

Entrusted by
United National Environment Programme

Report on Quick Survey for Plastic Waste Related Data & Information in Phnom Penh

under
The Project of Promotion of Countermeasure
Against
Marine Plastic Litter in Southeast Asia and India

March 5, 2020

NPS / EXRI ASIA

Contents

1	Outline of the survey.....	1
1.1	Background.....	1
1.2	Scope of Works.....	1
1.3	Implementation Schedule.....	1
1.4	Organizational Structure for Implementation	1
1.5	Organizational Structure for Implementation	3
2	Activities in the Survey.....	3
2.1	1 st Visit to Phnom Penh.....	3
2.1.1	Itinerary & Program.....	3
2.1.2	A Kick-Off Meeting with Phnom Penh municipality	4
2.1.3	1 st Official Meeting for Survey & Initial Discussion	5
2.1.4	Site Survey	6
2.2	Preparation for the Survey	6
2.2.1	2-2-1. Internal Discussion.....	6
2.2.2	Conclusion from the Internal Discussion (Methodologies to collect data)	7
2.3	Implementation of the Survey including 2 nd visit to Phnom Penh.....	9
2.3.1	2-3-1. Itinerary & Program	9
2.3.2	Site Visits of illegal dumping sites	9
2.3.3	Microplastic sampling.....	10
3	Output & Findings from the survey	10
3.1	General Data and Information of Phnom Penh	10
3.1.1	General Information.....	10
3.2	Municipal Solid Waste.....	14
3.2.1	Waste generation.....	14
3.2.2	Waste Collection and Transportation.....	15
3.2.3	Recycling/ Intermediate Treatment.....	17
3.2.4	Final Disposal	17
3.2.5	Waste Flow in Phnom Penh	18
3.3	Plastic Waste.....	19
3-3-1.	Illegal dumping sites	19
3.3.1	Current Situation of artificial barriers	20
3.3.2	Composition of wastes tacked at Artificial Barriers	20
3.3.3	Waste management at piers.....	23
3.4	Microplastic sampling.....	25
4	Lesson learned of data collection activities in Phnom Penh	27
4.1	Challenges.....	27
4.1.1	Difficulty in data & information collection	27
4.1.2	Accuracy of Available Data & Information.....	27
4.2	Propose.....	27
	References.....	28

List of Figures

Figure 1 Organizational Structure for Implementation.....	3
Figure 2 Image of Data Collection & Transaction via Mobile Application.....	8
Figure 3 Image of Microplastic sampling works	9
Figure 4 Urban Poor Settlements in Phnom Penh.....	13
Figure 5 Municipal solid waste generated by source in Phnom Penh.....	14
Figure 6 Waste composition in Phnom Penh	15
Figure 7 Waste Collection Coverage in 2013 (CINTRI, 2020)	16
Figure 8 Organization structure of CINTRI.....	16
Figure 9 Location of Dangkor landfill	18
Figure 10 Organizational structure at the Dangkor landfill Management Authority	18
Figure 11 Map of the visual inspection for illegal dumping sites, artificial barriers, and ports.....	19
Figure 12 Composition of accumulated plastic wastes at artificial barriers.....	21
Figure 13 Survey of microplastic sampling points	26

List of Tables

Table 1 Implementation Schedule	2
Table 2 Sheet provided by UNEP and Working Condition with priority	7
Table 3 The detail of data and information.....	11
Table 4 Number of urban poor communities and families in 2017	12
Table 5 Total families and waste collection service users in 2017	15
Table 6 Visual inspection for artificial barriers	22
Table 7 Waste management at piers	24
Table 8 Schedule of microplastic sampling works	25

List of Appendix

Attachment 1.	Site survey for Microplastic sampling works
Attachment 2	Area, population, density, waste collection service users in Phnom Penh
Attachment 3	Metadata sheet
Attachment 4	Location of Urban Poor Communities
Attachment 5	Waste data of Phnom Penh
Attachment 6	Detail of the illegal dumping sites visited
Attachment 7	Detail of the artificial barriers visited
Attachment 8	Microplastic sampling points

1 Outline of the survey

1.1 Background

In recent years, global attention on marine litter and plastic pollution has surged. However, scientific knowledge on marine plastic litter and effective countermeasures remains insufficient. Ministry of Foreign Affairs of Japan and the United Nations Environment Programme Asia and the Pacific Regional Office (UNEP ROAP) joined to boost information and know-how to develop countermeasures against marine plastic litter in Southeast Asia and India during May 2019-March 2020 (10 Months). The project sites are (1) Mumbai, Ganges River (Haridwar/ Rishikesh and Prayagraji) and Yamuna River (Agra) Basins and (2) Mekong River Basin (Five sites in Laos, Thailand, Cambodia and Viet Nam) because Asia as a main source of marine plastic pollution.

In 2015, Cambodia produced approximately 4,090 thousand tons of solid waste in which 64.76% was collected by the management service. The uncollected volume is improperly managed that may have pressures on environmental quality. About half of the generated waste is the food waste followed by about 20% of plastic waste. In the same year in Phnom Penh, waste generation equaled to 1,007 thousand tons, and the collection rate was about 83.33% (the Ministry of Environment, Cambodia, 2019).

Mismanaged waste, especially plastic waste, has become a global problem. Marine litter is one of the concerns as an increased volume of plastic debris is found over the oceans and seas. It harms the various species living in the marine environment such as seabirds, fishes, whales, turtles, etc. It was estimated that plastic waste entered the oceans may be around 1.15 and 2.41 million tons per year (Lebreton et al., 2017).

Plastic waste is believed to leak from inland into the oceans through 20 polluting rivers. One of them is the Mekong River that travels through China, Myanmar, Thailand, Laos, Cambodia, Vietnam. This means that Cambodia may be also a source of plastic waste leakage (Lebreton et al., 2017). Therefore, it is necessary to study potential leakage of Cambodia's plastic debris into the Mekong River.

1.2 Scope of Works

- 1) To collect base data of Phnom Penh city for development of GIS based platform through conducting Secondary Survey.
- 2) To collect municipal solid waste related data and information in Phnom Penh by conducting desk review, interview with stakeholders and visit sites to collect necessary data related to municipal solid waste in Phnom Penh.
- 3) To collect plastic waste related data & information focusing on hotspots, such as illegal dumping points, artificial barriers in channel &/or river and ports & pier in the river, in the city through conducting primary survey (site visit).
- 4) To coordinate and facilitate UNEP's activities in Phnom Penh.
 - To facilitate & Coordinate UNEP's activity in Phnom Penh, if any.
 - To coordinate and support Pirika Inc for microplastic sampling works in Phnom Penh.

1.3 Implementation Schedule

The implementation schedule is as per shown in **Table 1** below.

1.4 Organizational Structure for Implementation

The organization structure for implementation is as per shown in **Figure 1** below.

