Agreement has been the subject of in-depth analysis by various WTO Panels and Appellate Bodies.⁴⁴⁰ The provision codifies the national treatment principle with respect to the application of technical regulations. It requires member states to

⁴³⁸ *Supra* note 435 at para 95.

⁴³⁹ In *Thailand – Restrictions on Importation of and Internal Taxes on Cigarettes*, the Thai government sought to pursue health policy goals by restricting the importation of cigarettes. A WTO Panel held that the policy measure adopted by Thailand in restricting importation of cigarettes without a corresponding restriction on its internal sale of cigarette was inconsistent with *GATT* and not “necessary” within the meaning of Article XX(b). See *GATT Panel Report, Thailand – Restrictions on Importation of and Internal Taxes on Cigarettes*, DS10/R, adopted 7 November 1990, BISD 37S/200.

⁴⁴⁰ *Supra* notes 420, 422, 423, 435.

extend any advantage enjoyed by domestic products or products of any WTO member state to like products originating from all other member states. Article 2.1 contains three basic elements that must be shown in order to establish an inconsistency with the provision. These three elements are (i) the measure in issue is a “technical regulation” within the meaning of Annex 1.1; (ii) the “likeness” of the imported products in relation to the domestic product and/or other products from other countries; (iii) the treatment accorded to imported products is less favourable than that accorded to like domestic products and like products from other countries.⁴⁴¹ Having considered the meaning of “technical regulation” above and having come to the conclusion that the measure at issue here is a technical regulation, there remains the need for an examination of the concept of “like product” within the context of the *TBT Agreement*.

When products are considered ‘like’, the general implication under the WTO trade regime is that one product may not and should not be treated more favourably than the other. Generally, it will be a breach of the provision if a technical regulation is applied to a product originating from a member country but not applied to ‘like product’ in the domestic country or originating from other member countries.⁴⁴² However, when products are not considered “like”, members may treat them differently. For example, a WTO member may choose to apply a lower tariff for certified palm oil which meets an international certification standard while at the same time imposing a higher tariff for palm oil not meeting that standard. If both categories of palm oil are considered ‘like product’, they must be treated similarly and the preferential tariff would not be permitted. However, if the categories of products are not viewed as ‘like’, then the preferential tariff would be permissible.

⁴⁴¹ *Supra* note 434 at para 202.

⁴⁴² Nathalie Bernasconi-Osterwalder et. al. *Environment and trade: a guide to WTO jurisprudence* London: Earthscan, 2005 pg 7 [Bernasconi-Osterwalder et. al. *Environment and trade*].

Some domestic environmental measures differentiate between products which might be similar on their face or in their use but manifest different health and environmental implications in terms of their use and disposal. Bernasconi-Osterwalder et al. reasoned that if the concept of “likeness” was interpreted so as to consider environmentally harmful products as being different from environmentally sustainable products, then the WTO regime would grant considerable leeway to Members enacting domestic environmental and health measures. On the contrary, if health and environmental considerations are not important in determining whether two products are alike, then Members states would be constrained in their effort to enact domestic environmental and health protection measures.⁴⁴³

Hence, we must interpret the term “like products” in accordance with the rules of interpretation of public international law. This will require that we ascertain the ordinary meaning of “like products” and interpret it “in the light of the context and of the object and purpose of the provision at issue and of the object and purpose of the covered agreement in which the provision appears.”⁴⁴⁴ Also relevant to the interpretation of “like products” are WTO Panels and Appellate Body interpretations of similar terms as used in various provisions of the GATT.⁴⁴⁵ The judicial authority for this is found in Article XVI:1 of the *Agreement Establishing the World Trade Organization* which clearly provides that except as otherwise provided, the WTO shall be guided by the decisions, procedures and customary practices followed by the GATT.⁴⁴⁶ Thus the interpretative practices of the GATT could also be used to determine the scope and meaning of

⁴⁴³ *Ibid* at 8.

⁴⁴⁴ *Supra* note 422 at para 7.199.

⁴⁴⁵ See for example Article I:1, II:2, III:2; VI:4, IX:1, XI:2(c), XIII:1, XVI:4 and XIX:1 of the GATT 1994.

⁴⁴⁶ Article XVI:1 of the Marrakesh Agreement Establishing the World Trade Organization, Annex 1A, 1867 U.N.T.S. 410.

the provisions of the TBT Agreement including but not limited to the interpretative meaning of “like products”.

The dictionary meaning of the term “like” relates to “[h]aving the same characteristics or qualities as some other person or thing; of approximately identical shape, size, colour, character, etc., with something else; similar; resembling; analogous”.⁴⁴⁷ Thus the dictionary definition above seems to suggest that products that share same characteristics or qualities, or that are identical in shape, size, colour or character are “like products”. However, the wholesale application of dictionary meanings such as the one above to the interpretation of “like product” may be somewhat problematic. Such a problem becomes evident when we try to compare a new and used electronic product that serves the same purpose. For example, a brand new Lexmark C543 printer and a used Lexmark C543 printer may share a great deal of similarity, however they still do differ in some respect in that one is new and the other is not. Thus the dictionary meaning above leaves us in the dark as to the extent to which the two products must be similar in order to be considered “like”?

The problem with the application of dictionary definitions to the interpretation of “like products” in GATT/WTO Agreements was noted by the Appellate Body in its interpretation of “like products” in Article III:4 of GATT. It observed that:

First, this dictionary definition of “like” does not indicate which characteristics or qualities are important in assessing the “likeness” of products under Article III:4. For instance, most products will have many qualities and characteristics, ranging from physical properties such as composition, size, shape, texture, and possibly taste and smell, to the end-uses and applications of the product. Second, this dictionary definition provides no guidance in determining the degree or extent to which products must share qualities or characteristics in order to be “like products” under Article III:4. Products may

⁴⁴⁷ Oxford English Dictionary online <www.oed.com>.

share only very few characteristics or qualities, or they may share many. Thus, in the abstract, the term "like" can encompass a spectrum of differing degrees of "likeness" or "similarity". Third, this dictionary definition of "like" does not indicate from whose perspective "likeness" should be judged. For instance, ultimate consumers may have a view about the "likeness" of two products that is very different from that of the inventors or producers of those products.⁴⁴⁸

The problem with the interpretation of “like products” in Article 2 is further compounded by the fact that the provision does not contain an introductory paragraph setting out the general principle that would guide the understanding of the extent of similarities in terms of qualities and characteristics to be borne by products in order to be considered “like products”. Hence various approaches have been formulated for the purpose of determining “likeness” of products within the context of GATT/WTO Agreements. Suffice it to state that there is no single framework that is applicable in all cases. Therefore, the adoption of a particular framework to aid in the examination of evidence of “likeness” does not dispense with the duty to examine all of the pertinent evidence.

Accordingly, the WTO Appellate Body noted in *Japan – Alcoholic Beverages*, a case concerning Article III:2 of the GATT 1994:

... there can be no one precise and absolute definition of what is "like". The concept of "likeness" is a relative one that evokes the image of an accordion. The accordion of "likeness" stretches and squeezes in different places as different provisions of the WTO Agreement are applied. *The width of the accordion in any one of those places must be determined by the particular provision in which the term "like" is encountered as well as by the context and the circumstances that prevail in any given case to which that provision may apply....*⁴⁴⁹ (emphasis added)

Similarly, the Appellate Body in *EC-Asbestos* noted that:

⁴⁴⁸ *Supra* note 425 at para 92.

⁴⁴⁹ Appellate Body Report, *Japan – Alcoholic Beverages*, WT/DS8/AB/R, WT/DS10/AB/R, WT/DS11/AB/R, adopted 1 November 1996, DSR 1996:I, 97 (Article III:2 of the GATT 1994) at 114.

The kind of evidence to be examined in assessing the 'likeness' of products will, necessarily, depend upon the particular products and the legal provision at issue. When all the relevant evidence has been examined, panels must determine whether that evidence, as a whole, indicates that the products in question are 'like' in terms of the legal provision at issue.⁴⁵⁰

One framework or approach for determining the “likeness” of products can be found in the *GATT Working Paper report on Border Tax Adjustments*.⁴⁵¹ This approach has been followed and developed by several WTO panels and Appellate Body.⁴⁵² The approach consists of four general criteria for analyzing “likeness”: (1) the properties, nature, and quality of the products; (2) the end-uses of the products; (3) consumers’ taste and habits - more comprehensively termed consumers’ perceptions and behaviour - in respect of the products; and (4) the tariff classification of the products.⁴⁵³ These four general criteria were endorsed by Appellate Body in *EC-Asbestos* as “tools to assist in the task of sorting and examining the relevant evidence” for the purpose of determining “likeness”.⁴⁵⁴ The Appellate Body also observed that “in this determination, ‘[n]o one approach ... will be appropriate in all cases’.”⁴⁵⁵

⁴⁵⁰ *Ibid* at paras 103. [Emphasis supplied] (EC – Asbestos).

⁴⁵¹ Report of the Working Party on Border Tax Adjustments, L/3464, adopted 2 December 1970, BISD 18S/97

⁴⁵² See, further, Appellate Body Report, *Japan – Taxes on Alcoholic Beverages II*, WT/DS8/AB/R, WT/DS10/AB/R, WT/DS11/AB/R, adopted 1 November 1996, DSR 1996:I, 97 at 113. See, also, Panel Report, *United States – Standards for Reformulated and Conventional Gasoline*, WT/DS2/R, adopted 20 May 1996, at para. 6.8 as modified by Appellate Body Report WT/DS2/AB/R, DSR 1996:I, 29.

⁴⁵³ The fourth criterion, tariff classification, was not mentioned by the Working Party on Border Tax Adjustments, but was included by subsequent panels (see, for instance, Panel Report, *EEC – Measures on Animal Feed Proteins [“EEC – Animal Feed I”]*, adopted 14 March 1978, BISD 25S/49, para. 4.2, and *Japan – Alcoholic Beverages*, *Supra* note 452 para. 5.6).

⁴⁵⁴ *Supra* note 423 paras. 101-103. The Appellate Body further noted that “these general criteria, or groupings of potentially shared characteristics, provide a framework for analyzing the “likeness” of particular products on a case-by-case basis. These criteria are, it is well to bear in mind, simply tools to assist in the task of sorting and examining the relevant evidence. They are neither a treaty-mandated nor a closed list of criteria that will determine the legal characterization of products.” at para 102.

⁴⁵⁵ *Ibid* paras. 102.

(1) the properties, nature, and quality of the products

Assessment of “likeness” under the Border Tax Adjustment framework starts with an analysis of the properties, nature, and qualities of the products in question. This analysis has been held to cover the physical qualities and characteristics of the products.⁴⁵⁶ The Appellate Body in *EC-Asbestos* noted that this would require full examination of the physical properties of the products.⁴⁵⁷ However, this examination is by no means an easy one as it may (and often does) overlap into the other criteria identified in the Border Tax Adjustment framework. This is especially so considering the fact that the different “likeness” criteria are interrelated. For example, the physical qualities and characteristics of a product may shape and limit its end-uses, consumer taste as well as tariff classification. The Appellate Body in *EC-Asbestos* noted that:

Although not decisive, the extent to which products share common physical properties may be a useful indicator of 'likeness'. Furthermore, the physical properties of a product may also influence how the product can be used, consumer attitudes about the product, and tariff classification.⁴⁵⁸

Hence there is a need to exercise judicial caution in the analysis of physical characteristics of a product in order to avoid confusing it with an analysis of end-uses.⁴⁵⁹ This is important because products with different physical properties may in some cases be capable of achieving the same or similar end-use. This does not necessarily imply that they are equivalent. Thus products may be “like” in respect of identical end-use but not “like” in terms of physical characteristics and qualities. Hence, physical properties deserve a distinct analysis that should not be confused with an analysis of end-use. However, this criterion is not always the sole determining criterion in the

⁴⁵⁶ *Ibid* para. 110.

⁴⁵⁷ *Ibid* para. 114.

⁴⁵⁸ *Ibid* at para 111.

⁴⁵⁹ The Appellate Body in *EC-Asbestos* noted that the Panel in the case erred in the course of its examination of "properties", the Panel went on to rely on "end-uses" – the second criterion – and on the fact that, in a "small number" of cases, the products have the "same applications" and can "replace" each other.” at para. 110.

“likeness” analysis. It should be noted that the extent to which products share similar physical properties may serve as a useful guide in the determination of “likeness”.

The Appellate Body in *EC-Asbestos* ruled that the tentacles of physical properties and consumer taste criteria extend to evidence relating to health risks associated with a product.⁴⁶⁰ If health risks can be evaluated under these criteria, there is no reason why same should not apply to environmental risks posed by a product. Thus there is need to take into consideration the health and environmental impacts associated with new and used electrical and electronic equipment in our analysis of “likeness” between the two products.

Accordingly, we will proceed to examine the physical characteristics of *new* and *used* electrical and electronic equipment in order to ascertain the extent of similarity or dissimilarity between them. Although there may be a great deal of similarity between new and used version of same electrical and electronic product in terms of shape, size, colour etc, undeniably, they differ in certain respects - in terms of packaging, durability, lifespan etc. A close examination of new and used version of same electrical and electronic equipment will undoubtedly reveal dissimilarities in physical quality between the two. New electronics usually arrive in mint condition, factory packaged (often with operational manuals), with product warranty and in functional condition. This is not usually the case with used electronics often characterized by wear and tear, a measure of depreciation and in most cases, not fully functional. They are also characterized by a diminished life span as compared to new electronics.

⁴⁶⁰ The Appellate Body rules that carcinogenicity or toxicity constitutes a defining aspect of physical properties of chrysotile asbestos fibres when compared with PCG fibres that do not share the same toxicity. This amounts to a *significant* physical difference that must be taken into consideration in examining the physical properties of a product as part of a determination of “likeness”, at para 114.

In terms of health and environmental risks, as we have seen in this paper, international trade in UEEE poses a special threat to human health and environment in the developing world unlike international trade in new electrical and electronic products. There is a much higher degree of possibility that greater quantities of imported used electrical and electronic equipment will most likely end up in some waste dump as compared to new electrical and electronic equipment.

More so, as has been discussed in this paper, the essence of the certification and labelling scheme for used electrical and electronic equipment relates to health and environmental impacts associated with international trade in used electrical and electronic equipment. These impacts are not evident in international trade in new electrical and electronic equipment. The application of different regulatory frameworks for these products is supported by the difference in terms of risk to public health and environment posed by the trade. Thus the Panel in *US Clove Cigarette* noted that taking into consideration the health objective of a trade regulation in the analysis of “likeness” between products is in harmony with the *TBT Agreement* and as well as the object and purpose expressed by the sixth preambular recital of the *TBT Agreement*.⁴⁶¹ The rationale for this rule is based on the fact that WTO Members have a large measure of autonomy to determine their own policies to protect human health. Thus, a health objective might be a legitimate ground for a Member state to require labelling for some products according to their adverse health and

⁴⁶¹ *Supra* note 426 at paras. 7.116, 7.189. While reviewing this case on appeal, the Appellate Body expressed the view that the health risks associated with a given product may be relevant to an analysis of the “likeness” criterion under Article III:4 of the GATT 1994, as well as under Article 2.1 of the *TBT Agreement*, to the extent they have an impact on the competitive relationship between and among the products concerned. *United States – Measures Concerning The Importation, Marketing And Sale Of Tuna And Tuna Products* WT/DS381/AB/R (16 May 2012) at para. 119.

environmental characteristics, while at the same time not requiring same labels for similar products lacking these characteristics.⁴⁶²

(2) *The end-uses of the products*

An analysis of the end-use criterion relates to “the extent to which products are capable of performing the same, or similar, functions (end-uses).”⁴⁶³ In the context of Article III:4 of the GATT 1994, analysis of the end-use criterion will involve certain of the key elements relating to the competitive relationship between products because Article III GATT is particularly concerned with competitive relationship in the market place.⁴⁶⁴ Whether this applies to a similar analysis under Article 2.1 TBT is doubtful. This is because a purely economic objective would not provide a legitimate justification for a state to impose an obligation to label certain products on the basis of their health and environmental implication.

In *US Clove Cigarette*, the issue before the Panel related to whether imported clove cigarettes and domestic menthol cigarette are “like products” within the context of *Article 2.1 TBT Agreement*. While the panel was not persuaded to accept that “a fundamentally competition-based analysis would always be the correct approach in analyzing likeness under Article 2.1 of the *TBT Agreement*,”⁴⁶⁵ the Panel came to the conclusion that both imported clove cigarettes and domestic menthol cigarettes are “like products” because they have the same end use namely – “to be smoked”. The Appellate Body faulted this line of reasoning noting that:

⁴⁶² See Vogt “Environmental Labeling” *Supra* note 411 at 10526. In *US Tuna II*, it was noted that Article 2.1 does not necessarily imply that WTO Members may not draw any regulatory distinction between products that have been determined to be like products.

⁴⁶³ *Supra* note 423, para. 117.

⁴⁶⁴ *Supra* note 426 at para 7.191.

⁴⁶⁵ *Ibid* at 7.191.

[a]n analysis of end-use should be comprehensive and specific enough to provide meaningful guidance as to whether the products in question are like products. It is not disputed that both clove and menthol cigarettes are "to be smoked". Nevertheless, "to be smoked" does not exhaustively describe the functions of cigarettes. As a consequence, to find, as the Panel did, that the end-use of both clove and menthol cigarettes is "to be smoked" does not, in our view, provide sufficient guidance as to whether such products are like products within the meaning of Article 2.1 of the TBT Agreement. Also cigars, loose tobacco, and herbs share the same end-use of being "smoked", although this does not say much as to whether all these products are like.⁴⁶⁶

While the facts of the measure in this research does not necessarily warrant the sort of detailed end-use analysis proposed by the Appellate Body in *US – Clove Cigarettes*, what we can infer from the reasoning above is that this criterion (end use) alone should not be taken as decisive in “likeness” analysis. New computers and used computers do have the same end uses but the mere fact that products have same or similar end-uses is not decisive in analysis of “likeness” because products with the same or similar end-uses may share different physical properties.⁴⁶⁷ More so, products that *prima facie* seem to have same end use may on detailed investigation reveal a different end use.⁴⁶⁸

(3) Consumers’ taste and habits

Consumer taste and habits is often discussed in the context of consumer preference. In *EC-Asbestos*, the Appellate Body defined “consumer preference” in the context of Article III:4 of the

⁴⁶⁶ *Supra* note 435 at para 129.

⁴⁶⁷ A refrigerator containing Chlorofluorocarbons (CFCs) and another not containing such substances may have the same end uses in that they share the same application and can replace each other, however they cannot be considered “like products” because of their differing physical properties.

⁴⁶⁸ For example, water and alcohol may generally have the same end use of ‘being drunk’, but a detailed investigation may reveal that they do not really have the same end use. While water is meant for thirst quenching, alcohol may have the end use of pleasant intoxication.

GATT 1994 as the “extent to which consumers are - or would be - willing to choose one product instead of another to perform those end-uses”.⁴⁶⁹ It should be recalled that a determination of “likeness” under Article III:4 is an overall determination of the extent to which a competitive relationship exists between and among products. Hence a determination of ‘likeness’ under *Article III:4 GATT 1994* entails a consideration of the extent to which consumer taste and habits affect the competitive relationship of the products in the market place. While such competition-based jurisprudence may be very essential for a “likeness” analysis under Article III:4 GATT, the panel in *US - Clove Cigarette* cautioned against automatically transposing same into “likeness” analysis in Article 2.1 of the TBT Agreement. That notwithstanding, the same panel noted that we can glean some useful guidance from previous analysis under Article III of GATT 1994 when analyzing consumer preferences under Article 2.1 of the TBT Agreement.⁴⁷⁰

Thus an analysis of consumer preference under Article 2.1 of the TBT Agreement would entail a consideration of the extent to which consumers are, or would be, willing and *capable* to choose new electrical and electronic devices over used electrical and electronic devices (or vice versa) for the same end-use.

The driving force behind the massive growth in international trade in used electrical and electronic equipment is the socio-economic situation in developing countries. The low-income and poverty in the region has made it practically impossible for the majority of people in the region to afford brand new electrical and electronic devices. For this majority of consumers, whatever their preference for brand new electrical and electronic devices might be, the fact remains that they cannot afford these devices. Their capability to acquire these devices is highly

⁴⁶⁹ *Supra* note 423 para. 117.

⁴⁷⁰ *Ibid* Para 7.207.

limited, if not restricted. The economic situation tailors consumer perception and preference in favour of used electrical and electronic devices. This economic reality which is directly related to consumer capacity and which in turn determines their taste and preference has a determinative impact on whether the two types of products are “like”. Thus consumers in developing countries have certain preferences for used electrical and electronic devices based on the low prices of these devices as compared to new devices, and it is important to take these facts into consideration in assessment of “likeness”.

