

The 7th International Conference on Waste Management and Technology

Situation of e-waste management in Cambodia

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Abstract

With regarding to the Royal Government of the Kingdom of Cambodia's policy to reduce the poverty, Cambodia has allowed to import both the branch new and second hand of electronic and electric equipment to meet demand of local people. The importation of EEE second hand include the scrap metal into Cambodia, most of them are un-functional or low quality, which cannot use, use only in short-period (one to three years) or doesn't work or is broken. In condition of using EEE above, it has been generated of WEEE and the flow of EEE through the repairing, reassemble/refurbishment and dismantling include junkshop and then recycling and informal exported of the reusable part and recyclable material to abroad.

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Keywords: E-waste; Used Electric and Electronic Equipemnt(UEEE); Waste Electric and Electronic Equipment(WEEE)

1. Introduction

Importation of second hand of Electric and Electronic Equipment (EEE) into Kingdom of Cambodia will be generated E-waste because of low quality and short period time for using. E-waste generated and handle practiced by formal and informal sector, which is improper practice on storage, collection, transportation and discarding with municipal waste collect and after that disposed at dumping-site.

Ministry of Environment (MoE) in role of responsible the prevention, protection as well as minimizing/reduction all activities that impact to human health and environment from all sources polluted is effort to develop project proposal to conduct research, consultation workshop, training workshop and dissemination to stakeholders related to E-waste generation and its impact to human health and environment. All project supported among technical expert and financial supported under Basel

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Convention. The international organization especially, Secretariat of Basel Convention(SBC) coordination with Basel Convention Regional Center for South-East Asia(BCRC-SEA) and Basel Convention Regional Center China(BCRC-China), Ministry of Environment, Japan, Ministry of Environment, Korea and UNEP IETC as well, to provided the project proposal to Ministry of Environment, Cambodia through Basel Focal point to research study and developed document reporting on inventory outcome of Electronic and Electric Waste in the Kingdom of Cambodia, national inventory on use EEE in Cambodia, WEEE/E-waste management in Phnom Penh, guideline on the environmentally sound management of Waste Electrical and Electronic Equipment (WEEE) in Cambodia and disseminate workshop and training workshop to promote awareness raising to stakeholders on the environmentally sound management of Electronic and Electrical Wastes and inventory of E-waste manual etc, which are implemented by Cambodia Environmental Association (CEA) and Department of Environmental Pollution Control (DEPC).

Base on national inventory on using EEE in Cambodia, the importation of EEE/UEEE has been continuously done into the Kingdom of Cambodia with different amounts responding to internal demands. From 2000 to 2006, imported TVs have 903,334 sets (Colour 271291 sets, and black-white 632,043 sets); air-con 193,391 sets; refrigerator 91,935 sets; PC 14010 sets; MP 343,033; and washing machine 30,941 sets. Remarkably, these combined EEE/UEEE statistics have recorded by responsible institutions, while importers registered and asked for permission to import these materials/facilities.

The inventory has indicated the waste generation by type of UEEE such as: TV sector has great amounts of 40,983.00 kg, while air-con's wastes have 13,318.80 kg, MP's wastes 2,016.24 kg, and PC's wastes 1,310.40 kg (CEA report 2007).

The increasing e-waste generated every year and implementation of the informal sector of the activities of collection, transportation, repairing, reassemble and dismantling, which is unsound management during practicing; it will cause effect to human health and environment.

2. Regulation and Framework

Cambodia has not specific law related to E-waste Management, but some regulation has concerned to control, monitoring the activities operation, which are impact to human health and environment. The regulation concerning to e-waste management has been described below:

2.1. Law on Environmental Protection and National Resource Management

Laws on Environmental protection and National Resource Management adopted by national assembly on 24 December 1996 stipulated that “the prevention, reduction, control of airspace, water and land pollution, noise and vibration disturbances as well as waste, toxic substances and hazardous substances, shall be determined by sub-decree following a proposal of the ministry of Environment in Article 13, chapter 5 of this law.

