

Improving the Capacity of Public Private Partnership (PPP) in Municipal Solid Waste Management, Phnom Penh

by
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ABSTRACT

The Phnom Penh Capital City of Cambodia has been growing in the last decade due to population growth, geographical boundaries and increased economy. The rapid change has significantly increased waste in the city, thus creating challenges in public health, environmental degradation and increasing competition on scarce resource of the city. In this regard, the government adopted the Public-Private Partnership model to mitigate these challenges, although the model is not sufficient in resolving the challenges thus gaps were discovered in the model too.

From 2002 until 2019, there had only one private company responsible for waste collection services. Thus, this research aims to study how to improve the capacity building of Public-Private Partnership in Phnom Penh solid waste management. It was used mixed method quantitative analysis and qualitative analysis. The result found that 100% of citizens concern about the effect of waste management, yet their action toward it was not going well. Another significant is willing to pay; 90% of people want to increase the price in providing a better service. However, the fee does not increase well enough; just 1,000 Riels added more. The old price is 4,000 Riels since 2002. If it will increase to 5,000 Riels, the private company surely does not come to invest more in Phnom Penh. To sum up, the best ways to improve Public-Private Partnership in waste management: for the authorities must implement all regulation and strategy that have been done before to change the environment in Phnom Penh clean and people to understand about what is happening around. Finally, divide the service area into 3 or 4 zones with 3 or 4 private companies, respectively.

Keywords: Solid Waste, Municipal Waste Management, Public Private Partnership, Sustainable Development Goals (SDGs)

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1. INTRODUCTION

The Millennium Development Goals (MDGs) endorsed by the United Nations Millennium Declaration in 2000 ended in December 2015. The post MDGs development agenda called the Sustainable Development Goals (SDGs) was developed by the UN member states under the leadership and coordination of the United Nations. While the MDGs envisioned to, inter alia, slash global poverty by half, SDGs, among various goals, fundamentally aim to eradicate world poverty and hunger by 2030 and seriously embedded environmental sustainability into the pro-poor growth agenda.

The main concept of sustainable development is generally focused as making ecological, economic, and social developments together. As the framework of sustainable development, the concept of sustainable waste management is important to study not only to understand the effects of improper waste management on human health and the natural environment but also the to determine how current practices affects resource conservation and environmental green growth (Schubeller, 1996). The main causes that contributes to solid waste generation is urbanization and population growth.

The practice of Sustainable Solid waste management has not been fully adopted in most developing countries) as a result, the capacity building and knowledge of municipalities in providing proper services remains low and the services standard required for protection of public health and the environment are not reached. (Zurbrugg, 2003)

Unlike other countries in the world, based on World Bank Data, Cambodia's economy has shown strong growth over many years. GDP annual growth has been over 7% since 2011, with a GDP per capita increase from US\$882 in 2011 to nearly US\$1,510 in 2018. The rise in economic activity and consumption is fueled by rapid population growth. The population has risen from 13.8 million in 2008 to 16.2 million in 2018, an increase of 2.4 million people in a decade.

Most of the population increase is happens in the urban areas of secondary cities while the growth in the economy and population have vastly increased the use of energy and materials thus increases the amount of waste generated, putting significant additional pressure on Cambodia's valued and finite natural resources, and its environment.

In 2010–2015, the average, energy consumption in Cambodia grew by 6.9% in the period, this is caused by increasing demand on petroleum products (50.5%), biomass (36.0%), electricity (13.1%), and coal (0.4%) (ADB, 2018). According to the Press Release on 14th December 2018 by UNDP in Cambodia, the transport sector, which primarily relies on petroleum, accounts for 46% of total energy consumption. The two major sources of electricity production are hydropower and coal. Between 2000 and 2015, Cambodia (significantly) doubled its consumption of goods per capita, during the same period, manufacturing, construction, and consumption gave rise to a sharp increase in both materials use and waste (ADB, 2018)

Total waste generation in a business-as-usual scenario is expected to grow from 33 million tons per annum (tpa) in 2017 to 99 million tpa in 2050. Municipal Solid Waste (MSW) from consumption alone is estimated to be 4 million tpa, 25% of which is generated in Phnom Penh. Waste from industries pose another challenge (Ministry of Environment, 2019). In 2017, commercial and industrial waste and construction and demolition waste contributed 16 million tons (48%) and 15 million tons (44%) respectively. To deal with the problem, government decided to (adopt) Public Private Partnership (PPP) approach as an alternative in provision waste collection service.

The waste private contractors took up almost all responsibilities for waste management including collection, transport, disposal of waste and even fee collection while municipal administration is mainly responsible for monitoring and control of waste collection program of the waste contractor. It is no doubt that government institutions were not solid in the rules of operation.

Due to the complexity of the operations the private contractors tends to benefit from long- term contract (Spoann, 2019) Many concerns have been raised about the inappropriate management due to the nature of solid waste management systems therefore there has been efforts to redevelop and reorient the systems towards sustainability for the waste processors and generator (Spoan, 2019; Arbulú, 2016 and Shekdar, 2009). In the past, the government has tries to create more acts and regulations to monitor waste management as a result, it found out that there are no adequate human and finance resources to efficiently and effectively manage solid waste in the city.

Before we discuss the research objective, it is vital to define a few technical words, first. According to the United Nations Environment Program (UNEP), the word solid waste is defined as non-liquid, non-soluble materials ranging from municipal garbage and industrial wastes that contain complex and (sometimes) hazardous substance. While the World Bank Group also defines it as any garbage, refuse, trash, or discard material. It is categorized into various types depending on where the waste is generated. All in all, it can conclude that solid waste refers to all waste which people generated every day in daily life.

Based on the challenges mentioned above, this research is going to study the public private partnership as an option to public sector-controlled waste management and as a possible conclusion for the increasing problem of municipal solid waste in Phnom Penh city. Therefore, the research question and sub questions of this study has been formed as below: “To what extent can public private partnership improve the solid waste management situation in Phnom Penh?” it will investigate the current solid waste management practices and associated problems of it in Phnom Penh city? How public private partnership can help in provision of better waste services to reduction health and environmental risks? and the possible prospects and constrains of public private partnership?

The scope of this research primarily focused on the current responsible barriers of public private partnership in Phnom Penh waste management. In order to make this study clear and effective, we identified 2 districts from the total of 14 districts with a population of around 142,000 people. However, by using the sampling method a number of 140 people was surveyed from 2 district in the study of Phnom Penh city.

The 2 districts are *Beung Kengkong* and *Kombol*, as the sampling size to be surveyed, the survey will focus on how much people knows about the current application of public private partnership (PPP) in Phnom Penh solid waste management.

The contributions of People opinions can help in improving and developing PPP models, aside survey, there was as in-depth interview with the focal persons who are related to the solid waste management operations from the private and public sectors like from Ministry of Environment, Phnom Penh Waste Management Division, District offices, etc.

Many researchers have worked on Phnom Penh waste management, but mostly focused on how to improve waste collection service, no service can run smoothly if there are no strong institution to monitor all processing. Therefore, there is need to develop a sustainable government policies and structure for solid waste management (Vong, 2016). this paper aimed to provide ways on how to make waste management institutions to become more effectively and reliable for all citizen.

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THERITICAL FRAME WORK

Waste Management Challenges

In 2015, United Nations Environment Program and International Solid Waste Association published “*The Global Waste Management Outlook*.” It concluded that waste is a worldwide issue. If we have not a better solution to deal with it, waste could be threat to the public health and the environment. It is a growing issue linked directly to the way society produces and consumes. It concerns everyone.

- **Public health: Not having a solid waste collection service has a direct health impact on residents, particularly children. The uncontrolled burning of waste creates particulate and persistent organic pollutant emissions that are highly damaging locally and globally. Accumulated waste and blocked drains encourage vectors to breed, resulting in the spread of cholera, dengue fever and other infectious diseases and are a major contributing factor to flooding. Uncontrolled dumpsites, and in particular the mixing of hazardous and other wastes, can cause disease in neighboring settlements as well as among waste workers.**
- **Environment: Dumpsites on land can pollute both surface and groundwater. These sites are often alongside rivers or the sea, and therefore may directly pollute them as well as the coastal environment. Coastal dumpsite erosion is one source of marine litter. Other potential damage costs include losses resulting from decreases in tourism due to polluted beaches and losses incurred through damage to fisheries. Former dumpsites, particularly those that have received hazardous waste, are a major category of contaminated site (UNEP, 2015).**

If we look further into UN Sustainable Development Goals, the term of solid waste related to sustainable development goals has more than it was mentioned above. For instance, Goal 4: Quality Education, Goal 8: Decent Work and Economic Growth, Goal 9: Industry, Innovation and Infrastructure, Goal 11: Sustainable Cities and Communities, Goal 12: Sustainable Consumption and Production and Goal 17:

Partnerships for the Goals. This research will focus more on Goal 8 and Goal 17 since it has not much study about it yet.

In overall, solid waste management is given a very low priority in developing countries and as a result, the capacity and knowledge of municipalities in providing proper services remains very low and the levels of services required for protection of public health and the environment are not attained (UNEP, 2015).

Public Private Partnership in Solid Waste Management

Public private partnership is a long- or medium-term arrangement between the public and private sectors whereby public sector transfers part of its responsibilities to the private sector (World Bank, 2017). These arrangements are typically formed with clear goals and agreements for delivery of public services or delivery of public infrastructure.