Table 1 Implementation Schedule

Activities	Date																															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
January 2020																																
Initial Discussion with Phnom Penh Municipality													x																			
A kick-off meeting, introduction of the project and initial discussion with Phnom Penh Municipality														x																		
Potential microplastic sampling points observation															x																	
February 2020																																
Mobile app testing									x	x																						
Training to assistants											x																					
Illegal dumping observation												x	x		x	x	x	x		x	x											
Artificial barrier observation												x	x		x	x				x												
Port & pier observation												x			x	x		x														
Meeting STT														x			x															
Dumpsite observation																		x														
Meeting UNDP																		x														
Meeting ODC																			x													
Meeting EuroCham-Cambodia																				x												
Microplastic sampling																						x	x									
Site observation with Pirika																								x								
March 2020																																
Submit the report (Municipal Solid Waste Management in Phnom Penh), Data inventory and Metadata sheet					x																											

1.5 Organizational Structure for Implementation

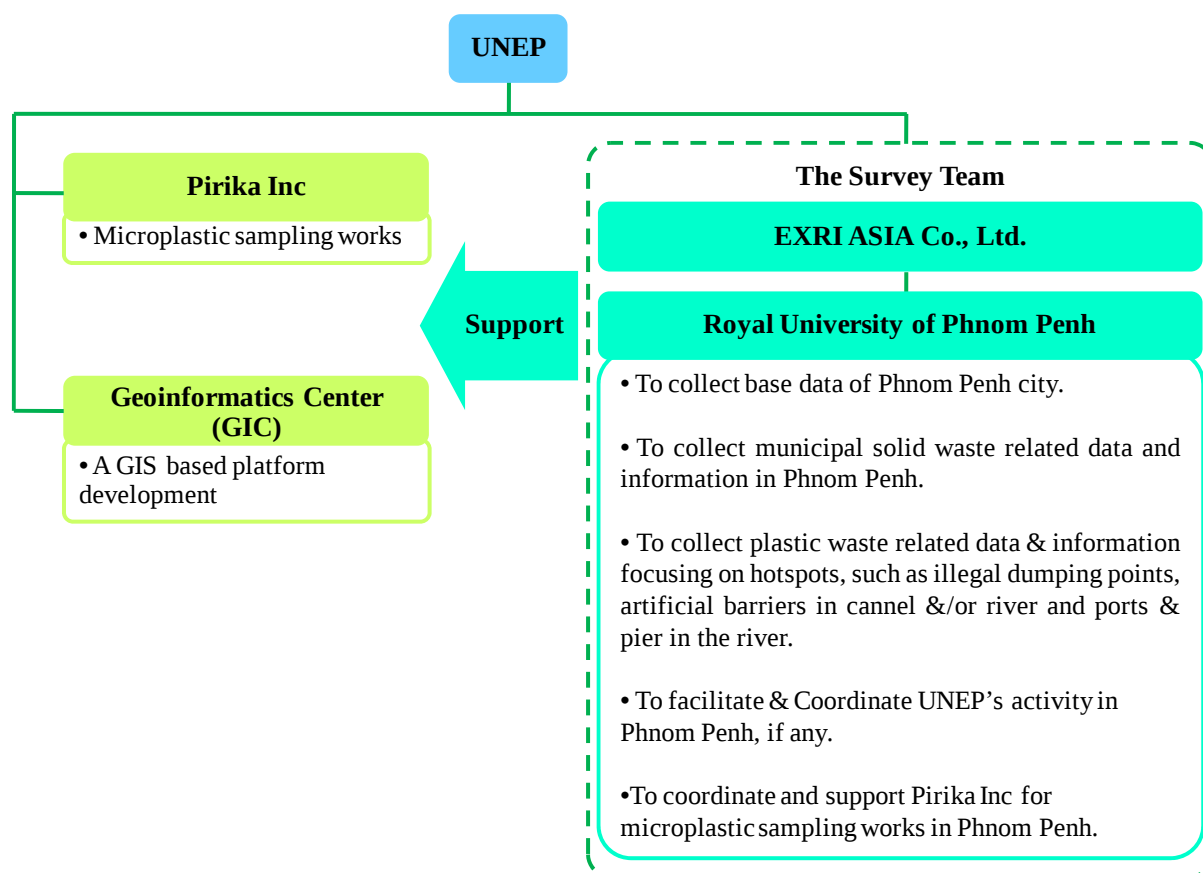


Figure 1 Organizational Structure for Implementation

2 Activities in the Survey

2.1 1st Visit to Phnom Penh

The Survey Team together with Mr. Tsubasa Enomoto, Associate Expert of Chemicals, Waste and Air quality, United National Environment Programme conducted its first visit to Phnom Penh during January 13-15 with purposes of having (1) a kickoff meeting with Phnom Penh Municipality and (2) an initial discussion with Royal University of Phnom Penh, of which details are as below;

2.1.1 Itinerary & Program

Itinerary & program of the 1st visit Phnom Penh was as per shown below.

Date	Time	Itinerary & Program
2020/01/13	AM	Bangkok-Phnom Penh
	PM	An initial meeting with Royal University of Phnom Penh
2020/01/14	AM	A kick-off meeting with Phnom Penh Municipality (Introduction)
	PM	Introduction of the Project and Initial Discussion with Phnom Penh Municipality
2020/01/15	AM and PM	Sites Survey (Potential sampling points for microplastic)
	PM	Phnom Penh-Bangkok

2.1.2 A Kick-Off Meeting with Phnom Penh municipality

During the 1st visit Phnom Penh, the Survey Team with Mr.Tsubasa Enomoto participated in the meeting with representatives from Phnom Penh Municipality, of which details are as below;

(1) General Information

Venue	Meeting Room at Phnom Penh Municipality
Date & Time	09:00-12:00 on January 14, 2020
Agenda	City-City Cooperation Between City of Kitakyushu & Phnom Penh Municipality
Participants	1) Officers from Phnom Penh Municipality including Director from Environment Dept. and General Affairs Dept. as Co-Chairmen 2) Representatives from Districts in Phnom Penh city 3) Japanese Team for JICA's Grass Root Project 4) Mr. Tsubasa Enomoto, UNEP ROAP 5) The Survey Team for the Project
Distributions	Introduction of UNEP's activities in the field of Plastic Waste Management in the Region

(2) Program

Time	Program
AM	Introduction of UNEP's activities in the field of Plastic Waste Management in the Region By Mr. Tsubasa Enomoto, UNEP ROAP

(3) Conclusion

Phnom Penh Municipality agreed with UNEP and The Survey Team to support the data collection work in Phnom Penh and details of the Work would be discussed in the other meeting held in the afternoon.



Pictures taken at the Initial Meeting with Phnom Penh municipality

2.1.3 1st Official Meeting for Survey& Initial Discussion

(1) General Information

Venue	Meeting Room at Phnom Penh Municipality
Date & Time	13:30-15:00 on January 14, 2020
Agenda	The Project of Promotion of Countermeasure Against Marine Plastic Litter in Southeast Asia and India
Participants	1) Officers from Phnom Penh Municipality including Director from Environment Dept. and General Affairs Dept. as Co-Chairmen 2) Representatives from Districts in Phnom Penh city 3) Japanese Team for JICA's Grass Root Project 4) Mr. Tsubasa Enomoto, UNEP 5) The Survey Team for the Project
Distributions	Introduction of the Project planned to be implemented in Phnom Penh under UNEP project

(2) Program

Time	Program
13:30-13:35 (5 mins)	Opening Remarks By Representative from Phnom Penh Municipality
13:35-13:40 (5 mins)	Short Speech By Mr.Tsubasa Enomoto, UNEP ROAP
13:40-13:45 (5 mins)	Self-Introduction of Participants to the meeting - Phnom Penh Municipality - City of Kitakyushu - UNEP Team
13:45-14.30 (45 mins)	Introduction of Activities under consideration - Data & Information Collection - Micro Plastic Sampling Works - Joint Clean Up & Waste Analysis By the Survey Team
14:30-15:30 (60 mins)	Questions & Answers and Free Discussion
15:30-15.40 (10 mins)	Conclusion
15:40-	Closing Remarks & Closing of the Meeting by Representative from Phnom Penh Municipality

(3) Conclusion

Deputy Mayor of Phnom Penh Municipality initially accepted the proposal submitted by UNEP and The Survey Team, while advised UNEP to write an official request letter to the Mayor of the City for support on the Work, and UNEP agreed to his advice.



The 1st Official Meeting with Phnom Penh municipality

2.1.4 Site Survey

1) Pre-Survey for the microplastic sampling works

On January 15, 2020, The Survey Team together with UNEP surveyed area along the river to find microplastic sampling points and selected 8 sites in the city, as per shown in **Attachment 1**.



