Sustainable Development and the Challenge of E-Waste in Sri Lanka

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***Abstract*— *Sustainable Development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. However, loosely discarded, surplus, obsolete, broken, electrical and electronic equipment which are called e-waste have become a huge challenge in achieving sustainable development in the modern world endangering public health and the environment, due the release of harmful and toxic substances contained therein. This research addresses the problem whether the legal system of Sri Lanka has adequately responded to the challenge of e-waste management in order to uphold the concept of sustainable development in the country. Data collection was done through literature survey and interviews with government authorities, company officials and experts on the subject. For comparative purposes, legal developments in India were taken into account. It was found out that Sri Lanka has taken efforts to address the issue through introduction of regulations on disposal of hazardous waste, in keeping with the obligations under the Basel convention. National policy on e-waste management is still at the draft stage and the legal framework needs much improvement in comparison to the developments that have taken place in other jurisdictions. Introduction of regulations that specifically deals with the issues pertaining to e-waste with provisions on responsibilities of various stakeholders such as producers, dealers, collection centers, recyclers and consumers, introducing the concept of Extended Producer Responsibility making the manufacturers liable for safe disposal of electronic goods, promoting the import of electronic equipments with less hazardous materials, streamlining e-waste recycling and collection system through legal means, enhancing public awareness on e-waste management and promoting research and development activities are the major recommendations to be made to meet the challenge e-waste management in upholding the concept of sustainable development in Sri Lanka.*

Keywords*— *Electronic Waste, Sustainable Development, Environment

I. INTRODUCTION

The concept of sustainable development emphasizes the importance of preserving the environment and its riches in the process of development. The Brundtland Commission Report (1987) defines sustainable development as:

> *"the development that meets the needs of the present without compromising the ability of future generations to meet their own needs".*

Development of technology and the globalization of the economy have made a whole range of electronic and electrical equipments making them an integral part of our daily lives providing us with more comfort, security, ease and faster acquisition and exchange of information. However, the unrestrained consumption, increasing demand and the rapid obsolescence in the electronic and electrical equipments due to technological updates have resulted in the generation of one of the fastest growing waste streams in the world called "e-waste", which can be broadly defined as loosely discarded, surplus, obsolete, broken, electrical or electronic equipment (Samarakoon 2014).

The rapid generation of e-waste has become a huge challenge in achieving the goals of sustainable development in the developed as well as developing countries like Sri Lanka and India. E-waste consists of all waste from electronic and electrical appliances which have reached their end- of- life period or are no longer fit for their original intended use and are destined for recovery, recycling or disposal and includes computers and their accessories, mobile phones and chargers, remotes, compact discs, headphones, batteries, TVs, air conditioners, refrigerators and other household appliances (Central Environmental Authority, 2010). Solving the E-Waste Problem (StEP) Initiative (2014), reported that the world e-waste generation in 2014 was 41.8 metric kilotonnes and predicted that it will swell by a third in the next five years, led by the United States and China.

Improvement of the electrical and electronic industry is essential for the development of the mankind. However the concept of sustainable development emphasises the balance between the technological improvements,

environmental sustainability and the interest of the present and future generations. The damage caused by e-waste on the human health and environment has become a challenge towards maintaining this balance. This study seeks to addresses the problem whether the legal system of Sri Lanka has adequately responded to the challenge of e-waste management in order to uphold the concept of sustainable development in the country. Data collection was done through literature survey and interviews with government authorities, company officials and experts on the subject. For comparative purposes, legal developments in India were taken into account.

II. WHY E-WASTE IS A CHALLENGE?

The Greenpeace Organization (2013) says that the estimated amount of e-waste generated on the planet every year put into containers on a train would go at least once around the world**.** E-waste consists of non-hazardous materials such as iron, aluminium, plastics and glass as well as hazardous materials. It is because of these hazardous materials E-waste has become a challenge which undermines the objectives embedded in the concept of sustainable development due to its possible dangerous environmental and health impacts. E-Waste is more hazardous than many other municipal wastes because electronic gadgets can contain thousands of components made of potentially harmful chemicals such as lead, cadmium, chromium, mercury, beryllium, antimony, polyvinyl chlorides (PVC), brominated flame retardants, and phthalates (Sinha 2007).