Due to increasing problem of municipal solid waste management in most cities in the developing countries, private sector participation in providing solid waste service started as a response to major failures of service delivery by the public sector (UNESCAP, 2011). It is often believed and proposed that private sector participation in providing municipal services could be the best possible way to solve the current waste problems in developing countries, and in particularly public private partnership is seen as a potential alternative to the traditional service delivery system fully controlled by the public sector. Moreover, public private partnership is believed to provide the service that the public sector neither have the resources nor the expertise to supply alone (Forsyth, 2005).

Public private partnership arrangements pave the way to both the public and private sectors to share the responsibilities in provision the services (Cointreau, 1995). It can be many forms, but the common distinguishing characteristic is a shared governance structure and decision-making process. Such a partnership combines the private sector's dynamism with the public sector's responsibility to public interest which makes it work better (Admad et al., 2006).

Furthermore, a third party, the citizens also can play as an important role in public private partnership.

They can make significantly to service delivery for instance supporting private sector

Table 1, Analysing the various type of PPP: Advantage and Disadvantage of PPP Relationship

PPP Type	Main Features	Application	Strength	Weaknesses
Contracting	<ul style="list-style-type: none"> • Contract with Private party to design & build public facility • Facility is financed & owned by public sector • Key driver is the transfer of design and construction risk. 	<ul style="list-style-type: none"> • Suited to capital project with small operating requirement • Suited to capital projects where the public sector wishes to retain operating responsibility. 	<ul style="list-style-type: none"> • Transfer of design and construction risk • Potential to accelerate construction program. 	<ul style="list-style-type: none"> • Possible conflict between planning and environmental considerations • May increase operational risk • Commissioning stage is critical • Limited incentive for whole life costing approach to design • Does not attract private finance
BOT	<ul style="list-style-type: none"> • Contract with a private sector contractor to design, build and operate a public facility for a defined period, after which the facility is handed back to the public sector. • The facility is financed by the public sector and remains in public ownership throughout the contract. • Key driver is the transfer of operating risk in addition to design and construction risk 	<ul style="list-style-type: none"> • Suited to projects that involve a significant operating content. • Particularly suited to water and waste projects. 	<ul style="list-style-type: none"> • Transfer of design, construction, and operating risk • Potential to accelerate construction • Risk transfer provides incentive for adoption of whole life costing approach • Promotes private sector innovation and improved value for money. • Improved quality of operation and maintenance. • Contracts can be holistic • Government able to focus on core public sector responsibilities. 	<ul style="list-style-type: none"> • Possible conflict between planning and environmental considerations. • Contracts are more complex and tendering process can take longer • Contract management and performance monitoring systems required. • Cost of re-entering the business if operator proves unsatisfactory. • Does not attract private finance and commits public sector to providing long term finance.

DBFO	<ul style="list-style-type: none"> • Contract with a private party to design, build, operate and finance a facility for defined period, after which the facility reverts to the public sector. • The facility is owned by the private sector for the contract period and it recovers costs through public subvention. • Key driver is the utilization of private finance and transfer of design, construction & operating risk. • Variant forms involve different combinations of the principal responsibilities. 	<ul style="list-style-type: none"> • Suited to projects that involve a significant operating content. • Particularly suited to roads, water and waste projects. 	<ul style="list-style-type: none"> • Attracts private sector finance • Attracts debt finance discipline • Delivers more predictable and consistent cost profile • Greater potential for accelerated construction program; and • Increased risk transfer provides greater incentive for private sector contractor to adopt a whole life costing approach to design. 	<ul style="list-style-type: none"> • Possible conflict between planning and environmental considerations. • Contracts can be more complex and tendering process can take longer than for BOT. • Contract management and performance monitoring systems required. • Cost of re-entering the business if operator proves unsatisfactory. • Funding guarantees may be required. • Change management system required.
Concession	<ul style="list-style-type: none"> • As for DBFO except private party recovers costs from user charges. • Key driver is the Polluter Pays Principle and utilizing private finance and transferring design, construction and operating risk. 	<ul style="list-style-type: none"> • Suited to projects that provide an opportunity for the introduction of user charging. • Particularly suited to roads, water (nondomestic) and waste projects. 	<p>As for DBFO plus:</p> <ul style="list-style-type: none"> • Facilitates implementation of the Polluter Pays Principle; and • Increases level of demand risk transfer and encourages generation of third-party revenue. 	<p>As for DBFO plus:</p> <ul style="list-style-type: none"> • May not be politically acceptable • Requires effective management of alternatives / substitutes, e.g., alternative transport routes; alternative waste disposal options)

Source: Guidelines for Successful Public-Private Partnerships (EU, 2003)

participation with payment of the service charges and playing an active role in accountability improvement and service quality of both sectors. These kinds of arrangements turn the people's role passive service receivers to active service partners that in return lead to high quality and efficiency of work (Ahmad et al., 2006; UNESCAP, 2011)

Types of Public Private Partnership (PPP)

According to the European Union there are four main types of PPP, each type having its own strengths and weaknesses as the following:

- Contracting
- Build-Own-Transfer (BOT)
- Design-Build-Finance-Operate (DBFO)
- Concession (European Commission, 2003).

Possible Limitations of Public Private Partnership

PPP could have significant limitations if many important aspects such as socio-economic, political, legal and administrative which need to be evaluated clearly before agreeing the contract, are not properly taken into account. Limitation possibly includes:

- All projects are not feasible for different reasons such as political, legal, commercial viability, etc.
- The private sector may not take interest in a project due to possible high risks or due to lack of technical, financial capacity to implement the project.
- A PPP project in some cases may be more costly unless additional costs (higher transaction and financing costs) can be off set through efficiency gains (UNESCAP, 2011).

Although it is strongly believed and proposed by the most influential organizations such as European Commission and World Bank that public private partnership is a better alternative for solving the municipal solid waste management problems in developing countries, but there are still significant barriers to successful implementation of that. There have:

- Lack of capacity to conceptualize and implement innovative approaches by municipalities. Public sector is facing a huge lacking skills and incentives to change the traditional methods of service provision and establish a collaborative partnership with people.
- Most of municipalities do not see it necessary to work with private sector, NGOs and people.

- Encouragement of municipalities for making public private partnership is hardly possible by private sector, NGOs or community-based organizations due to lack of access, skills and in most cases fund (Ahmad et al., 2006).

Case Study of Waste Management in New Delhi, India

The Commonwealth Games, which was planned to be held in Delhi in 2009, was the main factors that forced Municipal Corporation of Delhi to accelerate privatization of solid waste management in 2004. As a result, the Supreme Court ordered authorities to develop the waste management systems in Delhi, the ambitious becoming a 'world class city', the desire to maintain that the city had a functioning waste management system when it hosted the Games and the hope for not losing the trust in the municipality's ability to provide essential services (ICRA, 2008).

In January 2005, private sector has been chosen to contract with the municipal corporation of Delhi contracted the collection, transportation, and disposal of municipal solid waste in different zones of Delhi. Among the contractors Metro Waste Handling (p) Ltd. (MWH) received the contract for the west zone of Delhi.

The west zone, that has 1.5 million people withing an area around 80 square kilometers, generates about 500 tons of solid waste per day. MWH has 697 people who have worked in the west zone where divided into different categories such as 45 supervisors, 42 office and technical workers, 50 drivers, 60 helpers and 500 collection and segregation workers (Garg et al., 2007). This team responds to do all task of collection, segregation and transportation. The west zone is divided into 16 wards, with a team leader in charge of each ward. Under each team leader there is a group of field supervisors and each supervisor is responsible for a group of collectors, segregators, and drivers. The supervisors have many tasks for the following activities:

- Tracking the daily waste collection
- Visiting the waste storage depots at least twice a day

- Optimizing the worker at the waste storage depots and maximizing their productivity by assigning them adequate responsibilities
- Ensuring vehicle time and route plan
- Making sure the waste storage depots are thoroughly disinfected
- Maintaining that their staff (helpers, drivers and waste storage depot workers) are being on time and following adequate safety and hygiene norms
- Keeping in touch with residents, community-based organizations, councilors and Municipal Corporation of Delhi to make sure that proper coordination is maintained with them (Khandelwal, 2007).

Collection and storage system

The collection and storage of waste has remarkable change with privatization (SERD, 2010). Prior to the privatization, waste from the depots was collected in open trucks. The problems such as waste spillage and odor were common. Moreover, the staffs carrying out the collection of the waste without the provision of any safety equipment such as the masks, gloves, boots etc. was highly vulnerable to potential health hazards.

Before the partnership, the system was not efficient and proper managed for instance the waste in the waste storage depots used to rot for several days due to improper scheduling or tracking of the waste collection vehicles (SERD 2010). Furthermore, the waste was collected without separation between the wet and dry portion and was picked in the mixed form, therefore the minimization waste going to the landfill was totally neglected.

