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Policy & legislative developments of e-waste management in Asia

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Abstract

This paper examines the policy and legislative developments of electronic waste (e-waste) management in Asia. E-waste is a rapidly growing waste stream in the world today. Internationally, e-waste is estimated to be growing at 3-5% per annum or approximately three times faster than any other individual waste stream. Fast paced development of information technology and the introduction of novel designs in the electronic sector have inadvertently resulted in the obsolescence of electronic products and the generation of e-waste. Furthermore, there are concerns that e-waste generated in developed countries are ending up in developing countries especially in Asia resulting in adverse environmental and health impacts from improper management of e-waste. Consequently, a number of countries in Asia have developed or are in the process of developing policy and legislative instruments to ensure the proper management of e-waste. These include the development of e-waste regulatory frameworks, data and inventories, and infrastructure & capacity building. These trends indicate a positive development path towards sustainable e-waste management in Asia. Nevertheless, potential limiting obstacles for e-waste management in Asia may also include an over-reliance on legislation to drive e-waste management or the simplistic adoption of policies and legislations from developed countries without taking into context the local political, cultural and socio-economic waste management issues. In conclusion, policy and legislative development of e-waste management in Asia appears promising in the long-term provided potential limiting obstacles are avoided in the short-term.

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Keywords: electronic, e-waste, policy, legislation, Asia

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1. Introduction

Electrical and Electronic Equipment (WEEE) waste or e-waste is one of the fastest growing waste streams around the world today. According to studies conducted in the European Union, e-waste is growing at a rate of 3-5% per annum or approximately three times faster than other individual waste streams in the solid waste sector (Schwarzer et al., 2005). Rapid uptake of information technology around the world coupled with the advent of new design and technology at regular intervals in the electronic sector is causing the early obsolescence many electronic items used around the world today. As a result, e-waste has become a serious social problem and an environmental threat to many countries worldwide. United Nations estimate that collectively the world generates 20 to 50 million tonnes of e-waste every year (Schwarzer et al., 2005). E-waste also contains a number of toxic substances, including plastics and heavy metals such as lead, nickel, chromium, cadmium, arsenic and mercury. There are growing concerns that most of the e-waste generated in developed countries is ending up in developing countries that are economically challenged and lack the infrastructure for ESM of e-waste resulting in adverse socio-economic, public health and environmental impact of toxics in e-waste.

The generation of reliable data on the exact amount of e-waste generated in different regions of the world is difficult to achieve as the amount of used e-waste reaching their end-of-life cannot be measured directly with some reliability. Most of the estimates available are based upon predictions made incorporating production or sales data and estimated life span of e-waste. Several countries have conducted e-waste inventories to determine the quantities and composition of e-waste. Unlike other used products, there is a tendency for consumers to store used e-waste at homes and offices, thus, making the estimation a challenging task. An estimation of global generation of e-waste by Robinson (2009) gives an annual production of 20-25 million tonnes. Ongondo et al., (2011) summarises some of the available e-waste data/estimates from different sources (Table 1). Consequently, this paper examines the policy and legislative development of electronic waste (e-waste) management in Asia as well as highlight potential policy trends and potential limiting obstacles for e-waste management in Asia.

Table 1: Global generation of e-waste

<table>
<thead>
<tr>
<th>Country</th>
<th>E-waste generation (tonnes/year)</th>
<th>Per capita generation (kg/person)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>1,100,000 (2005)</td>
<td>13.3</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>940,000 (2003)</td>
<td>15.8</td>
</tr>
<tr>
<td>Switzerland</td>
<td>66,042 (2003)</td>
<td>9</td>
</tr>
<tr>
<td>China</td>
<td>2,212,000 (2007)</td>
<td>1.7</td>
</tr>
<tr>
<td>India</td>
<td>439,000 (2007)</td>
<td>0.4</td>
</tr>
<tr>
<td>Japan</td>
<td>860,000 (2005)</td>
<td>6.7</td>
</tr>
<tr>
<td>Nigeria</td>
<td>12,500</td>
<td>2.7</td>
</tr>
<tr>
<td>Canada</td>
<td>86,000 (2002)</td>
<td>2.7</td>
</tr>
<tr>
<td>South Africa</td>
<td>59,650 (2007)</td>
<td>1.2</td>
</tr>
<tr>
<td>Argentina</td>
<td>100,000</td>
<td>2.5</td>
</tr>
<tr>
<td>Brazil</td>
<td>679,000</td>
<td>3.5</td>
</tr>
<tr>
<td>United States</td>
<td>2,250,000 (2007)</td>
<td>7.5</td>
</tr>
</tbody>
</table>
2. E-waste Policy & Legislation