Survey of microplastic sampling points in Phnom Penh

2.2 Preparation for the Survey

2.2.1 Internal Discussion

As requested by UNEP, the Survey Team participated in the NET Meeting set up by UNEP as follows;

(1) General Information

Venue	E-Meeting by skype
Date & Time	11:00-12:00 on January 30, 2020
Agenda	The Project of Promotion of Countermeasure Against Marine Plastic Litter in Southeast Asia and India
Participants	1) Mr. Tsubasa Enomoto, UNEP 2) GIC team 3) Pirika team 4) The Survey Team for the Project
Distributions	Discussion (Methodologies to collect data)

(2) Program

Time	Program
PM	• Data Inventory in Phnom Penh – Availability of data and the process to obtain data (Dr.Sethy and Dr.Bandith) • Methodology of data collection – Visual Inspection at port, pier and illegal dumping site (Mr.Tsukiji) • Methodology of the field survey – Mobile application and filed survey planning, tips (GIC) • Question & Answer for the data inventory and the methodology

2.2.2 Conclusion from the Internal Discussion (Methodologies to collect data)

(1) Data Collection

- Data would be collected based on Data Inventory Sheet & Meta Data Sheet provided by UNEP/ GIC, of which details are as per **Table 2** below.
- UNEP would write an official letter to request Phnom Penh Municipality to support activity
- Since the Work would be implemented under the condition of time constrains with budget limitation, all the parties agreed to work, on best available basis, as per **Table 2** shown below;

Table 2 Sheet provided by UNEP and Working Condition with priority

1. Data Inventory and Metadata sheet		
Sheet Name	Contents &Working Condition	Priority
Data Inventory	<u>Contents</u> - Demographic information - Topographic/ Basin characteristics information - Infrastructure information - Land use information - Waste/ Wastewater management information <u>Work Condition</u> The Survey Team will conduct Desk Research, then other sources of information, such as Government Agencies &/or Non-Government Organizations (NGOs), who might have data, however Quantity & Quality of Data & Information will be collected by the Survey Team will be depending on accessibility secured by UNEP.	Medium
2. General Data Collection on Waste Management		
Sheet Name	Contents &Working Condition	Priority
Waste Management	<u>Contents</u> - Waste composition - Waste generation - Waste collection - Intermediate treatment - Final disposal <u>Work Condition</u> The Survey Team will conduct Desk Research, then other sources of information, such as Government Agencies &/or Non-Government Organizations (NGOs), who might have data, however Quantity & Quality of Data & Information will be collected by the Survey Team will be depending on accessibility secured by UNEP.	Medium

3. Waste Management at ports and piers		
Sheet Name	Contents & Working Condition	Priority
Waste Management at port and pier	<u>Contents</u> - Name of the port - Basic information - Waste management information - Accumulated wastes from the river at the port <u>Work Condition</u> The study team visited 8 piers along the rivers to observe the waste management situation.	High
4. Visual Inspection for artificial barriers		
Sheet Name	Contents & Working Condition	Priority
Visual Inspection for artificial barrier	<u>Contents</u> - Frequency of cleaning of the accumulated wastes at the barriers - Estimate total amount of accumulated wastes - Identify type of accumulated plastic wastes - Take photos with GPS <u>Work Condition</u> The study team found 18 points of artificial barriers in Phnom Penh.	High
5. Visual Inspection for illegal dumping sites		
Sheet Name	Contents & Working Condition	Priority
Visual Inspection for illegal dumping site	<u>Contents</u> - Estimate total amount of accumulated wastes - Take photo with GPS <u>Work Condition</u> The study team found 221 points of illegal dumping sites in Phnom Penh.	High

- Some data collected from site visit shall be recorded and transferred to GIC from the site via mobile application provided by GIC. (see Figure 2)

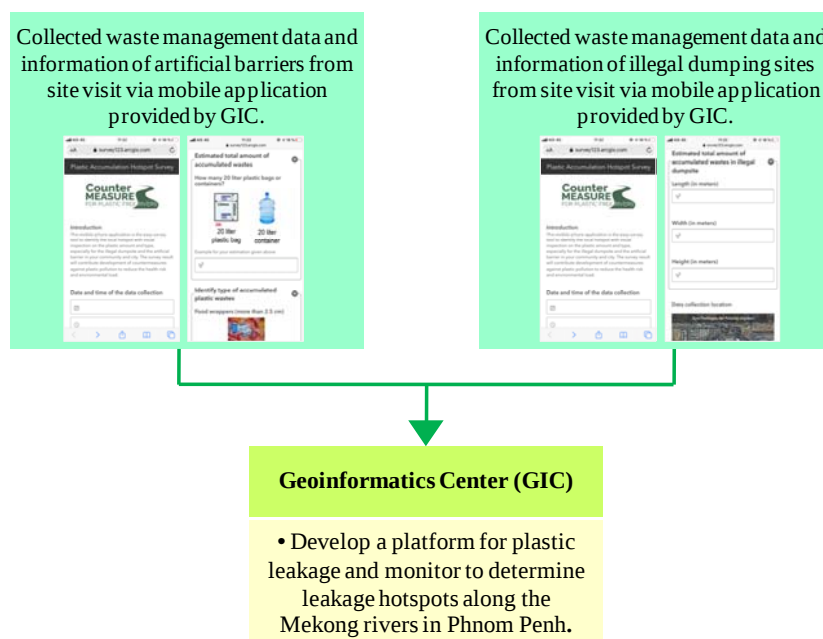


Figure 2 Image of Data Collection & Transaction via Mobile Application

(2) Microplastic Sampling Works

- Pirika needed to select sampling points carefully or arrange small boat(s) to collect microplastic samples in middle of the rivers, in order to avoid having contamination with mud and others. Thus Pirika would select 6-7 points among 8 potential sites selected through 1st survey. (see Figure 3)

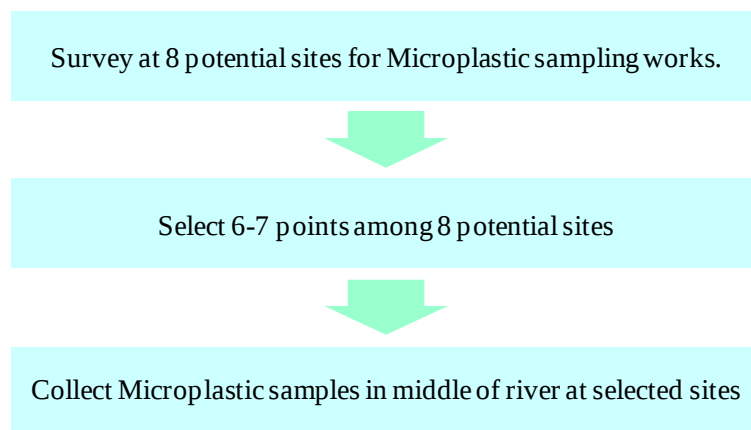


Figure 3 Image of Microplastic sampling works

2.3 Implementation of the Survey including the 2nd visit to Phnom Penh

2.3.1 Itinerary & Program

Date	Time	Itinerary & Program
2020/02/17	AM	Bangkok-Phnom Penh
	PM	• Survey at Port nearby Phnom Penh municipality (One of Microplastic sampling points) • Visited National library, National bank of Cambodia and Sahmakum Teang Tnaut (STT)
2020/02/18	AM	Visited Ministry of Planning and Survey around Dangkor landfill
	PM	Visited Mr. Michael Wasserman, UNDP and Ministry of Planning
2020/02/19	PM	• Visited Open Development Cambodia (ODC) • Metadata sheet preparation for GIC
2020/02/20	AM	Meet Mr Guillaume Maltaverne, EuroCham-Cambodia
	PM	Visited illegal dumping sites (1)
2020/02/21	AM and PM	Visited illegal dumping sites (2)
2020/02/22	AM and PM	Supported Pirika on their Microplastic sampling
2020/02/23	AM	Phnom Penh-Bangkok

2.3.2 Site Visits of illegal dumping sites

During February 20-21, 2020, the Survey Team visited illegal dumping sites in the city, collected & transfer data as per instruction given by GIC.