Currently the waste is brought to the street corner bins by households themselves or in most cases the waste pickers hired by the people, so the responsibility of the waste conveying from generation point to the bins is up to the people (Garg et al., 2007). The bins for biodegradable and non-biodegradable waste are also separate. Then the compactor loaders collect the waste from the bins and transport them to the waste storage depots (WSD) also known as Dhalaos. Collecting waste with compactor loaders is a containerized mechanical loading and unloading which reduces spillage, ensures public hygiene around the depots, thus reduces health and environmental risks (ICRA, 2008). Designate trucks are

being used for biodegradable (Green trucks) and non-biodegradable (blue trucks) and the biodegradable waste is transported to the composting facility which also has been run by the private sector. After arriving to the waste storage depots, the waste is being segregated by workers and then disposed it into the sites by the trucks. An appreciable amount of wet waste is being separated by workers at the waste storage depots and taken to the centralized compost plant at Bhalaswa, which reduces the amount of waste in the meantime goes to Bhalaswa landfills.

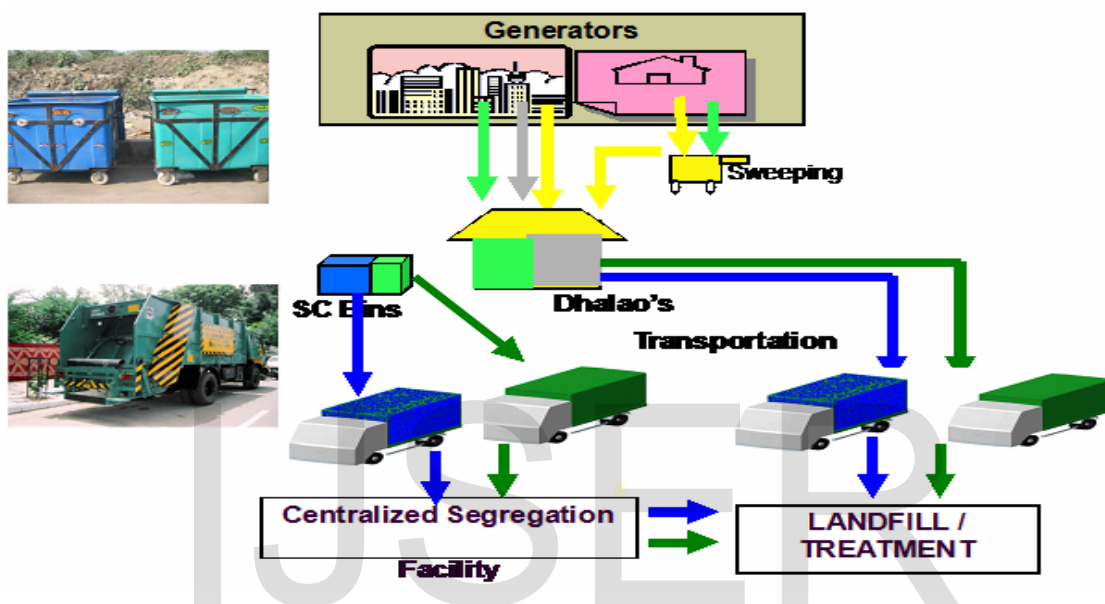


Figure 1: Waste Management System in West Zone of Delhi (Garg et al., 2007)



Figure 2: Waste Storage Depot (WSD) Before and After

Cooperation between the supervisors, team leaders, drivers and other staff have very strong connection. The movement of the vehicles takes place following to the proper schedule and the communication between the staff takes place through Command-and-control communication devices comprise of wireless sets on vehicles and wireless handsets with operational and technical staff and cellular phones. GPS system are installed on the trucks that makes them easier to be tracked.

The waste storage depots have been reconstructed and repaired as shown in **Fig. 2**. The waste is not thrown on the floor of the depot as the earlier practice but is stored in bins. There bins for wet and dry waste are separated. Water, electricity, and drainage connections have also been provided in the WSDs. All the waste is daily collected from the WSDs and transports to the landfills or composting facility. Proper hygiene and cleanliness are also maintained.

Without people cooperation waste segregation, which is the main task in waste management, cannot be achieved, thus waste awareness campaigns (Figure. 3) for rising the people`s information to segregate their waste properly at source is extremely important (ICRA, 2008). Regarding to this matter, Metro Waste Handling private limited has been conducting Slum programs, Street play`s, School assembly sessions student rallies, Posters & banner displays, awareness programs for household segregation at source level, training of operational staff etc. and these campaigns have been proven very useful.



Figure 3: Waste Awareness Campaigns for the People and Waste Pickers

In general, solid waste management in the west zone of Delhi since the partnership with the private sector can conclude as below:

- Solid waste management, which was one of the most poorly managed public activity, has developed and changed into the most well managed activity.
- Relevant technical equipment such as GPS based tracking system for the vehicles, using wireless sets and cell phones has resulted in better coordination, improved community participation and operation.
- Waste segregation, which used to be a totally neglected affair, has witnessed improvement.
- The informal sector involved in waste segregation beginning of a new era.
- Awareness is raising among the people regarding to the benefits of segregation at source (Khandelwal, 2007).

Phnom Penh Waste Management Governance: Phnom Penh Overview

Phnom Penh is big city in Cambodia which has 2,281,951 people (14.7% of total population), with annual increase rate 4.9% and density 3.361 (National Institute of Statistics, 2020). It is located in the south-central region of the country at the confluence of three rivers-Tole Sap, Mekong and Bassac, and it has 692.46 km² equal 0.37% of the total land area.

The city has gradually extended its geographical boundaries in the last few years in four steps, which contributed to growth of its population. In 2019 after subsequent to administrative integration in 14 Khan (districts) which described as below:

- Phase 1: Extended Khan DangKo
- Phase 2: Created Khan Russey Keo
- Phase 3: four village combination from Kanthork Commune
- Phase 4: Integration of 20 communes from 5 districts of Kandal Province to Phnom

Penh

- Phase 5: New creation of 2 administrative districts (Khan Beung KengKong and Khan Kombol) from existing districts (12 Khan)

The Socioeconomic development of Phnom Penh has resulted in drastic changes in the city's landscape over past decades, with considerable loss of water bodies such as lakes, canals, and rivers, as well as green landscapes across the whole city area. This resulted in increased flooding due to the loss of drainage function of the city (Save Cambodia's Wildlife, 2014).

Municipal Solid Waste (MSW)

Legal and Policy Framework

Various laws, regulations, declarations, sub-decrees and instructions have been issued by both national agencies as well as Phnom Penh Capital Administration over the years relating to the management of MSW.

National Regulations:

- Sub-Decree on Solid Waste Management, No.36 (1999)
- Inter-Ministerial Declaration of Ministry of Interior – Ministry of Environment on Waste and Solid Waste Management in Province/Municipalities of Cambodia, No.80 (2003)
- Sub-Decree on Urban Solid Waste Management, No.113 (2015)
- Waste Management Strategy and Action Plan of Cambodia (draft)

Sub-National Regulations:

- Draft Strategy and Methodology for Improving Waste Management and Cleansing, Collection and Transport of Solid Waste in Phnom Penh City
- Notification on Waste Storage, Cleansing, Waste Discharge and Penalties on Improper Waste Disposal in Phnom Penh Municipality, No.13 (2013)
- Instruction Plan on the Application of Penalties to Promote Environmental Sanitation Raising in Phnom Penh Municipality, No.9 (2010)
- Instruction on Penalties on Waste Disposal in Public Areas, No.16 (2010)

- Instruction Plan on Waste Separation Promotion in Phnom Penh Municipality, No.8 (2010)
- Waste Storage, Cleansing, Waste Discharge and Penalties on Improper Waste Disposal in Phnom Penh Municipality (2013)

2.4.3 Institutional Setup

a. Legal Framework and Waste Classification

As Fig. 4, National and sub national are making regulation, strategy, and action plan to divide the waste as categories.