When e-waste is loosely discharged and dumped in open yards, these hazardous substances are released to the environment and lead, brominated dioxin, beryllium cadmium, and mercury and other toxic metals are leached into the ground water and gets contaminated and toxic. They get deposited in rivers and other water sources through rain and acidify soil, fish and flora (Sangal P, 2010). Open burning of e-waste releases harmful gasses and substances like brominated dioxins, heavy metals and hydrocarbons into air. Long term exposure to these toxic compounds affects the nervous system, kidneys, bones, and reproductive and endocrine systems (Kumar and Jain 2014).

The need to face the challenge of e-waste is special to developing nations such as Sri Lanka and India because developing countries often become e-waste dump yards of the developed industrial countries. The consumers of the developing nations are unable to purchase electrical and electronic equipments with latest technology and they tend to buy second hand products which become e-waste in few years. Also e- waste has a growing market value where it is exported mainly to developing countries to extract valuable substances such as copper, iron, silicon, nickel and gold as an industry. Therefore many legal measures have already been adopted nationally as well as internationally to address the issue of e-waste.

III. INTERNATIONAL LAW ON THE SUBJECT

E-waste contains constituents which fall under the category of 'hazardous waste' and there exist a number of international instruments on the subject which can be listed as follows:

A. Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal - 1989

The Convention aims at protecting human health and the environment against the adverse effects of hazardous wastes. It seeks to:

(i) reduce hazardous waste generation and promote environmentally sound management of hazardous wastes,

(ii) the restriction of transboundary movements of hazardous wastes except where it is perceived to be in accordance with the principles of environmentally sound management system; and

(iii) a regulatory system applying to cases where transboundary movements are permissible. (Widmer R. et al.2005)

The Convention covers a wide range of wastes defined as "hazardous wastes" based on their character and composition under Article I and Annexes I, III, VII and IX. Waste electronic and electrical equipments such as mobile phones, Polychlorinated Biphenyls (PCBs) and compounds used in industry as heat exchange fluids, in electric transformers and capacitors containing hazardous wastes as defined in the convention are among the wastes regulated by the Basel Convention.

Article 11 of the Basel convention encourages the parties to enter into bilateral, multilateral and regional agreements on hazardous waste to help achieve the objectives of the convention

B. Bamako Convention 1998

Many African nations felt that Basel Convention was not successful in prohibiting movement of hazardous waste to Africa (Koko case in Nigeria, Probo Koala case in Ivory Coast) and accordingly Bamako convention came into force with much stronger prohibition of imports of hazardous waste. It does not make exceptions on certain hazardous wastes (Eg. radioactive materials) made by the Basel convention.

C. Waigani Convention 1995

The Convention seeks to prevent the import of hazardous and radioactive waste into the South Pacific region while minimising production within the region and ensuring the environmentally sound management and disposal of already existing waste. It covers a broad range of hazardous wastes but excludes those derived from the normal operations of a vessel and some radioactive wastes.

D. Rotterdam Convention 2004

The convention promotes obtaining and disseminating information through prior informed consent procedure so that decisions can be made by importing countries as to whether they wish to receive future shipments of certain chemicals. It promotes shared responsibility between countries to protecting human health and the environment from the harmful effects of such chemicals.

E. Waste Electrical and Electronic Equipment (WEEE) Directive of the European Union No. 2012/19/EU

The Directive lays down a comprehensive legal framework on waste from electrical and electronic equipment (WEEE) within the European Union. According to Article 1, the directive lays down measures to protect the environment and human health by preventing or reducing the adverse impacts of the generation and management of WEEE thereby contributing to sustainable development. Article 4 requires the producer to design the products in such a way that will facilitate dismantling and recovery while Article 5 imposes the obligation to collect waste electrical and electronic equipment at its end of life. It emphasises that 'best available treatment' must be used when treatment of the WEEE done in the recycling and disposal process.