Illegal dumping sites in the city

2.3.3 Microplastic sampling

During February 22-23, 2020, The Survey Team supported Pirika on their conducted microplastic sampling works at 7 points in the city.

3 Output & Findings from the survey

3.1 General Data and Information of Phnom Penh

3.1.1 General Information

General data and information of Phnom Penh, including demographic information (population density, urban density in Cambodia 2011 and population Projection for 2030), Topographic/Basin characteristics information (river network, canals and flood prone), infrastructure information (special economic zone and road network), land use information (administration, forest cover, land cover, cropland (agriculture) and fishery and aquaculture obtained through the survey are as per shown in **Table 3** below. (also see **Attachment 2** and **Attachment 3** for more detail).

Table 3 Detail of data and information

Data inventory	Unit/ Form	Availability	Detail
Demographic information			
- Population	Number	Yes	Attachment 2 and 3
- Population growth rate	-	No	-
- Floating population	-	No	-
- Household	Number	Yes	Attachment 2 and 3
- Slum Spot	Location	Yes	Attachment 4
Topographic/Basin characteristics information			
- River networks: Main stream and Tributary of rivers,	Zip, DB_TABLE, WMS	Yes	Attachment 3
- Canals	Shape file	Yes	Attachment 3
- Digital Elevation Model (DEM)	-	No	-
- Flow Observation	-	No	-
- Rainfall runoff data	-	No	-
- Level of vegetation	-	No	-
- Flood Hazard Map	Shape file	Yes	Attachment 3
Infrastructure Information			
- Industrial area/ Economic zone/ Factory location	SQLITE, DB_TABLE, WMS, JPEG	Yes	Attachment 3
- Tourism area	Location	Yes	Attachment 3
- Other Point of Interests	-	No	-
- Road network	Shape file	Yes	Attachment 3
- Building footprint	-	No	-
Land use information			
- Administration	Shape file	Yes	Attachment 3
- Land use land cover	GEOTIFF, JPEG, WMS	Yes	Attachment 3
-Plastic manufacturer	-	-	-
- Agriculture	Shape file	Yes	Attachment 3
- Fishery and Aquaculture	Shape file	Yes	Attachment 3
- Waste collection points	-	No	-
- Intermediate treatment facility (transfer station, recycling facility, junkshop)	Location	Yes	Attachment 3
- Illegal dump	Location	Yes	Attachment 6
- Disposal site (dumpsite)	Location	Yes	Figure 9
- Wastewater facility	-	No	-

3-1-2 Urban Poor Community

Sahmakum Taeng Tnaut (STT) reported that there were 277 urban poor communities in Phnom Penh in 2017 (in their report titled “The Phnom Penh Survey: A Study on Urban Poor Settlements in Phnom Penh (2017 PP Survey)” of which details are as per shown in **Table 4**, **Figure 4** and **Attachment 4**.

Table 4 Number of Urban Poor Communities and families in 2017

Districts (Khans)	No. of urban poor communities	No. of urban poor families
Inner Khans		
7 Makara	9	283
Chamkar Mon	19	2,051
Daun Penh	13	1,055
Toul Kork	15	1,494
Sub-total	56	4,883
Outer Khans		
Chbar Ampov	36	2,392
Chroy Chongva	13	867
Dangkork	23	4,270
Meanchey	41	2,274
Por Sencheay	19	2,915
Russey Keo	52	1,679
Sensok	27	5,200
Preak Pnov	10	1,727
Sub-total	221	21,324
Grand Total	277	26,207

Source: The Phnom Penh survey: A Study on Urban Poor Settlement in Phnom Penh, July 2018

3.2 Municipal Solid Waste

Despite of the commitment of Phnom Penh Municipality that the Municipality would provide support on survey, The Survey Team could not receive any support from the Municipality during conducting the survey, thus Data & Information related to Municipal Solid Waste in Phnom Penh is mainly from our desk research. Our findings from desk research are as follows;

3.2.1 Waste generation

(1) By Source

Phnom Penh generates around 4.09 million t/year of municipal solid waste, with the per-capita-per-day generation of households in Phnom Penh estimated as 0.73 kg based on a population of 15.39 million in 2015.

Figure 5 shows the distribution of generated MSW from each source in Phnom Penh considering six sources: households, markets, shops, offices, restaurants and hotels/guesthouses. Among all the sources, proportion of household waste was the largest with around 55.3% in total. Sources of non-household waste were varied, such as hotels/guesthouses (16.7%), restaurants (13.8%), markets (7.5%), shops (5.4%) and offices (1.4%), respectively.

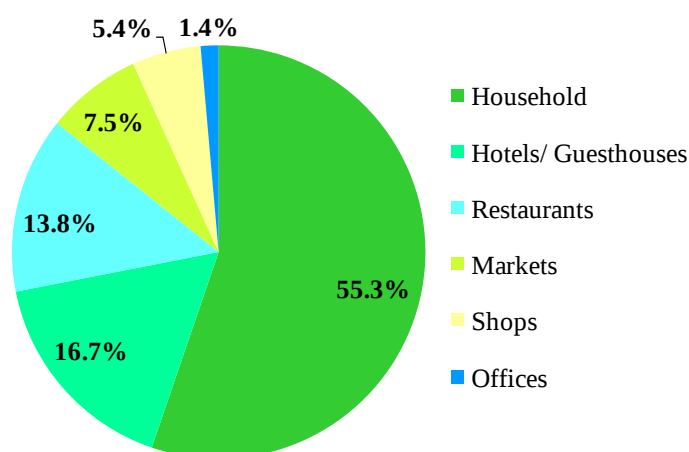


Figure 5 Municipal solid waste generated by source in Phnom Penh

Source: State of Waste Management in Phnom Penh, Cambodia, IGES-CCET, 2018

(2) By Composition

Regarding waste composition in Phnom Penh. Like other cities in Cambodian, more than 50% of waste at the sources of waste generation is organic waste, followed by plastics (20.9% including plastic bags, other plastics and PET bottles), papers (9.9%), grass and wood (2.3%), textiles (2.1%), glass (1.6%), metal (1.1%), ceramic and stones (0.5%), rubber and leather (0.2%) and others (9.5%), respectively as shown in **Figure 6**.

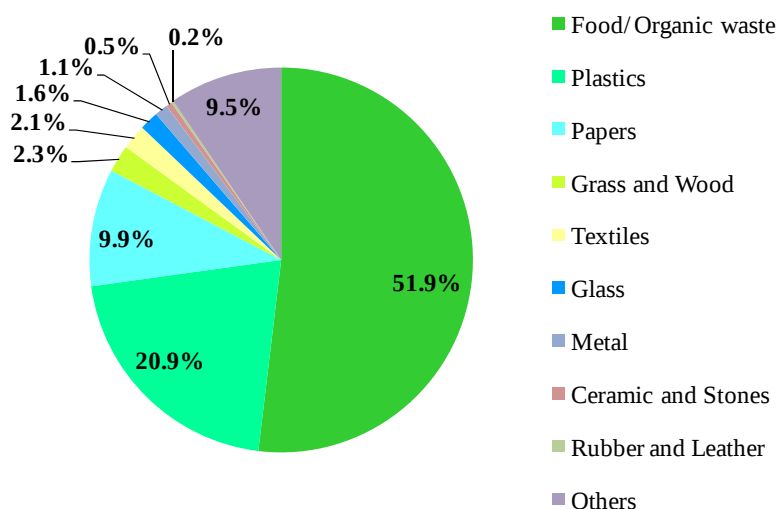


Figure 6 Waste composition in Phnom Penh

Source: State of Waste Management in Phnom Penh, Cambodia, IGES-CCET, 2018

3.2.2 Waste Collection and Transportation

In Phnom Penh, CINTRI a private company is in charge of solid waste collection and transport as an entrusted partner of the city hall. By 2013, the company ran the service over the city except for 20 Sangkat¹ at the rural areas (CINTRI, 2020) as shown in **Figure 7**. The quality of the waste collection and transport system has been raised to achieve a significant impact on operation coverage. By 2017, about 83% of the Phnom Penh's household could access the service. It equaled to 234,666 of 284,412 households (Commune Database, 2018) as presented in **Table 5**.

