

# **Technical Guideline**

**On**

**The Environmental Sound Management of  
Waste Electrical and Electronic Equipment (WEEE)  
in Cambodia**

**Developed by MoE Team under the UNIDO Cooperation  
Supported by KOICA and Samsung**

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## ABBREVIATIONS



3R	Reduce, reuse and recycle
4R	Reduce, reuse, repair and recycle
Air-con	Air-conditioner
Dept.	Department
EEE	Electrical and electronic equipment
EST	Environmental Sound Technology
KOICA	Korea International Cooperation Agency
MoE	Ministry of Environment
UNIDO	United Nations for Industry Development Organization
PC	Personal Computer
PCB	Printed Circuit Board
TV	Television
UEEE	Used electrical and electronic equipment
UNEP	United Nations Environment Programme
UNEP-IETC	United Nations for Environmental Programme/International Environmental Technology Center
WEEE	Waste electrical and electronic equipment (or E-waste)

## FORWARD



The protection and maintenance of environmental balance for long-term socio-economic development is the major missions of the Ministry of Environment (MoE) under the leadership of the current Royal Government which set important policies to support the national development, poverty alleviation, people welfare promotion, etc. Among them, the environmental protection is highlighted to continue the environmental integration into socio-economic development, increasing the monitor and minimizing environmental pollution through managing solid wastes and hazardous wastes, air quality monitoring, water pollution interception and so on. These are obvious evidence to show that the current Government of Cambodia pays more attention, and does the participation and commitment in protection and maintenance of the environment, natural resources and public health. The integration of environmental management into sectoral development and/or programmes – that is the key indicator implicating closely to the national agenda of sustainable development or the green growth.

The “Guideline on the Environmental Sound Management of WEEE in Cambodia” is the crucial guidance which aims to increase and promote stakeholders’ awareness, as well as to strengthen the management practice of WEEE based environmental friendly. The Guideline contents have developed in parallel the stipulation in annex of the Sub-decree on solid waste management, Sub-decree on WEEE management, and the Basel convention. The Guideline provides guidance to improve and strengthen the procedures and ways of proper management of WEEE within various stages of generation, separation, collection, transportation, recycling and final disposal.

It is identified the 4R initiatives (reuse, reduce, repair and recycle) the important tool should be widely introduced and applied at relevant WEEE generating sources in order to minimize adverse impacts to the environment and human health, as well as to maximize use WEEE based resource recovery prior to do a final disposal.

Achieving the environmental sound management of WEEE means to contribute the application of the Cambodia Millennium Development Goals for the environmental sustainability, the Policy Programme of the Royal Government of Fifth Legislature of National Assembly (Sept. 2013).

The Ministry of Environment is proud of the achievement of the “Guideline on WEEE Management” with the cooperation and participation of line ministries and agencies, and UNIDO, supported by KOICA and Samsung. The MoE firmly expects in advance that the Guideline will be applied at various related sources in order to protect and maintain the environment, ecosystem and human health in accordance with the environmental goals, sustainability and resource recovery.

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# 1. Background

Many kinds of used products, especially electronic and electric equipment are popularly consumed at all hands in the Kingdom of Cambodia due to affordability of people's consumption. The Government recognizes Cambodians still live below the poverty line – that is necessary to allow such used electronic and electric equipment (UEEE) are imported and sold in Cambodia to meet the poors' demand.

Less consideration and un-controlling of using quality of imported UEEE – it is a major concern so far. It means imported used electronic and electric equipment are neither checked nor controlled for consuming quality, and obviously some of them have either lower quality or were become wastes prior to import into Cambodia.

Both types of recyclable waste electronic and electric equipment (WEEE) or un-functioning electronic and electric equipment generating by different sources, e.g. households, repairing and dismantling shops and others, are commonly disposed in dustbins, opened areas and dumpsites afterward together domestic/urban wastes, which cause to impact to the environment and human health, especially occupational health to those are engaged these wastes. Serious impacts, on the other hand, may occur at dumpsite areas surrounding when such WEEE and other hazardous wastes were burnt or self-fired via releasing toxic emission into the atmosphere, or leachate containing hazardous substances, which contributes to atmospheric pollution, acid rain, etc.

To avoid risks and hazards to human health and the environment, as well as to minimize such negative effects, it is an urgent need to develop the specific guideline for the sound management of UEEE and WEEE including its dissemination and implementation at both national and sub-national levels in parallel with the strict implementing relevant national legal instruments and closed cooperation among stakeholders.

## 1.1 Objectives

In the economic and environmental context, the “Guideline on the Environmental Sound Management of WEEE in Cambodia” has fundamental objectives to maintain and protect the environment and human health which may be harmful by unsound management and disposal of WEEE, strengthening the capacity of existing management system in informal/ unorganized and formal/ organized sectors including policy and legislation implementation, as well as to promote the initiative of resources recovery from WEEE.

The specific objectives of the Guideline comprise as follows:

- a) Managing WEEE at generating to final disposal sources by a high effectiveness.
- b) Promoting and increasing the perception of government line agencies at both national and sub-national levels toward the consideration and control of importing

UEEE and its consuming quality in order to minimize the disposal of WEEE in the country, as well as implementing the existing national legislation/regulations and international convention.

- c) To establish a basis for a policy and regulatory frameworks on WEEE management.
- d) Promoting occupational health to whom who works involving EEE and/or WEEE.
- e) Raising stakeholders' awareness, especially private sector towards the sound management and disposal of WEEE (for its life cycle).
- f) Promoting the initiatives of 4R (reuse, reduce, repair and recycle) in relation to the sound EEE management at targeted sources to reach the approach of waste minimization for disposal at a safe-landfill and resource recovery target.
- g) Guiding to effectively manage WEEE at generating sources and at a safe-landfill in order to intercept and minimize serious impacts to the environment and public health.

## **1.2 Scope**

The Guideline has its scope of implementation to urge and improve WEEE management for: (i) large household appliances (refrigerator, AC, and washing machines); (ii) IT and telecommunications (mobile phones and computers); and (iii) consumer equipment – TVs (CRT and flat panels), due to the limitation of the references and these found to be used most at all hands in Cambodia.

The management of WEEE in the Guideline focuses on various sources of WEEE generation, e.g. households, public buildings as well as private sector, especially, selling and repairing shops, dismantling shops, junkshops and so on.

## **1.3 Purpose**

The purpose of the guideline is to assist the government, private sector, learning institutions among others to manage WEEE in a manner that enhances the environmental and human health protection and resources recovery.

## **1.4 Definition**

Several definitions have been provided to WEEE in according to common understanding, consuming, internal legislation (e.g. the Sub-decree on WEEE Management), its beneficial terms and so on. Following is a common definition of relevant e-wastes to be used merely in this guideline.

Electronic and electric equipment (EEE) means to several products of electronic and electric items – in this guideline, electronic and electric equipment is merely refer to the six identified items of: computer, mobile phone, TV, washing machine, refrigerator, and air-con.

Used electronic and electric equipment (UEEE) means a second hand electronic and electric equipment (as refer to above captioned items), requiring to classify as reusable equipment or may be continued to use.

Recyclable electronic and electric equipment means components of electrical and electronic products (as refer to above captioned items) may recyclable at point of disassembly of WEEE.

Recycle means the process of extracting resources from wastes and converting to resources for re-production.

Waste electronic and electric equipment (WEEE), refers to the Sub-decree on WEEE Management, means EEE which is stopped to use, but it maintains either the physical form or appearance, and small pieces or residues resulting from dismantling and recycling of EEE.

Environmentally sound management of WEEE means all implementing practicable steps to ensure that WEEE and related residues are managed in a manner in its cycle management, which aims to protect human health and the environment against adverse effects resulting from such wastes and relevant activities as well.

Environmentally unsound management of WEEE means the disposal of WEEE and related residues into dustbin, on ground or at urban dumpsite without doing a separation from household/urban wastes, or discarding in water source or doing opened burning, which may cause risks and hazards to environmental quality (water, soil and air), public health and biological diversities, including the loss of local aesthetics as well.