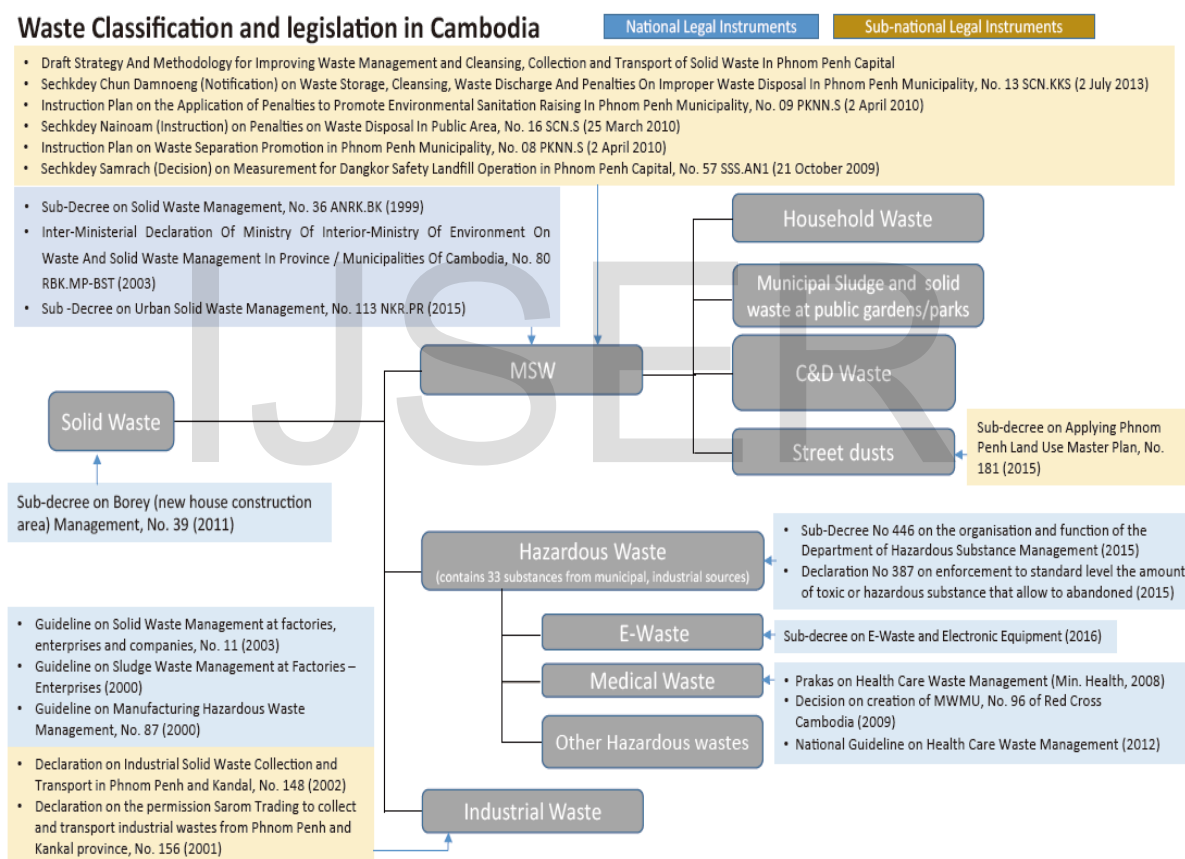


Figure 4: Waste Classification and Relevant Waste Management Legislation in Cambodia as of 2017

Sub-National Legal instruments:

- Decision on Measurement for Dangkor Safety Landfill Operation in Phnom Penh Capital, No. 57 SSS.AN1 (2009)
- Instruction Plan on Waste Separation Promotion in Phnom Penh Municipality, No. 08 PKNN.S (2010)
- Instruction on Penalties on Waste Disposal in Public Area, No. 16 SCN.S (2010)
- Instruction Plan on the Application of Penalties to Promote Environment Sanitation Raising in Phnom Penh, No. 09 PKNN.S (2010)
- Notification on Waste Storage, Cleansing, Waste Discharge and Penalties on Improper Waste Disposal in Phnom Penh, No. 13 SCN.KKS (2013)
- Draft Strategy and Methodology for Improving Waste Management and Cleaning, Collection and Transport of Solid Waste in Phnom Penh (on going)

National Regulations:

- Sub-Decree on Solid Waste Management, No. 36 ANRK.BK (1999)
- Inter-Ministerial Declaration of Ministry of Interior and Ministry of Environment on Waste and Solid Waste Management in Province/ Municipalities of Cambodia, No. 80 RBK.MP-BST (2003)
- Sub-Decree on Urban Solid Waste Management, No. 113 NKR.PR (2015)

Municipal Solid Waste is divided into the following types:

- Solid Waste
- Household Waste
- Municipal Sludge and Solid Waste at Public Gardens/Parks
- Construction Waste
- Street dusts
- Hazardous Waste (e-Waste, Medical Waste, other)
- Industrial Waste

All type has its own regulation to manage the waste properly , it is implemented in overall Cambodia, also specifically in Phnom Penh.

b. Roles and Responsibilities of Relevant Stakeholders

National Institutional Setting

In Cambodia when the ministry was created, there always has Law, Degree, Sub-Degree, and Instruction talking about their role and responsibilities in detail. For the part of Waste Management Governance, it has a few ministries related to it as the **table 2** explaining below.

Table 1: Mandate of Ministries Related to Waste Management Governance

Ministry	Responsibility
<i>Ministry of Environment (MoE)</i>	<i>MSW, industrial waste and hazardous waste including demolition and construction waste under the General Directorate of Environmental Protection.</i>
<i>Ministry of Health (MoH)</i>	<i>Medical waste through the Department of Hospital and Province Departments of Health.</i>
<i>Ministry of Industry and Handicraft (MoIH)</i>	<i>Administration of private industrial sector entities including management of industrial waste and promoting of cleaner production processes.</i>
<i>Ministry of Agriculture, Forestry and Fisheries (MAFF)</i>	<i>Registration of agricultural pesticides and fertilizers under the General Directorate of Agriculture and the management of its waste disposal in cooperation with MoE.</i>
<i>Ministry of Interior (MoI)</i>	<i>General Department of Administration, in cooperation with National Committee for Sub-National Democratic Development, is responsible for supporting local (capital, provincial and city) administration to promote decentralization and deconcentration of administration including waste management.</i>

The nation/sub-nation institutional setting is shown in **Fig. 5**, in which provincial department play the main role as representative of respective line ministries at the provincial level. It should be noted that while Phnom Penh Capital City and Battambang Municipality have their own waste management division, other cities have representative offices of provincial technical department (upper administration layer) to which they report.

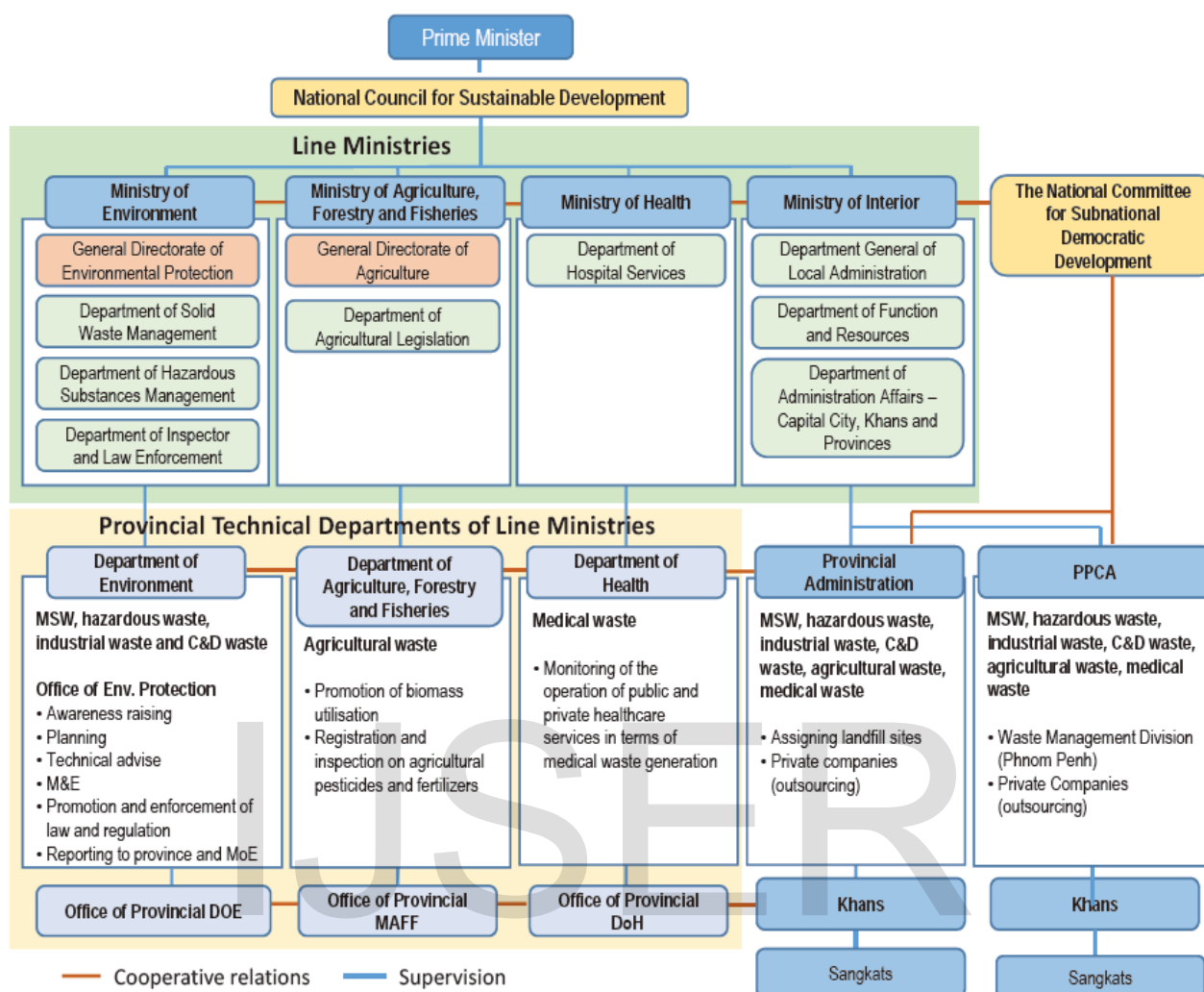


Figure 5: National-Subnational Institutional Setting for Waste Management

Institutional Setting in Phnom Penh City

In Phnom Penh, PPCA bears the responsibility for ensuring the provision of waste management service, while coordinating technical supports from respective department of line ministries, as previously described. **Fig. 6** is a visual representation of Phnom Penh's role in coordinating various stakeholders.