Table 5 Total families and waste collection service users in 2017

No.	Khan	Area (km ²)	Total families	Density per km ²	Waste collection service users	
					Number of families	%
1	7 Makara	2.06	12,500	31,551	12,500	100
2	Chamkarmorn	12.07	19,748	8,671	19,748	100
3	Chbar Ompov	92.96	28,889	1,469	25,706	89
4	Chrouy Changvar	91.85	13,855	692	6,156	44
5	Dangkor	105.82	21,764	938	13,597	62
6	Daun Penh	7.07	13,976	10,091	13,976	100
7	Mean Chey	30.57	30,174	4,853	28,977	96
8	Pouthisen Chey	133.07	38,909	1,625	27,410	70
9	Praek Phnov	114.41	12,262	495	4,437	36
10	Russey Keo	24.58	37,002	6,625	32,633	88
11	Sen Sok	55.95	29,996	2,603	24,800	83
12	Tuol Kouk	8.13	25,337	16,369	24,726	98
Total		678.54	284,412	2,068	234,666	83

Source: Commune Database, 2018

¹ Administrative Unit in Cambodia corresponding to "District"

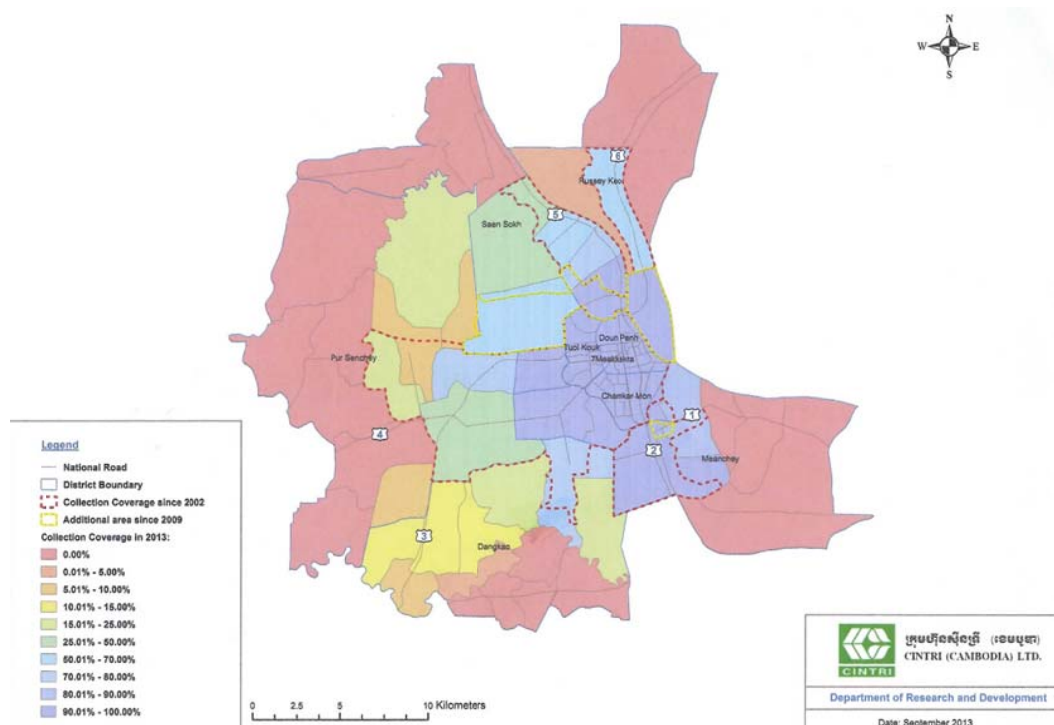


Figure 7 Waste Collection Coverage in 2013 (CINTRI, 2020)

Figure 8 shows the organizational structure of the CINTRI, which consist of two major operational divisions, i.e., Cleaning Operation and Collection and Transport Operation. The Cleaning Operation employs workers with waste carts, bins and brooms during daytime and times with less traffic (at night-time, it is risky due to limited security and safety). There are different ways and means of waste collection and transport, such as using waste carts, dumpster bins and waste trucks divided into daytime and night-time for households, public gardens and markets.

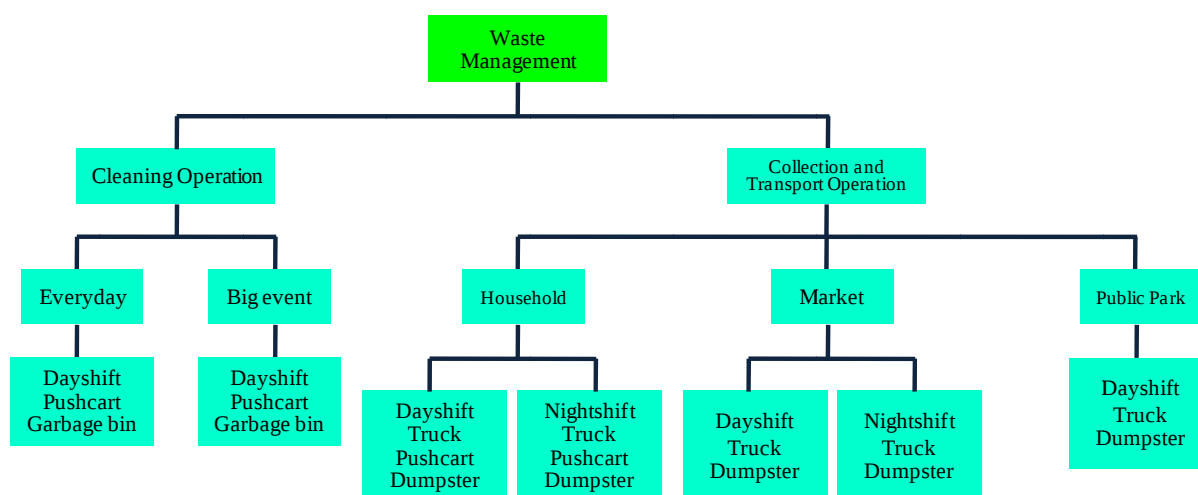


Figure 8 Organization structure of CINTRI

Source: State of Waste Management in Phnom Penh, Cambodia, IGES-CCET, 2018

Resident live in the areas where no waste collection & transportation service, sometime bury waste in land, burn waste in open air and/or throw garbage away at unauthorized places or areas (illegal dumping), and those behavior might give impact on environment including plastic waste pollution.