According to the Panel in *US Clove Cigarette*, the “likeness” test is intended to ascertain that the products to be compared would normally be expected to be in a competitive relationship.⁴⁷¹ However, there is no head-to-head competitive relationship between the two products here, in that the majority of consumers in the developing world would always opt for the used electrical and electronic equipment which they consider to be within their economic means as opposed to new ones which are outside their economic reach. Thus it could be argued that the preferences for used electrical and electronic devices, on the one hand, and new version of same in the developing world are non-identical.

The Panel in *US Clove Cigarette* also noted that an analysis of consumer preferences would involve determining the potential of a consumer substituting one good with another. Thus actual or current substitution is not required.⁴⁷² The concept seems to reflect not just the willingness of the consumer to substitute the products, but more so his potential or capability to do so. Hence a consumer may be willing to substitute his preference of used electronics for new electronics, but

⁴⁷¹ The Panel also added that factors that distort this relationship may be taken into account in the “likeness” analysis, “(while the subsequent “less favourable treatment” test would determine whether this competitive relationship has in fact been adversely affected by the measures, to the detriment of the imported products)” at para 7.208.

⁴⁷² *Ibid* at para. 7.211.

such willingness will not carry much weight where the economic means or potential to do so is lacking. Thus substitutability will arise where product A and B provide the same taste to the consumer, and where a consumer can opt for product B because he cannot find product A. However, where a consumer in the latter situation only opt for product B because he cannot afford product A, then it will be difficult to argue that product A and B are substitutes. This analysis thus substantiates the fact that new and used electrical and electronic devices do not have identical preferences nor are they substitutable within the context of the developing world and therefore they are not “like products” within the context of Article 2.1 of the TBT Agreement.

Thus we come to the conclusion that new and used electrical and electronic devices do not demonstrate identical preferences neither are they generally substitutable within the context of the developing world and hence they are not “like products” within the context of Article 2.1 of the TBT Agreement.

(4) The tariff classification of the products

The last criterion for assessment of “likeness” is the tariff classification for the products. In the *EC Asbestos case*, the Appellate Body noted that tariff classification clearly reflects the physical properties of a product.⁴⁷³ Where two products have different tariff classification, that might be an indication of their “unlikeness”. On the other hand, where the products being compared have the same customs tariff classification, this might be an indication of “likeness”. It should be noted though that on its own, this criterion is not conclusive. Hence an analysis of “likeness”

⁴⁷³ *Supra* note 423 at para 102.

under this head must be done in conjunction with the other criteria. A panel charged with examination of “likeness” must consider all evidence, and must determine whether the evidence as a whole, indicates that the products in question are “like products”.⁴⁷⁴

5.4.3 Conclusion on “Likeness”

We have found from the analysis above that used electrical and electronic equipment differs in many respects from new electrical and electronic equipment. In terms of physical qualities and characteristics, they differ in relation to packaging, texture, and durability. The difference between the two products is further highlighted by their diversity in terms of the magnitude of health and environmental risks that they pose. The two products also differ in terms of consumer taste and preferences. The analysis above seems to point to the preponderance of evidence which reveal that they are not “like products” within the context of Article 2.1 of TBT Agreement.

Further evidence that the two products are not ‘like products’ could be gleaned from the fact that new electrical and electronic equipment are required to comply with certain product and safety standards in order to be eligible for importation.⁴⁷⁵ Products not complying with such standards are deemed to be sub-standard. While the above requirements in the case of new products are imposed for safety reasons, the requirements in the case of UEEE proposed in this research should be imposed for health and environmental reasons.

However, assuming for the purpose of argument that the products in question are “like products” within the context of Article 2.1 of TBT Agreement, this will still not invalidate the technical

⁴⁷⁴ *Supra* note 423, paras. 101–103.

⁴⁷⁵ *Supra* note 234.

regulation proposed. It will, rather, invoke the “no less favourable treatment” principle. The principle is to the effect that technical regulation shall accord “treatment no less favourable than that accorded to like products of national origin and to like products originating in any other country.” The term “no less favourable treatment” is yet to be fully discussed within the context of the TBT Agreement, however some WTO cases have discussed the meaning of same term within the context of Article III:4 GATT.⁴⁷⁶ These cases have highlighted three interpretative elements.

First, the Appellate Body in *Korea - Various Measures on Beef* established that a formal difference in treatment of like products was not sufficient to show a violation of Article III:4.⁴⁷⁷ Secondly, whether a product is treated less favourably should be assessed by examining whether a measure modifies the conditions of competition in the relevant market to the detriment of the imported product.⁴⁷⁸ Thirdly, in the *US-FSC (Article 21.5-EC)* case, the Appellate Body stated that the examination of whether a measure involves a less favourable treatment of imported products within the meaning of Article III:4 GATT must focus on a close scrutiny of the “fundamental thrust and effect of the measure itself” in the market place.⁴⁷⁹

In other words, in determining whether or not there has been a breach of the principle, it has to be examined whether there is an objective, rational, non-trade related basis for distinguishing between the products in question. If this is the case, then it follows that no such breach could be

⁴⁷⁶ “The products of the territory of any contracting party imported into the territory of any other contracting party shall be accorded treatment no less favourable than that accorded to like products of national origin in respect of all laws, regulations and requirements affecting their internal sale, offering for sale, purchase, transportation, distribution or use. The provisions of this paragraph shall not prevent the application of differential internal transportation charges which are based exclusively on the economic operation of the means of transport and not on the nationality of the product.”

⁴⁷⁷ See *Korea - Various Measures on Beef*, WT/DS161/AB/R, WT/DS169/AB/R, para. 137.

⁴⁷⁸ *Ibid.* See also Tamiotti, in Wolfrum, Stoll and Seibert - Fohr (eds), Max Planck Commentaries on World Trade Law, Vol. 3, Art. 2 TBT, para 12.

⁴⁷⁹ See *US-FSC (Article 21.5-EC)*, WT/DS108/AB/RW, para 215.

said to have occurred. On the other hand, if no such basis could be established, then a breach of the principle could be validly presumed.⁴⁸⁰

Thus assuming (without conceding) that the products in question are “like products”, it is further argued that the application of the technical regulation proposed will not result in any violation of the principle. Although there might be a formal difference in the treatment accorded to both products in the sense that the technical regulation applies to one but not the other, the measure does not modify the conditions of competition in the relevant market to the detriment of any of the products. The “fundamental thrust and effect of the measure itself” in the market place is to prevent the flooding of the used electronic market with junk e-waste. More so, the distinction between the products is founded on an objective, rational, non-trade related basis.

It follows from this conclusion that the technical regulation proposed in this research in relation to certification and labelling requirements for used electrical and electronic equipment does not seem to contravene the provision of the Article 2.1 of the TBT Agreement. What is left to be examined then is whether it does constitute an unnecessary obstacle to international trade within the context of Article 2.2 of the TBT Agreement.

5.4.4 Unnecessary Obstacles to International Trade.

Article 2.2 of the TBT Agreement provides additional requirements for the validity of technical regulations. First, technical regulations shall not be “prepared, adopted or applied with a view to or with the effect of creating unnecessary obstacles to international trade.” Secondly, “technical

⁴⁸⁰ Grosz, “Sustainable Waste Trade” *Supra* note 110 at 379.

regulations shall not be more trade-restrictive than necessary to fulfill a legitimate objective, taking account of the risks non-fulfillment would create.” The second requirement tends to shed more light into the meaning of the first. Thus a technical regulation which is more trade-restrictive than necessary would automatically amount to an unnecessary obstacle to international trade.

In determining whether a technical regulation amounts to an unnecessary obstacle to international trade, it is important to inquire or determine whether the technical regulation is necessary, taking into consideration the legitimate objective of the member state applying the technical regulation. Whether a measure affecting international trade is “necessary” has been the subject of in-depth analysis in WTO jurisprudence especially in the context of Article XX(b) of GATT. In *Korea - Various Measures on Beef*, the Appellate Body split the necessity test into two: First, a situation where a claim is made to the effect that the measure is indispensable, and secondly, where the measure is justifiably necessary even in the presence of other alternative measures. With regards to the first, the Appellate Body noted that “the word ‘necessary’ is not limited to that which is ‘indispensable’”. Suffice it to state though, that a measure which is “indispensable” certainly passes the “necessary test”. With regards to the second, the Appellate Body noted that the second test involves a “process of weighing and balancing” of a series of factors including (1) the contribution made by the measure to the enforcement of a regulation at issue; (2) the importance of the common interests or values protected by the regulation; and (3) the impact of the regulation on international trade.⁴⁸¹

⁴⁸¹ para. 164.

This process of ‘weighing and balancing’ was elucidated in the *EC-Asbestos* where the Appellate Body noted that the more vital or important the common value pursued, the easier it would be to accept as “necessary” a measure designed to achieve those values or ends. Tamiotti has noted in this commentary that the WTO’s “weighing and balancing” process is particularly relevant in the context of Article 2.2 TBT analysis which is concerned with striking a balance between the legitimate objectives pursued by the Member state on the one hand, and the trade-restrictiveness of the measure on the other hand.⁴⁸²

A close examination of Article 2.2 clearly reveals that protection of human health and the environment which are the main objectives of the certification and labelling scheme proposed in this research are legitimate objectives expressly recognized in the said provision. Thus applying the WTO GATT principles above to our considerations under the TBT, it suffices to state that the objective pursued by the technical regulation proposed in this research, which is the preservation of human health and the environment, is a value that is both vital and important to the highest degree. The measure is thus “necessary” and should be held to constitute a necessary ‘obstacle to international trade’.

In addition, the measure is justifiably necessary even in the presence of other alternative measures. Earlier in this research, we examined the use of a non-trade restrictive framework which allows for free trade in used electrical and electronic equipment, along with a domestic framework for safe disposal and management of junk electronics or e-waste that will inevitably flow along with such used goods. Such domestic disposal or management framework will entail the use of incineration, landfilling and recycling. We did observe that there are many problems

⁴⁸² *Supra* note 478 at para 20

associated with this non-trade restrictive framework. It was noted that state-of-the-art incineration, landfilling and recycling technologies still leave communities vulnerable to the adverse health and environmental impacts associated with e-waste; such state-of-the-art technologies are not readily available in developing countries; and even if they are, a measure which permits the transboundary movement of junk e-waste will be contrary to the principles of the Basel Convention and Basel Ban Amendment. Thus the non-trade restrictive measures available will not achieve the stated objective of protection of human health and the environment. All this evidence taken together certainly justifies a conclusion to the effect that the trade measure proposed in this research does not constitute an unnecessary obstacle to international trade and hence does not contravene the provision of Article 2.2 of the TBT Agreement.

5.5 Import Ban

As has been noted above, the idea behind the proposed certification and labelling scheme is to provide a mechanism in international trade for effectively differentiating between functional used electrical and electronic equipment and obsolete waste electronic products which constitute a threat to public health and environment in developing countries. While the research advocates for free trade in the former, it proposes the application of an import ban by developing countries with regards to the latter. The reason for the trade ban, it must be restated, stems from the negative health and environmental impacts associated with obsolete e-waste in developing countries.

It must be acknowledged though that the possibly affected GATT provision in respect of a trade measure prohibiting the importation of obsolete electronics includes prohibition of quantitative restrictions. The negative attitude towards quantitative restriction is evident in Article XI:1 of GATT which provides:

No prohibitions or restrictions other than duties, taxes or other charges, whether made effective through quotas, import or export licences or other measures, shall be instituted or maintained by any contracting party on the importation of any product of the territory of any other contracting party or on the exportation or sale for export of any product destined for the territory of any other contracting party.

Article XI:1 formally forbids “prohibition” and “restriction” in relation to the importation of goods from Member states. Thus Member states generally shall not prohibit the importation of the products of other Member states into their market. In *Brazil - Tyres case*,⁴⁸³ the WTO panel found (and it was not disputed by Brazil) that Brazil’s ban on the importation of retreaded tyres was a violation of Article XI:1 GATT. The trade and environment debate thus raises the question in relation to the extent to which the WTO trade regime provides sufficient policy space for Member states to take adequate measures to protect the environment and human health within their jurisdiction or as Bernasconi-Osterwalder puts it “the debate focuses on whether or not the use of trade related-measures to protect the environment and human health are permissible under the WTO framework.”⁴⁸⁴

It is not disputed that the measure proposed in this research, namely the imposition of an import ban by developing countries with regards to the importation of waste electrical and electronic equipment, is inconsistent with Article XI:1 of GATT since an import ban comes within the

⁴⁸³ Panel Report, *Brazil – Measures Affecting Imports of Retreaded Tyres*, WT/DS332/R, adopted 17 December 2007, as modified by Appellate Body Report WT/DS332/AB/R, DSR 2007:V, 1649.

⁴⁸⁴ Bernasconi-Osterwalder et. al. Environment and trade” *Supra* note 442 at 76.

context of “prohibition” as used in the Article XI:1. However, although the WTO trade regime generally prohibits the application of trade restrictive measures such as import bans by member states, WTO rules and jurisprudence acknowledge the existence of limited circumstances where such measures can nevertheless be necessary and justified. Thus the Appellate Body in the *US - Gasoline* case noted that “there should not be, nor need be, any policy contradiction between upholding and safeguarding an open, non-discriminatory and equitable multilateral trading system on the one hand, and acting for the protection of the environment, and the promotion of sustainable development on the other.”^{*} WTO rules provide exceptional circumstances in which a trade measure incorporating an import ban could be justified. This research will thus examine these limited circumstances to determine whether the import ban proposed in this research could be justified under any of those provisions.

5.5.1 General Exceptions: Article XX GATT

Article XX GATT enumerates the various categories of measures which member states can validly promulgate or carry out in pursuit of legitimate state policies outside the confines of trade liberalization. It thus provides a very crucial guide for the resolution of conflicts that may arise between trade and other legitimate policy goals that a Member state may seek to pursue such as the protection of human health or the environment. Suffice it to state that the exceptions in Article XX are “limited and conditional”.⁴⁸⁵ They are limited because they restrictively apply only in defined circumstances, and they are conditional in that the validity of a national measure

^{*} *Supra* note 419.

⁴⁸⁵ See *US - Shrimp*, WT/DS58/AB/R, para. 157.

under Article XX is further subject to the condition that it does not constitute a means of arbitrary or unjustifiable discrimination or a disguised restriction on international trade.⁴⁸⁶

The relevant provision of Article XX is to the effect that:

Subject to the requirement that such measures are not applied in a manner which would constitute a means of arbitrary or unjustifiable discrimination between countries where the same conditions prevail, or a disguised restriction on international trade, nothing in this Agreement shall be construed to prevent the adoption or enforcement by any contracting party of measures:

(a) ...;

(b) necessary to protect human, animal or plant life or health;

....

(g) relating to the conservation of exhaustible natural resources if such measures are made effective in conjunction with restrictions on domestic production or consumption;

While Article XX(b) affirms the right of Member states to enact measures to protect human life or health, Article XX(g) confers the same right with respect to the environment - though limited to the conservation of exhaustible natural resources. Although the objective of the import ban proposed in this research relates to the protection of human health and the environment, the environmental protection sought in this case is outside the scope of conservation of exhaustible natural resources and hence does not come within the context of Article XX(g). Thus, for the purpose of this research, our interest shall focus on Article XX(b). Article XX(b) provides an appropriate context for considering whether the import ban proposed in this research can be justified within the context of WTO trade regime as evident in GATT.

⁴⁸⁶ Ibid.

WTO jurisprudence has established the procedure for determination of legality of a trade measure within the context of Article XX(b). Thus the Panel in *United States – Gasoline* identified a three-step approach. According to the Panel, a party invoking the provision of Article XX(b) has the burden of proving:

- (1) that the policy in respect of the measures for which the provision was invoked fell within the range of policies designed to protect human, animal or plant life or health;
- (2) that the inconsistent measures for which the exception was being invoked were necessary to fulfill the policy objective; and
- (3) that the measures were applied in conformity with the requirements of the introductory clause of Article XX.⁴⁸⁷

5.5.1.1 Policy designed to protect human life or health

The first step in the analysis here is the identification of the existence of a health risk. The Panel in *EC - Asbestos* noted that inasmuch as this first step includes the notion of “protection”, the use of the words “policies designed to protect human life or health” implies the existence of a health risk.⁴⁸⁸ If no health risk is identified, then it implies that the measure was not designed to protect against any health risk. In fact, such a measure might evidently be protectionist in nature and hence a disguised restriction on international trade contrary to the principles and philosophies of trade liberalization. Thus the existence of a risk to human health or life is fundamental to the justification of any policy measure under *Article XX(b)*. In the *Thailand – Cigarettes case*, the panel acknowledged, in accordance with the parties to the dispute as well as expert from the World Health Organisation ("WHO"), that:

⁴⁸⁷ *Supra* note 452 at para. 6.20.

⁴⁸⁸ *Supra* note 420 at para 8.170.

[S]moking constituted a serious risk to human health and that consequently measures designed to reduce the consumption of cigarettes fell within the scope of Article XX(b). The Panel noted that this provision clearly allowed contracting parties to give priority to human health over trade liberalization.⁴⁸⁹

Similarly, in the *EC - Asbestos case*, a French policy measure prohibited “the manufacture, import, domestic marketing, exportation, possession for sale... of all varieties of asbestos fibres or any product containing asbestos fibres.” The Panel in that case found that the use of chrysotile-cement products constitutes a risk to human health sufficient to bring the measure within the scope of application of Article XX(b). In coming to this conclusion, the Panel considered the evidence before it which tended to show that handling of chrysotile-cement products poses a risk to human health.⁴⁹⁰

In analyzing whether the Panel came to the right conclusion in holding that the French prohibition fell within the category of measures designed to protect human life or health, the Appellate Body in that case found that “the panel remained well within the bounds of its discretion in finding that chrysotile-cement products pose a risk to human life or health.”⁴⁹¹ A finding to the effect that a product constitutes a risk to human life or health lays the foundation for the validity of a policy measure designed to regulate trade in the said product.

Having identified a health risk necessitating protection, the next step would involve the weighing of relevant evidence to determine whether the measure in question was designed to provide protection against the identified risk. Suffice it to state that this examination does not and need not extend to an inquiry into the appropriateness or desirability of the level of protection a

⁴⁸⁹ *Thailand – Cigarettes*, Panel Report, para. 73.

⁴⁹⁰ *Ibid* at para. 8.193.

⁴⁹¹ *Supra* note 423 at Para 162. In *US Gasoline case*, the Panel noted that air pollution resulting from the consumption of gasoline constitutes risks to human, animal and plant life or health hence a policy measure to reduce such risk was within the scope of Article XX(b).

Member state intends to achieve. The Appellate Body in *Brazil - Tyres case* noted that “it is within the authority of a WTO Member to set the public health and environmental objectives it seeks to achieve, as well as the level of protection it wants to obtain, through the measure or policy it chooses to adopt.”⁴⁹²

In *EC - Asbestos*, France opted to “halt” the spread of asbestos-related health risks by prohibiting all forms of amphibole asbestos, and by severely restricting the use of chrysotile asbestos. The Appellate Body, while accepting that the measure was clearly designed and apt to achieve the level of health protection sought by France, noted that it is perfectly legitimate for a Member state to seek to halt the spread of a highly risky product by banning the product while at same time allowing the use of a less risky product in its place. What emerges from this analysis is the fact that a measure which seeks to regulate or prohibit the importation or sale of products that constitute risk to human health falls within the range of policies designed to protect human life or health.

In applying this analysis to an import ban for junk e-waste as argued in this thesis, it should be noted that waste electrical and electronic components consist of harmful and toxic constituents. The public health and environmental risks associated with e-waste management and disposal in developing countries was evident in Ghana and Nigeria in course of the field research for this thesis. These risks have also been well researched and documented as discussed in chapter three of the thesis. Hence it could be rightly argued in line with the jurisprudence discussed above that the existence of these public health risks calls for a policy measure which seeks to address the risks. Such a measure should give priority to human health over trade liberalization. A trade

⁴⁹² Appellate Body Report, *Brazil – Measures Affecting Imports of Retreaded Tyres*, WT/DS332/AB/R, adopted 17 December 2007, DSR 2007:IV, 1527 at para 140.

measure that seeks to prohibit the transboundary movement of hazardous e-waste to developing countries is apt to provide a measure of protection against the health risks associated with the disposal and management of such products in developing countries. Such a measure can rightly qualify as a ‘policy designed to protect human life or health’ within the context of *Article XX(b)*.

Thus once it is determined that the subject matter of a trade regulation or restriction constitutes health risk and the trade measure adopted provides a measure of protection against such risk, then the requirement under this head has been met, what is left to be considered is whether the measure is necessary to fulfill the stated policy objective under Article XX(b).