However, Sub-decree No. 113 (2015) promoted further de-concentration of the service delivery, allowing subnational governments to delegate, in part or in whole, the responsibility to lower governance tiers. As a result, reform of governance in the waste sector took place, with a range of responsibilities being transferred to the Khans (districts) and Sangkats (Communes), as excerpted below:

- Khan administrations shall be responsible for the implementation the duties they receive, and fulfill the role of supporting and coordinating the process of cleaning, collection and transportation services and urban garbage and solid waste field services in the municipality and is tasked as follows:
 - Managing and implementing the duties they receive to manage urban garbage and solid waste;
 - Participating and cooperating in the implementation of programs for urban garbage and solid waste management; and
 - Participating in tracking the implementation of cleaning, collection and transportation services and urban garbage and solid waste field services within their jurisdiction.
- Commune-Sangkat administration shall be responsible for the implementation of the duties they receive through the delegation and fulfill the role of supporting and coordination of cleaning, collection and transportation services and urban garbage and solid waste field services within their jurisdiction and is tasked as follows:
 - Managing the implementation of urban garbage and solid waste management as per the delegation;
 - Participating in widespread education and dissemination of using cleaning, collection, transportation of urban garbage and solid waste services within their jurisdiction;
 - Participating in providing comments regarding the preparation of cleaning, collection, transportation of urban garbage and solid waste program within their jurisdiction;
 - Participating in tracking the implementation of cleaning, collection, transportation and fields of urban garbage and solid waste services within their jurisdiction;
 - Participating in solving problems related to cleaning, collection, transportation and fields of urban garbage and solid waste services within their jurisdiction; and
 - Participating in enhancing the implementation of legal measures and legal documents concerning urban garbage and solid waste.

Accordingly, MoU has been signed between each Khan and the private waste collection company under the existing concession contract between the company and Phnom Penh Capital Administration, with the daily coordination and implementation of the collection service taking place in a decentralized fashion.

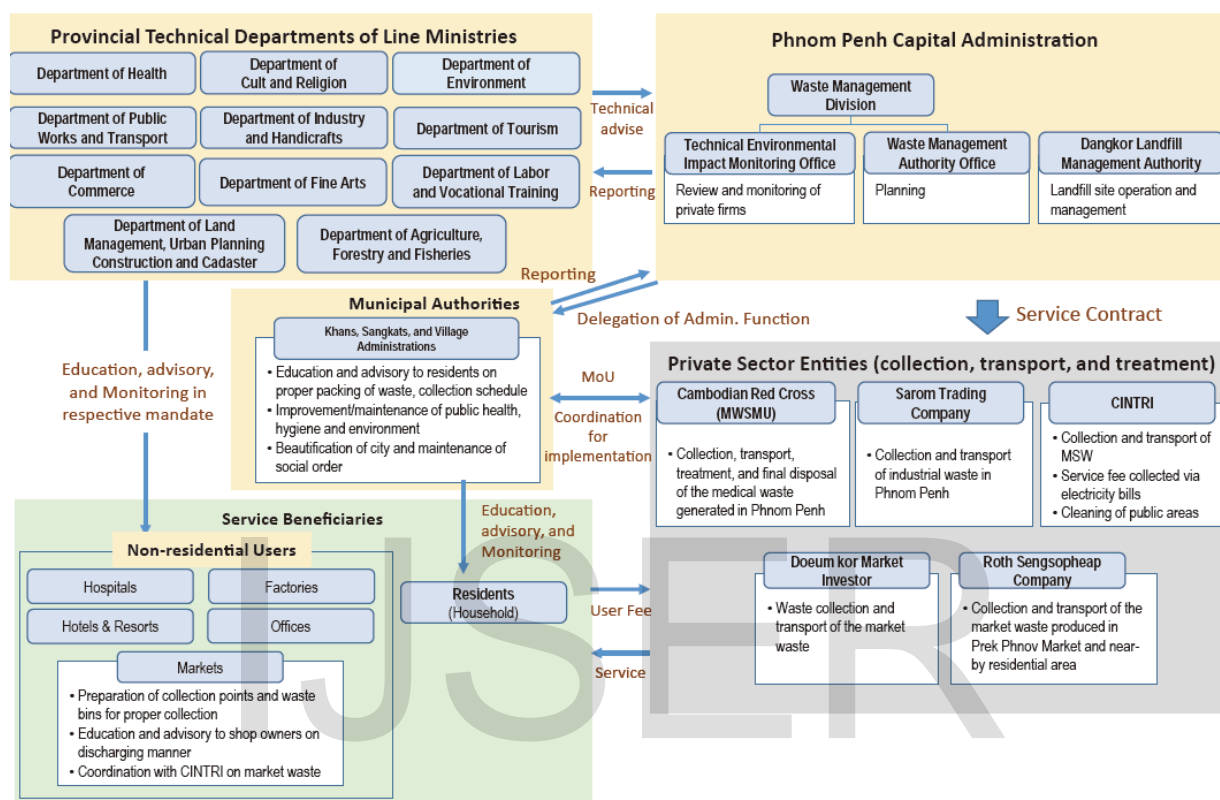


Figure 6: Stakeholder Map of Phnom Penh Waste Management Governance

Public Private Partnership in Phnom Penh Municipal Waste Management

In 1994, first institution of waste management was established directly operation by Department of Public Work and Transport. Then first private company was accepted in provision the waste collection service for 50 year, it was name Pacific Asian Development (PAD). After that, the collection service was changed many times due to political tension and the internal private company problems as **Fig. 7**. From 2002, only one private operator company (monopoly), CINTRI Cambodia Co. Ltd was responsible for collection and transportation the waste generated in the city and had gradually expanded its geographical coverage over the years. However, the service in peripheral areas of the city was still limited in capacity and often did not satisfy the technical standard. Complains are frequency received

related to delays collection and unsanitary collection practices (leakage of organic waste in public areas and overspill of leachate from collection trucks) among other (PPCA, 2017).

Based on the cause above, October 2019, the government has revoked the business license of CINTRI, Phnom Penh's only waste disposal contractor and will temporarily take over its services before putting waste disposal rights up for bidding, Prime Minister Hun Sen said (Phnom Penh Post, 2019). From that announcement, Phnom Penh Capital Administration takes over all responsible for waste collection service until new private companies pass the new bidding which was announced by PPCA in February 2020.

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Before CINTRI, there actually had many private companies too as the following:

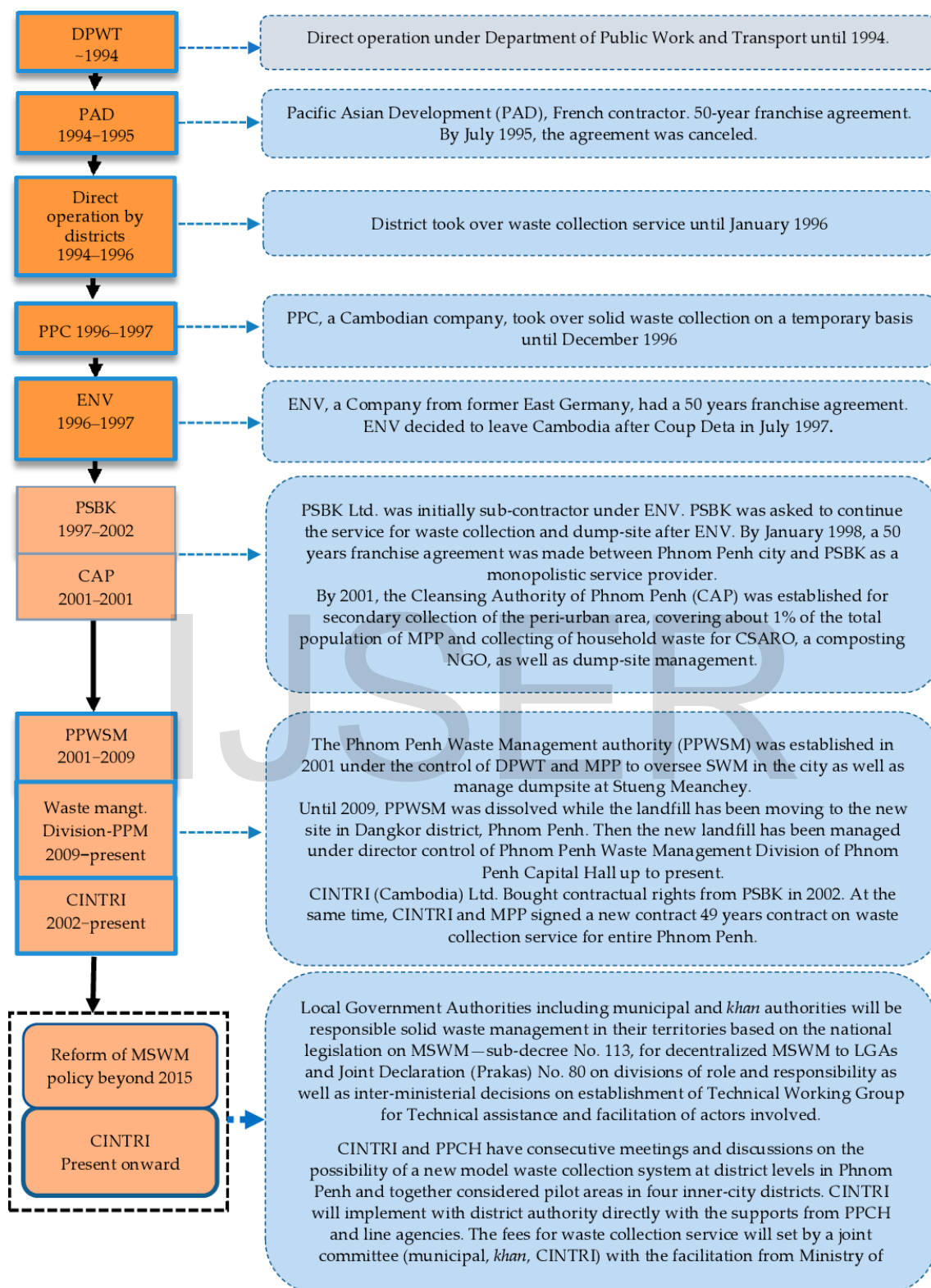


Figure 7: The Flow of MSWM Service Providers in Phnom Penh City

RESEARCH METHODOLOGY

Both Qualitative and Quantitative method was adopted to conduct in this research. As in **Fig. 8**. The main reason for this method is that it can allows difficulties with one method to be resolved by another, and also enable much richer and deeper data from the respondents.