2.2. Sub-decree on Solid Waste Management

The Sub-decree No. 36 on Solid Waste Management that issued dated on 27 April 1999 by Royal Government of Cambodia, covered all activities related to disposal, storage, collection, transport, recycling, dumping of garbage and hazardous waste.

In article 3 paragraph c of this sub-decree hazardous waste refer to “radioactive substances, explosive substances, toxic substances, inflammable substances, pathogenic substances, irritating substances,

corrosive substances, oxidizing substances, or other chemical substances which may cause the danger to human health and animal or damage plants, public property and environment.

In this annex of the Sub-decree hazardous waste also includes the following types of WEEE:

PCB waste from use of PCB contained in discarded air-conditioners, TV and microwaves,

Metal waste and their compounds: Zinc (Zn), Selenium (Se,) Tin (Sn), Vanadium (V), Copper (Cu), Arsenic (As), Barium (Ba), Cobalt (Co), Nickel (Ni), Antimony (Sb), Berillium (Be), Tullurium(Te), Lead (Pb), Titanium (Ti), Uranium (U), Silver (Ag);

Wastes from used or discarded electricity lamps; and Wastes from the production or use of batteries.

This sub-decree cover all activities related to storage, collection, transportation, treatment, recycling, disposal and dumping of solid waste and hazardous waste.

For importation and exportation of hazardous waste has stipulated in article 20 and 21 as below:

Article 20: The exportation of the hazardous waste from the Kingdom of Cambodia to abroad could be conducted if there are an agreement from the Ministry of Environment, export license from the Ministry of Trade, and permit from the import country.

The exportation of the hazardous waste shall be consistent with the provisions and principles of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal in 1989 which come into force on May 05, 1992.

Article 21: The importation of the hazardous waste from abroad into the Kingdom of Cambodia is strictly prohibited.

2.3. Sub-decree on Water Pollution Control

This Sub-decree stipulated that “The disposal of solid waste or any garbage or hazardous substances into public water areas or into public drainage system shall be strictly prohibited. The storage or disposal of solid waste or any garbage and hazardous substances that lead to the pollution of water of the public water areas shall be strictly prohibited.” This Article strictly prohibits to all activities disposing hazardous wastes and other residues into water sources in order to protect and maintain public health and the environment (Article 8, chapter 2).

2.4. Sub-decree on Air Pollution Control and Noise Disturbance

This Sub-decree will be strictly control/monitor emission from UEEE recycling and/or EEW burning. But this Sub-Decree seems to be unnecessary, because recycling process of UEEE does not existed in Cambodia right now.

2.5. Sub-decree on Ozone Depleting Substances

This Sub-decree applies to import, export, handling, production and the use of ozone depleting substances.

2.6. Sub-decree on Business Facilitation by risk Management 2006

This sub-decree aims to: (i) improve the importation/exportation processes of goods and other facilities in complying with the national laws/regulations and international agreements/protocols; (ii) effective management and monitoring; (iii) lower cost in service compared to other adjacent countries; (iv)

authorize functions/duties of line institutions at check-points; and (v) facilitate a rapid and easier way to importers/exporters.

2.7. Directive's Custom and Excise General department

This directive has been announced on the Ban of importation of old computers and spare-parts for occupation purpose, except, for self consumption and/or charity in minor amount (12/03/02).

2.8. Guideline on the Environmentally Sound Management of Waste Electrical and Electronic Equipment (WEEE) in Cambodia.

Currently, Cambodia has not specific regulation for management of e-waste yet, although, recently, Ministry of Environment of Cambodia has been developed the guideline on the Environmentally Sound Management of Waste Electrical and Electronic Equipment (WEEE) in Cambodia. This guideline was developed under the project proposal, namely “The Preparation of Guideline to manage on Waste electrical and electronic Equipment in Cambodia” that supported by Ministry of Environment Korea. This guideline aims to maintain and protect the environment and human health which may be harmful by unsound management and disposal of WEEE, as well as to achieve the initiative of resources recovery that is the crucial part of integrated waste management, or sustainable solid waste management. The principles of this guideline are target to manage of electronic and electric equipments and related waste (e-waste) should be governed by the following:

Reuse e-wastes as possible prior to disposal

Reduce e-wastes and the like at various generating sources, e.g. households, selling shops, repairing and dismantling shops, etc.