Safety landfill means a particular landfill constructing for hazardous waste storage in according with the environmental sound technology (EST) and engineering process pertaining with the stipulations of existing legislations. Noticeably, construction technique/method may differently based on hazardous waste's type, geography, geology, hydrology, and other main natural conditions.

WEEE treatment, in this guideline, means the process of extraction or destruction of toxic and hazardous substances in WEEE for the target of disposal based environmental safety.

## **2. Causes and Effects of WEEE**

### **2.1 Causes of Impacts**

The production and consumption of EEE is being noticeably increased at national and global scales, which are indicated the progress of science, IT, globalization and industrialization.



Competition trend of EEE production in developed countries and some developing countries indicates the human proud in the process of globalization and industrialization, e.g. on time communication capacity, understanding/getting global, regional, national or local situation/ information, sending information and image at one time shortly, and so on. Such examples are the reasons of popular use of EEE in developed and developing countries. It is estimated that global WEEE generation in total amount in 2014 was 41.8 million tonnes (Mt). It is globally forecasted to increase to 50 Mt of WEEE in 2018 (The Global E-waste Monitor 2014, UNU-IAS).

Parallel with the beneficial uses, EEE generates also negative impacts to the environment, society and economy if the sound management of WEEE and related residues are not operated in its cycle (producing, consuming and disposal). Base on the strict legislation/regulation with large expenditures for WEEE treatment and management, WEEE were exported to developing and/or poor countries where they have less strict regulation, low labor, and less expenditure for WEEE treatment or disposal. Considerably, WEEE movement to developing/poor countries for either treating or disposal commonly pose severe pressures to these countries, while they do not have enough capacity, capability, etc., in managing, treating and recycling based on the environmental friendly.

Understanding such pressures to developing/poor countries which caused by producing countries (especially developed countries), therefore, United Nations Environment Programme (UNEP) and other member countries adopted the “Guideline on the environmentally sound management of hazardous waste in 1987” and the “Basel convention” afterward in 1992. Point (d) of the Article 4: General Obligations mentioned that “Ensure that the transboundary movement of hazardous wastes and other wastes is reduced to the minimum consistent with the environmentally sound and efficient management of such wastes, and is conducted in a manner which will protect human health and the environment against the adverse effects which may result from such movement”.

## **2.2 Effects of Improperly WEEE Handling**

Improperly WEEE handling may describe by different ways, for instance, burning, discarding at public and opened areas including dumpsite mixing with urban wastes and household waste. Generally, improperly WEEE handling may experientially cause either serious impact or high risk to human health and the environment through various ways.

- a) Waste burning cause to health impacts through inhalation of polluted smoke, atmospheric pollution as well as acid rain, or generating POP by-products (e.g. Dioxins and Furans).
- b) Water and soil pollution is resulted from unsound disposal of WEEE and related residues on receiving sources (e.g. water, soil, etc.). Indeed, WEEE disposal at dumpsite mixing urban/household waste, or at public or opened areas – all are key driven to seriously pollute water and soil.

- c) Occupational health impact – it's another case concerning health related WEEE which pose to EEE repairers, dismantlers or recyclers, while they do their business or work without take into account the health protection/precaution. Eye or body contact, inhalation of chemical/hazardous waste, for instance, it is the key driven to their occupation health, unless such negative effects are minimized and phased out.

### **2.3 Situation Analysis of WEEE Management**

The findings getting from several reports in relation to WEEE management in Cambodia comprise as follows:

- a) EEE being used in Cambodia are brand new and second hand items. UEEE are used mostly, especially rural people, e.g. TV, computer, mobile phone, etc., based on their enabling. Therefore, UEEE importation from various countries is remarkably done to match the internal demands.
- b) EEE repairing, dismantling is manually done without a modern facility. Repairer, dismantler, refurbished and junkshop people do not care on their health protection. In short, they do not pay attention on the use of health protection/precaution facilities, e.g. mask, glove, glasses, etc.
- c) WEEE at generation sources is commonly discarded into dustbin with household waste and dispose afterward at dumpsite without separation. It causes major concerns on: (i) water pollution (surface and ground water) and soil pollution; (ii) biodiversity impact, etc., through leachate, chemical contaminant washing out by rainwater; (iii) atmospheric pollution and contributing to acid deposition or acid rain; (iv) generating by-products (Dioxins and Furans) due to WEEE burning at dumpsites and/or opened areas.
- d) Implementing legislation and regulation by responsible institutions is limited, which required improvement from now on, meanwhile stakeholders' awareness and participation are limited too.
- e) The taking action of WEEE management at national and sub-national levels is still narrow, including technical capacity building pertaining to the implementation of legal and institution frameworks.

Therefore, the "Guideline for WEEE management in Cambodia" is useful to improve the above findings as well as to urge the implementation of "Sub-decree on WEEE management" in an effective way reflecting to the address of Goal No. 7 "To ensure the environmental sustainability" of the Millennium Development Goals addressing the environmental sustainability.

### **3. Legal and Institutional Frameworks**

Up to now, Cambodia has relevant policy, legislations and regulations of WEEE management. Although most of them are not specifically to WEEE but these may use as the common tool for govern WEEE on the right way. Relevant policy, legislations and regulations are described below.

### **3.1 Existing Policy**

It is not a particular policy of the sound management of WEEE. One of the core areas, however, mentioned in the Policy platform of the Royal Government of Cambodia of the Fifth Legislature of the National Assembly (Sept. 2013) noticeably addresses that “Increasing environmental control and reducing pollution including: the management of solid waste, hazardous substances, air quality monitoring and quality improvement, monitoring and prevention of land and water pollution, including noise and visual pollution”. It actually can be interpreted the policy tool covering WEEE, where WEEE is so-called hazardous waste referred to the Sub-decree on Solid Waste Management (1999).

### **3.2 Existing Relevant Legislations**

#### **3.2.1 At National Level**

Cambodia has a specific legislation for managing WEEE on 01 February 2016 – that is the “Sub-decree on WEEE Management”. The Sub-decree aims to manage WEEE through minimize and intercept negative impacts to the environment and human health, as well as to promote local socio-economy. On the other hand the “Technical Guideline on the Environmental Sound Management of WEEE in Cambodia” is identified the implementing tool to accomplish targets of the stipulations of the Sub-decree based on the environmentally sound management.

As observing, before 01 February 2016 while Cambodia did not have the above captioned Sub-decree, there are several relevant legislations may be implemented to managing WEEE including such as: Law on Environmental Protection and Natural Resources Management (1996); Law on Labor (1997); Law on Water Resources Management in the Kingdom of Cambodia (2007); Law on Land Traffic (2007); Law on Cambodia Standard (2007); Sub-decree on Solid Waste Management (1999); Sub-decree on Water Pollution Control (1999); Sub-decree on Environmental Impact Assessment (1999); Sub-decree on Air Pollution and Noise Disturbance, etc. Noticeably, the Sub-decree on Solid Waste Management plays crucial roles implicating the WEEE management.

#### **3.2.2 At International Level**

The “Basel Convention on Control of Transboundary Movements of Hazardous Wastes and their Disposal” (1989) seeks to ensure environmentally sound management of hazardous waste and to reduce the release of toxic substances from poorly managed waste disposal. It is the international convention, which aims at reducing and phasing

out of local and global impacts resulted from various types of toxic and hazardous substances/wastes movement and disposal. Cambodia has signed the Convention on March 2, 2001.

Refer to some articles of the Basel Convention; it considers managing hazardous wastes in both produced countries and received countries for different causes in environmental safety and also during transportation as indicating in article 4, 6, 11, 12, and article 13 of the convention. Many kinds chemical and hazardous wastes are stipulated in Annex-1 of the Basel Convention, these must be strictly monitored and control in storing, managing and disposing illegally.