5.5.1.2 Necessity of the inconsistent measures

WTO jurisprudence here traditionally focuses on the meaning of “necessary” as used in Article XX(b). It is important to note that the term “necessary” was also used in Article XX(a) and (d). The WTO panel in *Section 337 case* had interpreted “necessary” within the context of Article XX(d) thus:

a contracting party cannot justify a measure inconsistent with another GATT provision as "necessary" in terms of Article XX(d) if an alternative measure which it could reasonably be expected to employ and which is not inconsistent with other GATT provisions is available to it. By the same token, in cases where a measure consistent with other GATT provisions is not reasonably available, a contracting party is bound to use, among the measures reasonably available to it, that which entails the least degree of inconsistency with other GATT provisions.⁴⁹³

Arising from the Panel interpretation is the fact that a trade measure is “necessary” within the context of Article XX(d) if there is no other reasonably available measure(s) which is/are

⁴⁹³ "United States - Section 337 of the Tariff Act of 1930", BISD 36S/345, para. 5.26 (adopted on 7 November 1989).

consistent with other GATT provisions, and the measure in question is the least GATT inconsistent measure reasonably available to achieve the level of protection sought by the Member state. Although, this interpretation was undertaken in relation to Article XX(d), the panel in *Thai Cigarette*⁴⁹⁴ held that the same interpretation could be applied in relation to Article XX(b). The panel, following the line of reasoning in *Section 337 Case* stated that:

the import restrictions imposed by Thailand could be considered to be "necessary" in terms of Article XX(b) only if there were no alternative measures consistent with the General Agreement, or less inconsistent with it, which Thailand could reasonably be expected to employ to achieve its health policy objectives.⁴⁹⁵

Thus the panel noted that the meaning of the term “necessary” under paragraph (d) should be the same as in paragraph (b). In coming to this conclusion, the Panel noted that the same term was used in both paragraphs and the same objective was intended. More so, the fact that paragraph (d) applies to inconsistencies resulting from the enforcement of GATT-consistent laws and regulations while paragraph (b) applies to inconsistencies resulting from health-related policies did not justify a different interpretation of the term “necessary”.⁴⁹⁶

Following the line of reasoning expressed in the WTO jurisprudence above, it is submitted that the test of necessity under Article XX(b) will require a two-step analysis. The first step will entail what I may refer to as the “no GATT-consistency” test and this will require a determination that there is no GATT-consistent measure reasonably available to achieve the level of protection sought or desired by the Member state. The second step will entail what I may refer to as the “least GATT-inconsistency” test and this will require a determination to the effect that -

⁴⁹⁴ Panel Report, *Thailand – Customs and Fiscal Measures on Cigarettes from the Philippines*, WT/DS371/R, adopted 15 July 2011, as modified by Appellate Body Report WT/DS371/AB/R.

⁴⁹⁵ *Ibid* at para. 75.

⁴⁹⁶ *Ibid* at para 74.

of all the GATT inconsistent measures available to achieve the level of protection sought by the Member state, the measure in question is the least trade restrictive.⁴⁹⁷

With regards to the first test, it suffices to note that the availability of a GATT consistent measure to achieve the objective sought by a Member state would invalidate any GATT inconsistent measure adopted by a Member state to achieve same objective. Thus such GATT-inconsistent measure would be ‘unnecessary’ within the context of *Article XX(b)*. In the *Thai Cigarette Case*, Thailand sought to reduce cigarette consumption which was harmful to human health by prohibiting the importation of cigarettes – a GATT-inconsistent measure. The United States challenged the measure on the basis of the availability of other GATT-consistent measures that were reasonably available to Thailand. It argued that Thailand could achieve its public health objective through other internal measures consistent with GATT such as public education on the effects of smoking. The WTO Panel ruled that Thai’s public health policy aimed at reduction of cigarette consumption could be achieved through other GATT-consistent measures such as a ban on advertisement of cigarettes.

Whether a ban on cigarette advertisement as proposed by the Panel would indeed result in decreased cigarette consumption is outside the scope of this research. What is relevant here is the

⁴⁹⁷ Important emphasis needs to be placed on the level of protection sought by the Member state. Thus the availability of other GATT inconsistent measures which are less trade restrictive, or other GATT consistent measures which are capable of achieving a measure of protection below the level of protection sought by the Member state, will not invalidate the necessity of the measure chosen by the Member state. The primary reason is that it is within the authority of a Member state to seek any level of protection it wants to obtain. This view was accepted by the panel in *EC - Asbestos Case* which noted that the panel does not have to access the choice made by France to protect its population against certain risk nor the level of protection of public health that France wants to achieve. para 8.171. Further, Howse and Tuerk argued that “a measure that is indispensable for achieving a member’s chosen level of protection will be “necessary”, regardless of its being vastly more trade-restrictive than the next less trade restrictive alternative, and regardless of whether the less trade-restrictive alternative comes very close to achieving the member’s chosen level of protection.” See Robert Howse and Elisabeth Tuerk “The WTO Impact on Internal Regulations—A Case Study of the Canada–EC Asbestos Dispute” in George A. Bermann and Petros C. Mavroidis (eds.) *Trade and Human Health and Safety*, (Cambridge, University Press, 2006) pp. 77-117 at 114.

fact that a GATT-inconsistent measure would not withstand a “necessity” scrutiny under *Article XX(b)* if there is a GATT-consistent measure reasonably available to achieve same objective.

With regards to the second test, a determination of the necessity of the inconsistent measure will require a comparison of the trade measure in issue with other alternatives. To qualify as a viable alternative, a measure must not only be less trade restrictive than the measure at issue, but it should also preserve the right of the Member state to achieve its desired level of protection.⁴⁹⁸ In addition, the alternative measure must be reasonably available taking into consideration the circumstances of the Member state whose measure has been called into question. As the Appellate Body indicated in *US - Gambling Case*, “[a]n alternative measure may be found not to be ‘reasonably available’ ... where it is merely theoretical in nature, for instance, where the responding Member is not capable of taking it, or where the measure imposes an undue burden on that Member, such as prohibitive costs or substantial technical difficulties.”⁴⁹⁹

The Appellate Body in *Brazil - Tyres*⁵⁰⁰ opined that the burden is on the complaining member to identify less restrictive alternatives. Once this burden is discharged, the onus then shifts to the responding Member to show that the suggested alternative is not reasonably available, or if available, is not capable of achieving the same level of protection sought by it. In *Brazil - Tyres*, the European Union challenged Brazil’s imposition of import restriction on retreaded tyres. Brazil sought to justify the import restriction on the basis of health and environmental concern. It

⁴⁹⁸ In Similar vein, in the *US – Tuna*, the appellate body while accepting that the measure relating to the use of United States “dolphin safe” label was discriminatory and inconsistent with *Article 2.1 of TBT Agreement*, noted that the alternative measure proposed by Mexico was not a viable alternative within the context of *Article 2.2* as the proposed alternative measure contributes to a lesser degree in the realization of the policy objective sought to be achieved by the United States. See *Supra* note 434 at para. 330.

⁴⁹⁹ Appellate Body Report, *United States – Measures Affecting the Cross Border Supply of Gambling and Betting Services*, WT/DS285/AB/R, adopted 20 April 2005, DSR 2005:XII, 5663 (Corr.1, DSR 2006:XII, 5475) at para. 308.

⁵⁰⁰ Appellate Body Report, *Brazil – Measures Affecting Imports of Retreaded Tyres*, WT/DS332/AB/R, adopted 17 December 2007, DSR 2007:IV, 1527.

argued that used tyres contain highly polluting and combustible materials so that their incineration in open landfills discharges hazardous toxic substances resulting in air, soil and water contamination. It further argued that used tyres that were not incinerated become a fertile breeding ground for mosquitos which, in turn increases the transmission of serious diseases like dengue, yellow fever, and malaria. Brazil argued that because of the large quantity of waste tyres it already has in its territory, additional importation would constitute a serious threat to public health and the environment. The EU on other hand argued that the import restriction was not necessary since Brazil could apply other alternative measures to reduce accumulation and improve the management of waste tyres in Brazil. Such alternative measures, the EU contended, includes landfilling, stockpiling, incineration of waste tyres in cement kilns, and material recycling.

The panel embarked on a detailed examination of the various alternative measures proposed by the European Community. In each case, the Appellate Body found that the proposed measure was not a reasonably available alternative. It noted that the proposed alternative measures were fraught with “prohibitive costs or substantial technical difficulties” resulting in the measures not being reasonably available.⁵⁰¹ The import ban imposed by Brazil was thus held to be necessary since its implementation does not involve prohibitive costs or substantial technical difficulties which are beyond the capacity of Brazil as a developing country.

With regards to public health concerns arising from transboundary movement of junk e-waste to developing countries, it suffices to state that GATT-consistent measures that can be adopted by developing countries in dealing with these concerns include landfilling, recycling and

⁵⁰¹ *Ibid* at para. 171.

incineration. However, we have noted earlier in this thesis that these measures come with risks - risks that do not arise in the case of non-generation measures such as import ban. More so, these alternative measures are not adequate to achieve the level of protection similar to an import ban, and just like the measures in the *Brazil - Tyres Case*, they come with “prohibitive costs and substantial technical difficulties” far beyond the capacity of developing countries. These alternative measures are not reasonably available especially taking into consideration the circumstances of these developing countries. The import ban proposed in this thesis meets the “no GATT-consistency” and “least GATT-inconsistency” tests outlined above. The measure is “necessary” to fulfill the policy objective of protecting human health within the context of *Article XX(b) GATT*.

5.5.1.3 Conformity with the requirements of the introductory clause of Article XX

The validity of a GATT inconsistent measure which has been found to be necessary under any of the paragraphs in Article XX is subject to its meeting the requirements in the introductory clause or chapeau. The requirement is to the effect that the measure in question is “not applied in a manner which would constitute a means of arbitrary or unjustifiable discrimination between countries where the same conditions prevail, or a disguised restriction on international trade.” The Appellate Body in *United States - Gasoline* has emphasized that under the Chapeau, it is not the measure as such that has to be examined, rather it is the manner in which the measure was applied.⁵⁰²

⁵⁰² Appellate Body Report, *United States – Standards for Reformulated and Conventional Gasoline*, WT/DS2/AB/R, adopted 20 May 1996, DSR 1996:I, 3. This was the approach that had earlier been adopted in the *US - Spring Assemblies*, BISD 30S/107, para. 56. Thus while paragraphs (a) to (j) of *Article XX* focuses on analysis of the

A determination to this effect will require two separate inquiries or examinations: first, a determination as to whether the application of the measure in question constitutes a means of arbitrary or unjustifiable discrimination; and secondly, whether the application of the measure is a disguised restriction on international trade. The chapeau requirements are necessary to prevent abuse of the Article XX exceptions and ensure that they are not used as a means to surreptitiously circumvent Member states' obligations to ensure free trade in goods. Thus the chapeau requires the exercise of good faith by Member states in their effort towards implementing legitimate policy objectives.⁵⁰³

i. means of arbitrary or unjustifiable discrimination

The panel in *EC - Asbestos* adopted the view that an analysis under this head would first require an examination to the effect as to whether the measure in question is “discriminatory” in application.⁵⁰⁴ If the measure is determined to be discriminatory, then the analysis will turn on the nature of the discrimination i.e. whether it is arbitrary or unjustifiable. Hence the question of whether the discrimination was arbitrary or unjustifiable will arise when facts of discrimination have been established.

“Discrimination” as used in the Article XX chapeau covers discrimination between products from different supplier countries and discrimination between domestic products vis-à-vis

measure in question, the *Chapeau* is concerned with the application of the measure to ensure that it does not constitute an “arbitrary or unjustifiable discrimination” or “a disguised restriction on international trade.”

⁵⁰³ The Appellate Body in *United States - Gasoline* noted that the principle of the chapeau is that while the rules of exception in *Article XX* may be invoked as a matter of legal right, they should not be applied in such a way as to frustrate or defeat the rights of other parties under the substantive rules. In essence the exceptions must be applied reasonably with due regards to both the parties claiming right under the exception as well as those entitled to rights under the general rule. *Ibid* at page 22.

⁵⁰⁴ *Supra* note 420 para. 8.226. This is important because if the measure is not discriminatory in its application, then it cannot constitute an arbitrary and unjustifiable discrimination between countries where the same condition prevail.

imported products.⁵⁰⁵ In this context, it will be difficult to fault a measure as discriminatory where such measure legitimately prohibits the importation of a product without any reference to its origin,⁵⁰⁶ and the product in question is not produced in the country where it is banned. More so, it is not sufficient to show that the implementation of the policy is discriminatory in nature, it still has to be shown that the discrimination is of the type that was prohibited by the chapeau namely - arbitrary or unjustifiable.

A determination as to whether a discrimination is arbitrary or unjustifiable would require an inquiry into the cause or rationale for the discrimination. This should be made in the light of the objective of the measure in question. A rationale that bears no relationship to the objective of the measure which had hitherto been found necessary under any of the paragraphs in Article XX can thus be said to be arbitrary or unjustifiable. In *Brazil - Tyres* case, the Appellate Body examined the rationale for the discriminatory application of Brazil import restriction on retreaded tyres. The discriminatory application stems from Brazil's decision to comply with the ruling of an arbitral tribunal. While acknowledging that the decision was rational, the Appellate Body was quick to note that the rationale bears no relationship to the objective of the measure in question.

In *United States - Gasoline*, the Appellate Body assessed the two explanations provided by the United States for the discrimination resulting from the application of its baseline measure at issue. The first explanation for the discrimination was the impracticability of the verification and enforcement of individual baselines for foreign refiners. The second explanation was that

⁵⁰⁵ *De jure* discrimination is used to refer to a measure that explicitly differentiates between products on the basis of country of origin, while *de facto* discrimination refers to distinction which though not explicitly linked to the origin of the products but which nevertheless results in discrimination between product from different countries. see Grosz at 379.

⁵⁰⁶ In *US - Spring Assemblies*, the panel found that an exclusion order directed against patent-infringing assemblies was not discriminatory because it was directed at all foreign sources. See Panel Report *US - Spring Assemblies*, BISD 30S/107, paras 54 – 55.

imposing the statutory baseline requirement on domestic refiners was not possible as it was not feasible to require domestic refiners to incur the physical and financial costs and burdens involved in immediate compliance with a statutory baseline. These explanations were found by the Appellate Body to be unsatisfactory thus resulting in its decision to the effect that the application of the baseline establishment rules resulted in arbitrary and unjustifiable discrimination.⁵⁰⁷ On the other hand, if discrimination between countries is based on a rationale legitimately connected to the policy of an Article XX exception, such discrimination is not arbitrary or unjustifiable within the context of the Chapeau.

ii. disguised restriction on international trade

In determining whether the application of an import ban constitutes a disguised restriction on international trade, it is important to first determine the actual scope of the words “disguised restriction on international trade”. This is problematic as the scope of ‘disguised restriction on international trade’ has not been clearly defined by existing WTO jurisprudence. Three different approaches have been progressively adopted by WTO panels and by the Appellate Body: *(i)* the publicity test, *(ii)* the consideration of whether the application of a measure also amounts to arbitrary or unjustifiable discrimination, and *(iii)* the examination of "the design, architecture and revealing structure" of the measure at issue.⁵⁰⁸

The publicity test was applied in the *US – Canadian Tuna* case. The panel adopted a literal interpretation of the concept of "disguised restriction on international trade". It held that "the United States' action should not be considered to be a disguised restriction on international trade,

⁵⁰⁷ *Supra* note 502 at 29.

⁵⁰⁸ WTO Committee on Trade and Environment “GATT/WTO Dispute Settlement Practice Relating to GATT Article XX Paragraphs (b), (d), and (g)” WT/CTE/W/203, 8 March 2002.

noting that the United States' prohibition of imports of tuna and tuna products from Canada had been taken as a trade measure and *publicly announced* as such".⁵⁰⁹

The Appellate Body in the *US – Gasoline* case adopted the second approach expressing the view that the kinds of considerations relevant in deciding whether the application of a particular measure amounts to "arbitrary or unjustifiable discrimination" may also be relevant in determining the presence of a "disguised restriction on international trade". It stated:

"Arbitrary discrimination', 'unjustifiable discrimination' and 'disguised restriction' on international trade may, accordingly, be read side-by-side; they impart meaning to one another. It is clear to us that 'disguised restriction' includes disguised *discrimination* in international trade (...). We consider that 'disguised restriction', whatever else it covers, may properly be read as embracing restrictions amounting to arbitrary or unjustifiable discrimination in international trade taken under the guise of a measure formally within the terms of an exception listed in Article XX".⁵¹⁰

The third approach was adopted by the Appellate Body in *US – Shrimp* and by the panel in the *EC – Asbestos* case. In *EC – Asbestos*, following a finding that the measure at issue met the publicity criterion, the panel examined as an additional requirement the "design, architecture and revealing structure"⁵¹¹ in order to discern whether the measure was protectionist in nature. The Appellate Body suggested that the protective application of a measure could most often be discerned from its 'design, architecture and revealing structure'.

Lo has argued that the third approach which seeks to identify elements of protectionism from the 'design, architecture and revealing structure' of the measure is more in line with the correct meaning of 'disguised restriction on international trade' as it would allow the disguised

⁵⁰⁹ See *US – Canadian Tuna*, Panel Report, para. 4.8. [emphasis added].

⁵¹⁰ *US – Gasoline*, Appellate Body Report, DSR 1996, p. 23.

⁵¹¹ para. 8.236.

restriction on international trade requirement to play a proper role in the application of GATT

Article XX.⁵¹² According to Lo:

If the [disguised restriction on international trade] is interpreted to mean ‘discrimination’, such requirement could become redundant, because there have already been non-discrimination requirements in the chapeau. If it is interpreted to mean ‘concealment’ or ‘non-announcement’, it becomes merely a matter of formality.⁵¹³

The Appellate Body in *EC - Asbestos* rightly noted that the key in understanding the scope of “disguised restriction on international trade” lies on the meaning of the word “disguised”.⁵¹⁴ Accordingly, “to disguise” (desuiger) means to "conceal beneath deceptive appearances, counterfeit", "alter so as to deceive", "misrepresent", "dissimulate"⁵¹⁵. Thus disguised restriction will be evident where the exception rules in Article XX are not applied in good faith e.g. where the true nature of the measure in question is to foster protectionism contrary to the substantive rule.

Although it might be quite problematic trying to identify the existence of protectionism in a measure, it has been suggested that reliable pointers may be obtained by considering the design, architecture and structure of the measure in question.⁵¹⁶ Where the true effect of the implementation of a trade measure which has been found necessary under any of the paragraphs in Article XX is to protect domestic products or provide less favourable treatment to foreign products, this amounts to a clear indication of disguised restriction. Accordingly, a measure will

⁵¹² Chang-Fa Lo, “The Proper Interpretation of ‘Disguised Restriction on International Trade’ under the WTO: The Need to Look at the Protective Effect” *Journal of International Dispute Settlement* (2012) pp. 1–27 at 3.

⁵¹³ *Ibid* at 3.

⁵¹⁴ The Appellate Body was of the view that the word “restriction” is not of much importance in as much as any measure falling within Article XX is a restriction on international trade. *Supra* note 423 at 8.236.

⁵¹⁵ Petit Larousse Illustré (1986), p. 292; Le Nouveau Petit Robert (1994), p. 572.

⁵¹⁶ See Wolfrum, in Wolfrum, Stoll and Hestermeyer (eds), *Max Planck Commentaries on World Trade Law*, Vol. 5, Art. XX GATT, para .45.

constitute a disguised restriction on international trade if in fact it is a cloak for pursuit of protectionism.

The measure proposed in this research is not a cloak for the pursuit of trade-restrictive objectives or protectionism so as to fall foul of the Chapeau. It is the argument here that the proposed measure could be validly adopted by developing countries in pursuit of a legitimate policy objective of reduction of adverse health and environmental impacts arising from the transboundary movement of e-waste by restricting the flow of junk e-waste products from developed countries. Hence the measure is not a disguised restriction on international trade.

Conclusion

This chapter has sought to address the fourth research question at the beginning of this thesis by proposing and developing trade measures which can be applied by developing countries in regulating the transboundary movement of e-waste. This chapter commenced on the premise that the inability of the existing legal frameworks to deal with the health and environmental impacts of international trade in UEEE in developing countries is linked to the absence of an adequate framework for distinguishing between functional UEEE which is useful to developing countries and junk e-waste, which constitute a serious threat to public health and the environment.

The chapter proposed the development of a certification system which could be utilized in differentiating between functional UEEE and junk e-waste. This is a novel idea which is currently non-existent in any of the existing regulatory frameworks. The chapter also proposed that the development of this certification system should be complemented by a ban on importation into developing countries of any UEEE not complying with such certification. The

legality of such import ban was examined in the light of GATT/WTO trade regime. It is the argument that the proposed trade measure can be justified within the context of *Article XX(b)* GATT as a measure necessary to protect human health.