Recycle e-wastes as possible prior to disposal based on the view point of “Waste is the Money”

Repair electronic and electric equipments for reusing purpose rather than either keep or throw it away

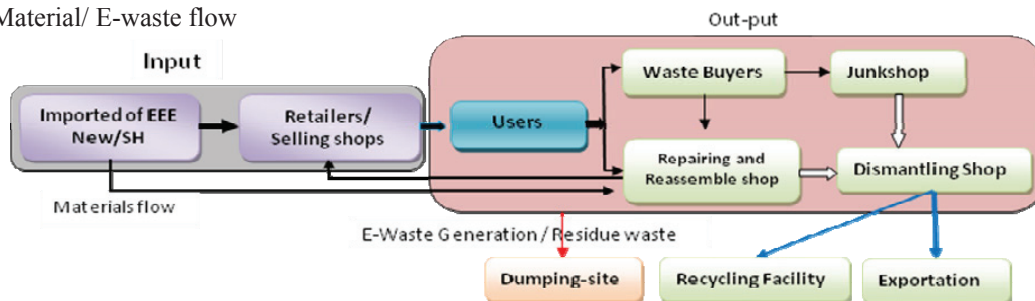
Manage e-waste at its cycle, e.g. generating process, storage, transportation, treatment and disposal based on the environmentally sound

Identify, establish and operate a safe-dumpsite for hazardous wastes, including e-wastes at selected urban and town areas

Implement in complying with national and international law, regulations, conventions, protocols, and so on.

3. Current E-waste Management in Cambodia

Material/ E-waste flow



Flow Chart of Electronic & Electric Equipment/Used Electronic & Electric Equipment

Figure 1: The flow chart of EEE/UEEE and WEEE

3.1. E-waste activities through 3R initiative

Currently, Cambodia has not policy, strategic plan and mechanism related to management of e-waste. E-waste management activities in Cambodia depend on the practicing by formal and informal sector through repairing, segregation, collection, reassemble/ refurbishment and dismantling and/or recycling and exportation of scrap-metal or recyclable materials. These informal sectors play an important role in repairing for reuse, reassemble of a new one by using reusable part materials from dismantling for example reassemble of TV set. Beside this, scavengers/middle-man collected e-waste from local/official use, and then sent to repairing or junkshop. WEEE/E-waste which is un-function and/or could not repair has been collected from selling shop, repairing shop and refurbishment activities and then sent to dismantling site.

The dismantling site and activities practice are in the simple manual, meanwhile, they did not use equipment and high technology for dismantle, shredding, and sort by item, in particular, did not use protection equipment during working.

Based on WEEE/E-Waste Management Report Phnom Penh Municipality in Kingdom of Cambodia 2009, E-waste treatment and disposal system in Cambodia, especially in Phnom Penh capital have been assessed both qualitatively and quantitatively. The qualitative description includes the observed practices of E-waste repair/ refurbishment and dismantling being carried out in PPM. The quantitative estimation has been carried out based on the existing and projected volume of reusable parts, recyclable materials and residues.

The estimated of reusable part, recyclable materials and residues generated in 2009 and 2019 has been carried out based on the inventory estimates, outcome of the field work carried out during 2009 and CEA estimates for the year 2006-07. The average estimates of reusable parts, recyclable materials and residues generated have been described in table 1.