### 3.3 Institutional Framework

Managing WEEE based on the environmentally sound cannot fruitfully achieve by MoE herself, unless the active participations from line agencies including local authority within its cycle, which is started from the commencing generating WEEE up to the final disposal. Pertaining with this responsibility, local authority plays important role to boost the appropriate management of WEEE at shopping center, private companies, business related to WEEE, EEE/UEEE repaired shops, dismantling/recycling business/shop, households, etc., in according with policy or guideline issued at national level, especially by MoE particularly.

## 4. Classification of WEEE

Different categories of waste of electronic and electrical equipment waste are based on their levels of toxicity. It's important to note that these elements may be found in combination with others. The main objective of this section is to understand different types of electrical and electronic equipment so that they may be disposed of appropriately through collection, dismantling, sorting, treatment and disposal. Two broad categories of WEEE are classified based on type of function and operation as well as elemental composition.

### 4.1 Classification based on mode of function and operation

Type of WEEE	Equipment
ICT and Telecommunication equipment	Printers, Personal computers (CPU, mouse, screen and keyboard included), Laptop computer, Scanners, Mobile phones, Radio sets, Television sets, Photocopying equipment, Facsimile and Telephones.
Large Household Appliances	Refrigerators, Freezers, Washing machines, Dish washing machines, Cooking equipment, Microwaves, Electric fans, Air conditioner.
Lighting	Fluorescent tubes, Compact fluorescent lamps, High intensity discharge lamps, including pressure sodium lamps and metal halide lamps; Low pressure sodium

	lamps, Other lighting or equipment for the purpose of spreading or controlling light with the exception of filament bulbs.
Batteries	Lead Batteries, Nickel and Cadmium batteries etc.

#### 4.2 Classification based on element composition

This classification is based on the physical, chemical and gaseous components which is found in the electrical and electronic equipment including epoxy resins, fiber glass, Polychlorinated biphenyls (PCBs), (polyvinyl chlorides) (PVC), chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), thermosetting plastics, lead, tin, copper, silicon, beryllium, carbon, iron and Aluminium. These quantity of element composition is varied.

##### a) Elements found in small amounts

Elements are found in small amount in EEE including cadmium, mercury, and thallium.

##### b) Elements found in trace amounts

Elements are found in trace amount in EEE including americium, antimony, arsenic, barium, bismuth, boron, cobalt, europium, gallium, germanium, gold, indium, lithium, manganese, nickel, niobium, palladium, platinum, rhodium, ruthenium, selenium, silver, tantalum, terbium, thorium, titanium, vanadium, and yttrium etc. Almost all electronics contain lead and tin (as solder) and copper (as wire and printed circuit board tracks), though the use of lead-free solder is now being promoted all over the world. These substances can be divided further based on their level of toxicity to humans and the environment.

##### c) Hazardous elements

This will include those element that are harmful to the environment and human health. Table below shows hazardous elements contained in electrical and electronic equipment

Substance	Occurrence in WEEE
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<b>Halogenated compounds</b>	
PCB (polychlorinatedbiphenyls)	Condensers, Transformers
TBBA (tetrabromo-bisphenol-A) PBB (polybrominated biphenyls) PBDE (polybrominated diphenyl ethers)	Fire retardants for plastics (thermoplastic components, cable insulation) TBBA is presently the most widely used flame retardant in printed wiring boards and casings.
Chlorofluorocarbon (CFC)	Cooling unit, Insulation foam
PVC (polyvinyl chloride)	Cable insulation
<b>Heavy metals and other metals</b>	
Arsenic	Small quantities in the form of gallium arsenide within light emitting diodes
Barium	Getters in CRT
Beryllium	Power supply boxes which contain silicon controlled rectifiers and x-ray lenses
Cadmium	Rechargeable NiCd-batteries, fluorescent layer (CRT screens), printer inks and toners, photocopying-machines (printer drums)
Chromium VI	Data tapes, floppy-disks
Lead	CRT screens, batteries, printed wiring boards
Lithium	Li-batteries
Mercury	Fluorescent lamps that provide backlighting in LCDs, in some alkaline batteries and mercury wetted switches
Rare Earth elements (Yttrium, Europium)	Fluorescent layer (CRT-screen)
Selenium	Older photocopying-machines (photo drums)
Zinc sulphide	Interior of CRT screens, mixed with rare earth metals
<b>Others</b>	
Toner Dust	Toner cartridges for laser printers / copiers
<b>Radio-active substances</b> Americium	Medical equipment, fire detectors, active sensing element in smoke detectors

[E-wasteguide.info](http://E-wasteguide.info)

## 5. Guidelines for Target Groups in WEEE Management

Some of the major stakeholders, identified along the flow of WEEE management structure include importers, producers/ manufacturers, retailers, consumers (individual households, businesses, government and others), traders, scrap dealers, disassemblers/dismantlers and recyclers. In developing country like Cambodia, a majority of stakeholders in this category fall under unorganized/informal sector.

Up to date, there is no system and mechanism to manage the various groups involved in the management of WEEE in Cambodia. WEEE has to be managed through a carefully organized system, and existing actors should be part of the proposed system. The target groups do have a collective responsibility for managing WEEE at different stages in its life cycle.

Following description aims to guide EEE/UEE and WEEE related stakeholders by different aspects of responsibility and engagement. The Guideline commonly addressed separately for: (i) target groups in WEEE management; (ii) collection system; (iii) treatment technology; and (iv) establishment of treatment facilities, their processing and final WEEE disposal. The respective guideline is separately described below.

## **5.1 Producers, manufacturers and importers**

### **Producers and Importers**

There are very limited number manufacturer of EEE in Cambodia, except some producers at a small scale. Most companies have their production factories in countries in the region, where they have specialized in equipment and methods to recover useful raw materials from scrap. Producer commonly has important role in minimizing risk and hazard to human health and the environment through minimizing WEEE and related residues including the use of environmental sound technology. Therefore, producers need to:

- Establish channels to collect generated WEEE at the end of its life-cycle for the purpose of the environmental sound management.
- Implement individual take-back schemes or get organized into WEEE management sectoral or sub-sector programme.
- Clearly label products for easy identification and to show the constituents of the product.
- Comply with Cambodia standard on producing and manufacture of selected EEE and fully apply the Cambodia technical guideline on environmentally sound management of WEEE and other provisions regulated by the legislation and regulation particularly.
- Build in the cost of product take back and disposal into the purchase product price via consulting and agreeing from government responsible institutions.
- Pay attention and promote the implementation of green business in minimizing WEEE generation and pollutant release into the atmosphere. On the other hand, generated WEEE shall gather, pack and safely place prior to dispose at designated landfill.
- Cooperate and contribute the full carrying out of Pollutant Release and Transfer Register (PRTR) with the government responsible institutions.

On the other hand, producers/manufacturers should contribute the government agencies to educate and/or disseminate the sound management of WEEE including the promotion of implementing 3R/4R initiatives.

## **Importers**

Importers of electronic and electric equipment, in the Guideline, are divided into two categories including such as: importers of new units and importers of used units. Firstly, importers of new electronic and electric equipment (brand-new units) generally cause less impairs to the socio-economy and the environment, except for imported those which are fake with less using quality. In this regard, importers shall have a high morality in their occupation and/or business, otherwise laws/regulations will be taken action.

Secondly, importers of used EEE (second-hand units) shall pay attention and recognize on their occupation which may cause environmental and human health impact unless relevant terms of the environmental sound management of WEEE and related residues is applied. Therefore, importers of UEEE need to:

- Notify the Ministry of Environment or/and the government competent authorities for consent to transport UEEE through Cambodia subject to stated conditions, especially the used quality in order to minimize WEEE and related residues to be discarded from year after year.
- The specifications should be stated according to the Sub-decree on WEEE Management regarding the importation and exportation of WEEE.
- Ensure used electrical and electronic goods reach the pre-destined end users. A record of customers should be kept to facilitate waste collection.
- Indicate an envisaged lifespan of used units when importing used equipment and bear responsibility for this by ensuring that take back mechanisms are in place.
- Desist from importing poor quality UEEE or those are already waste from original countries.
- Ensure all generated WEEE and related residues will be properly managed to abide by the legislation/regulation.