The adoption of the measures proposed in this chapter will result in increased transboundary movement of functional UEEE and decreased transboundary movement of junk e-waste and its associated health and environmental impacts in developing countries. While such measure will inevitably increase the socio-economic benefits of international trade in UEEE and minimize the adverse health and environmental impact of the trade, it is necessary to admit here that the measure will not totally eliminate the e-waste problem in developing countries. This is because even the functional UEEE that are legally imported will eventually enter the waste stream in these countries, and when they do, the health and environmental problem noted earlier may still emerge again (though on a different scale).

It is the argument here that this later problem could be addressed through an effective design framework at the production stage of these electrical and electronic devices. This is an aspect of e-waste management that is best handled by developed countries. Hence going further from here, the next chapter of this thesis will examine a sustainable solution to this later problem from the perspective of the developed world especially in relation to electronic design and production.

Chapter Six

6. DESIGN FRAMEWORK FOR MANAGEMENT OF E-WASTE

The rapid proliferation of electronic products such as computers and consumer electronics in developed countries has resulted in mountains of high-tech trash sustained by a culture of obsolescence. New electronic products are being designed for disposability rather than reuse thus further compounding the e-waste problem. The design aspect of the problem is of particular concern because of its correlation to the quantity of electrical and electronic equipment being disposed of, as well as the health and environmental impacts of such products at the end of their life cycle. If electronic equipment were less toxic and easier to recycle at the end of its useful life, the health and environmental hazards associated with its end-of-life management would be highly minimized. Furthermore, if the equipment is designed in such a way that it can be serviced and reused, this would extend the life cycle of the products and thus delay their eventual and inevitable exit into the waste stream.

Thus the design of a product can directly impact reuse and recycling. It may also affect the impact such products may have on the environment, as well as on human health at the various production and disposal stages. Thus the design stage for electrical and electronic equipment is of important concern in e-waste management because it is the most effective stage at which to reduce or eliminate the adverse health and environmental impacts associated with electronic products. It is the stage at which such adverse effects can be reduced or eliminated at a relatively lower cost compared to the cost of managing such effects when the products have been launched into the market or at their end of life. For example, it is more effective to eliminate or reduce

toxic substances in electronic products at the production stage than to manage such substances when the products have reached their end of life.⁵¹⁷

Hence it is argued in this chapter that the incorporation of environmentally sustainable design frameworks into the manufacturing process for electronic equipment will go a long way to reduce the growth of e-waste, managing the adverse health and environmental impacts associated with e-waste as well as enhancing sustainable development in both industrialized countries as well as industrializing countries - societies that have now become major recipients of obsolete and end-of-life electronic equipment from industrialized nations.

6.1 Frameworks for End-of-Life Management of Electrical and Electronic Equipment

Recent years have witnessed a massive rise in electronic waste generation along with an attendant rise in the adverse health and environmental effects arising from the concentration of hazardous substances in electronic products. The e-waste problem has also raised concerns about unsustainable patterns of natural resource consumption. The threat posed by the increased e-waste generation as well as the high concentration of hazardous substances in electronic devices is now a serious cause for concern to both developed and developing countries. The current design framework for electronic products in most jurisdictions ignore durability and supports limitless use of toxic substances thus further compounding the world's e-waste problem.

⁵¹⁷ Five Winds International, *Design for Environment (DfE) Best Practices Lessons for British Columbia's Ministry of Environment*, (2009), at 9 available at <www.env.gov.bc.ca/epd/recycling/resources/reports/pdf/DfE.pdf> [Five Winds International, "Design for Environment"].

However, in recent years, legislative efforts especially in Europe and some states in the US have turned attention to these problems.⁵¹⁸

A sustainable framework for end-of-life management of EEE equipment should seek to regulate or control the toxic substances that go into the production of this equipment as well as enhance its reusability and recyclability and hence reduce waste generation as well as resource consumption. Such a framework should take into consideration the entire life cycle of the equipment commencing from the design stage to its end-of-life. The framework should develop along a broader concept known as design for the environment (DfE). DfE was originally developed in 1992 by the United States Environmental Protection Agency (USEPA) as a partnership program to help address the health and environmental risks associated with household products. The program's goal was to help manufacturers 'design or redesign products, processes, and management systems that are cleaner, more cost-effective, and safer for workers and the public.'⁵¹⁹ The DfE Program usually partners with industry sectors to assess the 'health and environmental risks, performance, and costs associated with existing and alternative technologies or processes.'^{*} Generally, the program is founded on the principle that product design plays a very crucial role in the impact of products on human health and the environment as well as the management of such products at the end of their useful life.⁵²⁰

DfE is a concept and a set of tools aimed at helping industry improve the environmental performance of a product throughout its entire life cycle. It is a combination of design strategies

⁵¹⁸ See WEEE Directive *Supra* note 35, RoHS Directive *Supra* note 36, *see also* Maine State Legislature, *Statute Title 38, Chapter 16: Sale of Consumer Products Affecting the Environment*, Article 1.

⁵¹⁹ USEPA "Design for the Environment Program - Partnerships for a Cleaner Future" (EPA/744-F-00-020) March 2001 < <http://www.epa.gov/dfe/pubs/index.htm>>.

^{*} *Ibid*

⁵²⁰ See Five Winds International, "Design for Environment", *Supra* note 517.

that improve environmental performance through, among others, ‘selection of low impact materials, ensuring the use of “clean” production technologies, enhancing use phase attributes...and ensuring that product has minimal impact on the environment’ when it has reached the end of life.⁵²¹ DfE seeks to break the traditional physical barriers for design and requires a vision of the products for its entire life cycle. Implementing the DfE principle entails pursuing a variety of environmentally friendly goals such as elimination of product toxicity, enhancing product durability, as well as enhanced recyclability.⁵²²

Hence DfE encompasses all aspects of product design aimed at reducing risks and enhancing environmental product performance. It addresses issues relating to design for toxic reduction, design for improved reusability/recyclability as well as other environmental priorities such as energy consumption and resource management.⁵²³ According to Fiskel, the DfE concept involves the entire chain of “upstream processes involved in producing the components, raw materials, and energy to fabricate the product as well as the downstream processes that enable distribution, use and disposal.”⁵²⁴ DfE thus represents a shift from the traditional manufacturing approach based on a one-way cradle-to-grave model. Sachs asserts that the linear model is a creature of law because ‘it is the law that determines what waste from the production line will be imposed on society and what will be internalized’ by the producer.⁵²⁵ Hence it is argued that a regulatory

⁵²¹ *Ibid* at 9.

⁵²² Ashley Deathe, Elaine MacDonald and William Amos, “E-waste Management Programmes and the Promotion of Design for the Environment: Assessing Canada’s Contribution”, *Review of European Community & International Environmental Law*, 17:3 (2008) pg 321 - 336 [Deathe, MacDonald and Amos “E-waste Management Programmes”].

⁵²³ Electronics Waste Recovery Study (2006) Prepared by PHA Consulting Associates available online at <www.nrcan.gc.ca/mms-smm/busi-indu/rad-rad/pdf/elec-sfr-eng.pdf> at 3-11.

⁵²⁴ Joseph Fiskel (ed.), *Design for Environment: Creating Eco-Efficient Products and Process*, (McGraw-Hill, 1996) at 3.

⁵²⁵ Noah Sachs, “Planning the Funeral at the Birth: Extended Producer Responsibility in the European Union and the United States”, 30:51 *Harvard Environmental Law Review* (2006), at 93 [Noah Sachs, “Planning the Funeral at the Birth”].

framework that requires producers to take back electronic products at their end of life has the tendency to potentially influence product design in relation to toxicity, reuse and recycling.

DfE contrasts with the concept of “planned obsolescence” which was coined and popularized by Brooks Stevens in the 1950s. Planned obsolescence is based on a design framework that is aimed at enhancing product sales by trapping the consumer in a vicious cycle of purchase and discard. Such design takes little or no account of the environmental impact of the product or its effect on resource depletion. Policy frameworks aimed at achieving DfE may take the form of providing incentives for electrical and electronic equipment producers to pursue a variety of environmentally friendly design frameworks aimed at toxic reduction, reuse, and recycling.

6.1.1 Design for Toxic Reduction

Suffice it to state that the problem with e-waste is not the electronic products per se, but rather the hazardous substances imbedded in their various components. Electronic products contain a variety of toxic substances including plastics and heavy metals such as lead, mercury, cadmium etc. When imbedded in the product, these chemicals ordinarily may not pose a serious threat to human health and the environment. However, this is not the case when such products are improperly disposed of or dismantled (as is often the case) at the end of their useful life. Improper disposal or dismantling could result in these toxic substances escaping into the environment and constituting hazard. For example, it has been estimated that:

the dumping of 315 million obsolete computers into landfills would be tantamount to dumping 1.2 billion pounds of lead, 2 million pounds of cadmium, 400,000 pounds of

mercury, 1.2 million pound of hexavalent chromium and 350 million pounds of brominated flame-retardants.⁵²⁶

Thus an appropriate framework for regulating this hazard would require that electronic products be designed in such a way as to eliminate or reduce the amount of hazardous chemical substances or toxins that go into their production. This process has often been referred to as design for toxic reduction (DfTR) which is an aspect of the broader concept of DfE.

DfTR is the most important and primary aspect of e-waste control and management. The importance of DfTR lies in the fact that it seeks to tackle the e-waste problem from the source by reducing or eliminating the amount of hazardous substances used in the production of electronic devices. Thus diminished quantities of hazardous substances in electrical and electronic devices have many benefits. First, it reduces the health risks from toxic exposure borne by workers engaged in the manufacture or assembly of electrical and electronic products. Secondly, it helps in mitigating the health and environmental impact of such devices at the end of their useful life. Additionally, even where the devices are subjected to formal or informal dismantling, recovery or recycling processes, DfTR has the tendency to reduce the adverse health and environmental effects associated with any of these processes.

Thus DfTR aims at reducing the use of toxic substances or processes and provides the framework for the development of new, non-toxic substances and processes in the production of electrical and electronic equipment. Successful implementation of DfTR will result in diminished environmental pollutants especially in relation to electrical and electronic products.

⁵²⁶ See Silicon Valley Toxic Coalition (SVTC), Just Say No to E-Waste: Background Document on Hazards and Waste from Computers (SVTC, 2003).

Since the concept of DfTR requires the elimination of certain hazardous substances in the electronics production process, the concept will also entail the development of safer alternatives to the hazardous substances, or in essence chemical substitution. A research study has noted that until the late 1990s, reduction in the use of hazardous substances in the electronics industry was driven by economic considerations.⁵²⁷ Economic considerations alone failed to provide adequate incentive especially considering the huge financial costs involved in the research and development of safe alternatives as well as the process of switching to a more environmentally benign process. Hence, the continued presence of these hazardous substances in electronic products as well as their unacceptable impacts and risks to human health and the environment makes direct regulation through substance ban highly imperative. This is a measure least welcomed by the electronics industry which is a microcosm of larger industrial corporations traditionally opposed to direct regulation. It is a common fact that even in the face of clear evidence relating to the dangers posed by toxic substances, the industry has often sought to oppose the implementation of DfTR by citing economic or technical feasibility.

Industry opposition notwithstanding, direct regulation may be the most direct way of effecting upstream design change because the electronics industry will be quick to develop alternative substances as a result of mandatory phase-outs, rather than voluntary, non-binding commitments.⁵²⁸

⁵²⁷ *Ibid.*

⁵²⁸ A survey of Canadian corporate executives reveals that 16% of the executives were motivated to take action on environmental issues when government programs were voluntary, while 95% were motivated to take action on environmental issues to ensure compliance with government regulation. *See* Ontario Federation of Labour, “Creating Ontario’s Toxic Reduction Strategy” Submission to the Ministry of Environment (EBR Registry number 010-4374).

To date, some of the most important initiatives aimed toward direct regulation of hazardous substances in electronic products have been the EU's REACH (Registration, Evaluation, Authorization, and Restriction of Chemicals) and RoHS (Restriction of Hazardous Substances) Directives. The REACH and RoHS Directives marked a change in policy direction in relation to the use of toxic and hazardous substances within the European Union. Under the previous approach as exemplified by the EU's 1979 Sixth Amendment to the Dangerous Substance Directive, chemicals that were in use in industrial production prior to 1980 were largely presumed to be innocuous until disproved by either a scientific study or some incident.⁵²⁹ Thus chemicals were presumed 'innocent until proven guilty'. Under this policy framework, the onus was on the government or its regulatory agency to prove the hazardousness or 'guilt' of chemical substances on a case-by-case basis. This was a very difficult burden and the increasing harmful effect of chemicals once considered to be harmless was generating a greater cause for concern. In some cases, the hazards associated with such chemicals began to manifest many years after their initial use or exposure.

⁵²⁹ According to Colin and Colin "Less than 2% of chemicals in commerce have been fully tested for health effect, and no data whatsoever is available for 70% of commercial chemicals. About 79,120 chemicals are listed on the Toxic Substances Control Act Inventory, and about 19,533 of these are pesticide products currently on the market." See Robin Morris Colin and Robert Colin *Environmental Reparations* in Robert D. Bullard (ed.) *The Quest for Environmental Justice - Human Rights and the Politics of Pollution* (San Francisco: Sierra Club Books, 2005). Similarly Bullard, Johnson and Torres observed that "An estimated 40% of deaths around the world can be now be attributed to various environmental factors especially organic and chemical pollutants. Approximately 80,000 different chemicals are now in commercial use, of which nearly 6 trillion pounds are produced annually in the US. More than 80% of these chemicals have never been screened to determine whether they cause cancer, much less tested to see if they harm the nervous, immune, endocrine, or reproductive system." See Robert D. Bullard, Glenn S. Johnson and Angel O. Torres, *Addressing Global Poverty, Pollution and Human Right* in Robert D. Bullard (ed.) *The Quest for Environmental Justice - Human Rights and the Politics Pollution* (San Francisco: Sierra Club Books, 2005).

Dealing with this development required not just a new regulation but a change in policy framework which underlies previous regulations.⁵³⁰ Such a policy framework had to be founded on the precautionary principle which is to the effect that even in the absence of conclusive scientific proof, if there are reasonable indications to suggest that a particular chemical is hazardous, there is an obligation to refrain from the use of such a chemical until there is conclusive evidence to prove otherwise. Hence in this case, the chemical is presumed ‘guilty until proven innocent’ by the industry or producer.

In the EU, the legislative move to this effect led to the REACH Directive, which was a primary step in a continuing move to remedy the existing policy failure that allowed thousands of toxic substances to be used in production processes without adequate knowledge of their health and environmental effect, and even after their adverse health and environmental effect became obvious, continued to be used in production processes.

The REACH directive, which was based on the precautionary principle, created a huge, new responsibility for the European chemical industry. It shifted the burden of proof of the “innocence” of chemical substances utilized in production processes onto the industry that wishes to use them. It then became the responsibility of the industry utilizing a particular chemical in its production process to assess the risks and hazards associated with the substance and ensure that it was safe. Specifically, the Directive would have a substantial impact on the electronic industry in Europe especially in relation to efforts to restrict the industry’s use of carcinogens, mutagens, reproductive toxins, and persistent and bioaccumulative substances in electronic production.

⁵³⁰ Ken Geiser and Joel Tickner, “International Environmental Agreements and the Information Technology Industry” in Ted Smith, David A. Sonnenfeld and David Naguib Pellow (eds.), *Challenging the Chip: Labor Rights and Environmental Justice in the Global Electronics Industry* (Philadelphia: Temple University Press, 2006).

A further attempt at mitigating the health and environmental effect of toxic substances in electrical and electronic products in Europe resulted in the RoHS Directive. The RoHS Directive required EU member states to pass national laws restricting the use of lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) and polybrominated diphenyl ethers (PBDE) in new electrical and electronic equipment put on the market. Hence, it has been stated that the RoHS Directive effectively brought an end to lead solder typically used in circuit boards, to cadmium in portable batteries, to cadmium and chromium in paints and inks, and to mercury switches.⁵³¹ The restriction of these chemical substances applies to all electrical and electronic equipment that is within the scope of the directive.⁵³² The foreign producer of electrical and electronic equipment marketed in the EU jurisdiction is obliged to comply with national laws of EU member countries implementing the Directive. A “producer” was defined by the WEEE Directive to mean any person who, irrespective of selling technique used, (i) manufactures and sells electrical and electronic equipment under his own brand; (ii) resells under his own brand equipment produced by other suppliers; or (iii) imports or exports electrical and electronic equipment on a professional basis into a member state.⁵³³ Although there is no mandatory requirement for the products to carry any specific mark indicating compliance, it is assumed that the producers, by placing the products on the market, are declaring compliance.

⁵³¹ According to Grossman “RoHS does not mean an end of leaded glass in CRTs, of mercury lamp used in flat-panel display screens, of beryllium processors, or polyvinyl chloride-encased wires and cables. It also does not require the elimination of the deca-BDE flame retardant-the PBDE most commonly used in hard plastics that house electronics, nor of TBBPA flame retardant used in nearly all circuit boards and many other plastic parts of high-tech equipment. It does, however, require that these and other exceptions to the hazardous substance restrictions be revisited every 4 years with a view to substituting materials determined to be less toxic, leaving open the possibility that more substances could be added and standing exemptions removed.” Grossman, “High tech trash” *Supra* note 94 at 244.

⁵³² The Directive applies to electrical and electronic equipment that is dependent on electric or electromagnetic fields to function properly. The scope of the directive covers large household appliances, small household appliances, IT and telecommunication equipment, consumer equipment, lighting equipment (including light bulbs, and luminaires in households), electrical and electronic tools (except large scale stationary industrial tools), toys, leisure and sports equipment, automatic dispensers.

⁵³³ *Article 3 Supra* note 35.

The attempt to restrict the use of hazardous chemicals in electrical and electronic equipment in EU is a sound policy initiative founded on the precautionary principle; it is aimed at reducing the adverse health and environmental impacts associated with such hazardous chemicals. These adverse impacts are common facts acknowledged within and outside the EU jurisdiction. A report prepared by the United States Environmental Protection Agency documented the health risks associated with lead used in the manufacture of electronic equipment such as CRTs.⁵³⁴ Lead is found in the glass of traditional CRT displays in computers and television sets, in printed circuit boards, and in other components of electronic devices. High concentration of lead could result in health problems ranging from reproductive harm such as miscarriages and birth defects, to developmental harm in children, to cancer and even death.⁵³⁵

It was surprising therefore that the U.S. government and the U.S. electronics industry vehemently opposed the REACH and RoHS Directives. This opposition seems to stem from the U.S. government and industry position on the precautionary principle, a principle on which these Directives were founded. Speaking of the precautionary principle, John D. Graham of the U.S. Office of Management and Budget's Office of Information Regulatory Affairs said: "We consider it to be a mythical concept, perhaps like a unicorn."⁵³⁶ Similarly, Michael E Daniel Jr. then director of the White House Office of Management, was quoted as saying "While the

⁵³⁴ CRTs; USEPA 2001.

⁵³⁵ Overwhelming scientific evidence exists concerning the ill effects of lead on the human body. In fact, Luis Sullivan, while serving as secretary to the US Dept of Health and Human Services, identified lead as the number one environmental health threat to children. Over the past four decades, the US Center for Disease Control and Prevention lowered the threshold levels considered dangerous in children by 88%, from 60 to 10 micrograms per deciliter. see Robert D. Bullard (ed.) *The Quest for Environmental Justice - Human Rights and the Politics Pollution* (San Francisco: Sierra Club Books, 2005) at 26.

⁵³⁶ John D. Graham, "The Role of Precaution in Risk Assessment and Management: An American's View" Remarks Prepared for "The US, Europe, Precaution and Risk Management: A Comparative Case Study Analysis of the Management of Risk in a Complex World" available online at <http://www.whitehouse.gov/omb/inforeg_eu_speech>.

European Union busies itself writing layer upon layer of rules, Americans are starting 600,000 new businesses every year ... Americans fix problems as they arise; Europeans often seem bent on preventing any chance of trouble arising in the first place.”