F. Restriction of Hazardous Substances (RoHS) Directive 2011/65/EU

This Directive lays down rules on the restriction of the use of hazardous substances in WEEE with a view to contributing to the protection of human health and the environment, including the environmentally sound recovery and disposal of WEEE (Article 1)

The Directive requires the substitution of various heavy metals, namely lead, mercury, cadmium, hexavalant chromium and brominated flame retardants like poly-brominated biphenyls or poly-brominated diphenyl ethers in new electrical and electronic equipment in order to prevent the generation of WEEE.

IV. E-WASTE IN INDIA

Article 48A of the Constitution of India 1949 makes the state responsible to protect and improve the environment and to safeguard the forests and wild life of the country. The United Nations (2015) reported that India is the fifth biggest producer of e-waste in the world, discarding 1.7 million tonnes of electronic and electrical equipment in 2014. Jog (2008) states that there are 10 states that contribute to 70 per cent of the total-waste generated in India, and Maharashtra ranks first followed by Tamil Nadu, Andhra Pradesh, Uttar Pradesh, West Bengal, Delhi, Karnataka, Gujarat, Madhya Pradesh and Punjab among the top e-waste generating states. The main sources of electronic waste in India are the government, public and private (industrial) sectors, which account for almost 70 per cent of total waste generation and the contribution of individual households is relatively small at about 15 per cent (Sinha 2007). Indian Market Research Bureau survey of 'E-waste generation at Source' (2009) found that out of the total e-waste volume in India, televisions and desktops including servers comprised 68 per cent and 27 per cent respectively. Mobile phones comprised of 2 per cent of the e-waste.

India is one of the largest waste importing countries in the world. All types of wastes are imported into the country, in the form of cheap raw materials including hazardous and toxic wastes. Customs Department reveal It generates about 3, 50,000 tonnes of electronic waste every year and imports another 50,000 tonnes (Sangal 2010). A study conducted by the Research Unit of Rajya Sabha Secretariat (2011) revealed that so far, India has been the destination of the hazardous and industrial wastes like mercury, electronic and plastic wastes from the United States; asbestos from Canada; defective steel and tin plates from the European Union, Australia and the United States. These wastes contain toxic components which are damaging to the public health and environment.

Accordingly e-waste has become a huge challenge to India and the Indian government has taken steps to introduce number of legal measures that deal with the subject which can be listed as follows:

A. E-waste (Management and Handling) Rules, 2011

These rules can be viewed as a progressive step in the battle against e-waste and lays down a comprehensive legal mechanism in relation to proper control and management of e-waste.

Rule 3 defines E-waste as "waste electrical and electronic equipments whole or in part or rejects from their manufacturing and repair process which are intended to be discarded". It makes the producers of the electrical and electronic equipment responsible for the collection

of e-waste generated during the manufacturing process and to channel them for recycling or disposal.

Introduction of the concept of extended producer liability is very important and It imposes the responsibility of e-waste management not only on individual consumers but also bulk consumers such as government and commercial institutions (Rule 6). It also makes responsible dismantler, recyclers and collection centres as well (Rules 7 and 8).

State Pollution Control Board is the responsible government authority on the subject and It establishes an authorising mechanism on e-waste to ensure that the collection and recycling process in done in a legal manner. To address the issue of health and environmental impact created by careless storage of e-waste, it introduces a procedure for the storage of e-waste.

Recycling and controlling the existing e-waste is not an adequate solution to meet the challenge of e-waste. There needs to be a mechanism to reduce the use of hazardous substances in the manufacture of EEE. This need has been catered under rule 13. Additionally Rules 12, 16 and 17 deals with storage, transportation and reporting of accidents while transportation of e-waste respectively. Schedule I deals with the categories of EEE covered under these rule and includes information technology and communication equipment and consumer electricals and electronics.

