



# Country Chapter

## State of the 3Rs in Asia and the Pacific

# The Kingdom of Cambodia

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This country chapter for Cambodia was prepared as an input for the 8<sup>th</sup> 3R Forum in Asia and the Pacific. Purpose of this country report is to assess the status of 3R implementation in Asia and the Pacific and to share the knowledge of 3R activities among the region.

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## **ABBREVIATION**

CDIA	Cities Development Initiative for Asia
CEA	Cambodia Environment Association
DoPC	Department of Pollution Control
EEW	Electric and Electronic Waste
EIA	Environmental Impact Assessment
Gg	Gigagram
GHG	Greenhouse Gas
JICA	Japan International Cooperation Agency
IEIA	Initial Environmental Impact Assessment
IEE	Initial Environmental Examination
MoE	Ministry of Environment
MM	Millimeter
MP	Mobile Phone
MSWM	Municipal Solid Waste Management
RG	Royal Government
SWAPI	Solid Waste Management Experts in Asia and Pacific Islands
TV	Television
UEEE	Used Electric and Electronic Equipment

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## A: WASTE DEFINITION

In Solid Waste Management Sub-decree in Cambodia (established in 1999, Sub-decree No 36 ANRK.BK hereafter refer to as sub-decree) “Solid waste” comprise all the waste arising from human activities, including animal waste that is discarded as useless or unwanted. The sub-decree defines the key terms of “solid waste” and “garbage” as follows:

- Solid waste refers to hard objects, hard substances, products or refuse which are useless, disposed of, are intended to be disposed of, or required to be disposed of; and
- Garbage is the part of solid waste which does not contain toxic or hazardous substances, and is discarded from dwellings, public buildings, factories, markets, hotels, business buildings, restaurants, transport facilities, recreation sites, etc.

The sub-decree also describes household waste and hazardous waste terms as follows:

Household waste is the part of solid waste which does not contain toxic or hazardous substance, and is discarded from dwellings, public buildings, factories, markets, hotels, business buildings, restaurants, transport facilities, recreation sites, etc; and

Hazardous waste refers to substances which are radioactive, explosive, toxic, inflammable, pathogenic, irritating, corrosive, oxidizing, or other chemical substances which may cause danger to human and animal health, or cause damage to plants, public property or the environment. Hazardous waste may be generated from dwelling houses, industries, agricultural activities, business and service activities, mining, etc. Types of hazardous waste are listed in the APPENDIX.

The purpose of this sub-decree is to regulate the solid waste management in a proper technical manner using safe methods in order to ensure the protection of human health and the conservation of biodiversity. This applies to all activities related to disposal, storage, collection, transport, recycling, dumping of garbage and hazardous waste.

According to MoE (2004), solid waste is classified into three categories which are: (1) Domestic/household waste; (2) Commercial waste (from businesses); and (3) Industrial and Hazardous waste including hospital waste.

The national strategy on 3R for waste management in Cambodia was prepared by MoE in 2008 supported by UNEP, and it provides the definition of 3R as follows:

“The 3R initiative is a new concept for Cambodia aiming at managing waste complying with the environmental and economic bases. The 3R — reduce, reuse, recycle, in this strategy focuses merely on solid waste management context”.

- *Reduce* is an activity of the reduction of solid waste at generating sources, e.g. households, industries, business centers, etc., using various appropriate ways for disposal, in order to reduce the serious pressures on the environment and human health, and prolong the timeframe for use of dumpsites. To reduce waste involves waste avoidance.
- *Reuse* is an activity to repeatedly use the same product or the same or different target at various sources, especially in households and the industrial sector until end-of-life, e.g. a drinking-

water bottle can be reused for drinking water or for other liquids. To reuse means to effectively achieve the target of waste reduction.

*Recycle* is an activity whereby recyclable wastes are used to produce raw materials and new products of the same type as the former product or slight different depending on the recycling process, for instance the recycling of plastic bag litters to produce plastic raw materials and plastic products by type. Organic composting using organic waste is another important concept to integrate the environment. Achieving a recycle process with an environmental and economic purpose contributes to the goal of the environment and sustainability.

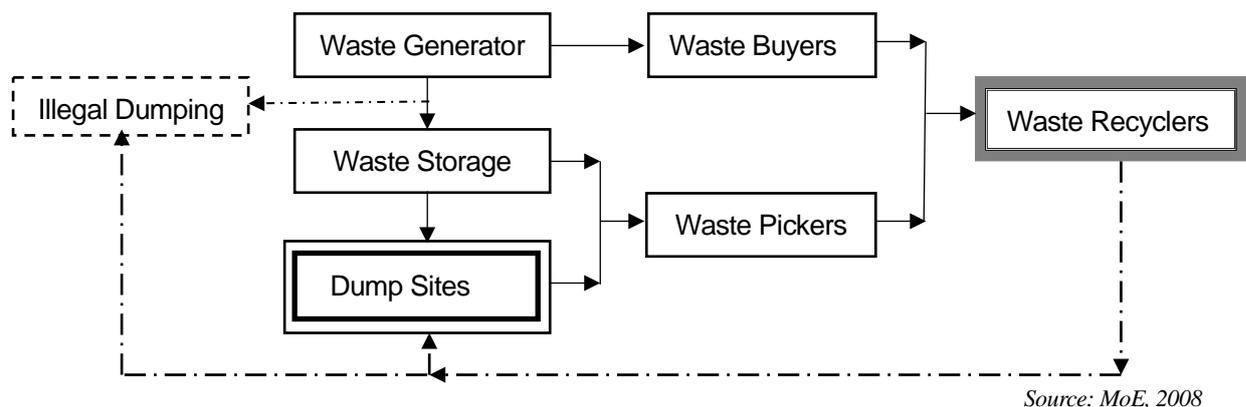


## II. Municipal Solid Waste Management and Composition

Solid waste has become an increasing concern in developing countries, particularly in urban poor areas. Cambodia is categorized as a “least-developed country”<sup>3</sup> and it is increasingly becoming urbanized due to a high population growth rate and internal migration from rural to urban areas for job and business opportunities. The increasing volume of solid waste is due to a combination of factors:

- Population growth,
- Increasing per capita consumption and affluence,
- An increasingly consumer-based society and economy, and
- The type of package materials used and available in country

These factors are making the solid waste management system more complex. Most Cambodian waste collection, transportation and disposal in major cities and towns are provided by private companies under the supervision of local authorities and government technical line agencies. However, some provincial towns and urban areas in Cambodia still do not have solid waste collection services. Each household therefore manages its own waste, through burning, burrowing or through illegal disposal on vacant land, rice fields or into water bodies.



Source: MoE, 2008

**Figure B-2 Waste management flow in Cambodia**

Regarding waste composition in Cambodia, the percentage of kitchen waste ranges from 63.30% to 80.46% while the percentages of plastic, rubber and leather ranges from 3.30 % to 15.60 % (Table B-1).

<sup>3</sup> The following three criteria are used to classify countries as least developed: (i) Gross national income per capita, (ii) Human Assets Index, (iii) Economic Vulnerability Index, and based on these Cambodia remains on the United Nations list of Least Development Countries (December 2013)  
[http://www.un.org/en/development/desa/policy/cdp/ldc/ldc\\_list.pdf](http://www.un.org/en/development/desa/policy/cdp/ldc/ldc_list.pdf)

**Table B-1 Household Waste Composition**

Composition (%)	Phnom Penh	Siem Reap <sup>a</sup>	Battambang <sup>a</sup>	Kampong Chhnang <sup>a</sup>
Kitchen Waste	63.30	65.18	71.88	80.46
Textile	2.50	4.34	2.88	1.26
Grass and wood	6.80			
Metal	0.60	5.33	1.06	7.70
Ceramic and stone	1.50			
Paper	6.40	0.88	2.72	2.10
Plastic	15.50			
Rubber and leather	0.10	8.85	8.61	3.30
Bottle and glass	1.20	7.80	5.40	0.70
Others	2.10			

Source: JICA, 2005

<sup>a</sup> Department of Environmental Pollution Control (DoEPC), 2008

### III. Waste Collection and Transportation

The waste collection system in Cambodia has been provided by private companies that normally operate in central urban areas including the capital city of Phnom Penh, provincial towns and some district areas. The collection system uses trucks along the roads, particularly for large roads. However for some narrow roads and communities which cannot be accessed by the collection trucks, push carts are used to collect waste to be stored at temporary transfer stations with public bins for secondary truck collection. The compactor trucks and other modern trucks are only used in Phnom Penh as well as in some provincial tourist towns such as Siem Reap, Battambang, Kampong Cham and Sihanouk Ville while open trucks are used for the remaining provinces.

However, not all towns in Cambodia have an official waste collection system (SWAPI, 2012). Solid waste collection, transportation and disposal are properly undertaken only in Phnom Penh municipality, Preah Sihanouk, Siem Reap and Battambang towns, which are major population centers. In some towns, waste is only collected from markets and residences surrounding those markets. Therefore it is not possible to collect exact data on the solid waste generation in all urban areas (SWAPI, 2012). However, based on MoE's report (2011) Table 0-2 shows that the proportion of waste collection and disposed at provincial dumpsites is very variable. Tourist cities, e.g. Siem Reap have good waste management service coverage, but more remote provinces e.g. Mondulkiri, Rattanakiri, or Pheah Vihear, have a very low percentage of MSW collected.

**Table B-2 Waste Generation and Disposal into dump sites by towns**

No	Name of Towns and Province	Waste generation (Ton/day)	% of waste disposed into landfill/dump site
1	Takhmao, Kandal Province	116.0	34
2	Preyveng, Preyveng Province	17.2	32
3	Siem Reap, Siem Reap Province	130.0	85
4	Svay Rieng, Svay Rieng Province	2.1	75
5	Sihanouk, Sihanouk Province	110.0	73
6	Kampong Cham, Kampong Cham Province	35.0	71
7	Chbamon, Kampong Speu Province	19.7	67
8	Battambang, Battambang Province	80.0	63
9	Senmonorom, Mondul Kiri Province	6.5	62
10	Kep, Kep Province	8.7	57
11	Steung Sen, Kampong Thom Province	31.8	36
12	Samrong, Odormeanchey Province	6.0	33
13	Kratie, Kratie Province	20.0	28
14	Kampong Chhnang, Kampong Chhnang Province	27.0	26
15	Khemarak Phoumin, Koh Kong Province	15.0	20
16	Daun Keo, Takeo Province	13.0	15
17	Pursat, Pursat Province	35.6	14
18	Kampot, Kampot Province	28.0	7
19	Serey Sophorn, Banteay Meanchey Province	168.0	6
20	Preah Vihear, Preah Vihear Province	9.6	6
21	Pailin, Pailin Province	8.0	0

*Source: Department of Environmental Pollution Control (MoE), 2011*

#### **IV. Treatment and Disposal**

Waste treatment is limited in Cambodia. Apart from small amounts of recyclable materials sorted out by the waste pickers and a few local NGOs, waste items are dumped in open dumpsites without any treatment.