Since the EU Directives apply to electrical and electronic products marketed in the EU, the Directives have the capacity to apply to electrical and electronic equipment manufacturers located outside the EU who sell products in the EU jurisdiction. It is the likelihood of this significant transboundary impact of the directives that prompted the US and its electronics industry to try without success to stop the Directives.⁵³⁷

The introduction of the RoHS Directive has ignited the debate as to whether direct environmental regulation in relation to the electronics industry promotes or hinders innovation. On one side, it has been argued that such direct intervention “impede the development of new technologies and products, increase costs, and restrict global trade in these products”.⁵³⁸ It was also argued that the introduction of the new Directives would cost the industry more human and material resources which would have to be devoted to developing chemical substitutes and redesigning existing products for compliance at the expense of developing new and innovative products.⁵³⁹ There is

⁵³⁷ According to Raphael and Smith, in 1998, the American Electronics Association (AEA), a major trade association, convinced the U.S. Trade Representative (USTR) and the Mission to the EU to fight the EU Directives. The trade associations argued that the mandated phase-outs of toxic materials would undermine the “functionality, safety, and reliability” of their products, and “impede the development of new technologies and products, increase costs, and restrict global trade in these products”, see Chad Raphael and Ted Smith *Importing Extended Producer Responsibility for Electronic Equipment into the United States*, in Ted Smith, David A. Sonnenfeld and David Naguib Pellow (eds.), *Challenging the Chip Labor Rights and Environmental Justice in the Global Electronics Industry*” (Philadelphia: Temple University Press, 2006) at 248.

⁵³⁸ Ibid.

⁵³⁹ The German Electrical and Electronics Manufacturers’ Association (ZVEI) strongly believes that environmental regulation have an adverse effect on innovation. It stated in one of its publications “Even in the electrical engineering and electronics industry over-regulation and unnecessary rules hinder the growth of our companies and the establishment of new businesses. Detailed regulations far away from practice prevent solutions achieved by the market and competition, quick reactions to market opportunities and competent people working on innovations. The current quickly growing flood of new taxing, inconsistent and restricting regulations are particularly critical, for example in the area of the protection of the environment and consumers. Detailed regulations at national and

no yardstick for measuring the exact degree to which the direct regulation of hazardous substances in electronic products has stifled the development of new products. On the contrary, it has been argued that the level of scientific research publications relating to better alternatives to hazardous substances in electronic products as well as increased applications ‘for patents relating to innovations in electrical and electronic equipment’ could act as a good indicator of the extent to which direct regulation could spur the level of innovations.⁵⁴⁰

Masaru has noted that “the early start in Japan in establishing collaborative networks for R&D activities on lead-free solders in the middle of the 1990s resulted in successful patent applications related to lead-free solders” and that the number of patents for US firms increased significantly in the early 1990s when attempts were made towards regulation and then subsequently declined when the move towards regulation was subsequently reversed.⁵⁴¹ The study went further to reveal a significant increase in scientific research papers on lead-free solders being produced in Europe, the United States and Japan around the time of entry into force of the RoHS Directive in 2003.* A research study noted that awareness of the RoHS Directive has sparked considerable research and innovation around the world and that

European level slow down innovation competition.” See German Electrical and Electronic Manufacturers’ Association (ed.) “The courage to change is worth it! Strengthen the ability to innovate, grow and be competitive - The ZVEI political messages and growth initiatives” March 2005. <https://www.zvei.org/fileadmin/user_upload/english_Version/courage_to_change.pdf>.

⁵⁴⁰ See Bogaert et al. “A study on RoHS and WEEE directives” N° 30-CE-0095296/00-09. Final report. European Commission. DG Enterprise and industry. 06/11925/AL. March 2008 <www.ec.europa.eu/environment/waste/weee/pdf/rpa_study.pdf>.

⁵⁴¹ See Yarime Masaru, “University-Industry Collaboration Networks for the Creation of Innovation: A Comparative Analysis of the Development of Lead-Free Solders in Japan, Europe and the United States”, March 2006, *National Institute of Science and Technology Policy (NISTEP)*, Ministry of Education, Culture, Sports, Science and Technology (MEXT) at 31.

* *Ibid.* Masaru used data from the Scientific Citation Index maintained by Thomson Scientific to analyze the trends in the publication of scientific papers by authors in Europe, United States and Japan. See also Bogaert et al “A study on RoHS and WEEE directives” N° 30-CE-0095296/00-09. Final report. European Commission. DG Enterprise and industry. 06/11925/AL. March 2008 <www.ec.europa.eu/environment/waste/weee/pdf/rpa_study.pdf> at 147.

information available identifies not only the seriousness of this type of regulatory initiative to the industry, but also the creativity of responses that can be obtained when regulatory regimes establish specific criteria and deadlines for compliance.⁵⁴² An EU Commission Staff Working Document has noted that:

...well-designed regulatory instruments generally encourage companies to seek innovative solutions that otherwise would remain unexplored. Available evidence broadly supports the conclusion that in the long term, environmental policy will tend to encourage innovation in environmentally-friendly products and processes provided there is enough legal clarity and security.⁵⁴³

Issues around direct environmental regulation can be complex, but available evidence points to the fact that direct regulation in Europe in the area of material composition of electronic product has yielded overwhelming compliance not just in Europe where the Directive is binding, but also in other countries (outside Europe) where the Directive has no legal effect. Grossman observed that the application of the RoHS Directive to all electronics sold in the EU regardless of their country of manufacture has resulted in U.S. and Japanese electronic companies making their products to be sold in the international market to comply with the Directive. Also Chinese high-tech companies which export products to Europe, as well as manufacture components for American and European electronic companies are not only complying with the Directive but

⁵⁴² See PHA Consulting Associates, "Electronic Waste Recovery Study" (2006) at 3-12. online <www.nrcan.gc.ca/mms-smm/busi-indu/rad-rad/pdf/elec-sfr-eng.pdf>.

⁵⁴³ Commission Staff Working Document, "The Effects of Environmental Policy on European Business and its Competitiveness: A Framework For Analysis, Brussels", 10.06.2004, SEC(2004) 769 <www.ec.europa.eu/enterprise/policies/...competitiveness/.../sec_769_2004_en.pdf>. Bogaert et. al. cited an article by Kristina Taylor in July/August 2006 edition of the VISION magazine to highlight the fact that some companies are viewing the implementation of the RoHS Directive as an opportunity for developing their competitiveness rather than it being a restriction on product development: "*The global impact of RoHS highlights the pinnacle of a cultural change that has been underway in the electronics industry for several years. One company's executive described this change as his organization's 'new religion'-an amalgam of concern for the environment and a ripe opportunity for increased competitiveness and efficiency.*" They further stated that "Another article, published by CMP, a media and marketing solutions company serving the technology industry in 2006, examines the innovation effects of the RoHS Directive in the wider context of eco- design, arguing that manufacturers are dealing with RoHS compliance as part of a broader move towards designing products which are more environmentally friendly." See Bogaert et. al., "Study on RoHS and WEEE Directives" Final Report N° 30-CE-0095296/00-09, March 2008.

even more importantly China has gone a step further in preparing legislation similar to the RoHS Directive. She went on to predict that the EU Directive, though regional in nature, will eventually metamorphose into a global requirement.⁵⁴⁴

DfTR, if implemented with a defined objective, can have a profound impact on the end-of-life management of electrical and electronic equipment. A regulatory framework that provides incentives or mandates DfTR in the electronic industry will not only spur innovation, it will result in the design of environmentally sustainable electronic products. It will also result in diminished toxic substances in electrical and electronic gadgets. The latter is of great importance to sustainable development in that at the end of the useful life of these products and their subsequent export to developing countries either for reuse, recovery or recycling, the health and environmental impact that will arise from their transboundary movement to the developing world would have been substantially minimized at the production stage.

6.1.2 The Reuse Framework

While reduction or elimination of hazardous substances as envisaged in the EU's RoHS Directive is apparently an effective framework for addressing the adverse health and environmental impacts associated with waste electrical and electronic equipment, suffices to state that toxic reduction or elimination alone does not address some other problems associated with e-waste such as increasing waste generation/disposal and resource depletion. Reduction or elimination of hazardous substances in electrical and electronic products has no relation or correlation to the lack of sustainability evident in resource and energy consumption resulting

⁵⁴⁴ Grossman, "High tech trash" *Supra* note 94 at 244-245.

from production and disposal of electrical and electronic equipment. Although it will reduce the health and environmental impacts associated with e-waste, toxic reduction may have little (if any) effect in reducing the amount of e-waste being generated. It is in this respect that the reuse framework becomes a very relevant framework for e-waste management. The reuse framework aims at extending the life span of electronic devices thus delaying their eventual exit into the waste stream. Two aspects of the reuse framework can be identified.

The first aspect of the framework will entail that electronic products and components be designed for durability as opposed to the so-called ‘design for the dump’ which leads to increased waste disposal and resource depletion. Electronic products, parts and components can be designed to allow for model upgrading as technology changes thus extending the technological life of the product and preventing untimely discard which will ultimately add to mounting e-waste stock.⁵⁴⁵ Upgradable parts in the product could be designed as sub-assemblies to facilitate removal and replacement when necessary.⁵⁴⁶ Kellner was of the view that product designers can facilitate reuse of products and parts by ‘choosing assembly procedures that facilitate efficient product disassembly’ and reduce the number of different tools required for that purpose.⁵⁴⁷ For example, products like Apple Iphone or Ipod are designed in such a way that repairs and replacement of parts like cell batteries are so complex and require intricate disassembly. Such design frameworks make repair costly and provide disincentive for reuse.

Design for reuse (DfRe) results in a decreased cost of repair and servicing thus providing incentive to consumers to attempt to fix rather than discard electronic products when they break down. Hence Grossman has argued that reuse of electrical and electronic equipment is the most

⁵⁴⁵ Hester and Harrison “Electronic Waste Management” *Supra* note 272 at 153.

⁵⁴⁶ *Supra* note 319

⁵⁴⁷ *Ibid.*

efficient way to extend the life span of such equipment and thus reduce the production and consumption process for new products – a process that feeds the proliferation of e-waste.⁵⁴⁸ The DfRe framework (if effectively utilized) provides a great deal of economic incentive for the developing world and environmentally benefits both developed and developing countries. Although it will not completely eliminate the electronic waste stream, this framework provides an eco-efficient management strategy in the form of reduced resource and energy consumption. In addition, by extending the useful life of electronic devices, the framework delays their disposal thus resulting in reduced waste generation. The DfRe framework also has the capacity to reduce the level of pollution that arises from the three phases of an electronic life-cycle namely – raw material extraction, manufacturing and disposal/recycling.⁵⁴⁹

It may be difficult to conceive or propose a regulatory framework that will impose a positive obligation on electronic manufacturers to design their product for reuse without infringing on their internal and proprietary corporate decision-making, however the EU's Waste Electrical and Electronic Equipment (WEEE) Directive sought to achieve this objective by imposing a negative obligation. The Directive requires producers of electrical and electronic equipment sold in EU jurisdiction not to 'prevent, through specific design features or manufacturing processes, WEEE from being re-used, unless such specific design features or manufacturing processes presents overriding advantages, for example, with regards to the protection of the environment and/or

⁵⁴⁸ Grossman, "High tech trash" *Supra* note 94 at 217.

⁵⁴⁹ Puckett and Smith "Exporting Harm" *Supra* note 8.

safety requirements'.⁵⁵⁰ Hence while the Directive does not compel 'design for reuse', it does restrain 'design to prevent reuse'.

Another aspect of the framework incorporates initiatives aimed at encouraging the reuse of electrical and electronic equipment where possible after repair and servicing as opposed to early disposal. This aspect of the framework is evident in the transboundary movement of used electrical and electronic equipment from developed to developing countries thus resulting in economic, socio-political and technological transformation in the latter. This aspect of the reuse framework makes available cost-effective electrical and electronic equipment in developing countries while at same time resulting in waste diversion from landfills and incinerators in developed countries. While this aspect of the framework may present a win-win situation for developed and developing countries, it was noted in the preceding chapter that the framework has the potential to serve as a conduit for transboundary dumping of obsolete electrical and electronic equipment in the developing world, thus giving rise to health and environmental concern. The abuse of the reuse framework in relation to transboundary movement of e-waste has been successfully perpetrated as a result of the absence of any regulatory standard for classifying or distinguishing used electronics from junk electronics/e-waste.

Hence there is a need for an appropriate reuse framework capable of addressing this challenge. The development of such a framework will require a balancing of the cost/benefit analysis associated with the framework especially in relation to the transboundary movement of used electrical and electronic equipment to developing countries. This is not an easy task especially when we analyze two possible approaches under this head. The first approach (which is currently

⁵⁵⁰ European Union, 2003. Directive 2003/ 108/EC of the European Parliament and of the Council of 8 December 2003 amending Directive 2002/96/EC on waste electrical and electronic equipment (WEEE), Article 14 <<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CONSLEG:2002L0096:20090112:EN:PDF>>.

in place) permits the exportation of used electronic devices to developing countries for refurbishing and subsequent reuse. This approach takes advantage of the skilled but low labour costs and working conditions in the region, thus resulting in commercial opportunities to refurbish and resell electronic products at much lower cost than would have been the case were the products to be refurbished in developed countries where labour cost is high. Thus this approach results in cheaper used electronic products. The approach is most compatible with the economic conditions in developing countries which supports purchase of cost effective used electrical and electronic equipment as opposed to expensive new equipment.

The problem with this framework though lies in the fact that it is not the most environmentally friendly for the developing world. Junk electronic products which corporations, organizations and recyclers in the developed world are eager to get rid of (and cheaply) can be easily shipped to developing countries under the cover of used electronics meant for refurbishing and resale.⁵⁵¹ Hence, the main problem with this framework lies on the fact that it sustains the current abuse of developing countries as dumpsites for junk and obsolete electronics from industrialized nations.

Another approach (which was earlier proposed in this thesis) will entail having the used electrical and electronic equipment refurbished or repaired in their country of origin, and an assurance to the effect that they are in proper working condition before they are certified fit for export to or import by developing countries. This will thus require that the used electronic products are collected, repaired or refurbished, tested for safety and usability, and then sorted according to technical specifications or grades. The success of this approach will also require the

⁵⁵¹ Statistics shows that about 30% of the used electronics import into Nigeria for repair and re-sell are 'junk' not repairable. Consequently this junk is discarded in unregulated dump sites and openly incinerated thus causing environmental hazards. See Ogunbuiyi et. al. *Supra* note 250.

development of an international certification system or standard.⁵⁵² Such a certification system would set the standard which must be complied with before used electronic devices are eligible for export to or import by developing countries. This could entail prior testing of the device to ensure its functionality followed by a certification mark or label which should serve as a prima facie evidence that the electronic product has complied with the certification standard and hence is eligible for exportation as a functional used electronic device and not junk. The beauty of this approach is that it will serve as an effective bar to the use of developing countries as dumping grounds for obsolete and junk electronic products. However, the high cost of labour in industrialized countries where most of these used electronics will be refurbished may eventually drive up the cost and hence reduce the ability of people in developing countries to afford the products.

Notwithstanding the problem identified in relation to the latter approach, the fact remains that it is the most environmentally-friendly (for the developing world) and is very essential in ensuring environmental justice,⁵⁵³ otherwise, the rich countries most capable of managing a hazardous waste problem can wash their hands off the global toxic burden for electronic waste by passing it to countries least able to deal with the problem. This would create a world where global pollution burdens from certain industrial sectors would effectively be transferred to the last user – the poor.

In conclusion, the reuse framework is an effective mechanism for extending the life span of electrical and electronic equipment thus delaying their eventual and inevitable exit into the waste stream. The success of the framework will require that electrical and electronic equipment

⁵⁵² Such certification could be developed by international standardization bodies such the ISO.

⁵⁵³ The principle of environmental justice is to the effect that no people or group should be made to assume disproportionate environmental burden by virtue of their socio-economic situations or position in life.

manufacturers design their products with reusability in view. It will also require the development of an appropriate regulatory framework to restrict the transboundary movement of obsolete electrical and electronic equipment to developing countries in the guise of export for reuse.

6.1.3 Design for Recycling

Recycling in this context refers to a series of activities by which electrical and electronic products or components are recovered from or diverted from the waste stream and utilized as raw materials in the manufacture of new products. The principal idea behind electronic waste recycling is to liberate valuable materials such as precious metals, ferrous metals, non-ferrous metals, integrated circuits, plastics etc and utilize same in the manufacturing process. Thus e-waste recycling involves the recovery of materials that have previously been used in the manufacture of electrical and electronic products and incorporating the same into the manufacture of new products. In contrast to reuse, recycling involves the reutilization of items for their material value as opposed to their value as products. The process thus entails the alteration of the original materials between their point of discard and the point at which they emerge as a constituent of a new product.

The environmental benefit of e-waste recycling has been well documented by scholars. Hilty was of the view that e-waste recycling clearly pays off in terms of environmental impact because primary production can be avoided when metals are recovered. In addition, he noted that about 20-25% of the energy consumption in the production phase of electronic products could be

theoretically saved via the e-waste recycling process. Hence the reuse of metals and other valuable components makes e-waste recycling environmentally beneficial.⁵⁵⁴

Although there are many components that go into the production process of electrical and electronic equipment, metals make up the greater percentage of the components in equipment like personal computers (PC). This exhaustible material resource is extracted at great cost and much of it will end up in landfills, incinerators or other dumpsites if not recovered through the recycling process. While diverting electronic products from the waste stream via recycling will not completely eliminate the health and environmental impacts associated with e-waste, such a waste diversion strategy is important in e-waste management as it results in waste reduction, reduction of toxics in landfills as well as preservation of natural resources. E-waste recycling enhances efficient resource utilization thus conserving exhaustible natural resources for future generations in line with the concept of sustainable development.

Besides the direct impact of effective recycling on the resource base, Schluep et al. argued that state of the art effective recycling also considerably reduces greenhouse gas emissions.⁵⁵⁵ Primary productions involving mining, concentrating, smelting and refining, especially of precious metals, has significant carbon dioxide impact due to the low concentration of these metals in the ores and often difficult mining condition. For example, almost 10,000 tons CO₂ emissions are discharged in the course of producing 1 ton of gold, palladium or platinum.* As compared to mining, e-waste recycling is much more environmentally friendly. Environmentally speaking, even the best mining process is worse than recycling. Schluep et al. further stated that:

⁵⁵⁴ Hilty, "Information Technology and Sustainability" *Supra* note 32.

⁵⁵⁵ Schluep et al. "Recycling - From E-waste to Resources" *Sustainable Innovation and Technology Transfer Industrial Sector Studies*, (July 2009) United Nations Environmental Programme (UNEP) <www.unep.org/PDF/.../E-Waste_publication_screen_FINALVERSION-sml.pdf>.

* *Ibid* at page 6

Recovering metals from state-of-the art recycling processes generates only a fraction of these CO₂ emissions and also has significant benefits compared to mining in terms of land use and hazardous emissions. For example, production of 1 kg aluminium by recycling uses only 1/10 or less of the energy required for primary production, and prevents the creation of 1.3 kg of bauxite residue, 2 kg of CO₂ emissions and 0.011 kg of SO₂ emissions as well as the impacts and emissions associated with the production of the alloying elements used in aluminium.⁵⁵⁶

Masanet and Horvath in their introductory text noted that the concept of design for recycling is now an important dimension of environmental management for electronic equipment manufacturers, especially computer manufacturers in the years leading up to 2002. The duo referred to take-back policies in Europe, recycle-oriented eco-label requirements and increasing environmental awareness among consumers of electronic products as important factors that have prompted the electronic industry to continually improve the recyclability of its product designs.⁵⁵⁷

The concept of design for recycling incorporates the designing of products and components in such a way as to enhance the ease of dismantling and recyclability. Product or component design that makes disassembly and recycling cumbersome results in high labour costs thus providing an economic disincentive for recycling. Hence product design could have a negative or positive impact on product recycling. If the cost of recovering the materials in e-waste is higher than the value of the materials extracted, there will be no incentive on the recycling industry to engage in recovery activities. Thus designing electronic products in such a way as to enhance the ease of recycling will improve the cost and efficiency of recycling industries. This will also enhance e-

⁵⁵⁶ *Ibid* at 10.

⁵⁵⁷ Eric Masanet, & Arpad Horvath, "Assessing the benefits of design for recycling for plastics in electronics: A case study of computer enclosures" (2007) 28:6 *Materials and Design*, 1801-1811.

waste recycling in developed countries as opposed to the current practice of shipping such waste to developing countries.

In addition, toxic reduction or substitution also enhances recycling. Toxic substitution or elimination enhances recycling by eliminating or reducing health risks involved in the recycling process. To enhance e-waste management especially in relation to recycling, the WEEE Directive in Europe required original electronic manufacturers to provide technical information relating to the material composition of their product to recycling agencies. While such information will enable the recyclers to take the necessary steps in reducing the occupational health and environmental impacts associated with the recycling process, electronic producers have on the other hand expressed concern about the proprietary nature of such information which in some cases may be considered as trade secrets.