2.1. Basel Convention

Officially known as the ‘Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal’, the Basel Convention is the most comprehensive global environmental agreement on hazardous wastes ever developed. Its main aim is to protect the human health and the environment from adverse impacts resulting from the generation, management, transboundary movements and disposal of hazardous and toxic wastes. It entered into force on 5 May 1992 in accordance with article 25(1) of the Convention. As at September 2010 there are 178 parties to the Convention. The Basel Convention’s Conference of the Parties (COP) has made several decisions to achieve environmentally sound management of electrical and electronic waste. The Basel Convention has developed two important initiatives to encourage private sector participation in ESM of e-waste. Launched in 2002 the ‘Mobile Phone Partnership Initiative’ (MPPI) has overall objectives for better product stewardship, changing consumer behaviour, promoting best reuse, refurbishing, material recovery, recycling and disposal options and mobilising political and institutional support for environmentally sound management. A guidance document on the environmentally sound management of used and end-of-life mobile phone was adopted by the 8th Conference of the Parties. The Partnership for Action on Computing Equipment (PACE) was adopted by the Basel Convention in June 2008. The main objective of the PACE is to provide new and innovative approaches for addressing emerging issues on used and end of life computing equipment. In July 2011, the Basel Convention released the ‘Technical guidelines on transboundary movements of e-waste, in particular regarding the distinction between waste and non-waste’ which is still in draft form.

2.2. E-waste Management in China

China is considered to be one of the fastest-growing economies around the world and the largest exporter of information and communication technology products to the world surpassing Japan, European Union and United States. It is also estimated that total amount of e-waste generated in China is around 1.11 million tonnes per year mainly coming from EEE manufacturing and production processes, end-of-life of household appliances and information technology products and import from other countries (Xuefeng et al., 2006). China has become a key player in the global e-waste recycling system by employing over 0.7 million people in 2007 of which 98% in the informal recycling sector (Jinglei et al., 2009). In order to address the problem of e-waste, the Chinese government undertook number of measures including prohibiting the import of e-waste and other hazardous waste since 2000, implementing the Technical Policy on Pollution Prevention and Control of Waste Electrical and Electronic Products (2006) and the Administrative Measures for the Prevention and Control of Environmental Pollution by Electronic Waste (2007) which is in force since 2006. Also recently, China introduced a licensing scheme for proper e-waste recycling and in that process prohibiting informal recycling by unauthorised recycling firms (Jinhui Li et al., 2011).

China’s problem with e-waste has come about mainly due to recycling operations conducted by labour intensive small and informal business sectors which lack the capacity to handle such wastes in a proper manner. In order to legalize the management of waste electrical and electronic products and promote the comprehensive utilization of resources and development of circular economy as well as protecting
environment, on March 5, 2009 the State Council adopted and promulgated the "Administration Regulation for the Collection and Treatment of Waste Electrical and Electronic Products", namely China WEEE. The regulations came into effect on 1st January 2011. The new regulation consists of 5 Chapters and 35 Articles. The Article 4 allows for 'Catalog for Disposal of Waste Electrical and Electronic Products'. The first list of controlled products was announced in December, 2010 and took effect on 1 January 2011. The first list includes televisions, refrigerators and freezers, washing machines, air conditioners and personal computers. The Article 6 stipulates a system of licensing for recovery processing of waste electrical and electronic products. The environmental protection department of the municipal People’s Government, with district division, is authorized to examine and approve qualification of enterprises in the line of recovery processing of electrical and electronic products.

2.3. E-waste Management in Japan

Japan has formulated two laws to deal with the e-waste situation in Japan. The first law is called the Law for the Promotion of Effective Utilisation of Resources (LPUR) and the second law is called the Law for Recycling Specified Kinds of Home Appliances (LRHA). LPUR covers personal computers and small-sized batteries while LRHA deals with televisions, refrigerators, washing machines, air conditioners and clothes dryers. While LPUR encourages the manufacturers to voluntarily help e-waste recycling to reduce the generation of waste, LRHA imposes more compulsory obligations on the consumers and manufacturers. When disposing home appliances consumers are required to pay for cost of transportation and recycling. Manufactures are responsible for establishing proper e-waste recycling facilities and are required to achieve compulsory recycling rates such as 70% for air conditioners, 60% for refrigerators and 65% for washing machines (Chung and Murakami-Suzuki, 2008). An amendment to the Law for the Effective Utilisation of Resources took place on 1 July 2006. This amendment mandates that manufacturers provide material content declarations for certain categories of electronic products from sold after 1 July 2006. Manufacturers and importers are required to label their products and provide information on lead, mercury, chromium VI, cadmium, PBB and PBDE. Apart from manufacturers, importers of the items listed above must meet the Design for Environment (DfE) criteria, which are required for domestic manufacturers.