There are no sanitary landfills, or other treatment facilities for industrial or municipal waste. Therefore, municipal solid waste (MSW) is disposed of in open dumpsites except in Phnom Penh where MSW waste goes to an engineered landfill.

According to SWAPI Book (2012) there are 72 dump sites across the whole country. The sites are generally open dumps, without fencing or covering, and there is a lack of management or control. This leads to environmental and human health impacts. The dumpsites therefore attract many flies, insects and other disease vectors as well as generating bad odors which are a problem for nearby residents or workers.

Some MSW is also illegally dumped on vacant land, public roads and in waterways. JICA (2004) states that the percentage of waste illegally dumped in Phnom Penh is approximately 2.5% in the centre and 15% in the outskirts, while the percentage of burning is 15% in the centre and 50% in suburban areas. This demonstrates a general lack of control over MSW in Cambodia, and a lack of treatment and disposal facilities.

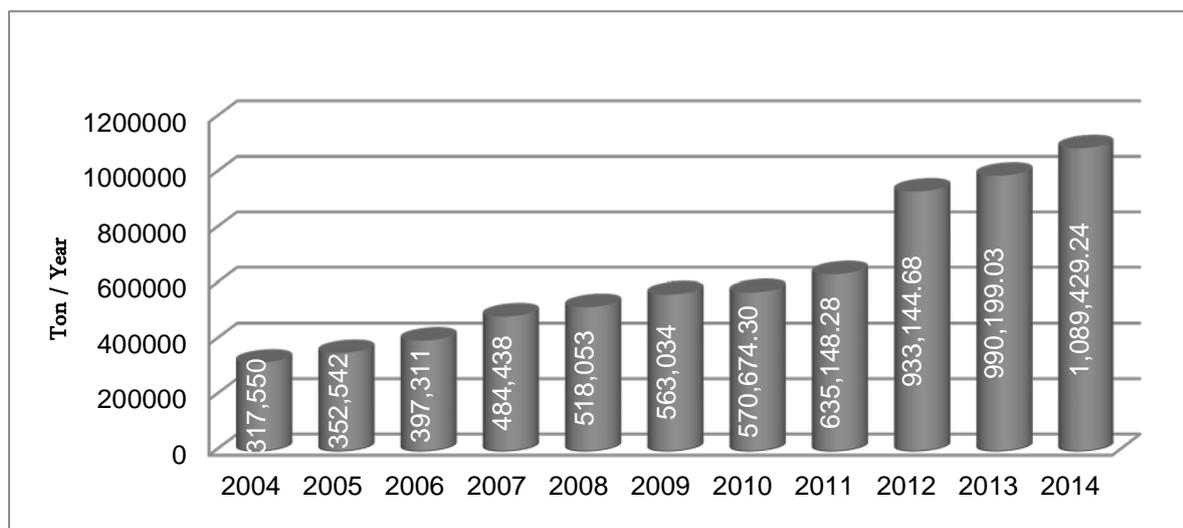
## C: 3R INDICATORS

### I. Waste Generation

(Municipal Solid Waste Management in Asia and the Pacific Islands, Cambodia Chapter, 2012)

Cambodia's capital city, with 23 provinces including 26 towns under provincial supervision (Census, 2008), are all quickly developing their infrastructure and becoming more urbanized. Many towns within the provinces are extending their waste collection coverage, to include the increasing population. Population is over 15 million people (Census, 2013), generating around 7,305,000 tons/year of waste. This is based on the country's only available per capita waste figure of approximately 0.487 kg per capita per day for Phnom Penh (JICA, 2005).

As given by MoE (2015)<sup>4</sup>, the total amount of solid waste collected and transported to dump sites has increased by 317,550 tons in 2004 to approximately 1,089,429 tons in 2014. Figure 0-1 shows a comparison of waste amount collected and transported over the 10 years from 2004 to 2014. The result of the waste collected and transported shows positive achievement with rapidly increased percentages of waste collection. However, by comparison of the waste collected and generated in the whole country, there are still many challenges remaining due to the high volume of uncollected wastes.



Source: MoE (2015), and SWAPI (2012)

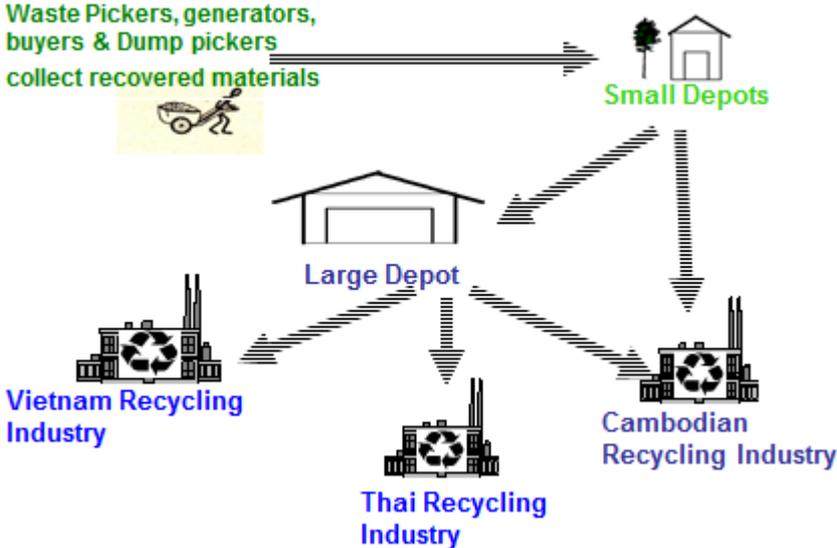
**Figure C-1 Amount of waste collected and transported to landfill and dump sites in Cambodia**

<sup>4</sup> The data was calculated from the raw data from Department of Pollution Control of Ministry of Environment in year 2015.