B. The Hazardous Waste (Management and Handling) Rules, 1989 as amended in 2003

These rules were introduced under the Environmental Protection Act, No. 29 of 1986. Under Schedule 3, E-waste is defined as "Waste Electrical and Electronic Equipment including all components, sub-assemblies and their fractions except batteries. Schedule 1, 2 and 3 are relevant to certain hazardous components of e-waste. Electrical and electronic scraps as a hazardous waste are covered under Sl.No. A 1180 in List A and Sl.No. B 1110 in List B. Wastes under List A are not allowed to be imported into the country without the Director General of Foreign Trade licence(Rule 12).

A. *The Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2008*

These rules prohibit transboundary movement of hazardous waste parallel to the Basel Convention, to which India is a signatory (Johri R., 2008). Accordingly, every person desirous of recycling or reprocessing hazardous waste including electronics and electrical waste is required to register with the Central Pollution Control Board (CPCB). The waste can be sent or sold only to a registered or authorized re-cycler or re-processor or re-user having environmentally sound facilities satisfied by the CPCB. The Ministry of Environment and Forests is authorized to grant permission for the movement of hazardous wastes through any part of India. The rules categorises hazardous waste imported to India into 3 categories namely substances that can be imported with prior approval, free imports under Open General Licence and substances which are prohibited for importing into the country.

C. Guidelines for Environmentally Sound Management of E-waste, 2008

This provides guidance for the identification of various sources of e-waste and the approach and methodology for handling and disposal of e-waste in an environmentally sound manner. These Guidelines apply to all those who handle e-waste including generators, collectors, transporters, dismantlers, recyclers and stakeholders of e-wastes irrespective of their scale of operation. The guidelines include:

(i) details such as e-waste composition and recycle potential;
(ii) identification of possible hazardous contents in e-waste;
(iii) the recycle, re-use and recovery options, treatment and disposal options and
(iv) the environmentally sound e-waste treatment technologies.

Most importunately the guidelines emphasises on the concept of Extended Producer Responsibility as well.

D. Draft Electronic Waste (Handling and Disposal) Bill, 2013

The objective of this draft law is to provide for proper handling and disposal of electronic waste generated by discarded electronic devices by prescribing norms and fixing responsibilities and duties on manufacturers, re-cyclers and consumers with regard to disposal of electronic waste. It defines "e-waste as waste generated from discarded television, personal computer, floppy, audio-video CD, battery, cell phone, refrigerator, air conditioner, electronic toys, telephone, washing machine, electronic switch and such other products (Clause 2 (d)).

Clause 4 places the responsibility of ensuring that all the electronic waste generated within its territorial jurisdiction is handled and disposed of by the state governments in accordance with compliance criteria and procedure which shall be prescribed under the Bill. Clause 5 states that it shall be the duty of every

manufacturer, to ensure that every electronic product offered for sale in the market contains—

(i) the procedure for its handling and disposal;
(ii) the information about the parts which can be re-cycled and which cannot be re-cycled;
(ii) to set-up adequate number of collection centres for the hazardous electronic waste; and
(v) To create public awareness through advertisements, publications and other electronic media about the hazardous substances in their products which may cause ill effects on human body.

The Bill also seeks to introduce penal provisions and accordingly whoever violates the provisions of this Act or the rules made thereunder shall be punished with imprisonment for a term which may extend to one year and with fine which may extend to five hundred thousand rupees (clause 8).

V. SRI LANKAN EXPERIANCE OF E-WASTE

Sri Lanka acquired an economic growth rate of 7.3 per cent in 2013 (Central Bank of Sri Lanka, 2014) and it was largely owing to the growth of exports and investments. Telecommunication and information technology industry was increasingly developed and as a result computers and their accessories and mobile phones flooded into the country. With the growth of the economy, consumer needs increased and a large demand for electrical and electronic products for household use and for commercial and industrial use was developed (Rodrigi C. 2013). As a consequence generation of e-waste also increased at an alarming rate in the country.