- Quantitative research: this part, a questionnaire will be sent to the respondents from two districts (**Table. 3**)
- Qualitative research, in this section, are questions which is got from content analysis will have in-depth interview with focal person related to study objective.

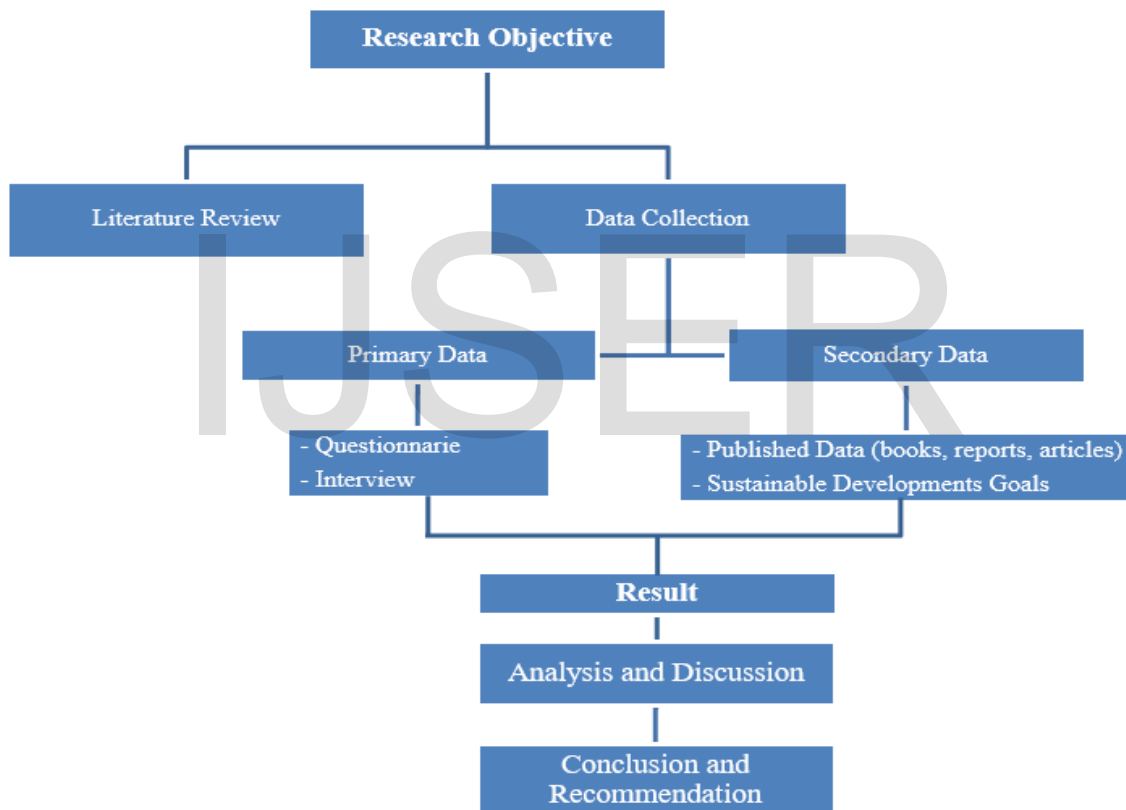


Figure 8 Research Flow diagram

Study Area

Phnom Penh Capital City of Cambodia has significantly development gradually day by day both city in both city area and population. As the end of 2020, total area of the city has 692,46 km² within population 2,189,460 based on National Statistic Institute. It is located in south part of the country where the four rivers meet together here, it is a unique city among another city around the world. In the meantime, the environment of city is still in lower point, according to Ministry of Environment, waste generated around 2,600 tons per day in 2018, and 2,900 tons per day in 2019. Thus, it makes the land fill (DangKao) will be full in 2021.

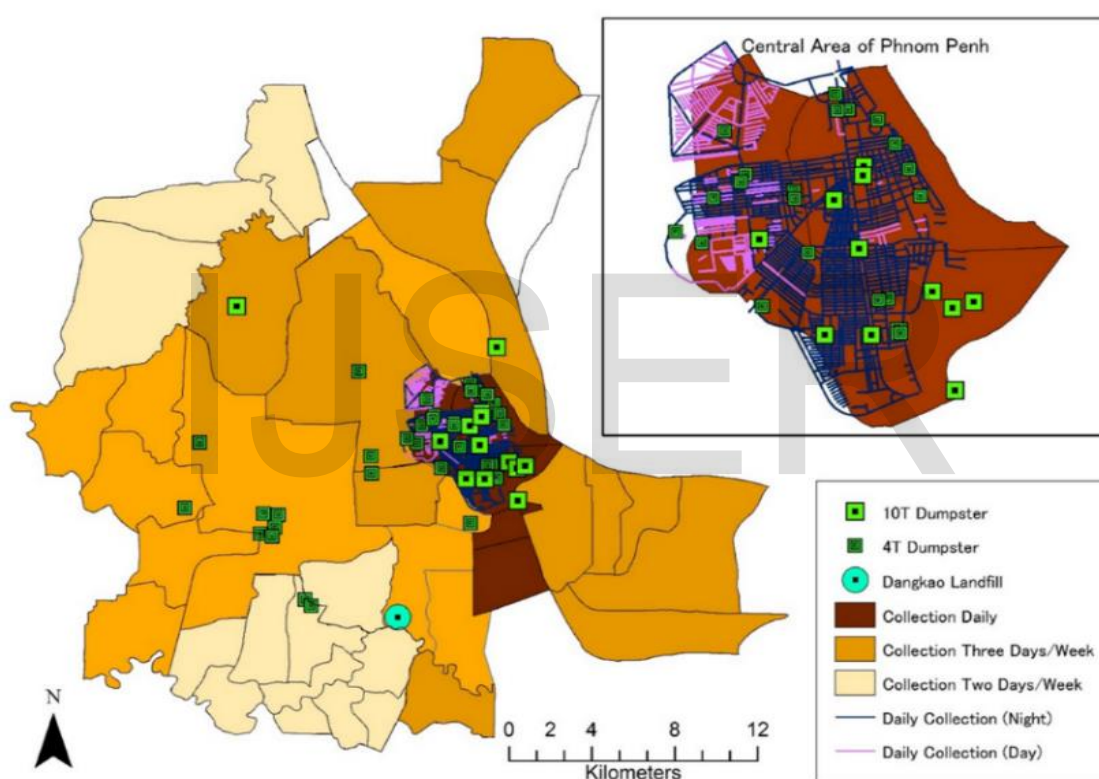


Figure 9: Waste Collection Service Data Map of Phnom Penh

Research Design

To design the questions, the research will conduct it through content analysis (CA) and qualitative comparative analysis (QCA) as **Fig. 10**.