2.4. E-waste Management in India

In India e-waste is a major issue due to the generation of domestic e-waste as well as imports from developed countries. India’s electronic industry is one of the fastest growing industries in the world. In 2005, India’s Central Pollution Control Board developed guidelines for environmentally sound management of e-waste in India. E-waste in India is not regulated at the present time. However, the Ministry of Environment and Forest as part of the Environmental Protection Act of India has enacted the ‘E-waste (Management and Handling) Rule of 2011 to take effect from 1st May 2012. The rule mandates producers to be responsible for the collection and financing the systems according to extended producer responsibility concept. The rule clearly defines the responsibilities of the producer, collection centres, consumer or bulk consumers, dismantlers and recyclers.

2.5. E-waste Management in Bangladesh

Bangladesh adopted its National Environmental Policy in 1992, The Environmental Conservation Act in 1995 and Medical Waste Management Rules in 2008. Currently there are no regulations specifically dealing with e-waste. However, the Government of Bangladesh has given top priority to the preparation of
'Electrical and Electronic Waste (Management and Handling) Rules' in 2011. In addition, the Government has already prepared a National 3R (Reduce, Reuse and Recycle) Strategy incorporating some aspects of e-waste management. Furthermore, two Rules, the Hazardous Waste Management Rule (under preparation) and the draft Solid Waste Management Rule (prepared and in the consultation stage) could also accommodate the issues related to e-waste (Ahmed, 2011). Currently there is no inventory of e-waste in Bangladesh. (Environment and Social Development Organisation, 2010) estimates that every year Bangladesh produces about 2.8 million tonnes of e-waste out of which 2.5 million is contributed by the e-waste generated from ship breaking yards. As for end-of-life management of electrical and electronic equipment, reuse is a common practice in Bangladesh. Dismantling and recycling is also a growing business, mainly undertaken by the informal sector. Most of the e-waste in Bangladesh is dumped in open landfills, farming land and open water bodies causing severe health and environmental impacts.

2.6. E-waste Management in Pakistan

Pakistan currently has no inventory or exact data on e-waste generation. Pakistan has no regulations specifically targeting e-waste although the National Environment Policy has been active since 2005. The Ministry of Environment overseas the environmental protection and movement of chemicals and waste. There is no formal mechanism to manage e-waste at the national level. Therefore, people use different methods to manage e-waste locally. Informal recycling sector is very active and a number of workers, including children, earn their living by dismantling the electronic scrap and extracting valuable metals. Open burning and open dumping of e-waste is very common in Pakistan.

2.7. E-waste Management in Thailand

Thailand generated about 80,000 tons/year of e-waste expected in 2009, out of which electrical and electronic manufacturers generated about 20,000 tons/year. Thailand also suffers from issues such as lack of general awareness about e-waste, incomplete databases and inventories related to e-waste, lack of environmental sound management practices and lack of specific laws and regulations on e-waste. In order to address these issues the Thailand Government passed the National Strategic Plan on Integrated Management of WEEE (WEEE Strategic Plan) in July 2007. The strategy, which was approved by the Cabinet on 24 July 2007, is a 10-year road map.

2.8. E-waste Management in Vietnam

Currently in Vietnam there are no laws and regulations specifically dealing with e-waste although there are number of related Decrees. Vietnam also lacks a sound inventory of e-waste. (Nguyen et al., 2009) studied the e-waste flows of five large home appliances (televisions, refrigerators, washing machines, personal computers and air conditioners). They estimated that Vietnam would discard about 3.86 million appliances or 114,000 tonnes in 2010 and 17.2 million appliances or 567,000 tonnes in 2025.