Importers, on the other hand, should contribute the government agencies to educate and/or disseminate the sound management of WEEE including the promotion of implementing 3R/4R initiatives.

## **5.2 Assemblers, refurbishes, and recyclers**

### **Assemblers**

In this guideline, the description is addressed to those engage activities of assembling useable parts of UEEE/WEEE to become useable one. For the purpose of the sound management of WEEE, assemblers need to:



- Comply with Cambodia standard on the assembly of electronic goods and fully apply Cambodia technical guideline on environmentally sound management of WEEE and other provisions regulated by the Sub-decree on E-waste Management.
- WEEE related assembling process should under the control of MoE or Provincial/Municipal Dept. Environment including the issuing the permission.
- Clearly label products for identification of product constituents and storage by types.
- Clearly indicate extended producer responsibility on EEE.
- A safe occupational health is a prioritized shall be taken into account for workers. In the operational process worker/implementer should wear mask, gloves, glasses, etc.
- Hazardous wastes (WEEE and related residues) shall separately stored/kept away from household dustbins for different management purpose under the good protection condition, including discarding at a safe landfill identified by the MoE or Provincial/Municipal Dept. of Environment.
- For the purpose of reducing waste amount, it is necessary to urge the enable use of UEEE/WEEE prior to disposal.
- While a hazardous waste collection service is permitted and in place, assemblers shall use this special service for an appropriate management of WEEE.

## **Refurbisher**

The refurbisher means a person who renovates or processes UEEE or WEEE for reuse via selling to next users. Sometime refurbishing process and assembling process can do together. The refurbisher commonly extends the functional life of equipment and feeds it into the second hand market. Refurbishers need to:

- Ensure unusable material (WEEE) shall deliver to a licensed disposer whose does the service of collection and disposal at a permit safe landfill.
- Ensure WEEE plucked out of the equipment will go to the permit/license recycler.
- Prepare data on waste generated from the WEEE renovation processes.
- Provide incentives to consumer to donate used devices to someone who unable use the new one.
- Take into account on a safe occupational health for workers and operators, firstly the use of mask, gloves, glasses, etc.
- Avoid any harm or impact to surrounding environment including public health under the refurbishing and assembling process.

## **Recyclers**

These are organizations and individuals who dismantle, separate fractions and recover material from WEEE after the lifespan of the equipment. Recycler is a person who engages in treating or processing (of used or waste materials) to make them suitable for reuse. Recycler commonly does his/her business under the formal permission issued by competent author.

To prevent and minimize environmental and human health impacts from WEEE/UEEE recycling, all recyclers shall do abide by the environmental legal instruments through various countermeasures to:

- Improve and regularly monitor recycling system in order to reducing waste amount including air pollutants emission.
- Install the need technology and facilities for recycling process in order to minimize hazardous waste generation, air/atmospheric pollutants including the release of unintentional by-products Dioxins and Furans, noise and odor pollution.
- Ensure that revenue generated through sales of the materials recovered will support the administrative, plant and machinery and other overheads.
- Comply with Cambodia standard toward recycling of electronic goods and fully apply Cambodia technical guideline on environmentally sound management of WEEE and other provisions regulated by the Sub-decree on WEEE Management.
- WEEE and related residues shall be stored in the good protection conditions, and discarded separately from household wastes at the safe landfill, as refer to a guidance or an instruction of the MoE or the Provincial/Municipal Dept. of Environment.
- While a hazardous waste collection service is permitted by the MoE or the Provincial/Municipal Dept. of Environment and in place, recyclers shall use this special service for an appropriate management of WEEE.
- Take into account the setting up of work plan to intercept and minimize any emergency and environmental pollution incident resulting from recycling process.

## **5.3 Government organizations and learning institutions**

### **Government organizations**

In the core mission to ensure better conditions of the environment and human health, government line agencies especially the MoE, local authorities, etc., should take appropriate mechanisms of the environmentally sound management of UEEE and

WEEE at different generating sources and relevant sectors. Key factors of reusing, repairing, dismantling and recycling – these will be reached to appropriate and sustainable solutions. Achieving such solutions, it is a necessary need of full implementation and cooperation from the government responsible organizations by main activities herewith as follows:

- Specifying standards for products on the expected remaining lifespan of the equipment and electrical appliances, those are allowed to import and use in Cambodia.
- Identifying, introducing and delivering appropriate technology to agency and/or operators to improve existing practices of repairing, dismantling, refurbishing and recycling UEEE and WEEE in terms of both quality and quantity responding to the requirement.
- Promoting approaches of repairing, dismantling and recycling of UEEE and WEEE through mobilization of private partnership and investor, including the international cooperation to urge WEEE recycling process which is proceed forward smoothly, and to comply with the environmentally sound management.
- Playing important role as a focal point to communicate or find international markets or international partners for exporting recycle products of WEEE to meet the international requirement to abide by national and international legislations and agreements – that is the factor of stability of operation.
- Developing a management plan with particular responsibilities for different target groups, including the specific monitoring plan of WEEE recycle facilities within a geographical area.
- Providing incentives to entrepreneurs to set up WEEE collection and treatment facilities, including encouraging to those are successfully implemented.
- Under a closed collaboration with line agencies, MoE including the Provincial/Municipal Dept. of Environment, should regularly monitor and control environmental pollution at and/or surrounding WEEE repairing, dismantling, refurbishing areas and landfills, in order to intercept and prevents negative impacts to the environment and public health, especially the carrying out of the legal instruments.
- Promoting and raise comments to local authority or private company toward the identification and construction of a safe landfill for hazardous wastes or treatment plant based on the environmental sound technology.
- Urging the implementation of policy and legislation related to WEEE management including inspection procedure.

- MoE should do updated WEEE statistics, information and assess on environmental and human impacts, which is the base for developing strategy and plans for the next implementation.
- Increasing capacity and capability of technical officials to control the import of UEEE including to manage WEEE at generating sources and at a safe landfill.
- Promoting and boost the carry out of resource recovery from WEEE including 3R/4R initiatives.
- Increasing the capacity in negotiate with EEE produced country in relation to either take back policy or other doable procedures which aimed to minimize WEEE in the country.
- Promoting and increasing the stakeholders awareness in relation to the sound management of WEEE at both national and sub-national levels by various doable mechanisms including negative effects resulted from hazardous wastes containing in WEEE.
- Exchanging experience and strengthening network at global, national and sub-nation levels in relation to the sound management of WEEE.
- Strengthening cooperation and/or coordination among line ministries to improve the sound management of WEEE.

### **Learning institutions**

Learning institutions can be those associated with basic education, high school education or university education. They play important role to educate and disseminate the way and mechanism of appropriate use of EEE/UEEE or maximized use of WEEE prior disposal. Based on this function, learning institutions need to:

- Develop awareness-raising program and conduct sensitization campaigns including the TV contest programme in relation to WEEE management, especially the implementation of 3R/4R initiatives.
- Cooperate with the MoE or licensed WEEE management organizations or private sector for implementing the take-back mechanism, recycling and refurbishing of WEEE at life-end.
- Establish mechanisms to ensure that inspection certificates clearly specify end-of-life date and who bears responsibility thereafter.
- Develop and mainstream WEEE related education in curricula of all formal education levels.

- Identify qualified partners for experiences exchange of the sound WEEE management via at all-level educational system.
- Increase activities and promote the youth participation in the context of 3R/4R initiatives to EEE/UEEE and WEEE.

## **5.4 Consumers and transporter**

### **Consumers**

The consumer can either be an individual or a corporate organization that owns a device which falls into one of the WEEE categories and which is considered to have ceased to be of any value, or become waste.