NOTE

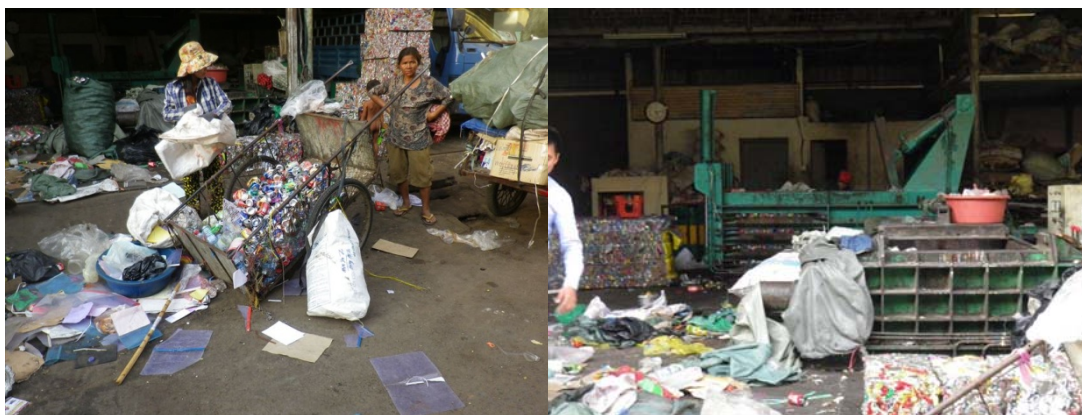
The Survey Team was informed by Phnom Penh Municipality that the Cabinet decided to disqualify exclusive right in waste collection & transportation in Phnom Penh at the Cabinet Meeting held on October 25, 2019. Phnom Penh Municipality, based on the decision made by the Cabinet, decided to establish public corporation to manage municipal solid waste in the city and announced to call for a tender to select parties to provide collecting & transportation service for the municipality within transition period of 6 months (after the decision made by the Cabinet).

According to Phnom Penh Municipality, they are under preparation for international tender to select at least 3 parties to serve for them. A Tender is planned to be held on May 1, 2020

3.2.3 Recycling/ Intermediate Treatment

The majority of Phnom Penh citizen, is said, well manage their recyclable waste generated at their places by reuse, recycle and keep for sell with junk shops in the city. However, there are no report other than that published by JICA in 2005.

Recycle & Intermediate Waste treatment is limited in Phnom Penh due to less quantity of recyclable waste generated in the city. Only some types of plastic waste, paper waste is recycled in Cambodia, while most of other types of waste are exported to either Thailand or Vietnam for further processing for material use. Most of recyclable waste with value is sorted out from trash bins before being collected by entrusted waste collectors. Thus amount of recyclable waste to be landfilled is rather small in comparison with amount of waste generated in the city.



Junk Shops located at the central part of the city

Source: Pictures taken by Mr. Satoshi Takagi, EXRI ASIA in 2017

3.2.4 Final Disposal

Phnom Penh has only one municipal solid waste disposal site, so-called Dangkor Landfill (**Figure 9**). It locates at Ta Lei village, Sangkat Dangkor, Khan Dangkor over 31.4 hectares of land (Seng et al., 2018). This landfill started to receive municipal solid waste from July 2009. People are not allowed to get into the site without permission from the city hall. In 2017, The amount of waste transported to the landfill for final disposal reached 2,215 tons per day (PPCA, 2018). Dangkor landfill has been operated by Dangkor Landfill Management Authority (DLMA) under the Waste Management Affair Department (WMAD) of Phnom Penh City Hall (PPCH). The organizational structure at Dangkor Landfill Management Authority is shown in **Figure 10**.

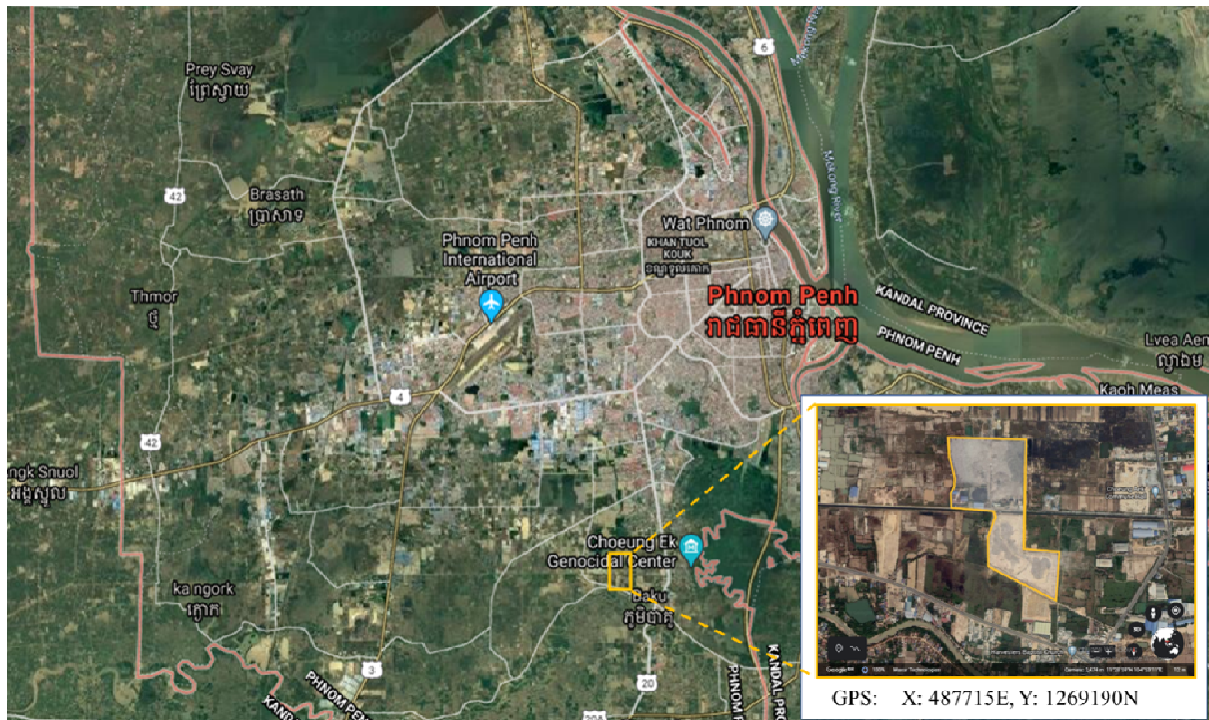


Figure 9 Location of Dangkor landfill

Source: Prepared by the Survey Team with Geographic Data retrieved from Google Earth

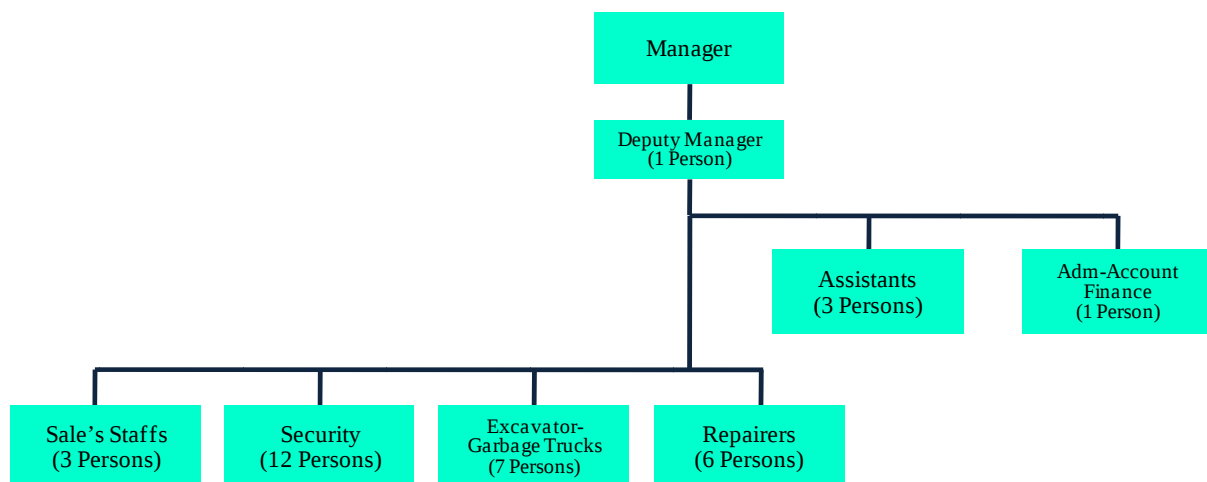


Figure 10 Organizational structure at the Dangkor landfill Management Authority

Source: State of Waste Management in Phnom Penh, Cambodia, IGES-CCET, 2018

3.2.5 More Waste related Data in Phnom Penh

The city has no recycling, transfer station, or sanitary landfill. Amount of Waste generated in the city is estimated about 2,760 tons per day², containing approximately 20% of plastic waste. The plastic bag appears to be the most consumed plastic products as it is supposed to be the second-largest waste composition in the country. (the Ministry of Environment, Cambodia 2019) However no systematic waste survey was conducted in the city. Waste Composition which published by different parties are as per **Attachment 5**.