Table1: Percentage E-waste Fractions generated during repair/ refurbishment & Dismantling

E-Waste Item/ E-waste Fractions	Reusable (%)	Recyclable (%)	Residues (%)
TV	51.5	41.6	6.9
PC	62.5	35.3	2.2
MP	60.8	33.0	6.3
Refrigerator	54.9	38.8	6.3
Air Conditioner	55.3	42.5	2.3
Washing Machine	60	20	20

This report projected the generation of e-waste fractions in metric tons has been estimated by considering that the existing repair/refurbishment and dismantling activities will continue in informal and semi formal sector in PPM without any intervention. The existing and projected e-waste fraction in metric tons from 2009 to 2019 has been described in table 2.

Table 2: Existing and Projection E-waste fraction (metric tons)

E-waste Items/	2009	2019
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E-waste Fractions	Reusable	Recyclable	Residues	Reusable	Recyclable	Residues
TV	980.54	792.05	131.37	5517.54	4456.88	739.24
PC	1706.69	964.62	59.39	2247.85	1270.48	78.23
MP	26.17	14.22	2.69	90.38	49.09	9.30
Refrigerator	548.70	387.79	62.97	1716.15	1212.87	196.94
Air Conditioner	490.83	377.56	19.99	1908.53	1468.10	77.72
Washing Machine	525.39	175.13	175.13	842.30	280.77	280.77

Moreover, due to the pilot project in Phnom Penh Capital on Training Programme for E-waste and Demonstration at a Recyclable Waste collection Site of Environmentally Sound Management of the E-waste has been shown/presented, the resulting of project implemented at a dismantling site of E-waste in Phnom Penh Capital for the reusable and recyclable material the period of time 4 months from 1st August to 30 November 2010 has been described in table 3 and 4.

Table 3: Data of the E-waste collection and purchasing at dismantling site.

Data of Electronic and Electrical Wastes at a selected recyclable wastes collection site (buy)										
Date	Circuit Board (Kg)					Other				
	Monitor	CPU	TV, Ma	Printer	HP					
Aug,2010	1,435.70	337.3	11,255.70	70.8	54.9					
Sep,2010	1,509.90	476.3	12,455.60	70.8	63.3	Refrigerators = 90Kg				
Oct,2010	681.3	174	5,741.50	6	59.2	DVD-HDD= 187Kg				
Nov,2010	512	194.8	4,629.80	142	9	Printer= 138Kg				
Data of Electronic and Electrical Wastes at a selected recyclable wastes collection site (buy)										
Date	Battery(kg)			Plastic(kg)						
	Laptop	HP	ID/ICOM	TV, Ma	Computer	Keyboard	Small Piece	CDR Box	Others	
Aug,2010	8.4	11.7	1.65	21,124.50	1,340.90	7.5	202.5	338.5	Remote	
Sep,2010	17.5	21.9	5.75	22,005.50	1,377.90	31	743.7	338.5	Control=45Kg	
Oct,2010	18	55.5	0	12,709	875.5	11.3	137	125.4		
Nov,2010	0	6	0	7,455	374.5	0	96	167.6		
Data of Electronic and Electrical Wastes at a selected recyclable wastes collection site (buy)										
Date	CRT-Television(No)			CRT-Monitor(No)		HDD	UPS	Disk	Other	
	Usable	Unusable	Sony	Usable	Unusable	(Kg)	(Kg)	(Kg)		
Aug,2010	13	2	4	30	3	113.2	31.4	283.3	LCD=37Kg	
Sep,2010	11	17	3	139	10	135.45	31.4	1,254.8		
Oct,2010	0	0	0	52	0	52.5	401.7	194		
Nov,2010	15	9	0	26	0	101.7	295	150	LCD=15Kg	
Data of Electronic and Electrical Wastes at a selected recyclable wastes collection site (buy)										
Date	Copper(kg)		Aluminium	Iron	Wire	Po-Supply	IC-Tr-STR...	Others		
	Yellow	Red	(Kg)	(Kg)	(Kg)	(Kg)	(Kg)			
Aug,2010	13.2	4.9	74.3	3,382.50	214.4	437.5	0.7	SPK=42Kg		
Sep,2010	10	1.8	134.7	4,069.80	660	858.6	2.7			
Oct,2010	0.6	1.6	46	981.4	93.5	364.3	1.8			
Nov,2010	0	20.4	6.8	1,321.50	68.3	145.5	6.5	SPK=155Kg		