The incorporation of the concept of Design for Recycling into the design process for electrical products is very crucial in ensuring the manufacture or production of recyclable electrical products and hence the management and control of e-waste. The cost associated with processing e-waste could be significantly reduced when products are designed and assembled in such a way that at the end of their useful life they can be conveniently dismantled or recycled.⁵⁵⁸ This will ensure that a greater percentage of recyclable materials will be recovered with minimal cost to the recycler and the environment thus resulting in both financial and environmental gain.

Although design for recycling may come at an initial additional cost to the original equipment manufacturer (OEM) in the form of expenses on research and development of the new process, in the long run, the expenditure will pay off in the form of a decrease in the cost of recycling the

⁵⁵⁸ Often, the problem with e-waste recycling is not just limited to complex assembly of materials, but may also take the form of complex mixtures of materials which cannot be recycled unless separated and then recycled individually.

manufacturer's products,⁵⁵⁹ eco-friendly products, as well as enhancing the manufacturer's corporate environmental responsibility.

While the promotion of design for recycling is an essential component of the DfE, it is also important to put in place necessary policy initiatives or measures to promote the recycling industry. This could take the form of measures to encourage or mandate producers to incorporate a certain percentage of recycled contents into the production of new equipment. Such a policy initiative will not only reduce mining of virgin resources and hence resource conservation, it will also create demand for products from the recycling industry.

From the discussion so far, it is evident that the incorporation of the concept of design for the environment in the design and production of electrical and electronic equipment will go a long way in contributing towards sustainable electrical and electronic products. It will also enhance the management of electrical and electronic equipment at their end of life. It is necessary also to note here that incorporation of DfE will represent a departure from the current unsustainable pattern of production, consumption and disposal that has resulted in piles of e-waste across the globe. Effectively engaging the electronic industry to adopt these design strategies will expectedly present a challenge. The electronic industry typically focuses on production methods that will result in the lowest production cost thus enhancing sales and profit. Once the product leaves the production line and enters the market, problems generated by poor design often incur no cost to the producer unless the producer is responsible for end of life management of the products.

⁵⁵⁹ This will be especially beneficial for producers located in jurisdictions where the concept of extended producer responsibility (EPR) applies. EPR laws require manufacturers of electronic products to bear the financial cost for the end-of-life management of their products including the cost of recycling. Since the producers in such jurisdiction bear responsibility for the cost associated with the end of life management of their products, any decrease in cost of recycling will represent a financial gain for the producer.

6.2 How to Achieve DfE

Three main approaches which could be adopted in implementing DfE have been identified. There is the “pull” or voluntary approach, the “push” or regulatory approach, or a combination of both.⁵⁶⁰ The pull approach involves the use of various programs such as informative or supportive programs, public procurement directives, or voluntary agreements.⁵⁶¹ Government procurement directives can be an effective tool for providing incentive for producers to adopt DfE. An example of such a procurement directive is the US Executive Order 13423 on Environmentally Preferable Purchasing.⁵⁶² Electronic products were the key focus of the Executive Order. The Order required that any federal agency purchasing or leasing electronic products must meet at least 95% of its requirements with EPEAT-registered product, unless there is no EPEAT standard for the product.⁵⁶³

A major problem with the pull or voluntary approach is that its success is dependent on the economic situation in the market places. In most cases, consumer demand for electronic products is guided by factors other than the environmental factors. Without consumer demand for greener and more sustainable products, it is less likely that the producers will design such products for the market. This is more so where such products would represent a radical departure from existing processes and thus resulting in greater cost of production. Thus consumer demand in

⁵⁶⁰ Five Winds International, “Design for Environment” *Supra* note 517 at 11.

⁵⁶¹ *Ibid.*

⁵⁶² Executive Order 13423, “Strengthening Federal Environmental, Energy, and Transportation Management”. Available at <<http://www.archives.gov/federal-register/executive-orders/2007.html>>.

⁵⁶³ Electronic Product Environmental Assessment Tool (EPEAT) is a tool designed to help institutional purchasers of electronic products such as computers desktops, laptops and monitors to select and compare such products based on their environmental attributes. EPEAT-registered products are designed to meet mandatory environmental performance standard for electronic products. <<http://www.epeat.net/about-epeat/>>.

most cases does not provide a clear market driver for producers to design for the environment.⁵⁶⁴ Even procurement directives might have a limited effect on DfE. Some producers might only be motivated by such a directive to apply DfE to products that are in high demand by the public sector but not those in demand by household consumers as the directive does not apply in the latter. More so, small producers who individually represent a small percentage of the market may see no economic sense in incurring additional costs redesigning their products to meet a more stringent requirement when in actual fact their products and sales represent just a small percentage of the market. While individually such producers may have little impact on the market, collectively, this might not be the case. Hence an effective framework for implementing DfE must be designed in such a way as to provide incentive to various players in the industry - small or big to design for environment. Proceeding from here, this research will examine the possibility of implementing DfE through the concept of extended producer responsibility.

6.3 The Concept of Extended Producer Responsibility

Theoretically, markets function most efficiently when social and environmental costs associated with the production of goods and services are reflected in the price of such goods and services and distributed fairly among those who benefit from them.⁵⁶⁵ In practice, this is not always the case. In the electronic industry, while the cost of a product may actually reflect the cost of production, most often it fails to reflect the environmental externalities associated with its production as well as its end of life management. This makes it possible for producers to escape

⁵⁶⁴ Five Winds International, “Design for Environment” *Supra* note 517 at 24.

⁵⁶⁵ Deathe, MacDonald and Amos “E-waste Management Programmes” *Supra* note 522.

responsibility for the costs and burdens associated with these externalities and effectively shift same onto society.

In most jurisdictions in developed countries, such environmental externalities are conveniently shifted to the municipalities and tax payers - no thanks to a default regulatory regime that imposes obligations on municipal authorities to collect, manage and dispose of waste products within their municipalities at little or no cost to the manufacturer of the product. In Canada, for example, managing electronic waste is primarily the responsibility of Canadian municipalities. The Canadian Council of Ministers of the Environment (CCME) has noted that waste management as a core responsibility of municipal authorities is uniquely challenging because municipalities have limited capacity and tools to regulate waste generation.⁵⁶⁶ It further noted that:

Their abilities to divert waste from disposal are also constrained by practical issues, such as affordable diversion technologies, weak or non-existent secondary materials markets and facility-siting challenges. Perhaps the most difficult aspect is that municipalities have few tools to address the consumption and design of products that are purchased and used by their citizens and which, at the end of their life, become a municipal waste management responsibility.^{556a}

Reducing waste generation and increasing the quantity of waste diverted from disposal and incineration are key challenges faced by municipal waste management authorities, and unfortunately they have little or no capacity to effect a direct solution to the problem. Municipalities are thus saddled with the responsibility for a problem which is not of their making and for which they have little control over its solution.

⁵⁶⁶ Canadian Council of Ministers of the Environment, *Canada-Wide Action Plan for Extended Producer Responsibility*, (Oct. 2009). Available at <www.ccme.ca/assets/pdf/epr_cap.pdf>.

^{556a} *Ibid* at 2

Sachs used the Hohfeldian analysis to highlight the need to reverse the default rule that imposes a duty on municipalities to collect, manage, and dispose of products within the municipal waste stream at no direct cost to manufacturers.⁵⁶⁷ Hohfeld had argued that right and duty are correlative concepts, i.e. the one must always be matched by the other. So if for example A has a right against B, this is equivalent to B having a duty to honour A's right. Similarly, If B has no duty, that means that B has a privilege, i.e. B can do whatever it pleases because B has no duty to refrain from doing it, and A has no right to prohibit B from doing so.⁵⁶⁸

In essence, Sachs argued that under the Hohfeldian analysis, a duty on municipalities to manage waste correlates with the right of manufacturers to design and produce their products without regard to end of life impact of their products. He further argued that reversing this default rule 'could arguably shift manufacturer incentives and bring environmental considerations to the forefront of manufacturers' business decisions.'⁵⁶⁹ Salzman was of the view that there is no reason why government rather than the industry should be made to manage such waste.⁵⁷⁰ Hence a waste management regime that externalizes social and environmental costs associated with end of life management of products will undoubtedly provide no incentive for producers to take the end of life impact of their products into consideration in designing such products. Knowledge of the fact of the absence of any obligation on their part to manage their products at end of life will not instil a serious sense of environmental responsibility on the electronic producers.

⁵⁶⁷ Noah Sachs, "Planning the Funeral at the Birth" *Supra* note 525 at 63; In developing countries, the environmental externalities associated with electrical and electronic products are evidenced in the health and environmental impacts arising from the transboundary dumping of junk e-waste.

⁵⁶⁸ See Wesley Newcomb Hohfeld, *Fundamental Legal Conceptions as Applied in Judicial Reasoning* (London, Ashgate 2001).

⁵⁶⁹ *Supra* note 525 at 63.

⁵⁷⁰ James Salzman, *Sustainable Consumption and the Law*, 27 *Environmental Law* (1997) at 1279.

Thus the concept of extended producer responsibility (EPR) is a very useful policy instrument to reverse this default rule as well as implement DfE. The EPR is an aspect of a new environmental policy instrument aimed at regulating the end-of-life management of products including electrical and electronic equipment. EPR is based on the premise that producers are in the best position to achieve environmentally friendly product design and hence should be mandated or encouraged to make the necessary design changes to achieve DfE. Lindhqvist viewed the concept of EPR as a policy principle. He thus defined EPR as:

a policy principle to promote total life cycle environmental improvements of product systems by extending the responsibilities of the manufacturer of the product to various parts of the entire life cycle of the product, and especially to the take-back, recycling and final disposal of the product.⁵⁷¹

The OECD Secretariat has been very influential in the development and promotion of EPR as an environmental policy tool. In its 2001 report which was intended to assist governments to design and implement effective EPR policies, it defined EPR as “[a]n environmental policy approach in which a producer’s responsibility, physical and/or financial, for a product is extended to the post-consumer stage of a product’s life cycle”.⁵⁷² The OECD report further noted that EPR involves two related features “(1) the shifting of responsibility (physically and/or economically; fully or partially) upstream toward the producer and away from municipalities, (2) to provide incentives to producers to incorporate environmental considerations in the design of their products.”⁵⁷³

While the OECD definition is much narrower to that of Lindhqvist, both definitions tend to emphasize the point of incidence as being the post-consumer stage of the products’ life cycle.

⁵⁷¹ Thomas Lindhqvist, *Extended Producer Responsibility in Cleaner Production - Policy Principle to Promote Environmental Improvements of Product Systems*, Doctoral Dissertation, Lund University, May 2000 at 154.

⁵⁷² OECD, *Extended Producer Responsibility - A Guidance Manual For Government*, (2001).

⁵⁷³ Organization for Economic Cooperation and Development, *Extended Producer Responsibility: A Guidance Manual for Governments* 48 (2001) at 9, available at <http://www.oecd-ilibrary.org/environment/extended-producer-responsibility_9789264189867-en>.

Although EPR as a policy tool is primarily concerned with end-of-life management of products, its influence goes far beyond that. van Rossem has noted that EPR is founded on two main environmentally-related objectives. The first objective is to effect upstream design improvement of products by providing incentives for manufacturers to improve the environmental performance of products and the systems surrounding the life cycle of the products.⁵⁷⁴ The second, according to the author, is to ensure “effective downstream re-utilization of product and material through effective collection, re-use, and environmentally sound treatment of collected products, components and materials.”⁵⁷⁵

Tojo noted that the concept of EPR can be viewed in the context of three general trends viz: the precedence of ‘preventative measures over end-of-pipe approaches, enhancement of life cycle thinking and a move from the command and control approach to a non-prescriptive, goal-oriented approach.’⁵⁷⁶ Thus an effective EPR regime is that which is able to impose responsibilities on manufacturers so as to provide the necessary incentive to effect upstream product design change as well as enhance downstream end-of-life management.

Toffel has identified four distinct types of legal responsibilities to this effect.⁵⁷⁷ This includes: (i) economic responsibility, which imposes an obligation on manufacturers to pay all or portion of the cost associated with end of life management of their products; (ii) physical responsibility - requires manufacturers to take physical possession of the products when they have been

⁵⁷⁴ See Chris Van Rossem, “Individual Producer Responsibility in the WEEE Directive: From Theory to Practice?” (2008) IIIIEE, Lund University [Van Rossem, “Individual Producer Responsibility”].

⁵⁷⁵ *Ibid* at 15.

⁵⁷⁶ Naoko Tojo, “Extended Producer Responsibility as a Driver for Design Change – Utopia or Reality?” IIIIEE: Dissertations 2004:2. Lund: IIIIEE, Lund University [Tojo, “Extended Producer Responsibility”].

⁵⁷⁷ Machael W. Toffel, *End-of-life Product Recovery: Drivers, Prior Research, and Future Directions* (Oct. 17 - 18, 2002) (unpublished paper presented at Conference on European Electronics Take-Back Legislation: Impacts on Business Strategy and Global Trade, Fontainebleau, Oct. 17-18, 2002. Available at <citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.200.6612>.

discarded by the consumer; (iii) informative responsibility which entails mandates for product labelling, such as components or a material list. This is aimed at reducing the cost of third-party involvement in post-consumer recycling; (iv) finally, the liability rules impose financial liability for environmental damage and cleanup costs from disposal of hazardous products.⁵⁷⁸

The economic responsibility here could be full or partial in the sense that the cost of end-of-life management of a product could be borne fully by the manufacturer or it could be shared with the consumer in the form of an end-of-life management fee collected at point of sale. While these four responsibilities are features of an EPR regime, it suffices to state that economic and physical responsibilities are essential or core components of any effective EPR regime. They are most effective in compelling producers to explore alternatives toward designing products that will last longer and/or incur minimal costs of management at their end-of-life.

Sachs also compared the concept of EPR to the concept of product liability. He described EPR as:

an ecological extension of product liability law, making producers responsible for long-term environmental management of their products, and its goals are similar in many respects to product liability law, such as reducing ‘injury’ and spurring improved product design.⁵⁷⁹

EPR is based on the “polluter pays” principle and aims to make manufacturers responsible for the entire life circle of their product.⁵⁸⁰ Unlike the traditional command and control

⁵⁷⁸ Ibid.

⁵⁷⁹ Noah Sachs, “Planning the Funeral at the Birth” *Supra* note 525 at 53.

⁵⁸⁰ In the proposal for a WEEE Directive, the European Commission noted “The polluter pays principle is laid down in Article 174 of the EC Treaty. The idea behind this principle is to make those persons responsible for environmental pollution who have the possibility to improve the situation. Producers of electrical and electronic equipment design the product, determine its specifications and select its materials. Only producers can develop approaches to the design and manufacture of their products to ensure the longest possible product life and, in the

environmental regulation which seeks to focus mainly on reducing externalities from the production process, EPR seems to focus more on mitigating the externalities from the products rather than their production. That notwithstanding, such efforts at mitigating product's environmental impact may influence (albeit indirectly) the design of the product.

On the contrary, industry groups have argued that the concept of EPR runs counter to the polluter pays principle. They argue that it is the consumers and not the producers that are the real “polluters” in the context of product externalities. It is the consumer of the product and not the producer that should be assigned responsibility for the product's environmental impact.⁵⁸¹ In their view, the producers are making a useful product and not waste, while the consumers on the other hand actually introduce the product into the waste stream by discarding them. Thus product externalities such as waste disposal are caused by consumers' decision to consume and not by producers' decision to produce.⁵⁸²

Intelligent as this argument might seem, there are valid reasons for assigning responsibility to producers. Sachs based one of such reason on the principles of industrial ecology.⁵⁸³ According to Sachs:

The implication of industrial ecology is that the interface between industry and the environment is not just at the point where the smoke leaves the smokestack, but rather, environmental externalities have their origin in the design decisions for the

event that it is scrapped, the best methods of recovery and disposal”. See Commission proposal for WEEE Directive COM(2000)347, 13 June 2000 at page 11.

⁵⁸¹ See European Organization for Packaging and Environment, “Producer Responsibility Defined: A Briefing Paper”, (1998) available at <<http://www.europen.be/issues/prodrep.html>>.

⁵⁸² *Supra* note 525 at 65.

⁵⁸³ Industrial ecology has been defined as “the activity of designing and managing human production-consumption systems, so that they interact with natural systems to form an integrated (eco) system which has ecological integrity and provides humans with a sustainable livelihood.” See James J. Kay, “On Complexity Theory, Exergy, and Industrial Ecology,” in Charles J. Kibert, Jan Sendzimir, and G. Bradley Guy, eds., *Construction Ecology – Nature as the Basis for Green Buildings* (New York, Spon Press, 2002) at 82.

products produced in the factory, and indeed, in the decision to produce a certain product in the first place.*

The implication of industrial ecology is that the interface between industry and the environment is not just at the point where the smoke leaves the smokestack, but rather, the environmental externalities have their origin in the design decisions for the products produced in the factory, and indeed, in the decision to produce certain products in the first place.⁵⁸⁴ Thus Sachs argued that under this perspective, it make no sense to argue that a consumer “introduces” a product into the environment upon disposal, because the full life-cycle impacts of products, from virgin materials extraction to energy use to disposal impacts, are all determined by the design decisions of producers.⁵⁸⁵

Although the consumer is the last person in the product life cycle, how soon such products end up in the waste stream and their impact thereon is to greater extent determined by the producer. The producer’s design decision in relation to material selection, toxic composition, reusability, and recyclability are the major determinant of a product’s environmental externalities. Producers are in the best position to conduct a cost-benefit analysis of whether design changes are necessary especially given the possibility of their having to take back the products at end of life.⁵⁸⁶ More so, from a regulatory point of view, it is more efficient to impose responsibility for costs associated with end of life management of products on their producers. These producers can efficiently (depending on their market power and demand elasticity) pass the cost or some of it over to the consumers.

* *Supra* note 525

⁵⁸⁴ Noah Sachs, “Planning the Funeral at the Birth” *Supra* 525 at 66.

⁵⁸⁵ *Ibid.*

⁵⁸⁶ *Ibid* at 67.

Dempsey and McIntyre have noted that EPR is having, and will increasingly have over the coming years, a substantial impact across the globe.⁵⁸⁷ They further noted that from the outset, the concept was ‘considered as a means of creating design incentives for manufacturers, as well as requiring producers to take responsibility for the end-of-life cost of their product.’⁵⁸⁸ Although the concept of EPR began to gain prominence in Scandinavia and Germany in the early 1990s, policy documents from these areas dating back to the mid-1970s clearly articulated the importance of involving manufacturers and product designers in the search for a sustainable solution to issues relating to waste management and recycling. Years later, EPR is now being increasingly adopted in various countries for management of waste electrical and electronic equipment and is now an important aspect of waste management policy toolkit in Asia, Europe and North America.⁵⁸⁹

A typical EPR regime will usually impose an obligation on manufacturers for the cost of collection and end-of-life management (including recycling) of their product. In relation to electrical and electronic products, EPR has as its objective the reduction at source of environmental hazards associated with electrical and electronic equipment (EEE). As was noted above, it seeks to achieve this objective by imposing responsibilities which in turn result in incentives to producers of electrical and electronic products who indeed are in the best position to effect design change in their products necessary for realizing the object of the concept.

⁵⁸⁷ See Mark Dempsey and Kirstie McIntyre “The Role of Collective versus Individual Producer Responsibility in e-Waste Management: Key Learnings from Around the World” in Ronald E. Hester and Roy M. Harrison eds *Electronic Waste Management - Design, Analysis and Application* (Cambridge: RSC Publishing, 2009) at 213 [Dempsey and McIntyre “Collective versus Individual Producer Responsibility”].

⁵⁸⁸ *Ibid.*

⁵⁸⁹ Some jurisdictions especially in North America use the term Product Stewardship to refer to the EPR. However there is a slight difference between the two. Some product stewardships are usually voluntary in nature. Such voluntary product stewardships are probably not sufficient in effecting the objective of EPR. A Stewardship process may result in EPR as long as it is consistent with the principles of EPR namely - effecting upstream change in product design as well as downstream change in waste collection and management.

Determined to implement EPR in Europe, the European Union in 2002 adopted the WEEE Directive. The concept of EPR was at the heart of the Directive which was aimed at providing incentive to electrical and electronic equipment producers in the region to design and produce electrical and electronic equipment which facilitates repair, reuse, disassembly and recycling. In essence, the WEEE Directive introduces EPR for e-waste founded on mass-based collection, recycling and recovery targets that must be met by member states.⁵⁹⁰ Member States were obligated to ensure that producers or third parties acting on their behalf, in accordance with Community legislation, set up systems to provide for the treatment of WEEE using best available treatment, recovery and recycling techniques.⁵⁹¹

The responsibility of Member States with regard to end of life management of e-waste is now limited to providing ‘convenient facilities’ for consumers to return their waste electrical and electronic equipment at end of life.⁵⁹² Thus following the introduction of the WEEE Directive, the responsibility of municipal authorities in EU shifted from the historical e-waste collection and disposal to only e-waste collection. Producers of electrical and electronic equipment marketed in their jurisdiction then became responsible for the management of such waste after it has been collected. This responsibility includes a mandatory recycling requirement for collected e-waste products.⁵⁹³ Such a mandatory recycling requirement indirectly results in design for recycling which is an aspect of DfE. Thus while not dictating any specific product design, the end of life management responsibility on a producer allows the producer to assess the marginal

⁵⁹⁰ Each EU member state is responsible for ensuring a set minimum collection of WEEE. The current set minimum is 4 kg per capita per year. See *Article 5.5 WEE Directive*.