## II. Recycling Rates and Targets

In Cambodia, recyclable materials are picked up by waste collectors including truck collectors, and waste pickers at source such as from residential, commercial, market, and public areas, or dumpsites. Cambodia’s recyclables collectors are generally either poorer people who collect recyclables from waste bins or illegal dumps, or collectors with a vehicle collecting metals and plastics from households and businesses (SWAPI, 2012). In addition, most of households are involved in separation of their recyclable wastes at source, for example, aluminum cans, plastic bottles, and carton papers for sale to waste pickers or junkshop.

According to Wildblood (2008), the practice of 3Rs is active only in the major urban areas while in rural areas only practical material reuse is implemented. In rural and urban areas, informal waste recycling is undertaken by private recyclers and some NGOs but on a limited scale. JICA (2004) states that 86 tons per day of material are recycled in Cambodia while CSARO is involved in recycling of recycle materials with a figure of 1.5 to 2.0 tons/month. However the informal recycling sector is very active in the collection and separation of value materials for recycling. In Phnom Penh collected recyclables are estimated to reach 39.7 tons/day, or 4.3% of the total waste generated in the Phnom Penh municipality (JICA, 2004). The majority of recyclables are exported to Vietnam and Thailand, with little or no processing in Cambodia (SWAPI, 2012).



Source: Sethy, 2006

Figure C-2 Flow of recyclable materials in Cambodia

MoE, 2008, stated that the National 3R Strategy should be accomplished by two different specific target years, by 2015 and 2020 in the target areas. Summaries of the two target years are as below:

1. The First Target Year in 2015: Achieve an appropriate solid waste management system and practices through:
  - Solid waste and garbage collection for disposal and treatment based on the capability, capacity and geographical features:
    - up to 50% of municipal waste,

- up to 70% of industrial waste, and
  - around 50% of medical waste.
  - Solid waste separation for recycling purpose:
    - in households for 10-20%,
    - in business areas 30-40%, and
    - 50% for industrial waste.
  - Organic waste composting:
    - 20% of household organic waste, including from business centers, to be composted and used instead of chemical fertilizers for agricultural land improvement instead of using chemical fertilizers.
    - 30% of appropriate dumpsites to be established and operated in selected urban areas.
2. *The Second Target Year in 2020: Achieve an appropriate solid waste management system and practices through:*
- Solid waste and garbage collection for disposal at landfill/dump sites based on the capability, capacity and geographical features:
    - around 60% of municipal waste,
    - 70-80% of industrial waste, and
    - around 70% of medical waste.
    - around 90% of solid waste generated from industrial and health sector accordingly will be treated before disposal at secure landfills.
    - 70-80% of industrial waste, and
    - around 70% of medical waste.
  - Solid waste separation for recycling purpose:
    - up to 50% in households,
    - 70% in business areas, and
    - 80% of industrial waste.
  - Organic waste composted to produce organic fertilizer to improve agricultural land instead chemical fertilizers.
    - up to 40% of household organic waste,
    - 50% of organic waste generated by business centers will be used for composting fertilizer for land improvement instead of chemical fertilizers.
    - 40% of appropriate sanitary landfills will be established and operated in cities and provinces.

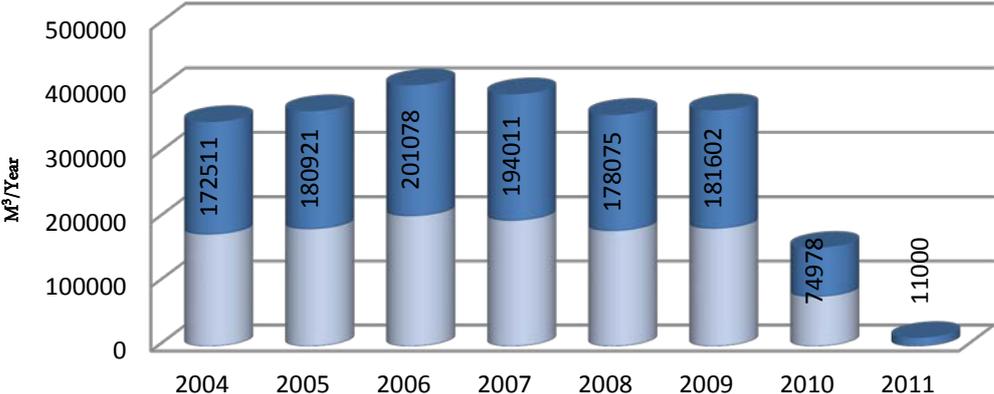
### **III. Amount of Hazardous Waste Generated and Disposed**

General waste or non-hazardous waste is collected and disposed at domestic dumpsites, but hazardous waste is safely stored, transported and disposed at secure dumpsites designated by the MoE. The hazardous waste has been collected by Sarom Trading Company which is contracted by the government to collect the hazardous waste from industries and others. Based on DoPC (2011), the waste collection service for hazardous waste has been provided only in Phnom Penh, Kandal and Kampong Speu provinces. A total of 227 factories are located in Phnom Penh, Kandal and Kampong Speu provinces but only 163 factories have contracted to use the service offered by Sarom

Trading. According to the DoPC, 2011, the Sarom Trading collected and transported a total of 74,978 m<sup>3</sup> of waste in 2010 and 11,000 m<sup>3</sup> of waste in 2011. The amount of collected waste has been decreasing yearly because of increasing 3R activities, particularly re-use and recycling activities. Recyclable industrial wastes such as scrap cloth are sold to waste buyers who come to buy recyclable waste from factories.