2.9. E-waste Management in Malaysia

An e-waste inventory for Malaysia was conducted in 2008 under the funding from Ministry of Environment, Japan. This study found that Malaysia generated 1.1 million tonnes of e-waste in 2008, (Department of Environment Malaysia, 2008). E-waste has been regulated in Malaysia since 2005. The Department of Environment (DOE) within the Ministry of Natural Resources and the Environment (NRE)
is responsible for the planning and enforcement of regulatory requirements related to e-waste. Although there are no direct regulations to deal with e-waste, the management of e-waste is incorporated within the Environmental Quality (Scheduled Waste) Regulations 2005 and the Environmental Quality (Prescribed Premises) (Treatment, Disposal Facilities for Scheduled Waste) Regulations, 1989 (control on collection, treatment, recycling and disposal of scheduled waste including e-waste). In January 2008, the Department of Environment (DOE) issued the ‘Guidelines for Classification of Used Electrical and Electronic Equipment in Malaysia’ for assisting all stakeholders involved in e-waste management to identify and classify the used products according to the regulatory codes. The guideline provides a list of the types of electrical and electronic waste which may contain the hazardous compounds or materials. Currently the DOE is working on a draft regulation to manage e-waste, which will be known as the Environmental Quality (Recycling and Disposal of End-of Life Electrical and Electronic Equipment) Regulations. The purpose of this regulation is to make it a mandatory requirement for producers and manufacturers to design equipments to minimize hazardous components and facilitate ease of recycling including the requirement for producers and manufacturers to take back e-waste for recycling or disposal

3. E-waste Development Trends

E-waste development trends in Asia were reviewed in terms of e-waste legislation, informal sector, information system as well as infrastructure and technologies. The first e-waste development trend is that there seems to be an active and abundant development of e-waste policy and legislation in Asia. Countries such as China, Japan and India have developed e-waste legislation while countries such as Bangladesh, Thailand and Malaysia are in the process finalizing their own e-waste legislation or strategy. Furthermore, countries such as Vietnam, Pakistan and Malaysia are in the process of developing e-waste instruments such as Extended Producer Responsibility (EPR). EPR is seen globally as one of the most effective ways of dealing with the e-waste issue. However unlike in the developed world implementing EPR in developing countries is a major challenge to policy makers due to the active involvement of the informal sector. This may indicate that countries in Asia may be attempting to fast-track the regulation of e-waste in their countries by adopting e-waste legislation based from international e-waste legislative trends especially from the European Union e-waste legislative framework.

The second e-waste development trend is that there seems to be an active and aggressive involvement of the e-waste informal sector in Asia. Countries such as China, India, Bangladesh and Pakistan are confronted with an active and sometimes aggressive informal e-waste sector that relies on e-waste recycling as an important source of income. This may indicate that e-waste forms an important construct in the economic and social structure of countries in Asia.

The third e-waste development trend is that there seems to be limited development of e-waste information systems in Asia. Countries such as Bangladesh, Pakistan and Vietnam lack a baseline e-waste inventory while other countries in Asia may lack integrated e-waste information systems that keep track of the e-waste flow in the country even though they may have conducted an initial e-waste inventory. This may indicate that many countries still lack the essential basic information required for strategic e-waste management. The lack of reliable data and inventories deter the formulation of appropriate policies and legislation in tackling e-waste management in the respective countries.

The fourth and final e-waste development trend is that there seems to be limited development of e-waste infrastructure and technologies in Asia. Many countries in Asia have a resilient informal e-waste sector that often lack proper e-waste infrastructures and technologies to recycle e-waste in environmentally responsible manner. Many countries in Asia are using ‘backyard recycling practices’ (BRP) to deal with the high amounts of e-waste imported from industrialised countries as well as from domestic production. Open burning of e-waste is widely used to recover metals such as steel, aluminium
and copper from wires, capacitors and other components of e-waste. The informal recycling sector is very active in number of Asian countries where harmful techniques in de-soldering circuit boards to recover valuable metals are very common. Open dumping of non-valuable fractions is also common and has caused significant environmental and health impacts.

4. E-waste Development Implications

The e-waste development trends indicate that a key advantage of countries in Asia is the development of e-waste related legislation and strategy including waste reduction initiatives such as Extended Producer Responsibility (EPR). This legislation provides countries in Asia with the legislative framework to tackle e-waste issues in a formal manner as well as fast-track the lessons learned from developed countries in e-waste legislation and management. Nevertheless, e-waste policies and legislation development may also pose a disadvantage if it is adopted from developed countries without customizing it to local socio-economic conditions and challenges (Agamuthu & Dennis, 2011). Furthermore, some developing countries are considering adopting technologies that have been implemented in developed countries where proper infrastructure is in place to manage e-waste. However, the economic, environmental and social situation in number of these developing countries are different compared the developed countries, hence, the need for adapting, implementing, and scaling up appropriate technologies that are more suited to the local conditions. This is consistent with studies on applying EPR policies and legislation in developing countries which have discovered certain challenges and limitation in legislation EPR implementation (Kojima et al., 2009). The first challenge is for the governments to collect funds from producers or imports if the goods are smuggled into the country or if the small shop-assembled products have a large share of the market. The second challenge is the systems that create incentives for collectors and recyclers to over-report the amount of e-waste collected to gain extra subsidies from the fund. The third challenge is the competition between the formal and informal recycling sector to gain access to e-waste.