The sources of e-waste generation in Sri Lanka is either household, industrial or commercial. A study conducted by the Basel Secretariat of Sri Lanka in collaboration with the government of Japan (2007) identified nine major types of e-waste in Sri Lanka. Accordingly, computers and their accessories form a large portion of e-waste in Sri Lanka. Mobile phones also form of large portion of e-waste. The study revealed that current market size of mobile phones in Sri Lanka is 1.0-1.2 million per annum and due to the estimated short life span of a mobile phone it ends up as e-waste within few years.

New technology makes the day today life easier and accordingly the demand for household electronic equipments increased during the past 20 years of Sri Lanka. Accordingly, televisions, washing machines and refrigerators which are at the end of their life span also contributes to the growth of e-waste in Sri Lanka (Bandara 2014). Apart from these air conditioners, photocopy machines and batteries from commercial and industrial entities also end their life as e-waste. Accordingly e-waste has become a huge challenge for Sri Lanka endangering the environment and the public health.

A. Impact of International law

Sri Lanka as a member of the United Nations Organization, is bound by the principals of sustainable development embedded in the in the Rio Declaration (1992) and Stockholm Declarations (1972). Accordingly the concept of sustainable development have been recognised and applied in a number of Sri Lankan Judgements such as *Bulankulama v Sec. of Minnistry of Lands and Wijebanda v Conservator General of Forests.* In the judgement of *Bulankulama v Sec. of Minnistry of Lands,* while giving reference to the principles of the above declarations, It was held that,

> *"Human beings are at the centre of concerns for sustainable development. They are entitled to a healthy and productive life in harmony with nature. (Principle 1, Rio de Janeiro Declaration). In order to achieve sustainable development, environmental protection shall constitute an integral part of the development process and cannot be considered in isolation from it."*

Furthermore, Sri Lanka ratified the Basel Convention in.1992 and accordingly bound by the obligations under the convention. Implementation of the National obligations on import, export and transit of waste listed in the Basel Convention is carried out by the Central Environmental Authority (CEA) as the national competent authority for the convention. According to the **a**pproval procedure of CEA for importation of hazardous waste, the importation of List A waste of the Basel convention is not allowed as Sri Lanka does not have disposal facilities. A proposal needs to be submitted by the Importer to the CEA .for the importation of List B waste which will be evaluated by a Technical Evaluation Committee of CEA. The Ports Authority and the Sri Lanka Customs are also informed of the decision taken. However, importation of post consumer waste to Sri Lanka and establishment of new recycling industry based on any imported waste/ recycled material is prohibited

B. Domestic Legal Framework

Sri Lankan Constitution of 1978 does not recognise an explicit right to a clean environment as in the Constitution of India. However, the Directive Principle of State Policy places an obligation on the state to "protect, preserve and improve the environment for the benefit of the community" (Article 27(14)). Also under fundamental duties, it states that every person in Sri Lanka has a duty "protect nature and conserve its riches" (Article 28(f)).

National Environmental Act, No. 47 of 1980 as amended by Act, No. 56 of 1998 is the principal piece of legislation that deals with the protection of environment. Section 23 A of the Act states that no person shall discharge, deposit, or emit waste into the environment without a license obtained under section 23 B. Accordingly National Environmental (Protection and Quality) Regulations, No. 1 of 2008 was introduced under section 32 read with Section 23A and 23 B of the Act which established a mechanism to regulate "scheduled waste" in keeping with the obligations under the Basel Convention..

1) National Environmental (Protection and Quality) Regulations, No. 1 of 2008

Regulation No. 13 states that no person shall generate collect, transport, store, recover, recycle or dispose waste or establish any site or facility for the disposal of any waste specified in the Schedule VIII (herein after referred to as "scheduled waste") except under the authority of a license issued by the Authority and in accordance with such standards and other criteria as may be specified by the Authority.