According to MoE (2008), six waste incinerators are in operation in Phnom Penh, of which five are for burning scrap-cloths/rags in garment factories to operate the steam ovens (at 249.60 tons annually), and one incinerator burns other industrial waste at 3,276 tons annually. There are no reports on the burning temperatures for respective incinerators. The onsite incinerators are operated with low technology without air pollution control systems.

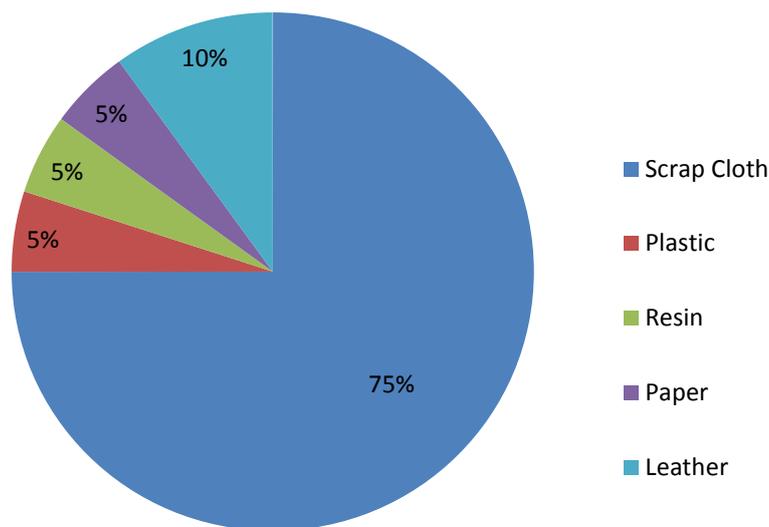
Based on the MoE (2008), a total of about 3,525.60 tons of industrial solid waste are annually burned in factory incinerators but there are no reports on the pollutant load of the emission. There may be other indicators to address on ways to decrease the amount of waste going to landfill (Figure 0-3). In rural areas, only one landfill in Ansnoul District, Kandal province has been designed for hazardous waste disposal. The landfill covered two hectares of land but it was closed in 2009, and a new landfill has been in operation from September 2009 that covers on five hectares of land.



Source: DoPC, 2011

**Figure C-3 Annual industrial waste amount disposed at landfill, in Ansnoul District, Kandal**

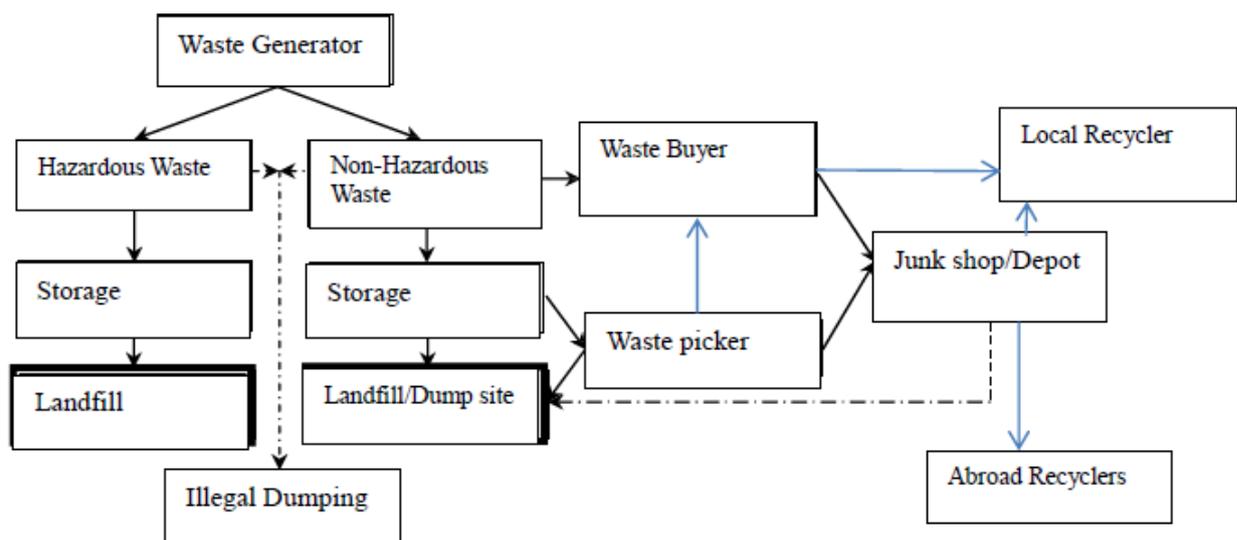
The types of industrial waste at the final disposal at the Sarom Trading landfill, located in Ansnoul District of Kandal province, shows that waste consists of 75% scrap cloth, , while 10% leather, and 5% each for plastic, paper and resin (Figure C-4).



Source: DoPC, 2011

**Figure C-4 Types of industrial waste disposed in the Sarom Trading Landfill**

The industrial waste management is normally separated into two categories such as hazardous waste and general waste or non-hazardous waste. A flow-chart of the industrial waste management is shown in Figure C-5.



**Figure C-5 Industrial waste flow-chart in Cambodia**

## **IV. Amount of Agriculture Biomass**

The Government of Kingdom of Cambodia promoted the country as an agricultural country, because a large majority of the population practice agriculture and most of them live in rural areas; however data on agricultural wastes are very limited. No specific study focuses on agricultural waste. Agricultural waste includes all leaves, straw and husks left in the field after harvest, hulls and shells removed during crop processing at the mills, as well as pesticide and herbicide bottles, and animal dung<sup>5</sup>. Leaves and straw are normally re-used for cattle. Annual statistics on animal populations are provided by the Ministry of Agriculture, Forestry and Fisheries (MAFF) (2003), and three-year averages are estimated about 2.8 million non-dairy cattle, 0.7 million buffalo, 2.1 million swine and 13.8 million poultry. As for the populations of horse, sheep and goat, these are not recorded in Cambodia, but their numbers are assumed to be low.