Table 4: Data of Electronic and Electrical Wastes at a selected recyclable wastes collection site (Sale)

Data of Electronic and Electrical Wastes at a selected recyclable wastes collection site (Sale)										
Date	Circuit Board (Kg)				Tr/IC (Kg)	Relay (Kg)	Transformer (Kg)	Others		
	TV-Monitor	Blue-CB	CPU	HP						
Aug,2010	5,636.50	0	397.5	38.9	12	19	242			
Sep,2010	7,275	214.5	351	40.1	39.5	15	335	Moyen Frequencies=73Kg		
Oct,2010	10,793.50	50.5	454.5	117.6	39.5	0	690.5	Speakers= 40.5 Kg		
Nov,2010	841.5	0	2,328	0	55.5	0	333	SPK=74.5Kg		
Data of Electronic and Electrical Wastes at a selected recyclable wastes collection site (Sale)										
Date	Usable CRT(No)		Disk (Kg)	UPS (Kg)	Keyboard (Kg)	CDR Box (Kg)		Others		
	TV	Monitor				CDR (big)	CDR (small)			
Aug,2010	0	51	0	201	55	153	155.2			
Sep,2010	0	133	275.5	112	75.5	142.5	210.6			
Oct,2010	0	30	1,185	215	331.5	578.5	231.5	Extractor fan: 300 Unit		
Nov,2010	14	16	194	426	0	126	35.5			
Data of Electronic and Electrical Wastes at a selected recyclable wastes collection site (Sale)										
Date	Copper(Kg)		Aluminium (Kg)	Magnet (Kg)	Iron (Kg)	Po-Supply (Kg)	HDD (Kg)	RAM (kg)	Wire (Kg)	Other
	Yellow	Red								
Aug,2010	127	246	429.5	39	3681.5	526	153	21.4	684.5	
Sep,2010	114	148	550	42	4,545.50	806	128	15.7	788.5	
Oct,2010	74	1,292	224.5	56	1,645	539	282.5	16	277.5	
Nov,2010	0	103	362	0	3,046	151.5	18.5	0	248.5	
Data of Electronic and Electrical Wastes at a selected recyclable wastes collection site (Sale)										
Date	Battery(kg)			Scrap of Plastic (Kg)				Other		
	Laptop	HP	ID	PS,ABS	BS,ABS	PP	HI, BK			
Aug,2010	0	12	0	16,900	3,319	3,110	940			
Sep,2010	0	0	0	20,250	2,569	3,350	550			
Oct,2010	13	208	37.5	17,385	336	1,225	0			
Nov,2010	0	0	0	9,150	0	864	2,500			

Source: Department of Environmental Pollution Control, MoE, Cambodia.

3.2. E-waste Disposal

The residue of E-waste focus on the kinds of waste/WEEE could not reusable and recyclable, which are generated from various sources such as household, commercial sector, repairing shop, junk shop, reassemble shop and dismantling site. These residue wastes are being disposed with household dustbin and/or illegal disposal at public road, land- lot/free land and forest. For the e-waste disposed in household dustbin, it was mixed with household waste without separation and then collected and transported directly to dumping site of the cities.

General observation during the project implemented at dismantling site. The project team has been identify that the solid waste/residue is being disposed with municipal collection system and dumped at the municipal landfill site and wastewater discharged from milling process of plastic discharged directly into the sewage system without treatment. The amount of solid waste disposal and wastewater discharging at dismantling site has been described in table 5.