To achieve the target of the environmentally sound management of WEEE at consuming sources, e.g. households, occupation sectors, etc., all consumers should take into account and apply the following guidelines:

- Consumers should ultimately use EEE prior to hand out to someone else, or repairing it and use again while it does not function properly.
- Prior to purchase EEE, consumers should identify and emphasize the consuming quality and lifetime of respective EEE by type and producer in order to minimize wastes to dispose into the environment and various expenditures (for those having short-lifetime with low consuming quality).
- A dry battery of EEE/UEEE which is out of its lifetime/expiry date, based on hazardous substance in origin – it should be separately from household wastes, safely stored and discarded at a safe landfill as said above.
- Paying attention and regular applying to a guidance of the EEE consumption to reach the expected lifetime of expiration, e.g. maintenance, battery recharge and use, etc.
- Separate WEEE from other household/urban wastes to facilitate the collection and transport to WEEE collection centers determined by responsible institutions, or discard appropriately at a safe landfill, or other sound management purposes.
- Using different dustbin/plastic bag for storage WEEE at a safe place prior to collect and dispose by a private collection service whose licensed by the MoE.
- Sell or donate WEEE to pickers/collectors or licensed refurbishers regulated by the regulations.

- Take back equipment to the manufacturer, importer or assembler, etc., if the process is allowed to do by the company.
- Dump e-waste at the licensed dumping site specified for the WEEE by their own or by licensed WEEE collectors and disposers.
- Be responsible for following recommended disposal methods or procedures especially date of expiry or end of usage period of the product.

## **Transporter**

Transporting of WEEE shall ask the permission from the MoE or Provincial/Municipal Dept. of Environment. There are main activities of which transporter must be done as habit, these include as follows:

### **a) Packing**

- Prior to transporting WEEE or recyclable EEE from place to place inside the country or from Cambodia to other country (according with the existing legislations) these must be compacted and packed by type, size, etc., beforehand.
- Strictly check and determine that WEEE or recyclable EEE are under a drying condition, good quality before packing.
- Symbols or signs of risk and hazard precaution and protection should be installed, e.g. flammable, combustible, toxic, hazard, spillage, etc., including detail information and address of import-export company.

### **b) Transportation service**

- Transportation of WEEE from companies or generating sources to junkshops shall do without caused any impacts and/or disturbances to surrounding communities and on-road travelers. The transportation can be done under the permission and control of the MoE or Provincial/Municipal Dept. of Environment.
- MoE should monitor and follow a company or sub-contractor towards the services of temporary storage and transportation of WEEE to ensure the service does not harm to the environment and public health. In consistent with this matter, MoE shall strictly control either waste collection service of unrecyclable WEEE to discard at a right landfill<sup>1</sup> by service provider.
- The servicing of WEEE transportation for recycling purpose which is provided by person or private companies to other countries shall follow the national and international legislations.

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<sup>1</sup> Under the permission of the Ministry of Environment

### c) Transportation Conditions

For the subject of transportation, as said above WEEE should be possibly compacted and packed to avoid any disturbances or impacts to travelers along the road and the publics, including the height of packing in according to the *Law on Land Traffic* of the Kingdom of Cambodia. Prior to do transportation, WEEE or recyclable EEE shall ensure to place in a firm/safe container with a proper seal to emphasize a strict control from competence authorities. The transportation of recyclable EEE and/or WEEE may implement by the same or different aspects as summarized follows:

- Action of transportation by waste scrap cart<sup>2</sup>: recyclable EEE/WEEE were collected or bought from respective generating sources, and moved to the target locations should be properly packed before placing into the push-cart or other means of transporting in order to avoid dropping, spilling out, combusting or firing, permeating or washing out by rainwater.
- Transporting from small waste scrap companies<sup>3</sup> to junkshops: all recyclable EEE and/or WEEE should be properly packed into the safety sacks or small containers prior to transporting, and it cannot exceed the size of the cart or truck, including vehicle height based on the Law on Land Traffic (*Article 54 of the Law, February 2007*).
- Transporting recyclable EEE and/or WEEE from generating sources and/or junkshops to recycling source:
  - Shred and grinded recyclable EEE and/or WEEE especially its plastic parts which are the purpose of transportation from junkshops or large generated sources should be properly packed before going to recycling places.
  - For holding up into transporting vehicles, such recyclable EEE and/or WEEE should neither impact the publics nor disturb neighbors and traffics.
  - Transporting recyclable EEE and/or WEEE to recycling places shall inform and report to the MoE or the Provincial/Municipal Dept. of Environment according to the Environmental law and related statutes.
  - The drivers should be trained on the risk and hazard resulted from transporting recyclable EEE and/or WEEE, but for the purpose of a safe traffic as well as to prevent and manage any serious events which might be occurred at all circumstances of transportation.
  - Transporting recyclable EEE and/or WEEE to overseas for recycling purpose shall have a license from the MoE and other concerned ministries based on the national legislations, imported license from imported country, and relevant documents as said by the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal as well. The exported party shall report the MoE about type, amount of wastes and the purpose of export. To abide by the Sub-decree on Solid Waste Management, the importing WEEE into Cambodia is prohibited.

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<sup>2</sup> *Push-cart*

<sup>3</sup> *Local agents, those are buying recyclable materials from generating sources and sell to the junkshop*

- Vehicle collecting and transporting recyclable EEE and/or WEEE must have a proper/safe cage or container, and hazardous/danger signals/signs.

## 5.5 Disposal authorities

In a nature of hazardous waste, WEEE shall dispose and manage based on the environmental sound technology. Hence, a safe landfill preparation for WEEE and hazardous waste disposal must be separately from urban wastes or household wastes. Significantly, the establishment of a safe landfill and dispose of WEEE shall be processed based EST under the particular permission of MoE or Provincial/Municipal Dept. of Environment.

Contributing the sound management of WEEE, disposal authorities or agencies need to:

- Develop disposal procedures for WEEE if required.
- Provide efficient transport for WEEE collecting to a safe landfill, which designated by the MoE or Provincial/Municipal Dept. of Environment.
- Raise awareness and build capacity for those who engage WEEE management, e.g. collectors, transporters and disposers.
- Set and announce specific times/days of WEEE collection at various generating courses including the storage site.
- Establish risk/hazard management plan including its practice drills to officials at landfill and people concerned.
- Set manageable fees to sustain WEEE management.
- Pay attention to WEEE landfill is identified a restrict area, where it is not allow any activities there. Additionally, it is suggested to put the sign-board of prohibited area.

However, responsible and concerned institutions including local authority shall strengthen their capacity to monitor and manage a safe landfill for WEEE disposal. While a specific landfill was constructed and operated, it is strictly and regularly controlled by responsible institutions, especially the MoE or Provincial/Municipal Dept. of Environment in order to ensure the proper landfill operation. Additional guidance shall be taken action:

- Preparing independent auditing on controlling system at the landfill, if needed, in order to ensure the effective landfill management is in the operation. This audit should include environmental audit routinely.



- Paying attention to improve communication between operators and responsible authorities to ensure that operators understand the advantage of technological works, maintenance work at safety landfill as mentioned above.
- Community and the public surrounding should have phone and facsimile numbers of landfill manager and competent authority in order to make communication easily or directly report, or call for intervention while environmental pollution emergency is happened.