According to MoE (2015), agricultural residues burned in fields were maize/corn (101 Gg), rice (3,862 Gg), beans (13 Gg), soya (30 Gg) and peanuts (8 Gg). As there are no national statistics on crop residues, default values are used for the residue-to-crop ratio. Field burning of agricultural residues was estimated to have emitted 75.91 GgCO<sub>2</sub>-eq in the year 2000.

Several projects have supported the biomass program in Cambodia. DoPC, 2011, stated that there are 2,895 biomass places in only five provinces as follows:

- 42 biomass places in total in Battambang, which 28 in Banon District supported by National Biomass Program, 10 in Thmal Kor District supported by SNV NGO, and 4 in Battambang municipality built by COMPET.
- 881 Biomass places which are supported by Wild Aid (NGO) and a composting program implemented by Provincial Department of Environment in Kampot province.
- In Kampong Speu Province, 1,437 Biomass places were located in only 8 districts of the province supported by the Ministry of Agriculture, Forestry and Fishery of Cambodia in cooperation with SNV (NGO) funded by the Netherlands.
- In Kratie province, there are only 6 biomass places supported by CRDT (NGO).

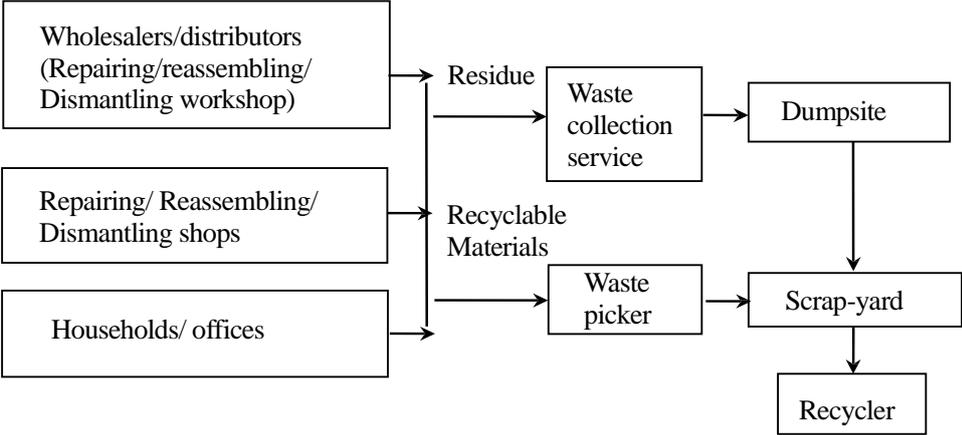
## **V. Amount of E-Waste Generation**

Cambodia is a low income and less-developed country which effects the used materials/equipment flows into this country which imports used materials from overseas, particularly electric and electronic equipment (EEE) such as TVs, computers, air-conditioners, mobile phones, refrigerators, and washing machines. Demand for used EEES, especially from poor people, was estimated at approximately about 25% of the total population (Sothun, 2015). Cambodia has no specific law on E-waste management yet; only guidelines on the Environmentally Sound Management of Waste Electrical and Electronic Equipment have been established in 2017. The main purpose of the EEE's Guidelines is improving the procedures and ways for proper management of waste electrical and

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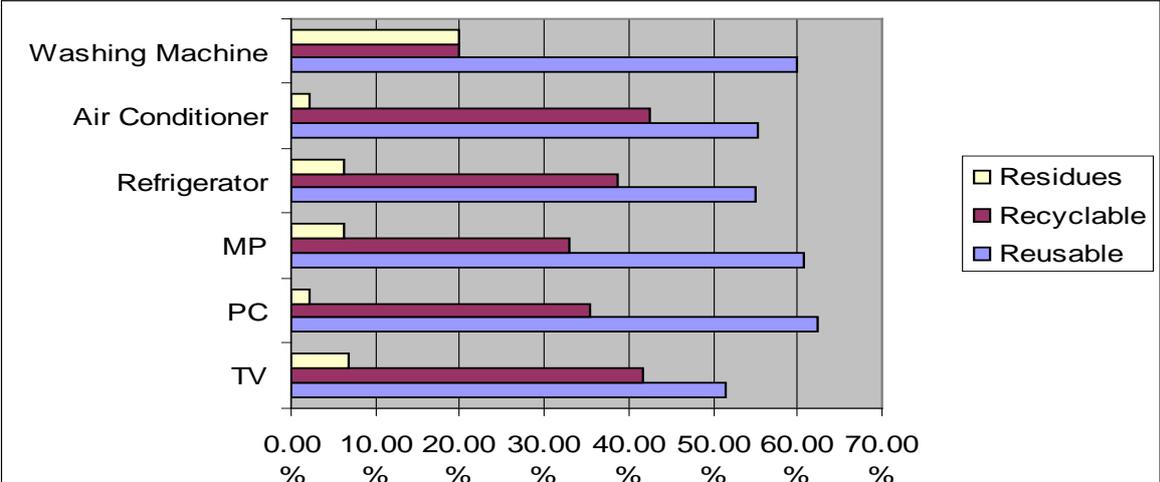
<sup>5</sup> An assessment of biofuel use and burning of agricultural waste in the developing world; <http://onlinelibrary.wiley.com/doi/10.1029/2002GB001952/full>

electronic equipment at the various stages of generation, separation, collection, transportation, recycling and final disposal in a secure landfill. According to a survey by CEA (2008), used electric and electronic equipment (UEEE) was not controlled and there were no prior checks on the quality by responsible authorities at check-points. Therefore, the lifespan of imported used e-waste is only between 6 months to 24 months in general, with some having a longer lifespan, based on item quality and self-maintenance. As an estimation for 2006, about 89.20% and 10.80% of EEW from repair shops and dismantling shops respectively were disposed at dumpsites through urban waste collection services (CEA, 2008).