²CINTRI claims that they handle more than 3,000 tons of MSW per day as of January 2020

3.3 Plastic Waste

A series of visual inspection were conducted by The Survey Team with purposes of identify plastic leakage hotspots in the city, covering

- illegal dumping sites (221 locations),
- artificial barriers in the cannels & rivers (18 locations)

in Phnom Penh city, of which locations are as per shown in **Figure 11**.

It is notable that two sub-urban Khans, including Chrouy Changvar and Praek Phnov, have low accessibility to the service, where the percentages of users accessing to the service are only 44% and 36% respectively (Commune Database, 2018). This could be a reason why illegal dumping frequently happens in the sub-urban areas more than the central area in the city. The waste collection trucks go door to door to collect the discharged garbage that is mixed with other types of household waste and commercial waste.

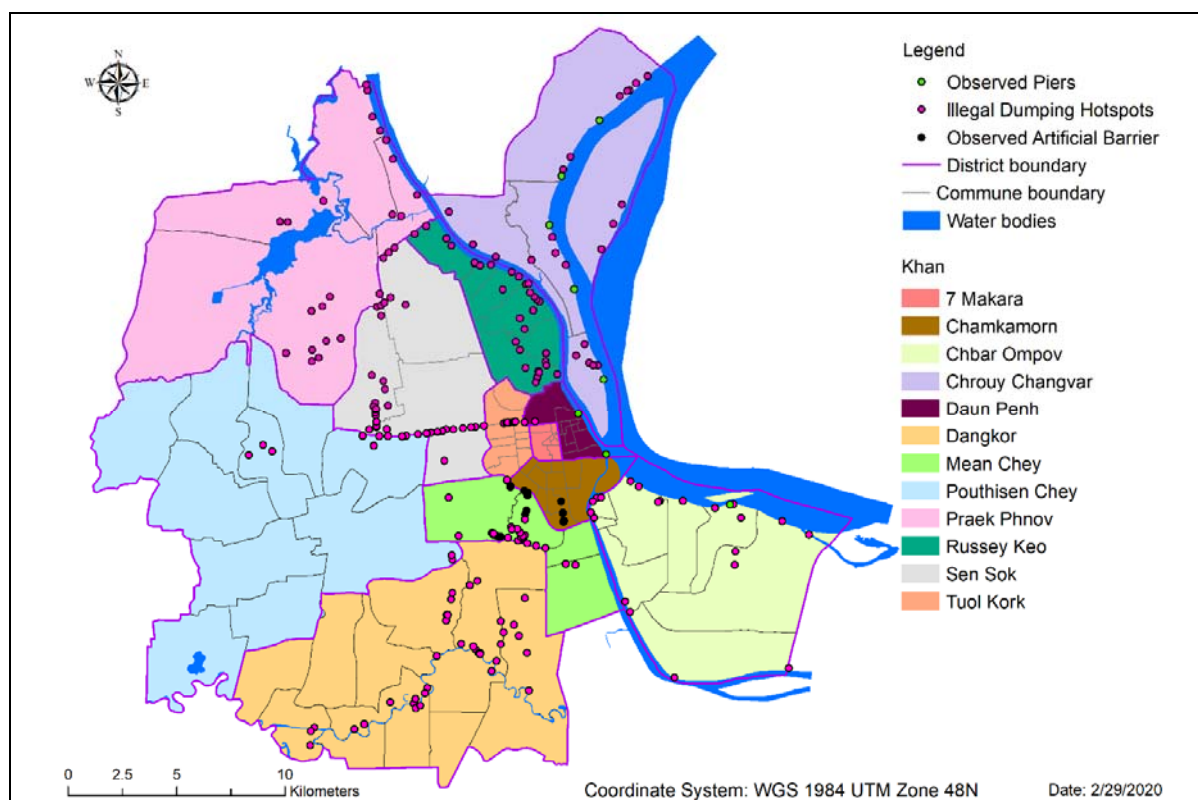


Figure 11 Map of the visual inspection for illegal dumping sites, artificial barriers, and ports

3-3-1. Illegal dumping sites

As a result of site survey, a total of 221 locations of illegal waste dumping sites were found in 10 sub-urban Khans. Land area of the sites was varied from 0.08 m³ to 3,500 m³ with estimated amount of waste of 6,172.5 m³ in total. The Survey Team found such sites at river banks, vacant lands, and/or even road sides close to waste collection point appointed by the local authority in the city. Thus The Survey Team wonder whether it might be occasionally incurred, in a transitional period for Phnom Penh Municipality to change Municipal Solid Waste Collection & Transportation System, while some are located in the areas where waste collection vehicle might not be easily access.



Illegal Dumping Sites in the City

Attachment 6 shows details of 221 illegal dumping sites and **Table 6** shows 18 artificial barriers in the canals and/or river in the city.

3.3.1 Current Situation of artificial barriers

The Survey Team surveyed the artificial barriers and open canal systems in 7 Sangkat of 4 different Khans. As a result, The Survey Team found that

- there was mismanaged waste accumulated at 18 points in total,
- there were the local authorities and local youth associations periodically engage in clean up at some locations in the central areas.
- The majority of waste in compositions was plastic bags, PET, Styrofoam, plastic bottle.
- residents along canals were requested to have more awareness, knowledge as for waste management
- quantity of accumulated waste along the artificial barriers was estimated as 4,830 liters in total, of which details areas per shown in **Table 6** and **Attachment 7** by the “20 liter plastic bag” method of GIC.
- there are 4 locations filled up by large amount of garbage, where the Survey Team estimated amount of garbage up to 200, 500, 1,600 and 2,000 bags.

3.3.2 Composition of wastes tacked at Artificial Barriers

Figure 12 illustrates the composition of accumulated plastic wastes at artificial barriers by percentage. The percentage of accumulated waste was Plastic Beverage Bottles (PB) (28.94%), Food Packaging (FP) (24.13%), Other specific plastic if any (more than 2.5 cm) (19.73%), Plastic Shopping Bags (more than 2.5 cm) (14.99%), Smoking Material (SM) (5.22%), Personal Care (PC) (4.04%), Home Packaging (HP) (2.92%) and Fishing Gear (FG) (0.03%), respectively.