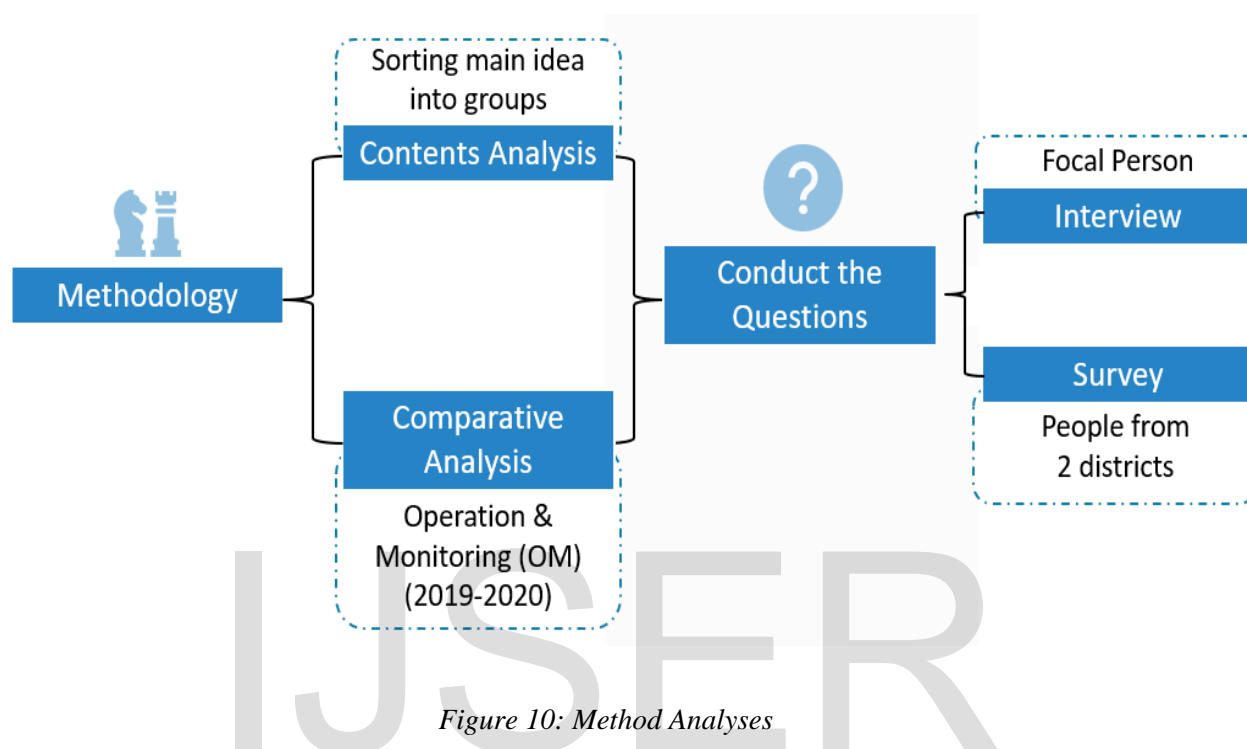


Figure 10: Method Analyses

Content Analysis

Content analysis is the systematic reading of a body of texts, images and symbolic matters, not necessarily from an author's or user's perspective (Krippendorff, 2004). It is distinguished from other kind of social science research in that it does not require the collection of data people. For example, documentary research, it is the study of recorded information. There are three essential types of sources for document analysis:

- Public records such as transcripts, statement of purpose, yearly reports, strategy manuals, eBooks...
- Personal Documents, such as messages, contracts, articles, social media posts, daily papers...
- Physical Evidence, such as flyers, publication, books or printed training materials.

There are two types of content analysis: conceptual analysis and relational analysis. Due to the time limitations, only conceptual analysis was selected to archive the privilege of research objective. Conceptual analysis is coded for certain words, concepts, or themes, and the analyst makes interferences based on the patterns that emerge. By collecting old research papers which were published related to

Nº	Title	Publisher	Year
1	Assessment of public private partnership in municipal solid waste management in Phnom Penh, Cambodia	Spoann, V., Fujiwara, T., Seng, B., Lay, C., & Yim, M.	2019
2	Municipal solid waste management in Phnom Penh, capital city of Cambodia	Seng, B., Kaneko, H., Hirayama, K., & Katayama-Hirayama, K.	2011
3	Improving the solid waste management in Phnom Penh city: a strategic approach	Kum, V., Sharp, A., & Harnpornchai, N.	2005
4	Progress and challenges of deconcentration in Cambodia: the case of urban solid waste management	Mun, V.	2016
5	Managing of solid waste through public private partnership model	Mohan, G., Shinha, U. K., & Lal, M.	2016
6	Application of public private partnership in sustainable solid waste management, case of Delhi and Manila metropolises	Saei, H., Christensen, P., & Hill, A. L.	2012
7	Solid wastes, poverty, and the environment in developing countries: challenges and opportunities	Medina, M.	2010
8	Public private partnership in solid waste management: literature review of experiences from developing countries with special attention to Sri Lanka	Muneera, M. N. F.	2012
9	Partnership for solid waste management in developing countries: linking theories to realities	Ahmed, S. A., & Ali, M.	2004
10	Public private partnership for solid waste management services	Massoud, M. A., & El-Fadel, M.	2002

the topic, the researcher can be categorize those ideas to the same code as it was identified.

Table 2: List of documents used for Documents Content Analysis

Next step, the main ideas of the research title above will be divided as the following:

Table 3: Identify the key points and divide into each group

Research main idea (code)	Type
<ul style="list-style-type: none"> . Improving MSWM regulation . Regulation regarding littering and improper disposal . Continue monitoring and enforcing solid waste disposal regulations 	<i>Regulation</i>
<ul style="list-style-type: none"> . Improving public information . Consideration of waste collection options . Creating incentive for waste minimization . Appropriate storage systems at source . Information sharing . Public awareness . A source reduction program and strongly promoted 	<i>Strategy</i>
<ul style="list-style-type: none"> . Enhancing PPP and social acceptability . Building on strengths and working politically and flexible . Improving institutional effectiveness, monitoring, and enforcement . The capacity building of local waste authorities . The role and responsibility of PPWM 	<i>Institution</i>
<ul style="list-style-type: none"> . Resource management of the public sector . Economic burden to LGAs and CINTRI . Improving investment and operation of municipal waste management services 	<i>Finance</i>

Qualitative Comparative analysis (QCA)

Qualitative comparative analysis is the name given by Charles Ragin (*The Comparative Method*, 1987). It is a means of analyzing the causal contribution of different conditions (e.g. aspects of an intervention and the wider context) to an outcome of interest. QCA starts with the documentation of the different configurations of conditions associated with each case of an observed outcome. These are then subject to a minimization procedure that identifies the simplest set of conditions that can account all the observed outcomes, as well as their absence.

QCA is a theory driven approach, in that the choice of conditions being examined needs to be driven by a prior theory about what matters. The list of conditions may also be revised in the light of the results of the QCA analysis if some configurations are still shown as being associated with a mixture of outcomes. The coding of the presence/absence of a condition also requires an explicit view of that condition and when and where it can be considered present.

As it was showed in Literature Review section, CINTRI (private company) was not responsible in waste collection service in Phnom Penh anymore. In this transitional period, under Phnom Penh Capital Administration- Waste Management Division is now taking control all, monitoring and operation of waste service. By using qualitative comparative analysis, the researcher expects to know how many people who satisfied the operation of waste collection service between inner/outer districts.

Depend on the total sampling (**Table 3**) of each district, and the types after categories the main idea, it can conduct a bunch of questionnaires in order to have in-depth interview by using QCA for comparing the service operator between Private (2019) and Public (2020) sector.

For the question by using QCA will divided into 4 parts to survey the people how they understand about PPP and participate in waste management field.

- 1st: General Overview
- 2nd: Perception of Waste Management
- 3rd: Waste Collection Service
- 4th: Public Private Partnership in Waste Management

Beside their understanding, the researcher wants to clarify that the services between 2 districts is going well even it is inner district or outer district.

To support QCA, another in-depth interview with the professional related to the field. The data got from citizen will not accurate 100%, so those professionals will complete the missing space how the PPP can help them solving the waste manage issue in the city.

Since the area and population of Phnom Penh have a huge amount, only two districts will be chosen to survey for achieving the research goal. There have inner district (Boeung KengKong) and outer district (Kambol) in **Fig. 11**, both districts are the new administration area which just created in 2019. Based on latest census in 2019 by National Statistic Institute of Ministry of Planning, total population of Boeung KengKong district has 75,526 people withing 18,157 households, while Kambol has 66,658 people and 13,055 household. Even two districts were chosen, the size of population is still a big amount. To make a sample size to be more reliable, the researcher will make use of sampling formula of Yamane (1960) in which its reliability is 90% and the error is 10%.

Table 4: Population and Sample Size of Each Districts

Sampling

District	Boeung Kengkong	Kambol
Total Population	66,658	75,526
Sample Size	68	68
Total Sample	140	

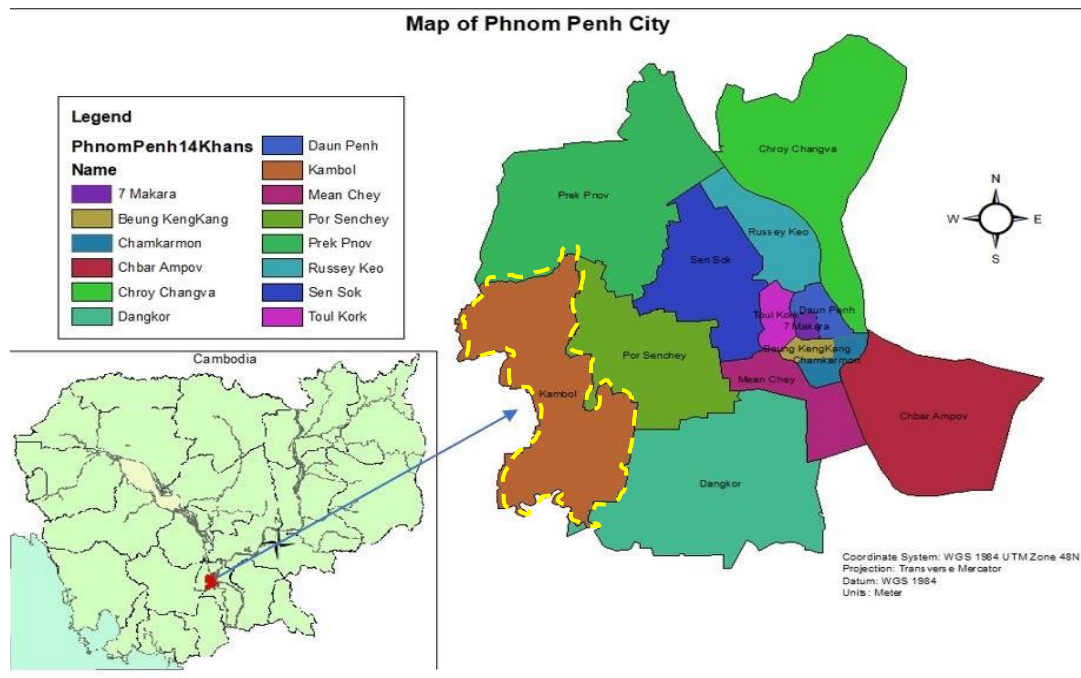


Figure 11: The District Map for Conducting Survey

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DATA ANALYSIS AND INTERPRETATIONS

In response to the research objectives mentioned in earlier section of the paper, this part will explain the data collection from the respondents, including inner and outer districts (Beung Kengkong & Kombol). Both quantitative and qualitative approaches were adopted to collect the data from respondent by using both questionnaires and interview. Due to the the current situation in the world , Cambodia is facing Covid 19 pandemic, questions was carried out online. In the Appendix section B, questionnaires were posted into social medias (Facebook & Telegram) looking for the respondents who is living in these two districts. After that, the qualitative approached was utilized to interview for the further information from the officer in two districts and ministry of environment. The interview questions were sent by Telegram due to social distance and travel restriction.