⁵⁹¹ *Article 6 WEEE Directive*.

⁵⁹² *Article 5(2)(a) WEEE Directive*.

⁵⁹³ *Article 5:4 WEEE Directive*.

cost and benefit analysis of product design or redesign with a view to minimizing the eventual cost for end of life management.

The WEEE Directive put in place two EPR frameworks for e-waste management namely: collective producer responsibility (CPR) and individual producer responsibility (IPR). Going further from here, this research will examine these twin EPR frameworks. It will also examine practical implementations of the two frameworks across jurisdictions with the objective of identifying which of the two is most effective for the realization of the objective of EPR, namely - effecting upstream and downstream change necessary to enhance end-of-life management of electrical and electronic equipment.

6.3.1 Collective Producer Responsibility (CPR)

Under the CPR regime, manufacturers of a particular type of product such as televisions or computers are jointly responsible for the physical and financial costs associated with end-of-life management of equipment falling within that product category including but not limited to the collection and recycling of the products. An essential characteristic of CPR is joint or collective responsibility by all producers of a specified product or group. Such collective responsibility arises mainly because products of similar kinds are physically handled together regardless of their brand name. Producers usually contract with a third party organization such as a Producer Responsibility Organization (PRO) for the handling of these products.

The PRO has among others the responsibility for the collection, management and processing including recycling of specified products. The costs associated with the collection, management and processing of the waste products is distributed to the individual producers in the group on the

basis of their market share.⁵⁹⁴ In such systems, individual producers are assessed the same unit cost which is the average costs for all producers within the system. Thus the unit cost incurred by an individual producer depends not just on the cost of its own product, but also on those of other producers in the system.⁵⁹⁵

In assigning responsibility for end of life management of electronic products under the CPR framework, the WEEE Directive distinguishes between historical and future waste.⁵⁹⁶ With respect to historical waste, all producers are jointly responsible for the end-of-life management of all electrical and electronic products falling within their product category (within the applicable jurisdiction) whether manufactured by them or not. The responsibility or cost assigned to each producer under the CPR is determined not by the actual quantity of its product in the waste stream but rather by its current market share in relation to the product category.⁵⁹⁷ Hence Article 8.3 of the Directive is to the effect that:

3. The responsibility for the financing of the costs of the management of WEEE from products put on the market before the date referred to in paragraph 1 (historical waste) shall be provided by one or more systems to which all producers, existing on the market when the respective costs occur, contribute proportionately, e.g. in proportion to their respective share of the market by type of equipment.

⁵⁹⁴ To determine a producer's market share, each producer is required to declare its sales figures to the authorities. Each producer's sales figure is divided by the total market figure for the product to give the percentage of market share for which each product shall be liable for the cost of recycling.

⁵⁹⁵ Atalay Atasu and Ravi Subramanian, "Extended Producer Responsibility for E-Waste: Individual and Collective Responsibility", *Production and Operation Management* (2012) [Atasu and Subramanian "Extended Producer Responsibility for E-Waste"].

⁵⁹⁶ Historical Waste (or historical WEEE) refers to electrical and electronic products that have entered the market before the 13th of August, 2005 when the WEEE Directive came into force and subsequently became waste. Future waste (or future WEEE) refers to those that came into the market after the said date and joined the waste stream subsequently.

⁵⁹⁷ To determine a producer's market share, each producer is required to declare its sales figures to the authorities. Each producer's sales figure is divided by the total market figure for the product to give the percentage of market share for which each product shall be liable for the cost of recycling.

It suffices to state though, that the application of CPR to historical waste by the Directive is a unique legislative approach and does not in any way imply that CPR cannot be applied to other waste such as future waste. The benefit of the CPR is that it is cost-effective and provides for holistic management of end-of-life products irrespective of the producer. This makes possible greater e-waste collection and recycling as CPR does not discriminate against orphan waste.⁵⁹⁸ CPR thus results in greater waste diversion from landfills since end of life management under EPR does not envisage or entail landfilling of waste products.

Having said that, there are disadvantages associated with the CPR regime which dilute its efficiency as an environmentally sound framework for realizing the goals and objectives of EPR. One of the shortcomings of EPR is its unfair or inequitable allocation of cost associated with end of life management of waste. CPR makes producers liable for the cost associated with their product as well as those of other producers who chose to take advantage of the system - free riders.⁵⁹⁹ Producers in a CPR scheme are also responsible for the cost of end of life management of orphan products - products that are still in circulation after their producers exited the scheme or defunct producers.

Although, CPR may result in waste management cost internalization by shifting such cost from municipalities to producers, however its ability to provide incentive to producers to design environmentally benign products is very weak. Dempsey and McIntyre observed a major

⁵⁹⁸ Dempsey and McIntyre defined orphan waste as “Products deposited for recycling that are the responsibility of a company that is either no longer present in the market or has not paid for its recycling. Producers responsible for orphan waste are known as free-riders”. Dempsey and McIntyre “Collective versus Individual Producer Responsibility” *Supra* note 587 at 230.

⁵⁹⁹ Free riders in this context refers to producers who benefit from the CPR but who refuse to register in the system thus formally evading their obligation to contribute towards the cost of managing their products. Free riders are usually small producers whose share of the waste stream is often small to attract attention. The scope of free riding is greater and more complicated to deal with when there are large number of producers in the CPR chain.

shortcoming with CPR relates to its inability to influence the design and manufacture of environmentally friendly products. The duo noted that:

...with the CPR there is no differentiation of the recycling costs according to how easy the product is to recycle. The costs are based upon the market share of the producer. Therefore, the costs of recycling will be the same for a product that has been designed to be easier to recycle, and a product that is much more difficult to disassemble and recycle.⁶⁰⁰

Thus Sachs opined that knowledge of the fact that they will be charged for end of life waste management in conjunction with their industry group as a whole, and that costs will not be scaled for environmental impact, provides no incentive to producers to improve the environmental profile of their own products.⁶⁰¹ Hence the major problem with CPR is that it does not promote the principle of design for the environment. If end of life waste management costs are subsistent on market share of each producer rather than the environmental impact of its waste or the actual time or resources expended in recycling its product, the average cost of recycling will be the same for all producers. The result is that producers are most likely to focus on minimizing production cost and maximizing profit with little (if any) regards for the environmental impact of their products. In consequence, if the waste management costs increases due to design change by an environmentally ‘malevolent’ producer, such change will not as much adversely effect the producer concerned as the effect will be borne jointly by all.

More so, a producer who expends resources designing its products for reuse or for ease of recovery and recyclability will be unable to reap corresponding benefit. Rather, the benefits of its efforts (reduction in the cost of end-of-life management) will equally benefit those producers who design for the dump or those whose products are more difficult to disassemble and recycle.

⁶⁰⁰ Dempsey and McIntyre “Collective versus Individual Producer Responsibility” *Supra* note 587 at 225.

⁶⁰¹ Noah Sachs, “Planning the Funeral at the Birth” *Supra* note 525 at 76.

Thus, CPR does not provide incentive for a producer to design environmentally benign products.⁶⁰² To be more precise, CPR provides disincentive for the design of environmentally friendly products. It is in this respect therefore that this research strongly argues that CPR is not an effective framework for effecting upstream change in product design relating to toxic reduction, reuse and recycling.⁶⁰³

6.3.2 Individual Producer Responsibility

An important aspect of an effective EPR regime is the extent to which the framework enhances design of environmentally friendly products. Indirectly related to this is the extent to which costs associated with end-of-life management of waste products is imposed not just on producers of EEE but on the very producer(s) responsible for the manufacture of a particular product. This is one area where IPR differs from CPR. Individual Producer Responsibility (IPR) unlike CPR imposes responsibility on the manufacturer of a particular product for the physical and financial costs associated with end-of-life management of its own product. Thus, IPR is based on the notion that producers should be responsible only for the actual share of the cost associated with the management of their own product in the waste stream. By making producers individually responsible only for the end-of-life management of their products, the IPR enables costs for end-of-life management of e-waste to be channelled to individual producers thus providing them with

⁶⁰² Sachs though has noted that this will depend on the structure of the market. He argued that if one or two companies are dominant in a particular product category and have substantial market-share, then a collective mandate could force design changes, depending on the marginal costs and benefits of doing so. *Ibid* at 77.

⁶⁰³ This position is further substantiated by the Arcadis/RPA report for the European Commission in 2008. The report analyzed the impact of systems implementing CPR established by the WEEE Directive in Europe on product design. The Report could not establish any evidence that CPR under the WEEE Directive has provided incentive for eco-friendly design. The report further points to the weak link between CPR and design improvement. See Arcadis, RPA (2007) *WEEE component - The impacts of the WEEE Directive and its requirements with respect to various aspects of innovation and competition – Draft Report* (Arcadis, RPA, Belgium).

incentives to incorporate the concepts of design for toxic reduction, reuse and recycling into their production processes.

The possibility of internalizing cost only for their own product will enable producers to assess the cost associated with environmentally friendly design against the cost associated with end of life management of products downstream. Thus the possibility of reduced cost for end of life management downstream will provide an incentive for upstream design change. The logic behind IPR is that every producer should be responsible for its own product so that the producer can fully benefit from DfE investments. This is feasible in a system that makes it possible for producers to be able to distinguish their products from those of others for the purpose of end of life management. IPR also has the capacity to facilitate healthy competition among producers over cost efficient management of a product's end-of-life. Such competition in turn will spur environmentally benign innovations.

Article 8.2 of the WEEE Directive introduces the concept of IPR in EU with regards to future waste. It provides:

2. For products put on the market later than 13 August 2005, each producer shall be responsible for financing the operations referred to in paragraph 1 relating to the waste from his own products. The producer can choose to fulfill this obligation either individually or by joining a collective scheme.

Thus the Directive makes IPR applicable only to future waste - those that enter the waste stream after 13 August 2005. The rationale behind this is probably based on the fact that while a producer cannot influence design change with respect to product(s) that has already been designed and produced, future products can be designed to incorporate reuse, ease of disassembly and recycling and to constitute less harm to human health and environment. Hence

it could be argued that by imposing individual responsibility on producers for the end-of-life management of their own products, IPR proves to be the most effective framework for actualizing the objective of EPR vis: effecting upstream change in product design by imposing downstream responsibility for the collection and management of end of life electrical and electronic equipment. Individual responsibility aside, there will be no incentive for producers to design products for ease of reuse, recycling, disassembly and recycling, and those who do may be forced by market and economic forces operating against them to discontinue the policy.

The WEEE Directive further states that producers can fulfill their individual responsibility under Article 8.2 “either individually or by joining a collective scheme”.⁶⁰⁴ Thus IPR could take either of two forms. First, a producer could set up an individual infrastructure including a product take-back as well as a recycling scheme for downstream management of its own products. The producer can do this either directly by itself or it could contract the activity out to a third party e.g a recycling company. In either case, the producer still bears an individual physical and financial responsibility for the end-of-life management of its products. According to van Rossem, Tojo and Lindhqvist:

A producer bears an individual financial responsibility when he/she pays for the end-of-life management of his/her own products. A producer bears an individual physical responsibility when 1) the distinction of the products are made at minimum by brand and 2) the producer has [responsibility for and] control over the fate of their discarded products with some degree of involvement in the organisation of the downstream operation.*

⁶⁰⁴ “Collective scheme” here does not refer to CPR but rather a collective recycling scheme set up by and managed on behalf of various producers. Under this scheme, products are still distinguished by brand and recycled accordingly. However, each producer remains liable only for the cost of recycling his brand.

* Chris Van Rossem, Naoko Tojo, Thomas Lindhqvist, *Lost in Transposition?: A Study of the Implementation of Individual Producer Responsibility in the WEEE Directive*, Greenpeace International, Friends of the Earth Europe and The European Environmental Bureau, 2006 at 3.

Contrary to common misunderstanding, IPR does not always imply that a producer must develop his own separate infrastructure for collection and end of life management of his own products. Article 8.2 of the WEEE Directive shows that IPR could also take the form of a collective scheme. This will involve an organized e-waste collection and management scheme set up by and/or managed on behalf of various producers. Under this scheme, products are distinguished by brand and recycled accordingly while each producer remains liable only for handling and recycling costs attributable to its brand. This collective scheme would require sorting and segregation of waste electrical and electronic equipment according to brands. Hence as long as each producer remains liable for the cost associated with his own product(s) only, it is immaterial that the collection and management of the product was done under a collective scheme.

While implementation of IPR under a collective scheme for waste electrical and electronic equipment may be easy to explain theoretically, how this could be effected in practice still remains a challenge. The challenge here, it has been noted, relates to how to arrive at a fee structure that reflects the actual cost of recycling a specific electronic product.⁶⁰⁵ In the packaging industry, such system has been implemented by basing fees on weight and material composition of the waste product, but this would be far more difficult in relation to complex electrical and electronic equipment which may contain hundreds of different types of materials and components.⁶⁰⁶ In the latter case, the cost of recycling may not necessarily be determined by weight but rather by other factors such as the hazardous nature of the components.

⁶⁰⁵ See INFORM, Inc., *The WEEE and RoHS Directives: Highlights and Analysis* (2003), available at <http://www.informinc.org/fact_WEEE.pdf>.

⁶⁰⁶ *Ibid* at 1.

6.4 CPR versus IPR

The debate as to the practical choice between CPR and IPR regimes has come a long way. Among parties affected by take-back legislation, the debate seems to center on the comparative cost-efficiencies of IPR and CPR models.⁶⁰⁷ Among environmental policy makers, the debate seems to center on among others, effective waste collection, recycling, diversion of waste from municipal landfills, and most importantly enhancing DfE.

Although the IPR model shapes the design of products through cost-internalization, the model is cumbersome as it involves the tracking and sorting of a very large quantity of products, or assessing fees which are measured on the basis of the environmental impact and disposal costs for each product.⁶⁰⁸ Though the CPR model on the other hand is far more economically efficient to implement, it does not provide the necessary incentive for DfE.

While an IPR model does not accommodate free-riders, it lacks room for the management of orphan products - products which are subject to EPR policy but whose producers have exited the scene due to bankruptcy or other reasons. Thus under an IPR regime, the cost of managing orphan waste will still fall back on the municipal authorities. Although CPR accommodates the processing of orphan products, the costs are actually passed on to other producers thus making the system unfair and inequitable. The activities of free riders in the CPR model also raises more challenges in relation to the fairness of the model, and the level of free riding in a CPR regime could threaten the financial viability of the program.

⁶⁰⁷ Atasu and Subramanian “Extended Producer Responsibility for E-Waste” *Supra* note 595 at 4.

⁶⁰⁸ Noah Sachs, “Planning the Funeral at the Birth” *Supra* note 525 at 77.

6.5 Practical Implementation of EPR Across Jurisdictions

So far, this research has conducted a detailed theoretical analysis of frameworks surrounding the concept of EPR. This theoretical analysis seems to support the view that the IPR model offers a more effective framework for the implementation of EPR concept. Going further from here, the research will examine practical implementation of the IPR framework across jurisdictions with the intent of further substantiating the conclusion reached from the theoretical analysis above.

6.5.1 Japan

Individual producer responsibility (IPR) has been implemented in Japan in relation to end-of-life management of specified category of electronic appliances. Prompted by inadequate waste disposal sites, an increased volume of e-waste generation and inadequate recycling facilities, the Specified Home Appliance Recycling Law (SHARL) was enacted in 1998.⁶⁰⁹ The law aims to reduce waste and effectively utilize resources by recycling specified home appliances discarded from households and offices. At its inception, the law was made applicable to four categories of household appliances which not coincidentally constituted about 80% of the e-waste volume in Japan. These appliances are air-conditioners, tube television sets, refrigerators/freezers, and washing machines.⁶¹⁰

The law imposes a responsibility on the producers of the specified appliances to take back the products at end-of-life, and recycle them. The recycling target for these appliances was set as follows: air conditioners 60%, television 55%, refrigerator 50%, and washing machines 50%. Under SHARL, the consumer is made to pay for the cost of recycling his home appliances. Such

⁶⁰⁹ Came into force in April 2001.

⁶¹⁰ In 2008 an amendment to the law was approved by the Japanese cabinet to include crystal/plasma television sets and clothes dryers.

appliances are deposited with the retailer who is permitted by law to charge a fee for collection and onward transportation of the appliances to the manufacturer for recycling. The ‘old-for-new’ policy under SHARL obliges electronic retailers in Japan to take back old appliances from their customers each time a new one is sold. The old appliance could be a similar used appliance or another appliance that was sold in the past. The retailers along with other designated collective organizations are required to transport the appliances to regional consolidation centers set up by or on behalf of the manufacturer.

The manufacturers have individual responsibility under the law with regards to end-of-life management of the said appliances and in fulfillment of this obligation, Japanese manufacturers have established two recycling consortia known simply as Group A and Group B for end-of-life management of the collected appliances. The retailer collects and sends the waste appliances to the regional consolidation center of the appropriate group. While producers in Group A contract mainly with existing recyclers, producers in Group B chose to recycle their appliances by setting up a joint venture recycling plant with financial contributions from individual producers in the group. The advantage of the collective scheme in group B lies in the fact that since the processing facility is jointly owned by the producers, there will be a desire on their part to minimize processing cost. This could provide an incentive for them to design recyclable appliances. Further, the operation of the two models will give rise to competition between the two systems as well as R & D into cost effective recycling process. Hence the group that achieves lower processing cost will attract more producers.

It would be observed from the above discussion that SHARL does not apply to personal computers (PC). This is because Japan adopts a separate IPR recycling program for PCs. The program is operated by the Japanese Electronics and Information Technology Association

(JEITA). The processing for PCs is regulated by the revised Recycling Promotion Law (RPL) which establishes two financial structures for end-of-life management of used PCs. The RPL makes a distinction between computers purchased prior to 1st October, 2003 and thereafter. With regards to the former, the law imposes a processing fee ranging \$27 to \$37 which is paid at the time of disposal. Such fee will not apply to computers purchased after the said date as the processing fee for such computers are included in their cost price at the time of purchase. Japan Post is responsible for the collection of end-of-life computers and individuals wishing to discard their computers could do so by depositing them at any branch of the federal post office or make arrangement for pick up from their residence. Japan Post is also responsible for sorting of collected computers and subsequent transportation to recycling facilities operated by the various appliance manufacturers.

6.5.1.1 Results

Japan has about 44 million households disposing of 18 million units of waste electrical and electronic equipment regulated by SHARL. Before SHARL, 71% of these items were disposed of through untargeted disposal, mostly as waste.⁶¹¹ In 2006, five years after SHARL went into effect, the Japanese Home Appliances Manufacturers and the Association for Electric Home Appliances reported that the recycling rates for all the four categories of household appliances exceeded the minimum requirement specified in the SHARL for the fifth straight year.⁶¹² Approximately 11.62 million of these appliances were collected in 2005 at designated sites

⁶¹¹ DTI Global Watch Missions Report “Waste electrical and electronic equipment (WEEE): innovating novel recovery and recycling technologies in Japan (2005) <www.cfsd.org.uk/aede/downloads/JapaneseWEE.PDF>.

⁶¹² MOE “FY 2005 Home Appliance Recycling Results Published by Manufacturers” (May 26, 2006) available online <<http://www.env.go.jp/en/headline/headline.php?serial=85>>.

nationwide, while 11.63 million were brought to recycling plants or facilities operated by the home appliance manufactures. This represented a 3.6 percent and 3.8 percent increase respectively from the previous year. Further analyses of the statistics shows that of the household appliances that were delivered to the recycling facilities, 84 percent of the air conditioners, 77 percent of the television sets, 66 percent of the refrigerators and 75 percent of the washing machines were recycled. This is much higher than the statutory target of 60 percent, 55 percent, 50 percent and 50 percent respectively. It should be noted though that these statistics do not cover PCs which are managed under a different processing program.⁶¹³

The operation of the two consortia provides a degree of individual producer responsibility. It also creates a link between the producer and downstream management of its appliances thus providing an avenue for the producer to solicit and receive feedback from the recycler relating to the recycling of its products. The recyclers provide the manufacturers with product design related feedback from the recycling of their own products. Such feedback from recyclers encourages proposals for design improvements and enhances DfE. Some producers view the process as very much part of their R&D structure and a number of manufacturers test their equipment through the plant before it is released.⁶¹⁴

As has been noted earlier, one of the main problems associated with the implementation of IPR is the problem of orphan waste. Since the concept of IPR requires that producers are only responsible for their own products, someone would have to bear the cost for the end-of-life management of orphan products - products which for some reasons are not attributable to an identifiable or existing producer(s). To deal with this problem, SHARL provides for the

⁶¹³ Mandatory take-back for personal computers from households was introduced in Japan in 2003, and was based on individual producer responsibility.