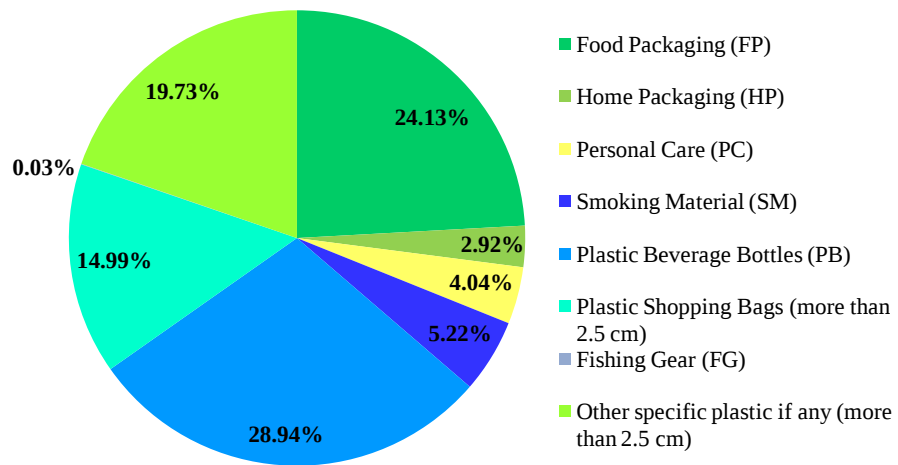


Figure 12 Composition of accumulated plastic wastes at artificial barriers



Artificial barriers

Table 6 Visual inspection for artificial barriers

Point	UTM		Frequency of cleaning of accumulated wastes	Estimate total amount of accumulated wastes	Identify type of accumulated plastic wastes (Piece)								Total
	X	Y			Food Packaging (FP)	Home Packaging (HP)	Personal Care (PC)	Smoking Material (SM)	Plastic Beverage Bottles (PB)	Plastic Shopping Bags (more than 2.5 cm)	Fishing Gear (FG)	Other specific plastic if any (more than 2.5 cm)	
1	489582.2	1276025	No one clean up	15	110	20	30	40	60	2	0	300	562
2	488951.1	1276249.8	No one clean up	10	100	10	40	30	70	250	0	80	580
3	489731.2	1275823.7	No one clean up	500	700	80	100	150	250	300	0	400	1,980
4	489710.9	1275860.4	No one clean up	1,600	2,000	500	300	400	2,800	900	0	800	7,700
5	489735.8	1275962.2	No one clean up	50	110	10	20	30	200	50	0	90	510
6	489691.9	1275121.4	No one clean up	15	60	5	8	25	90	40	0	70	298
7	489622.5	1274956.5	No one clean up	50	600	70	100	60	700	150	0	400	2,080
8	488786.9	1276507.1	No one clean up	20	120	20	30	20	100	30	0	60	380
9	488952.4	1276217.3	No one clean up	30	70	10	30	50	150	60	0	80	450
10	491362.7	1275014.2	No one clean up	5	30	5	15	20	70	10	0	50	200
11	491398.5	1274656.7	No one clean up	200	500	30	80	200	700	200	0	600	2,310
12	491394.8	1274612.1	No one clean up	2,000	4,000	300	700	800	5,000	3,000	10	4,000	17,810
13	491279.9	1275538.7	No one clean up	20	70	3	5	20	90	30	0	50	268
14	488285.1	1273968.6	No one clean up	90	120	5	12	20	40	200	0	90	487
15	488167.8	1274004.1	No one clean up	40	60	0	15	30	30	150	0	70	355
16	488440.5	1273912.8	No one clean up	50	90	2	18	20	200	50	0	80	460
17	488487.4	1273928	No one clean up	80	90	4	2	40	250	60	0	150	596
18	490177.1	1281273.6	No one clean up	55	212	20	10	0	45	135	0	22	444
Total				4,830	9,042	1,094	1,515	1,955	10,845	5,617	10	7,392	37,470
Percentage					24.13%	2.92%	4.04%	5.22%	28.94%	14.99%	0.03%	19.73%	100.00%

3.3.3 Waste management at piers

The Survey Team visited 8 piers along the rivers to observe the waste management situation. They are situated in 6 Sangkat in 3 different Khans. One of them is a Passenger and Tourist Terminal (TS1), managed by the Phnom Penh Autonomous Port of Cambodia. The other locations are the ferry port which transports passengers from inland to the islands nearby.

According to members of staff interviewed at piers, waste generation rate is varied from 2.5 to 30 kg/day due to the business of each point. Four points have their waste collection, while the others do not have such service. Therefore, open burning is an option. Moreover, littered debris is accumulated from the river near the piers. It could not be properly managed as some people usually leave on the riverbank and in the water.



Piers for River Crossing Boat

Table 7 shows location and information of 8 piers from visual inspection performed in Phnom Penh.

NOTE

The Survey Team could not visit some Khans such as Pouthisen Chey and Sen Sok, located at the outskirts of the city, due to limitation of the budget and time, while there might be a lot of leakage points for plastic waste, as public service for waste collection & transport do not cover in the areas.

Table 7Waste management at piers

Name of Pier	GPS		Basic information			Waste management information			Accumulated wastes from the river at the pier	
	X	Y	Authority	Operation	Activity and Amount	Diary amount of wastes	How is it managed	Waste composition	Amount of (total) waste accumulation per day	How it managed
Kampong Chamlong Phnom Penh AreiyKsatr	493361.4	1277717.5	Municipality		250 people/day	30 kg/day	Collected by the collection service	Plastic bag, straw, plastic cup	5	Not collected or just remove to the river
Kampong ChamlongSvayChrom	493240.5	1281220			150 people	15 kg/day				
Kampong ChamlongPreak Leap	491882.1	1285386.2			100 people/day	15 kg/day				
Kampong Chamlong Koh Dach Spean Ti 2	490734.9	1288359.6	Private	Self	75 people	10 kg/day	Open burning			
Kampong Chamlong Koh DachBak Kheng	491294.7	1290619.6			50 people	5 kg/day				
Kampong ChamlongKdey Chas	493055.3	1293185.3			50 people	10 kg/day				
Kampong Chamlong Ta Prom MoutKroses	499082.1	1275397.3			50 people	10 kg/day				
Passenger and Tourist Terminal of the Phnom Penh Autonomous Port	492069	1279593	Public	Phnom Penh Autono-mous Port	75 people/day	2.5 kg/day	Collected by the company with the restaurant waste	Paper, plastic bag, PET, glass bottle	3	Not collected

3.4 Microplastic sampling

As explained in 2-3-3 above, Pirika dispatched its member of staff to Phnom Penh to conduct microplastic sampling works at 7 points in the city during February 22-23, 2020. Sampling points of microplastic areas per shown in **Table 8** and **Figure 13** (also see **Attachment 8** for more details)

Table 8 Schedule of microplastic sampling works

Date	Time	Microplastic sampling points				
		Location				UTM
		Point	Commune	District	Province	
22 Feb 20	09:21	1	Kilometre 6	Russey Keo	Phnom Penh	48N 489774.3E 1285655.8N
	10:45	2	Prek Phnov	Prek Phnov	Phnom Penh	48N 483212.6E 1292272.8N
	13:52	3	Bakhaeng	Chrouy Changva	Phnom Penh	48N 491740.8E 1291486.7N
	14:38	4	Prek Anhchanh	Mukh Kampul	Kandal	48N 497608E 1297076.5N
23 Feb 20	09:49	5	Prek Thmey	Chbar Ompov	Phnom Penh	48N 502907.4E 1267668.2N
	10:56	6	Prek Eng	Chbar Ompov	Phnom Penh	48N 499047.1E 1275433.9N
	12:04	7	Wat Phnom	Daun Penh	Phnom Penh	48N 492095.9E 1279638.3N



Legend

- Boundary of Phnom Penh
- Microplastic sampling points

Figure 13 Survey of microplastic sampling points

4 Lesson learned of data collection activities in Phnom Penh

4.1 Challenges

4.1.1 Difficulty in data & information collection

- Less Data & Information published
- Limitation accessibility to data & information required (Official Approval shall be required to access to data & information, which might be available at the Government Agency)
- The Survey was conducted during transitional period of Waste Management System in Phnom Penh, and unable to estimate impact caused by, although the Survey Team heard that employees of CINTRI went for strike and their waste collection & transportation service was partially stopped in the past.
- Since CINTRI in turmoil, there are no sources of information other than Phnom Penh Authority for municipal solid waste, while we could not have enough support from them (due to limited time for the Survey).

4.1.2 Accuracy of Available Data & Information

- Data and Information is available for some parameter, but neither latest nor updated for long time.
- For some, only a part of data & information is available and/or data without evidence is widely published, and those (most probably incorrect data & information) miss-lead in survey & analysis.

4.2 Propose

International Organization and/or Donner Agency might consider to dispatch experts for Waste Management and transfer knowledge and know-how including establishment of social system to manage municipal solid waste in sustainable manner.

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