One of the key areas for consideration is that role of the informal e-waste recycling sector in developing countries compared to developed countries. This is because the informal sector in many developing countries is active in the e-waste recycling chain. These informal recyclers are motivated by the precious materials contained in the e-waste stream and its market value. In countries such as India and China, where significant amount of e-waste recycling is taking place, informal collectors achieve very high collection efficiencies. In fact informal collection of e-waste does not have any major adverse impacts on the environment. Instead they lead to high collection rates and many economical and social benefits to the poor section of the community. The informal sector is also involved in the second stage of the e-waste recycling chain - dismantling pre-processing. Even here there are no major impacts on the environment instead more economic and social benefits to poor community. The last stage of the e-waste recycling chain where processes/techniques are necessary to extract the valuable components such as metals is where the current environmental impacts are. Most of the informal recyclers utilise low efficiency processes resulting in major health and environmental impacts. For example backyard recycling practices (BRT) utilised by informal recyclers to extract raw materials from printed wire boards, wires and other metal bearing components have very low material recovery rates and also result in major environmental impacts.

Prohibiting and imposing fines on informal recycling have not helped in countries like China and India. This is due to the fact that informal recycling is undertaken by the poor people and as such the government is unable to impose heavy fines as they cannot pay it. These governments then attempt to regulate the informal e-waste recycling sector by licensing them. However, the effectiveness of such a scheme depends a lot on the responsibility of the disposer of e-waste. The challenge is how to deal with the e-waste disposer who receives more money from unlicensed informal recyclers than from the licensed
recyclers. (Shinkuma & Managi, 2010) argues that generally the disposers of e-waste are relatively richer than the recyclers; hence the government can afford to place a heavy fine on them. However, the issue of governments of developing countries are unable to impose fines on e-waste disposers of developed countries where most of the e-waste comes from. (Chi et al., 2011) argues that the emergence and growth of the informal sector in developing countries is the result of intricate interactions between economic incentives, regulation gaps, industrial interdependence and the social reality and predicted that informal sector may remain an influential recycling force for years to come. They suggested the whole informal recycling chain must be thoroughly investigated on which steps are environmentally harmless and should remain and which steps of the material mass flow should be changed for better downstream environmental and recycling performance.

The implications of the e-waste development trends for countries in Asia is that e-waste policy makers should cautiously adopt e-waste policy and legislation taking into account the local socio-economic conditions and its potentially effectiveness in addressing challenges related to the informal sector (Dennis & Agamuthu, 2012). E-waste policy makers should consider supplementing legislative instruments with economic and social initiates such as integrating e-waste management as part of a green economy strategy. This would allow developing countries to integrate the informal sector into the country’s economic development as well as enable positive social benefits to the informal e-waste sector. Furthermore, e-waste policy makers should also consider establishing an e-waste information system (EIS) that form the foundation for effective decision making related to e-waste issues in the country. This also enables an effective decision support system to tackle basic issues related to e-waste flow.

Finally, a key aspect of e-waste policy development for developing countries in Asia may require a paradigm shift in perception of e-waste from a informal sector economic, social and environment problem to a perception of e-waste as a potential opportunity for green economy growth and informal sector mainstreaming.

5. Conclusions

In conclusion, policy and legislative development of e-waste management trends in Asia indicate a positive development path towards sustainable e-waste management in Asia. This includes the development of e-waste management policy and legislative frameworks including the provision for EPR. Nevertheless, potential limiting obstacles for e-waste management in Asia may also include an over-reliance on legislation to drive e-waste management and the simplistic adoption of policies and legislations from developed countries’ without taking into context the local political, cultural and socio-economic waste management issues. Furthermore, e-waste policy development may also require a paradigm shift in perception from a problematic waste issue to a opportunitistic green growth solution for countries in Asia. Finally, policy and legislative development of e-waste management in Asia appears promising in the long-term provided potential limiting obstacles are avoided in the short-term.

References