**Figure C-6 Flow chart of e-waste generation and its managerial practice in the Kingdom of Cambodia**

Referring to a pilot project in Phnom Penh in 2009, the survey was conducted by MoE’s Team to analyze the e-waste from washing machines, air conditioners, refrigerators, mobile phones (MP), PC, and TVs. The waste was categorized into three parts — Residues, Recyclable, and Reusable. Figure C-7 shows the percentages of residues, recyclable and reusable from the six-types of E-Waste.



Source: Sothun, 2015

**Figure C-7 Percentage of E-Waste fraction during repair and dismantling**

## **VI. Policy, Regulations and Guidelines (not specific to EPR but more general policies related to environmentally-sound waste management and the 3Rs)**

There are no specific legislations or policies related to Extended Producer Responsibility (EPR). This section discusses general policy, regulations and guidelines related to environmentally-sound waste management and the 3Rs.

Several legal instruments established aimed at conserving natural resources and managing waste are applied in Cambodia. The instruments are summarized below:

- The Law on Environmental Protection and Natural Resources Management: The law was approved by the National Assembly on 24 December 1996. The main aims of the law include:
  - (i) To protect and promote environmental quality and public health through the prevention, reduction, and control point sources and non-point sources of pollution;
  - (ii) To assess the environmental impact of all proposed projects prior to the issuance of a decision by the RG;
  - (iii) To ensure rational and sustainable conservation, development, management, and use of natural resources of the Kingdom of Cambodia;
  - (iv) To encourage and enable the public to participate in environmental protection and natural resource management; and
  - (v) To suppress any acts that cause harm to the environment. In the law, Chapter 5, Article 13, states that the prevention, reduction, and 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 from the Ministry of the Environment”.
- Following the Law on Environmental Protection and Natural Resources Management, four sub-decrees were established during 1999: (i) Sub-Degree on Solid Waste Management (1999); (ii) Sub-decree on Water Pollution Control; (iii) Sub-decree on Environmental Impact Assessment Process (1999); and (iv) Sub-decree on Air Pollution and Noise (1999). Summaries of the sub-decrees are set out below:
  - **The Sub-Decree on Solid Waste Management:** The Sub-Decree on Solid Waste Management was prepared by MoE and was approved by the Council Ministers on April 27, 1999. The purpose of this sub-decree was to regulate the solid waste management in a proper technical manner and safe way in order to ensure the protection of human health and the conservation of bio-diversity.  
In Article 2, it states that the sub-decree applies to all activities related to disposal, storage, collection, transport, recycling, dumping of garbage and hazardous waste. Article 6 states that the Ministry shall also be responsible for monitoring the management of household waste, including disposal, collection, transport, storage, recycling. The enforcement of the sub-decree is not thorough; Article 7 states that waste disposal in public areas or any unauthorized site is prohibited. However it is clear from the number of illegal disposal sites that as yet, this Article is not yet fully enforced. The sub-decree also manages the import and export of household waste from Cambodia in Articles 9 and 10, as the issue of trans-frontier shipments of waste can cause health and environmental impacts, particularly in developing economies. Chapters 2 and 3 of the sub-decree focus on household and

hazardous waste management, for example on collection, transport, storage, recycling, minimizing, and dumping of waste, including the establishment of guidelines on waste disposal. Hazardous waste from factories, clinics or hospitals shall be separated from domestic waste. Chapter 4 mentions the procedures towards the monitoring and inspection of hazardous wastes management. The penalty for illegal activities is described in Chapter 5. The type of the hazardous waste is also described in the Annex of the Sub-decree on Solid Waste Management.

- **Sub-Decree on Water Pollution Control (1999):** The Sub-Decree on Water Pollution Control was prepared by MoE and adopted by the Council Ministers in 1999. The purpose of this sub-decree is to regulate the water pollution control in order to prevent and reduce the water pollution of the public water areas to ensure the protection of human health and the conservation of bio-diversity. Article 8 of Chapter 2 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. The type of the hazardous substances is also attached in the Annex of the sub-decree.
- **Sub-Decree on Environmental Impact Assessment Process (1999):** The Sub-Decree on Environmental Impact Assessment Process consists of three main objectives:
  - (i) To determine an Environmental Impact Assessment (EIA) for every private and public project or activity, that must be reviewed by MoE prior to submission, for a decision from the Royal Government.
  - (ii) To determine the type and size of the proposed project(s) and activities, including existing and ongoing activities in both private and public prior to undertaking the process of EIA.
  - (iii) To encourage public participation in the implementation of EIA process and take into account of their conceptual input and suggestion for re-consideration prior to the implementation of any project. The Annex of the sub-decree also describes about dumping sites which require preparing an IEIA or full EIA report if the capacity of the dumping site is for a population of more than 200,000.
- **Directive on Managing Medical Waste in Cambodia:** According to MoE (2008), the Directive was developed and approved in 2008 by the Minister of Health, under the technical working group composed of representatives from line-ministries. The Directive consists of four chapters: (i) General Views; (ii) Type of medical waste; (iii) Instructions for managing medication; and (iv) Operation and fining. The main objectives of the Directive aim at providing common identification on medical waste for proper, environmentally-friendly management. Labeling, classification, and specific techniques for managing, e.g. waste separation, collection, storage, transportation and disposal, all are the crucial tools to be strictly and regularly applied at all hospitals, healthcare centers, and clinics in Cambodia.