Schedule VII identifies Waste Electrical and Electronic Equipments (N 301 Discarded Computers and accessories and N 302 Discarded Mobile phones) as scheduled waste. Electrical equipment or parts, Mercury wastes containing metallic mercury from manufacturing of fluorescent lamps, discarded or off specification batteries containing lead, mercury, nickel, cadmium, lithium and Electrolyte from batteries and accumulators also falls under this category. Accordingly, regulations place the duties on a holder of a license to maintain records and send annual return to CEA in relation to the scheduled waste managed by the license holder. Additionally, scheduled waste sites of generation or storage, vehicle used for transportation, containers or tanks used for collection and storage and disposal site needs to display , the statement "Warning, contains waste, Dangerous to human, health and the environment"(Regulation31).

2) Draft Electrical and Electronic Waste Management Policy in Sri Lanka

The objective of the policy is to:

(i) Prevent or minimize negative impacts to the environmental and health of the people due to haphazard use of e-products and disposal of e-waste.
(ii) Promote integrated e-waste management by looking at all phases of the life cycle of the product and taking action where it is most effective.
(iii) Secure Social Responsibility towards sustainable production and consumption of e-products.

Accordingly the policy seeks to prohibited/restricted imports and exports of E waste while minimising of e-waste generated in the country. It recognizes the importance of controlling the import of usable used electrical and electronic equipment, practicing Extended Producer Responsibility to facilitate life cycle management, regularising waste collection, disposal, capacity building and awareness raising, institutional mechanism and coordination, monitoring, evaluation and reporting and strengthening the legal framework on E-waste. However, this policy is still at the draft stage.

V. RECOMMENDATIONS

Based on the findings discussed above, it is suggested that the following recommendations to be made for the purpose of facing the challenge of e-waste management in keeping with the principal of sustainable development in Sri Lanka.

(1) Introduction of a proper law on e-waste management.

Since e-waste is a special type of waste containing hazardous impacts which needs special attention, the existing National Environmental (Protection and Quality) Regulations, No. 1 of 2008 seems not adequate. It covers only a restricted number of items (computer accessories and mobile phones) as e-waste. Therefore a regulation can be introduced under section 32 read with sections 22A and 23B of the NEA on the subject of E-waste management as in the Indian context. E Waste needs to be clearly defined and the definition provided in the European Union directive No. 2012/19/EU can be used as a guideline. The regulation should cover the following areas:

(i) All the stakeholders (manufacturers, consumers, producers, importers, exporters, distributors, retailers, collectors, transporters, storers, recyclers and disposers) must be made responsible for proper management and handling of e-waste.
(ii) Definition for a consumer must include both individual consumers as well as bulk consumers such as private, state and industrial entities as in the Indian context.
(iii) Extended producer liability needs to be introduced to make the manufacturers responsible to take back and recycle the products at its end life stage.
(iv) Provisions relating to transport, storage, accident reporting, public warning instructions and safety of the employees of the recycling centres must be covered.

(v) Compliance, reporting and continue monitoring of the responsibilities of the stakeholders.

Apart from this the following recommendations are also suggested:

(2) Promoting the manufacture and import of electronic equipment with less hazardous materials.
(3) Streamlining e-waste recycling and collection system through legal means.
(4) Enhancing public awareness on e-waste management.
(5) Encouragement of manufacturers to be complied with the extended producer liability and the green production strategies through granting tax incentives, concessionary loan facilities for hazardous free green technology.
(6) Promoting research and development activities on productions free of hazardous materials and on safe e-waste recycling technology.

VII. CONCLUSION

While electrical and electronic equipments make our lives comfortable and easy-going, they have become a nuisance to the public health and environment at their end life point. Responding the challenge of proper management and control of e-waste is very important and introduction of a proper legal mechanism on e-waste plays a major role in this process. Therefore, the recommendations made in this study would assist to meet the challenge of e-waste management in upholding the concept of sustainable development in Sri Lanka.

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