⁶¹⁴ *Supra* note 611 at 23.

establishment of a ‘designated legal entity’ saddled with responsibility for the management of orphan products which was estimated at about 5 percent of the collected products.

6.5.1.2 Operation of individual producer responsibility under the framework

The operation of individual producer responsibility in the Japan EPR framework requires that retailers collect e-waste products returned to their facility as well as recycling fees (where applicable), sort collected appliances by brand name and pay recycling fees collected into the respective accounts of the producers. Though the collected fees may not adequately cover the actual recycling cost, the producer responsible will thereon bear the financial responsibility for the full cost of recycling the appliances by his contract recycler or by his consortium. While manufacturers in group A consortium are responsible under their contract with the recyclers for the cost of processing their products, producers in the group B consortium are equally financially responsible for the amount of their own product brand recycled under the joint venture.

The operation of SHARL which imposes individual responsibility provides tangible incentive for producers in Japan to design environmentally-friendly electrical and electronic equipment. Thus any efficiency that is achieved through improved product design could result in a reduced end of life management costs benefit to the producers. Tojo in her interview with some Japanese manufacturers reveals that they considered the anticipated regulatory requirement in SHARL in their product design. She noted that the introduction of SHARL brought about upstream changes in design in terms of reduction of hazardous substances, re-use and recycling.⁶¹⁵

⁶¹⁵ Tojo “Extended Producer Responsibility” *Supra* note 576.

6.5.2 *The Netherlands (1999 - 2003)*

As has been noted above, the WEEE Directive provides for the implementation of CPR and IPR. While the former applies to historical waste, the Directive makes the latter applicable to future waste. Unlike SHARL which applies to four categories of household appliances, the WEEE Directive embraces 10 categories of electrical and electronic equipment.⁶¹⁶ There are two different collection schemes for electrical and electronic equipment in the Netherlands. The ICT Milieu and NVMP are voluntary programs formed in 1999 to take back and recycle waste electrical and electronic equipment. The ICT Milieu collects ICT equipment falling within the category 8, 9, and 10 of the WEEE Directive including PCs, monitors, printers and laptops, while NVMP is responsible for the collection of refrigerators and electrical consumer products.

Between the period of 1999 to 2003, the operation of the ICT Milieu was based on the IPR framework whereby costs are allocated to members based on the quantity of their products on the waste stream returned for recycling. This cost is in addition to a fixed annual fee paid by the producers. The ICT Milieu utilizes the services of municipalities as well as retailers for the purpose of collecting discarded electrical and electronic equipment from consumers. The program also implements the ‘old for new’ policy though unlike the Japanese framework, there is no cost or fee imposed on the consumer. In addition to being liable for the financial responsibility related to their products, producers under the ICT Milieu are also financially responsible for the cost of recycling orphaned product as well as ‘free rider’ products. The latter cost is assigned to producers pro-rata based on their return share in the waste stream.

⁶¹⁶ See Annex 1A.

The high rate of orphan products generated under the ICT Milieu (initially as high as 48%) as well as the changing proportion of market shares of members from a historical perspective lead to the demise of the IPR scheme in 2003.⁶¹⁷ Manufacturers with significant levels of historic waste but limited current market share regarded the system as unfair and effectively a sort of retrospective tax. Thus a producer with a current lower market share (but a historical higher market share) may incur greater cost than other competitors even though his current market share is low. Van Rossem noted that the proportionate levy which such a producer must put on each current product sale will be higher than its competitors'. This will result in a higher levy per unit sale (if included as a separate item) or lower profit margins compared with other competitors.⁶¹⁸

WEEE collected under the ICT Milieu program is subject to full brand count and sorting. The cost associated with the sorting and counting proved too expensive and was not seen to be transparent.⁶¹⁹ Following the change in 2003, the EPR scheme came to be based upon a fixed annual fee together with a variable cost dependent upon a producer's/importer's current market share. Companies are thereon required to make a declaration of the total weight of equipment put on the market within the specified period of time by category of equipment as defined in the Dutch legislation.⁶²⁰ This brought an end to the IPR scheme in the Netherlands.

Available records show that in 2002, ICT Milieu collected and treated some 9.9 million-kg of ICT related waste. In 2009, a total of 22.4 million-kg of used ICT equipment was collected and recycled while in 2010 a total of 20.6 million kilograms of used ICT equipment was collected and recycled. This represents an 8 percent decrease and part of the reasons for the decrease has

⁶¹⁷ *Supra* note 581 at 216.

⁶¹⁸ Van Rossem, "Individual Producer Responsibility" *Supra* note 574 at 253.

⁶¹⁹ Future Energy Solutions, "Study into European WEEE Schemes", November 2003.

⁶²⁰ *Ibid* at 68.

been attributed to the 2009 economic recession and its aftermath in 2010. The vast majority of the equipment was collected via the municipal environment centers. The table below shows the quantity of ICT equipment collected and recycled by the ICT Milieu between 1999 and 2002:

ICT Milieu: Scheme Costs per Kg Collected				
Year	Tons collected	Scheme cost (Million €)	Cost per KG	Orphan Products (%)
1999	2850	1.5	0.54	48.1
2000	6840	3.4	0.51	43.9
2001	8550	4.3	0.51	36.8
2002	9875	4.8	0.48	35.0

The major criticism against the IPR scheme under the ICT milieu was the high rate of orphan waste generated. In 1999 when the ICT Milieu was introduced, there was a record 48.1 percent orphan waste generated and the last available record in 2002 when it was about to be discontinued shows the rate to stand at 35 percent. The recent record available after the discontinuance of the IPR (and hence commencement of CPR) showed that the level of orphan products dropped to about 10 to 20 percent - a figure that is also considered high.⁶²¹

6.5.3 Maine, USA

In 2004, the state of Maine adopted the first EPR law in the United State which requires manufacturers of televisions and computer monitors to ensure that their waste products generated

⁶²¹ Dempsey and McIntyre “Collective versus Individual Producer Responsibility” *Supra* note 587 at 230.

by households are collected and recycled at end-of-life. The IPR scheme adopted in Maine closely resembles that under ICT Milieu. The choice of the IPR model in Maine was prompted by the desire to enhance DfE in electrical and electronic equipment and this was evident in the legislative intent expressed in the EPR law. One of the objectives of the EPR law in Maine is to “*encourage the design of electronic products and components that are less toxic and more recyclable*”.⁶²² To achieve this purpose, the state adopted the IPR concept by imposing individual responsibility on manufacturers of specified electronic products sold in the state. The law states thus:

Each computer monitor manufacturer and each television manufacturer is individually responsible for handling and recycling all computer monitors and televisions that are produced by that manufacturer or by any business for which the manufacturer has assumed legal responsibility, that are generated as waste by households in this State and that are received at consolidation facilities in this State. In addition, each computer manufacturer is responsible for a pro rata share of orphan waste computer monitors and each television manufacturer is responsible for a pro rata share of orphan waste televisions generated as waste by households in this State and received at consolidation facilities in this State.⁶²³

The law thus relieved municipalities of the cost of recycling such waste by shifting the responsibility to the individual manufacturers. The scheme in Maine though is rather limited. It basically covers recycling of e-waste generated by households. Hence it has been referred to as a household e-waste recycling system. More so, the law relates only to computer monitors and television sets.

⁶²² Maine State Legislature, Statute Title 38, Chapter 16: Sale of Consumer Products Affecting the Environment, Article 1.

⁶²³ *Ibid* section D1.

The municipal authorities are saddled with the responsibility for the collection of the affected products after which they are transferred to approved consolidators. Each consolidator thereon records the collected waste by type, brand, and weight. The next step taken by a consolidator is determined by the manufacturer and could include any of the following:

1. The manufacturer could arrange to pick up its branded waste from the consolidator for shipment to its preferred recycler. The consolidator thereon bills it for handling and administrative cost including its applicable share of costs for orphan waste.
2. The manufacturer could arrange to pickup a representative quantity of mixed waste (not necessarily his branded waste product) for shipment to its preferred recyclers and is billed by the consolidator for handling and administrative costs including costs relating to its share of orphan waste.
3. The manufacturer could permit the consolidator to send its share of the waste product to a recycler chosen by the consolidator and thereafter bill the manufacturer for the handling, transportation and recycling costs including cost related to its share of orphan products.

Although Maine operates an IPR model, the cost for e-waste management in Maine is to some extent shared between the municipalities and the manufacturers. While the municipalities bear the costs for e-waste collection from households, the manufacturers bear financial responsibility for the processing of the e-waste. The Department of Environmental Protection (DEP) is responsible for the implementation of Maine's e-waste program. Its major responsibilities include encouraging and evaluating compliance of manufacturers, consolidators, retailers and collection sites, and to conduct enforcement when necessary; conducting field visits to ensure compliance by consolidators and recyclers.

To reduce the level of free riding and orphan products, DEP examines electronic products offered for sale by retailers to ensure that they sell only electronic products registered to manufacturers that are in compliance with the state's e-waste law. DEP also provides the retailers of electronic products with online access to check the compliance status of manufacturers.

6.5.3.1 Result

E-waste recycling in Maine is measured in terms of pounds per capita annually. Based on available data, the state's e-waste recycling program attained a recycling rate of 3.20 pounds per capita in 2006, 3.61 in 2007, 4.06 in 2008, and 6.19 pounds per capita in first 6 months of 2009.⁶²⁴ The result above reflects the limited scope of products covered under Maine's E-waste law. Hence there is need for the legislature to consider extending the scope of the program to include other electronic devices not currently covered by the law as well as electronic products discarded by small and medium enterprise (SME). With regards to orphan waste, the level under Maine's scheme was estimated at 4.8%. This contrasts with the significant volume of orphan waste recorded in the ICT Milieu program. The low level of orphan waste generated under the Maine scheme is attributable to two factors: the first is the limited scope of the program as noted above and the second is the presence of a regulatory framework which restrains retailers from the sale of electronic products from manufacturers not compliant with the Maine's e-waste law thus limiting the possibility of free riding under the system.

⁶²⁴ It has also been reported that in addition to computer and television monitors (the processing of which is mandated by the state's law), consolidators also pick up and recycle computer CPUs apparently because of their commodity value. However, the latter is not reported since it is outside the scope of the e-waste law in Maine. DEP: Report on Maine's Household E-waste Recycling Program (2010).

6.6 Comparative Analyses

One common trend that runs through the various IPR regimes discussed above is the fact that they all sought to effect upstream change in product design by imposing physical and financial responsibilities on the producers for their downstream management. There are noticeable differences though in the methods adopted by the various jurisdictions in effecting this change. While under the Japanese IPR regime, the consumer is to some extent financially responsible for the costs of end-of-life management of the product; this responsibility is clearly absent under the ICT Milieu and State of Maine's IPR frameworks, although it could be inferred in the latter case that such cost might have been passed on to the consumer through the purchase price of the product. The scope of products covered under Maine's framework seems to be much more restrictive than the others. Although the scope of products covered under the Japanese framework is considerably narrower than that under the EU WEEE Directive, its rate of collection is somewhat closer to the WEEE Directive's target of 4kg/capita/year.⁶²⁵

While the EU framework applies IPR to future waste, this is not the case in Japan or Maine. The provision in Japan's Recycling Promotion Law (RPL) established two financial structures for end-of-life management of PCs purchased prior to 1st October, 2003 and thereafter.

There is a high sense of apprehension among policy makers that IPR would lead to high level of orphan waste generation, but the results from the data above seem to point to the contrary. Although orphan waste under the ICT Milieu IPR program constituted about 35% of recycled

⁶²⁵ This excludes computers and peripherals which are managed under another system.

products,⁶²⁶ this is considerably high when compared to 4.8 percent under the Maine IPR scheme and 5 percent under the Japanese IPR scheme. Hence one key lesson from the Maine framework which should be of interest to policy makers is the fact that best practice in terms of regulating orphan waste in an IPR regime should take the form of mandating manufacturers' registration and compliance with regulations relating to end-of-life management of their products coupled with rules restricting or banning the sale of products by manufacturers not compliant with the regulation.

One significant observation from the various frameworks considered above is the emphasis on collection and recycling of discarded products. There is clearly an absence of adequate initiative to encourage re-use of discarded products. Recycling re-usable electrical and electronic equipment is not an environmentally efficient waste management strategy even if the producers are effectively made to bear the costs. In this regards, this research faults regulations which seeks to set recycling quota for e-waste without adequate provisions relating to the reusable part of the waste stock.

Rather than simply concentrating on recycling collected waste products, there is need for regulatory frameworks to incorporate provisions requiring collectors or consolidators to sort out functional and repairable discarded products. Refurbishment, repair and reuse of EEE should be encouraged whenever appropriate from the human health and environmental perspective. Hence there is need to put in place a framework to encourage re-use of products either locally or permit their exportation for reuse abroad. In the latter case, the export regulation should require a test report for each piece of electrical and electronic product, a declaration that they are not junk e-

⁶²⁶ Under the ICT Milieu CPR program it was between 10 - 20 percent.

waste, appropriate protection to prevent physical damage during transportation, as well as reference to third party certification.

6.7 Conclusion

The development of a sustainable framework for end-of-life management of electrical and electronic equipment is of urgent concern in view of increasing piles of e-waste that are currently being generated in industrialized nations, as well as the health and environmental impacts from the design of such products. This chapter has endeavoured to provide an in-depth theoretical and practical analysis of various frameworks that could be used to address these impacts, including the toxics reduction framework, recycling framework, and the reuse framework. These frameworks are useful in reducing the level of e-waste generation, the health and environmental hazards associated with e-waste as well as ensuring conservation of scarce natural resources.

The Chapter also examined the theoretical and practical aspects of the concept of extended producer responsibility (EPR). EPR was identified as a very important policy tool for implementing the frameworks relating to toxic reduction, reuse, and recycling because of its ability to stimulate upstream change in product design by imposing obligations for downstream management of electrical and electronic equipment. The Chapter also examined the twin pillars of EPR viz: collective producer responsibility (CPR) and individual producer responsibility (IPR), and identified IPR as a more effective tool in effecting upstream change leading to design of environmentally-friendly products.

A consideration of the EPR regime here is of importance in relation to the transboundary movement of e-waste to developing countries. An effective framework for management of e-

waste in developed countries will contribute towards reduction in illegal transboundary dumping of e-waste in developing countries.

Suffice it to state that although EPR seems to be the an effective framework for management of waste electrical and electronic equipment, it should be noted that it is much easier to implement the concept of EPR in developed countries as opposed to developing countries. This is because the former is characterized by availability of data relating to manufacture and sale of electrical and electronic equipment as well as strict enforcement of rules relating to manufacture, sale and end-of-life management of such products. However, this is not the case in developing countries that are currently being flooded with e-waste and near end-of-life electrical and electronic equipment. Most of the producers of this electrical and electronic equipment have little or no physical presence in these developing countries. Hence the imposition of financial responsibility for the end of life management of these products on producers who are off-shore may only give rise to legal difficulties in terms of enforcement.⁶²⁷

In addition, most industrialized countries are characterized by a few large-scale electrical and electronic equipment retailers while the developing countries are characterized by a multitude of small-scale electrical and electronic equipment retailers. As has been noted from the analysis of Maine's EPR law above, effective implementation of IPR would require banning or restriction of sales of products not compliant with registration requirement. Such a restriction is more difficult

⁶²⁷ It suffices to state here that while some laws in developed countries such as the Alien Tort Statute (ATS) in the United States permits the district courts to hear any civil action brought by an alien for a tort committed outside the United States e.g. environmental torts committed in developing countries, environmental tort or harm alone will not suffice for litigation under the ATS. Unless the environmental harms overlap with a human right abuse, such environmental harm or tort alone may not form the basis of an action in ATS. Even in such a case, the primary cause of action will be the human right abuse and not the environmental harm. See *Amlon Metals, Inc v. FMC Corp*, 775 F. Supp. 668 (S.D.N.Y. 1991); *Beanal v. Freeport-McMoran, Inc (Beanal I)*, 969 F. Supp. 362 (E.D. La. 1997), *aff'd*, 197 F.3d. 161 (5th Cir. 1999).

to enforce where the retailers are small-scale and large in number as opposed to industrialized countries where they are large-scaled and small in number. In this vein, a big question that comes up for further research is: how do we develop an EPR framework that suits the peculiar circumstances and situation in the developing world? This is an aspect of e-waste management which is not considered in this research and hence merits further research.

CONCLUSION

This research has provided an in depth analysis of the socio-economic benefits as well as the public health and environmental impacts associated with international trade in used electrical and electronic equipment in developing countries. The field research for this thesis revealed that international trade in UEEE provide a veritable means for individuals, households and small businesses in developing countries to acquire UEEE at affordable cost thus enhancing savings as well as fostering access to the myriads of benefits arising from the ICT revolution. It also noted the growing influx of e-waste into developing countries in the guise of international trade in UEEE along with the unsustainable pattern of e-waste management in the region.

The transboundary movement of e-waste is a trans-national activity that can be regulated through an international framework in the form of an international treaty. However, an examination in this research of the existing international frameworks relating to the transboundary movement of hazardous waste such as the *Basel Convention* reveal the difficulties in the application of such frameworks in dealing with the problems associated with transboundary movement of e-waste. Such difficulties include the reuse exception under the *Basel Convention*, as well as the status of the Convention in developed countries like United States and Canada. Specifically, the problem with the reuse exception is also evident even in the European Community where export of e-waste is currently prohibited.

The major challenge before policy makers in both developed and developing countries lies on the need to develop a policy framework that would assist developing countries achieve sustainable development by enhancing the socio-economic benefits arising from international trade in UEEE while at same time minimizing the public health and environmental hazards arising from it. To this end, this research has made a case for two distinct frameworks.

The research proposed the development of an international certification system including the use of third party certification marks or label on functional UEEE. The use of such certification mark will serve to differentiate functional UEEE being shipped to developing countries for reuse from junk e-waste transported for dumping and thus prevent the abuse of the reuse exemption that currently exists under the *Basel Convention* framework as well as the EU and OECD frameworks. The research also proposed a ban on commercial importation of UEEE not complying with the requirement under the proposed certification system. This trade framework was analyzed in the light on WTO trade rules and it was submitted that the framework does not contravene WTO rules relating to trade liberalization.

The second framework proposed by the thesis relates to the design of electrical and electronic equipment. The design stage is of important concern in e-waste management because it is the most effective stage to reduce or eliminate the adverse health and environmental impacts associated with electronic products. To this end, the thesis proposed a design framework which incorporated the concept of design for the environment (DfE). It was the argument of the thesis that the concept of extended producer responsibility (EPR) could be used to effect design change on electronic products by shifting the burden of end-of-life management of e-waste to the original producers.

Reduction or elimination of hazardous substances in electrical and electronic products is of important concern to developing countries in that when these products are eventually shipped to the region at their end of life (in the developed world) either (legally) as UEEE or (illegally) as e-waste, their adverse health and environmental impacts would be considerably lower.

It is not the argument of this thesis that the frameworks proposed herein will completely resolve all problems relating to the transboundary movement of e-waste to developing countries nor their management therein. However, these proposals, it is argued, will strengthen the existing framework by helping to amend the loopholes in the existing framework that has sustained the transboundary dumping of junk e-waste in developing countries.

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APPENDIX: ETHICS APPROVAL

File Number: 05-12-07

Date (mm/dd/yyyy): 07/04/2012



Université d'Ottawa
Bureau d'éthique et d'intégrité de la recherche

University of Ottawa
Office of Research Ethics and Integrity

Ethics Approval Notice Social Science and Humanities REB

Principal Investigator / Supervisor / Co-investigator(s) / Student(s)

<u>First Name</u>	<u>Last Name</u>	<u>Affiliation</u>	<u>Role</u>
Gideon	Christian	Law / Law	Principal Investigator
Amir	Attaran	Law / Law	Supervisor

File Number: 05-12-07

Type of Project: PhD Thesis

Title: Framework for Regulating Health and Environmental Impact of Transboundary Movement E-waste to Ghana

Approval Date (mm/dd/yyyy)	Expiry Date (mm/dd/yyyy)	Approval Type
07/04/2012	07/03/2013	Ia

(Ia: Approval, Ib: Approval for initial stage only)

Special Conditions / Comments:
N/A