Table 5: Data of the Residue from dismantling site

Data of Electronic and Electrical Wastes at a selected recyclable wastes collection site (Sale)							
Date	Solid Waste (Kg)	Waste Water (M3)	Air	Noise	Waste CRT (No)		Other
					TV	Monitor	
Aug,2010	267	24.2	-	-	5	7	
Sep,2010	294	26.6	-	-	28	2	
Oct,2010	224	20.8	-	-	1	3	
Nov,2010	148	16.5	-	-	10	0	

3.3. E-waste Impact to human health and Environment

According to the interim report of the project on the preparation of guideline to manage on waste electrical and electronic equipment in Cambodia, it has identified the E-waste directly and indirectly impact to the human health and environment as detail below:

a) Occupational health impact resulting from E-wastes

It may occur in the different stages of e-waste flow of: repairing and dismantling shops, junkshops, recycling and reassemble shops as well. The accidents at the repairing process are caused by acid emission, and other chemical substances, including electric shocking. Additional negative aspects of smelling, noise pollution, particles release, smoke and toxic substances are recognized from repairing and dismantling shops too.

As an observation, workers ignore to wear the protective equipments. Most of these people do not realize the chemical substances contain in EEE or WEEE, or they do not know the negative impacts on their health.

b) Environmental impacts.

Most WEEEs are being generated by repairing and dismantling shops, and junkshops. Remarkably, some small amounts are generated by consuming sources (e.g. households, public entities, business centres, etc.). In a short, these wastes are collected, transported and disposed at dumpsite same as household waste without separation for different hazardous waste disposal.

The way of unsound disposal of WEEE is recognized to cause serious impacts and hazards to waste pickers, as well as to pollute surface/ground water quality and ecosystem through the release or leakage of hazardous substances into water sources. Another serious concern from unsound management of WEEE – that is the atmospheric pollution due to burning or self-firing hazardous wastes and household wastes at dumpsites, which emit toxic fume/smoke into the atmosphere, and it is considered to contribute the cause of acid deposition and climate change.

c) *Public Health Impacts*

Unsound management of WEEE and related residues is not only caused serious impacts the environment and biological diversities, but it also impacts the public health indirectly by different route of pollution, e.g. drinking or consuming of polluted water or fishes, breathing toxic air, opened burning WEEE and related residues.

Waste pickers or scavengers absolutely confront to potential health risks and hazards due to directly contacting and absorbing harmful/hazardous wastes and other pollutants through their daily tasks of picking recyclable wastes/items at dumpsite and waste disposal areas, unless, they have strictly paid attention to health precaution. Waste pickers commonly do their jobs without wearing safe-facilities, e.g. glove, mask glasses, etc. As observing, they concernedly use both dirty hands for either eating or smoking.

4. Gaps Analyze of E-waste Management

The increasing of E-waste and existing activities practice of the collection and transportation, repairing, reassemble, dismantling including junkshop and recycling facility, which is using simple technology for practice and unsound management, will be faced to main issue such as:

Cambodia has not specific law for environmentally sound management of WEEE.

Existing legislation lack of policy and mechanism related to WEEE management and un-ability to enforcement.

Importation of the second hand UEEE has low quality/improper function need to be either repaired or dismantled.

Cooperation and Coordination among line agencies is still limited.

Awareness and capacity building deal with UEEE and its residue management is commonly limited.

5. Conclusion

Cambodia has being imported the EEE both branch new and second hand for local demand use. E-waste has being implemented by formal and informal sector through the flow of collection, transportation, repairing, reassemble, dismantling and recycling, which seem unsound management activities. It may cause effect to human health and environment during the process of working above. Although, Cambodia has been gotten the many projects from International Organization, especially, under Basel Convention, it still lack of legal framework, financial and strategy plan for the environmentally sound management of waste electrical and electronic equipment in Cambodia.

Acknowledgement

This paper is reported summary from many reports related to E-waste implement project in Kingdom of Cambodia and supported by BCRC- Beijing, China during a technical internship from 26 June to the end of September 2012 at BCRC-Beijing, School of Environment, Tsinghua University.

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