## **5.6 Informal sector WEEE collectors**

Most collectors of WEEE and related residues, in Cambodia, do informally their career in collecting less valuable WEEE at generating sources and at dumpsites. They commonly do their daily career which confronting to self-health impact as well as cause impact to the publics and the environment. To protect their personal health as well as to contribute the environmental protection, every informal WEEE collector shall do the following guidelines:

- It is needed to acquire a license if they collect WEEE from various generating sources.
- Combining/forming as a group or an association which is easier managed by the government institutions, or easy to get other benefits from the government sector, NGOs, international organizations, e.g. education, advice, training, etc.
- WEEE should not break, dismantle or burn to withdraw less valuable parts at opened land and public area, because this activity will cause self-impact as well as pollute the environment.
- WEEE and related residues shall not discard at receiving sources opposing to the stipulations of existing legislation/regulation. These hazardous wastes shall dispose properly at a designated safe landfill.
- Contributing to the government responsible institutions in the environmentally sound management of WEEE by either educate other informal collectors – those do opposing to the stipulations of existing legislation/regulation, or report to competent authority whose located nearby for the case of seeing illegal/improper dispose or burnt of WEEE.
- Collectors should follow up and check regularly their personal health based on the Khmer Proverb said “Preventing is better than curing”.
- Collecting and moving/transporting WEEE to final disposal or recycle location, such WEEE shall properly pack and storage avoiding any negative impact to the environment and public health.

- Complying with the formal procedures on WEEE collections and fully apply the Technical Guideline on Environmentally Sound Management of WEEE and other provisions regulated by the Sub-decree on WEEE Management.

### **5.7 People Living near Dumpsites**

People living surrounding and/or closed to dumpsite may confront to a direct and/or indirect health impact via possible pollution routes, for instance, a direct impact through absorption/inhalation of polluted/contaminated emission (burning WEEE), water consumption (surface and ground water) which got pollutants from WEEE. Therefore, people should join the responsible government institutions to minimize health impact as well as the environmental protection.

- People living near dumpsites need to be educated on how to detect potential health hazards, through organized workshops by the WEEE management stakeholders and environmental health practitioners, or other means/ways.
- People should not consume water sources (surface and ground water) those are located surrounding and/or closed to dumpsite, except the study and analysis of water samples were properly done, and confirmed by responsible government institution to ensure its safety use.
- In the case of either doubt of water pollution or finding fish/aquatic species were died or continuously lost, people should urgently report or notify to responsible government institution for taking actions.
- Waste pickers at dumpsite face to risk and hazard of pollution/impact from WEEE, which should use health safety facilities like: mass, glove, boot, glasses, etc. On the other hand, they should not live closed to WEEE landfills avoiding such negative impacts.
- In the case of found illegal WEEE disposal at somewhere other than at the safety landfill or opened burnt, people should report or notify to MoE or Provincial/Municipal Dept. of Environment for taking actions complying with the legislation/regulations.
- Children must be away from WEEE landfill, while domestic animals should be properly feed and managed, otherwise such livestock will become harmful/pollutant agents to human.
- Soil mixed WEEE ashes shall not use for agricultural land improvement, or land filling at farm or residential areas – it is because people will live to confront high risk of impacts.
- People shall not burn or break WEEE to pick up less valuable parts for selling unless using appropriate technology. Because this practice will cause operator confronts to high risk and hazard, as well as cause to impact to neighbor and the environment.

- There is a requirement to provide awareness raising programmes to the poor whose commonly work dealing with WEEE, including people who live surrounding landfill in order to avoid and prevent their health and the environment from unsound disposal of WEEE or other hazardous/toxic wastes as well.
- People who live at/surroundings or near dumpsite should follow up and check regularly their personal health, although there is no advice or guidance from responsible institutions.

## **6. Guidelines for Collection System**

Generally, WEEE collection system should be a formal and informal channel. The WEEE collection system could be considered to duties of the producer, importer and retailer, while EEE user have to responsible his/her own waste (WEEE) and shall follow to the principle of the polluters to pay.

- Scenario of collection system starting from WEEE generation, temporary storage, collection and transportation, treatment/material recovery facility, recycle facility including extraction facility and final disposal of residue waste.
- The selection of collection system is necessary based on the flow channel. It can be integrate of channel collection between informal and formal and/or each channel.

## **7. Guideline for Selection of Collection Channels/Method**

### **7.1 Producer take back and storage**

Company/producer commonly has to set up the policy of take back system itself and/or it is required by regulation for whom responsible of their generated wastes at manufacturing/products. The producer needs to:

- Set up a collection center or take-back system either individually or collectively. The decision on collection mechanism can decide by the individual producer in accordance with their company policy and their responsibility of waste generation. These guidelines suggest the following options and requirement for setting up the collection center:
  - a) In case a producer him/herself sets up a collection center, he/she shall take authorization from MoE for setting up such individual collection center as requested by the Sub-decree on WEEE Management.
  - b) Producer may organize take-back system through their retailers or through service centers and set up collection points or bins or drop-off points and link them to their authorized individual collection centers. Such collection points can also be set-up by authorized common collection centers.

- c) Producer may organize take-back system through their retailers or service centers and set up collection points or bins and channelize the WEEE directly to registered dismantlers or recyclers.
- Producer may assess their individual requirements and design a collection or product take back system as they perceive appropriate as long as it facilitates channelization of WEEE for environmentally sound management.
- Producer may arrange for collection from both individual and bulk consumers, and channelize the waste to collection centers or recyclers/dismantlers.
- Producer may encourage wholesalers or retailers who successfully sole EEE based on take back mechanism.

## **7.2 Retailer take back and storage**

In response to the setting up policy of take back system of EEE producer, retailers may engage several processes of the system as mentioned as follows:

- Retailer shall promote and disseminate the take back system of the EEE shop based on fee charge of waste include the EEE cost, and discount by the percentage of total price of EEE while consumer brings back WEEE and buys the new one.
- This system should be considered the promotion by common name of products for example, Samsung, LG, Panasonic...etc., and type of EEE including space of temporary storage within cooperate with collection and transportation system and dismantle shop.
- Above activity requires a license issuing by Municipal/Provincial Dept. of Environment, and retailer has duty to send the report to this agency in relation to type and amount of WEEE were in the tack back system and discharge to their partners.
- For storage WEEE, retailer has to sort out by type and put in appropriate box/packing and labeling.
- In case of producer used the take back system based the company policy, it is required to do a contract with retailer whose will send WEEE back to company which include fee charge for WEEE disposal.

## **7.3 Municipal collection and storage**

It is necessary to consider and design the flow of WEEE collection and storage prior to discard at the safe landfill, which approved by the MoE and local authorities. The description of WEEE collection and storage flow is explained as follows:

- The collection points can be designated places where WEEE can be collected through residential areas, office complexes, commercial complexes, retail outlets, customer care stores, educational and research institutions, etc. These collection points will be financed by producers or common collection centers (on behalf of producers) to channelize WEEE to registered dismantler or recyclers.
- Collection bins could be installed in public places such as kerb sides, restaurants, malls, offices etc., which can be owned by the authorized collection centers or the producer. The contact details of authorized collection agencies should be printed on these bins for reference purposes of the general public. The WEEE collected in these bins should be transported to collection centers or channelized to registered dismantler or recyclers by the producers.
- Mobile collection vans can also act as collection systems from door to door collection of WEEE or from institutions/ individuals/small enterprises as mentioned above, and such vans shall be linked to collection center or provided by producer to channelize the WEEE to collection centers or registered dismantler or recyclers. A mobile collection van does not require authorization but their detail has to be provided to municipal hall while seeking authorization by the producers or collection centers.
- Local government and municipality/provincial hall, in consultation with the Provincial/Municipal Dept. Environment, should set up the collection and storage site for WEEE collection different to municipal and household wastes, including the collection schedule at generating sources.
- The service collection and storage could be combined the channel collection between formal and informal activity.

## **8. Guideline for Establishing Collection, Storage and Final Disposal Infrastructure**

Designing an appropriate infrastructure of WEEE collection, storage, transportation and the final disposal at a safe landfill is the main input at the last stage of WEEE management. The description in this stage have briefed earlier within several activities, however it is addressed again here to emphasize its linkage to the design of storage and final disposal infrastructure. Following are the guidelines to be implemented by key stakeholders:

### **8.1 Collection and Storage Infrastructures**

- Promoting education and dissemination on WEEE separation from household wastes, properly package and storage at generating sources for collection service of hazardous waste, which admitted by the MoE or Provincial/Municipal Dept. of Environment.