## VII. Greenhouse Gas Emissions

Cambodia is a tropical monsoon country with two main seasons — rainy and dry season. The rainy season starts from May to early October, brings winds from the southwest with heavy rains accounting for 90% of annual precipitation. The dry season, from November to April, is associated with the northeast monsoon, which brings drier and cooler air from November to March (MoE, 2015). The hottest times in Cambodia are in April and early May. The MoE, 2015, states that the maximum mean temperature is about 28°C and the minimum mean temperature is about 22°C. Maximum temperatures in excess of 32°C are common before the start of the rainy season and may rise to more than 38°C. The average annual rainfall from 1981 to 2011 in Kampong Thom Province was between 983.8 mm and 1,945.4 mm per year (IEE, 2013). As for MoE (2015), the average annual rainfall from 1994 to 2004 has fluctuated between 1,400 mm and 1,970 mm per year in Cambodia.

As a low income country, Cambodia produces less than 1% of the world’s carbon dioxide emissions, and is ranked at 181<sup>st</sup> out of 212 countries (CDIA, 2010). For Cambodia, it is clear that the key issue is vulnerability to climate change, rather than its greenhouse gas emissions. However, although Cambodia is vulnerable to climate change, it is clear that a contribution to reducing the global impacts of climate change from emissions can be made by sound waste management. The focus of this can be on waste prevention at source and waste reduction through recycling. Particular attention should be paid to the organic waste stream which can degrade to produce methane, a potent greenhouse gas.

Based on MoE (2015), the total net emissions from the waste sector including solid waste and wastewater in the year 2000 were estimated at 229.24 GgCO<sub>2</sub>-eq, of which methane contributed approximately 93% from solid waste disposal on land and wastewater handling, while N<sub>2</sub>O contributed about 7%. Table 0-1 presents an overview of GHG emissions from the waste sector.

**Table C-1 GHG emission from waste sector**

GHG source categories	CH <sub>4</sub>	N <sub>2</sub> O	Total CO <sub>2</sub> -eq
Solid waste disposal on land	9.69		203.46
Wastewater handling	0.49	0.05	25.78
Waste incineration			0.00
Other (please specify)	0.00	0.00	0.00
<b>Total</b>	<b>10.18</b>	<b>0.05</b>	<b>229.24</b>

*Source: MoE, 2015*

## **D: EXPERT ASSESSMENT ON WASTE MANAGEMENT AND 3R POLICY**

Cambodia had developed a national strategy on 3R for waste management since 2008 implicating to the objectives of the 3R Initiative of the "Ministerial Conference on the 3R Initiative" in Tokyo, held in April 2005, aiming to reduce, reuse and recycle waste and products to the extent economically feasible. The target of this strategy focuses on households, industries and health sector on how to manage them in proper way in consideration on waste collection for proper disposal at landfills, waste separation for recycling purpose, waste composting, developing and operating landfills properly. Therefore two target years related to the 3R have been set as following: (1) In year 2015, solid waste separation for recycling purpose should be between 10 to 20% for household, 30 to 40% for business areas, and 50 % for industrial wastes, while organic waste composting is about 20% for household organic wastes (including business centers); and (2) In year 2020, solid waste separation for recycling purpose should be increased to 50% for households waste, 70% for business areas, and 80% for industrial wastes, while waste composting should be increased double to 40% for household organic wastes, and 50% for organic wastes from business centers. Based on the above target indicators, there is difficult to assess due to no formal assessment or survey on 3R practices in the country yet. Through real practice and observation, the 3R waste separation indicators at sources are higher than the target indicators but the main purpose of the separation is for selling the separated value recyclable materials to Viet Nam and Thailand. As for 3R recycling activity in country, it seems still limited.

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## APPENDIX

### Type of the Hazardous Waste (Sub-decree 1999, No 36 ANRK.BK)

1. Fibrous and clothing waste from textile and garment industry;
2. Paper waste from paper-mill industry;
3. Sludge waste from factory wastewater treatment and product manufacturing processes;
4. Combustion residues from coal-fired power plants;
5. Plastics waste from production or use of plasticizers;
6. PCB waste from use of PCB contained in discarded air conditioners, TVs and microwaves;
7. Rubber waste from production or use of resins and latex;
8. Oil waste from oil refinery, use of lubrication oils, washing oils;
9. Acid waste;
10. Alkalis waste;
11. 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), Beryllium (Be),  
Tellurium (Te), Lead (Pb), Titanium (Ti), Uranium (U), Silver (Ag)
12. Soot and dust waste from incineration facilities, treating exhaust gas;
13. Waste from used or discarded electricity lamps;
14. Waste from production or use of batteries;
15. Waste from production and use of paints, lacquers and pigments;
16. Waste from production and use of inks and dyes;
17. Explosive waste;
18. Infectious diseases waste;
19. Agriculture drugs waste;
20. Waste from incinerators;
21. Waste from expired products;
22. Waste from production and use of film;
23. Waste from treatment of polluted soil;
24. Waste from production of drugs and medicines, and expired drugs;
25. Inorganic fluorine waste;
26. Cyanide waste;
27. Asbestos waste;
28. Phenols waste;
29. Ethers waste;
30. Waste from production and use of solvents;
31. Waste from production and use of dioxin and furan;
32. Radioactive waste;
33. Waste produced as a result of treating above item 1-32.