- WEEE collection vehicle (including pushing cart) shall equip appropriate protection facilities including risk and hazard labeling/sign, and abide by the stipulations in *Article 54 of the Law on Land Traffic, February 2007*.
- Collection center can establish for collecting WEEE individually or jointly, or it can be a registered community, or company or an association, etc., thus there is ample scope for evolving various ways in which a collection center can be set up and functional. To establish a collection center, it is required the authorization from competent authority.
- Collection center is a warehouse to store collected WEEE, which gathered from various generating sources.
- Person(s) or company who responsible for WEEE transportation/movement shall identify and arrange an appropriate temporary WEEE storage location which agreed by MoE or Provincial/Municipal Dept. of Environment, and shall properly manage this storage area.
- A storage location of WEEE, which is ready for transporting to a final disposal, shall have protecting facilities, a roof/cover, etc., avoiding its leakage, soak/flood or fire.
- A storage location of WEEE shall be cleaned, dried, regularly maintained as well as restricted to un-responsible people and domestic animals. It is also not a playground nearby.
- For collected WEEE or recyclable parts those intend or planned to export to overseas (other countries) shall follow the national and international legislations/regulations including the Basel Convention.
- Fire or risk/hazard prevention sign should be installed at the main areas/locations.
- Educating and/or training staffs who work at WEEE storage regularly.
- Promoting and increasing the cooperation and network with local authority, competent authorities.

## **8.2 Final Disposal Infrastructures**

- Prior to constructing a safe landfill for WEEE management including residues, and other industrial hazardous wastes, the stakeholders, especially designers and constructors should elaborately consider and further study necessary conditions such as: surrounding environment, archeology, geography, hydrology, storage capacity loading of landfill, transportation system, and ability to construct landfill according to the land feature itself to ensure the surrounding environment are safety and protection.

- Environmental impact assessment (EIA) must do and adopted by MoE or Provincial/Municipal Dept. of Environment as requested by existing legislation.
- Education and awareness raising for inside staffs shall regularly do in relation to risk and hazard management and response, including the practice drills.
- A final disposal site (landfill) is the restricted area for people and domestic animals, except for those who work inside.
- While a specific landfill was constructed and operated, it is strictly and regularly controlled by responsible institutions, especially the MoE in order to ensure the proper landfill operation. The landfill shall have the environmental management plan (EMP), including risk management and response planning.
- It is not allow to burn and/or self-fire WEEE at a safe landfill. Responsible people or agency/company must pay more attention on this matter. However, the reservation of fire-distinguished vehicles shall be in placed and ready to operate in a case of fire incident, in addition with accessible waterway system.
- Person(s) or company who responsible for operating and management of WEEE's landfill shall do a written report of their implement by every 03 months to MoE or Provincial/Municipal Dept. of Environment based on the Article 18 of the Sub-decree on Solid Waste Management.
- The MoE or Provincial/Municipal Dept. of Environment shall monitor and control the service of WEEE collection, storage, transportation, and final disposal (including treatment/burning).
- If needed, MoE and/or Provincial/Municipal Environment shall do the cooperation with local authority to design a safe landfill for WEEE disposal based on environmental manner.
- The "Guideline on Environmentally Sound Management of Waste Electrical and Electronic Equipment in Cambodia", does not explain or guide the safe landfill engineering for WEEE and other types of hazardous wastes. Therefore, landfill designer and constructor should firstly consult with technical officials of the MoE or Provincial/Municipal Dept. of Environment, and relevant institutions.

## **9. Guideline For WEEE Treatment Technology**

The presence of hazardous elements and compositions in WEEE can pose adverse negative effects to the environment and public health when improperly managed in its

cycle, especially at the final stage of disposal at landfill. Therefore, a recommended approach to treating WEEE is firstly reduce the concentration of these hazardous chemicals and elements and finally dispose WEEE fractions through either incineration or land- filling or a combination of both.

Treatment options for WEEE should include the following unit operations:

### **9.1 Decontamination or Dismantling**

- Removal of parts containing hazardous/ dangerous substances (CFCs, Mercury (Hg), switches, PCBs), and keep its separately and safety.
- Removal of easily accessible parts containing valuable substances (cables containing copper, steel, iron, and precious metals, e.g. contacts) and keep its for income purpose.
- Segregation of hazardous/ dangerous substance and removal of easily accessible parts, packing and keeping its separately at different locations.
- For those are unvaluable must package for final disposal.
- Hazardous wastes generating from dismantling must be safely packed and placed.
- Dismantlers should pay attention on occupational health, including environmental impact minimization through their operation.

### **9.2 Segregation of Ferrous Metals, Non-ferrous Metals and Plastics**

This separation is generally carried out after shredding and is followed by a mechanical and magnetic separation process. During the processing, operators should pay attention on their occupational health and surrounding environment.

### **9.3 Recycling or Recovery of Valuable Materials**

WEEE fractions after segregation consisting of ferrous and non-ferrous metals are further treated. Ferrous metals are smelted in electrical arc furnaces whereas non-ferrous metals and precious metals are smelted in smelting plants. The use of modern technology is recommended to release either less environmental impacts or zero impact to the environment.

### **9.4 Treatment or Disposal of Dangerous Materials and Wastes**

Shredded light fractions are disposed of in landfill sites or sometimes incinerated, while CFCs are treated thermally. Poly Chlorinated Biphenyls (PCBs) – are known as the persistent organic pollutant are incinerated or disposed of in underground storages, and



Mercury (Hg) and some heavy metals, on the other hand, are often disposed of in underground landfill sites where the environmental sound technology's construction was provided.

It is recommended all hazardous wastes must properly packed and disposed at designated landfill. On the other hand, incinerator for treating relevant hazardous waste should match to the environmental sound technology (EST). Lastly, operational report should regularly submit to MoE or Provincial Department of Environment as stipulated by existing legislation.

Practicably, the process of WEEE treatment should include the following components:

- a) Testing of WEEE product in order to sort reusable and non-reusable WEEE separately.
- b) Disassembling non-reusable WEEE and sorting WEEE fractions into reusable and non-reusable parts.
- c) Size reduction, separation and recovery of different materials from non-reusable WEEE.
- d) Disposal of the remaining WEEE fractions.

A detailed WEEE treatment system should categorize in three levels including such as: (i) First level treatment; (ii) Second level treatment; and (iii) Third level treatment. These three levels of WEEE treatment systems are based on material flow from first level to third level treatment. Each level treatment consists of unit operations where WEEE is treated and the output of first level treatment serves as input to second level treatment. After the third level treatment the residues are disposed off either in hazardous waste landfill or incinerated.

## **10.Guideline For Establishment Of Unit Treatment Facility, an Integrated Processing Treatment Facility and Disposal Sites For WEEE**

The establishment of WEEE recycling & treatment facilities in Cambodia shall be in line with the existing legislations, for instance: Law on Environment Protection and Natural Resource Management (1996); Sub-decree on Environmental Impact Assessment (1999); Sub-decree on Water Pollution Control (1999); Sub-decree on Solid Waste Management (1999); and Sub-decree on Air Pollution Control and Noise Disturbance (2000) -- requirements applicable for establishing and operating recycling, treatment and disposal facilities.

This section mostly describes the management aspect based on technical view at areas equipping facilities or landfill, while the previous descriptions in section V and VI are referred to common managerial tasks.

### **10.1 Setting -up and Management of a Unit Treatment Facility or an Integrated WEEE Facilities**

Any processing and recycling facilities that receive designated materials must ensure:

- Facility is fully licensed by all appropriate competent authorities.
- An Environment Impact Assessment (EIA) is undertaken and an EIA license issued.
- Facility should have obtained approvals under existing laws and regulations relating to environmental protection and occupational health and safety.
- Facility takes sufficient measures to safeguard the environment, occupational health and safety under applicable laws.
- Facility regularly implements and documented monitors and recordkeeping program that tracks key process parameters, compliance with relevant safety procedures, effluents, emissions, stored incoming and outgoing materials and waste.
- Facility has an adequate plan for closure. The need for closure plans and financial guarantees is determined by applicable laws and regulations, taking into consideration the level of risk.
- Risk and hazard management plan should be prepared for the facility, including capacity building to whom are operators.

## 10.2 Facility Operation Requirements

The facilities can exist as a separate unit operation or as an integration of all unit operations under either one or different roofing according to the building conditions. The key facility operation units are varied. The most common operation units include as follows:

- An effective collection channel and infrastructure.
- Adequate a safe storage area.
- An elaborate dismantling and segregation section.
- A recycling plant / unit.
- A Treatment and Disposal unit.

Following description is indicated about the implication of functions, beneficial use, etc., which should be considered and understood prior to selected for its operation.

### 10.2.1 Collection Systems for WEEE

- The collection systems shall be in line with the guidelines VI.
- The individual producers can have direct contact with dismantlers or recyclers to get back the re-usable components from their obsolete equipment for use in

production.

- The system may charge fees, provide free collection or provide discount on purchase of new EEE item in according with the set mechanism of producer/company.

### 10.2.2 Areas for Storage Facility

It is referred to the engineering aspects including as follows:

- The location can be within the facility (on site) or outside the facility (off site).
- It should be well covered to store recyclable wastes until it is recycled or treated.
- The covering should be weatherproof to minimize the contamination of clean surface and rain waters. It will also facilitate the reuse of whole appliances and components intended for recycling and to assist in the containment of hazardous materials and fluids.
- The type of weatherproof covering required will depend on the types and quantities of waste and the storage and treatment activities undertaken.
- WEEE items should be separated and kept in appropriate well-marked containers.
- The storage area should have impermeable surfaces and a sealed drainage system. Storage ensures that no liquid will run off the pavement and all liquids entering the system are collected in a sealed sump.
- The storage area requires a protecting fence/wall against any activities or intrusion from other people or domestic animals – that is a restricted area.
- Spillage collection facilities should be provided. They should include the impermeable pavement and sealed drainage system as the primary means of containment.
- An appropriate storage site should be provided for disassembled spare parts that contain oil or other types of fluids. They should be stored in containers that are secured that will not allow oil and other fluids to escape with an impermeable surface and a sealed drainage system.
- Components and residues arising from the treatment of WEEE should be contained for disposal or recovery. If they contain hazardous substances they should be stored on impermeable surfaces with weatherproof covering or/and in appropriate containers .
- Containers should be clearly labelled to identify their contents and must be secure

from liquids and rainwater seepage.

- Components should be segregated having regard to their eventual destinations and the compatibility of the component types.

### 10.2.3 Dismantling and Segregation of Dismantled Parts

Dismantling and segregation are the first steps towards recycling of WEEE. These are cost effective and labor-intensive activities and are mostly carried out in the informal sector, which needs to be brought into mainstream recycling.

WEEE segregation involves separation of equipment according to its level of difficulty to dismantle, and its hazardousness. Segregation can be done either before the equipment is dismantled or after.

Dismantling of WEEE may be carried out manually or mechanically depending upon the scale of operations and the WEEE being handled. Manual dismantling should only involve used electronic and electrical equipment where there is no likelihood of contact with hazardous substances. An integrated facility should provide a mechanical dismantling facility to dismantle WEEE containing hazardous substances.

Sorting of waste is encouraged at source to enable easier identification and access to particular waste streams. Identification will be carried out in three categories, these include such as: (i) items in good condition that can be reused; (ii) items that can be repaired/refurbished; and (iii) items for dismantling for recovery or disposal.

A part of WEEE management, the core components are identified and implemented, these include: dismantling, classifying/separation and broken apart.

Dismantling should be carried out after verification that items are no longer usable, therefore, the separation of useable parts and unusable parts have to be done by dismantling process to get those can be used as spare parts or recycles (e.g. cable containing copper, steel, iron, precious metal containing parts, etc.), while unusable/non-recyclable parts will be disposed accordingly based on the said of legislations.

Useable parts, under the dismantling process, can be recovered and sold to the second hand market or sold to repairing/recycling shops for some profits.

It's necessary to pay attention on occupational health and safety, which is the key to sustain the operation as well as to contribute the carry out of the government policy of poverty alleviation. The occupational health and safety concerns of facilities for storage and dismantling of the equipment, commonly, should be in accordance with Law of Labour.

### **10.3 Recycling and Recovery of WEEE**

Recycling is encouraged at a formal level where all institutions shall ensure that WEEE is collected and delivered to the designated collection centers. WEEE recycling is expensive and the costs are not necessarily covered by the resale of recovered materials.

MoE in collaboration with relevant lead agencies shall register and recognize collection schemes as well as recycling centers for regulation through licensing.

The supplier will be required to supply records of the amounts collected for this purpose to the government.

An integrated WEEE recycling facility should opt for the Best Available Technologies (BAT) and provide the state of the art facility complying with all the environmental laws in the terms of emissions, effluents, noise, waste treatment and disposal amongst others.

### **10.4 Developing a Treatment and Disposal Unit**

The treatment process in the Guideline has two aspects for consideration and applied for the two different options, but these tend to achieve the main purpose of the environmental and health protection.

Firstly, the description is focuses on the WEEE and related residues generated from the treatment process and facilities. The treatment technology and facilities installing are very expensive cannot affordable by the poor country like Cambodia, except incineration process. Therefore, incineration facility (or knowing as incinerator) based on the EST should be used for incinerating WEEE/related residues at the site. However, it is suggested, while unaffordable use a specific incineration facility, to use either a high temperature cement kiln or waste incinerator – those are met the environmental friendly, to incinerate such hazardous wastes temporary. Ashes/resides remaining after incineration process must be collected, pack and disposed at a safe landfill, as identified by MoE or Provincial Environmental department.

Secondly, the provision should be made of equipment for the treatment of collected contaminated water at and surrounding operational areas including rainwater, in compliance with the health and environmental regulations. Operators of treatment facilities should take appropriate steps to minimize the contamination of waters, soils as well as the atmosphere.

Impermeable surfaces should be provided for appropriate areas. The impermeable surface should be associated with a sealed drainage system and may be needed even where weatherproof covering is used. Spillage collection facilities that include the impermeable pavement and sealed drainage system as the primary means of

containment should be provided. However, spill kits to deal with spillages of oils, fuel and acids should be provided and used as appropriate.

On the other hand, records should be maintained on the treated waste to inform on WEEE entering a treatment facility and components and materials leaving each site (together with their destinations).

## 10.5 WEEE Disposal Sites

Several relevant factors have to be taken into account and implemented to sustain a final disposal site of WEEE or hazardous wastes. These include as follows:

- Disposal should be done in specialised cells or sections in a licensed landfill site.
- Owners/operators of disposal site (a safe landfill) shall ask for operational license by MoE. In addition, MoE or Provincial/Municipal Dept. of Environment shall do the monitor or inspection at operational sites in relation to WEEE management and disposal.
- Owners/operators must demonstrate technical knowledge and understanding of the hazardous nature of WEEE.
- Disposal sites shall be published after licensing for the general public is aware of the existence of the same.
- Disposal shall be paid for and the disposer shall be issued with a certificate of safe disposal.
- Disposers shall keep a record of the amounts and categories of wastes, which MoE or Provincial/Municipal Dept. of Environment may access upon request or during inspection of WEEE handling facilities, in parallel with reporting to Provincial/Municipal Dept. of Environment as stipulated by existing legislation.
- Burning and burying of unusable disposable parts is prohibited as contaminants emit and easily leach into the air, soil and pollute air, soil and groundwater resources.
- Disposal site shall have leachate/contaminated liquid collection system and treatment prior to release into receiving sources.
- The site is strictly access and equipped with prohibited/dangerous signs, other emergency saving facilities, and fence should be provided which surround by planting trees.