In order to make this part more systematic, the researchers divided the questions into two sections as follows:

- Quantitative data analysis
- Qualitative data analysis

Quantitative data analysis

Questionnaire delivered to the interviewee in two districts focuses on the perception of waste management in their district and compared the data. The general information result of the respondents is shown as below:

4.1.1 General Information

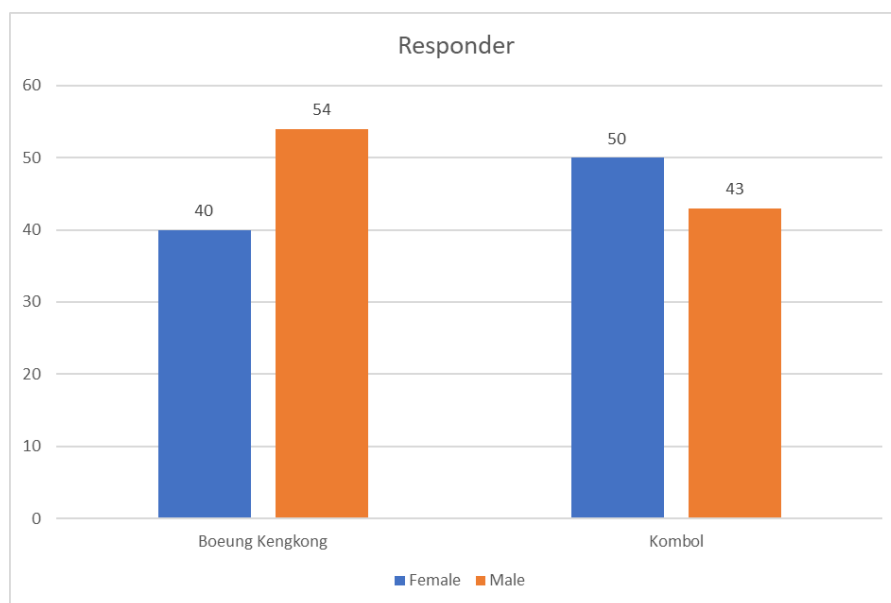


Figure 12: sample interviewee by gender

From the data in Fig.12, it is mainly emphasized about the number of the sample interview in Boeung Kenkong district and Kombol district, totally 94, 93, respectively. Also, the result was larger than sampling that calculated in part 3, only 70 each. If the result was shown that in Boeung Kengkong district 94 respondents had 40 (43%) were female and 54 (57%) were male while Kombol district had 50 (54%) women and 43 (46%) men.

Table 5 Age Rank of Respondents

	Age Rank					
	15-18		18-30		30+	
Boeung Kengkong	0	0%	80	85%	14	15%
Kombol	0	0%	85	91%	8	9%

The result in Table 6 illustrates that there are 80 interviewees (85%) whose ages are between 18-30 years old which is shown to be the most populated age group in Boeung Kengkong district. Furthermore, it is followed by 14 (15%) whose age are higher than 30 years old too. While in Kombol district, the most populated age also between 18-30 years old has 85 (91%) respondents, and more than 30 years old has 8 (9%).

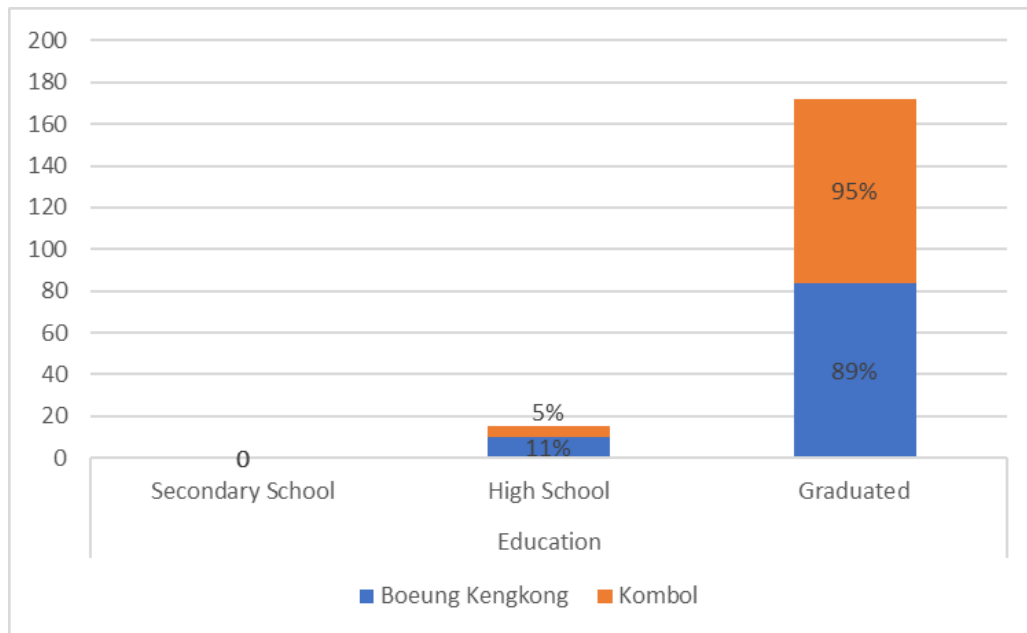


Figure 13: Sample interviewee by education

Figure 13 shows the level of education of people living in these two districts. However, the result shows that people education peaks at graduate level as 95% in outer districts and inner as 89%. While high school level has 5% and 11%. This result has relation with the age rank too (Table. 12), according to education system in Cambodia, student can enroll class when they reached 6 years old. So, the age from 18-30 is not only finished high school, but also finished university.

Waste Management Perception

For the question asking about the effect of the waste, the result shows that 100% affect. It means they all concern as the primary issue since it is not destroying their health but also their environment surrounding.

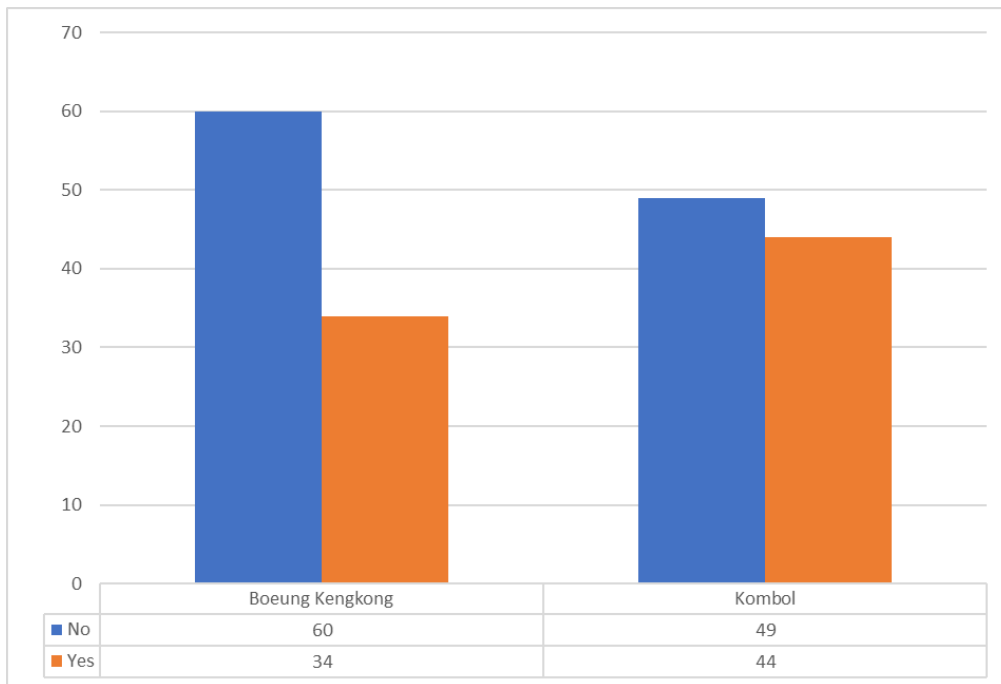


Figure 14: Waste Separation

As Fig.14 shows that both districts, they do not divide the waste as categorizes. In Boeung Kengkong is almost 70% (60 respondents) did not separate the waste while separate has only 30% (34 respondents). In meantime, Kambol has around 50-50 separate the waste they generated. The main reason also found in the survey question number 8 (see Appendix); they did not categorize due to the amount of waste generated is very small. Moreover, the collector from the household does not have the designate trucks which take only waste separation such plastic, organic, cans etc. Organic waste can be found collect from only vegetable market and the supermarket.

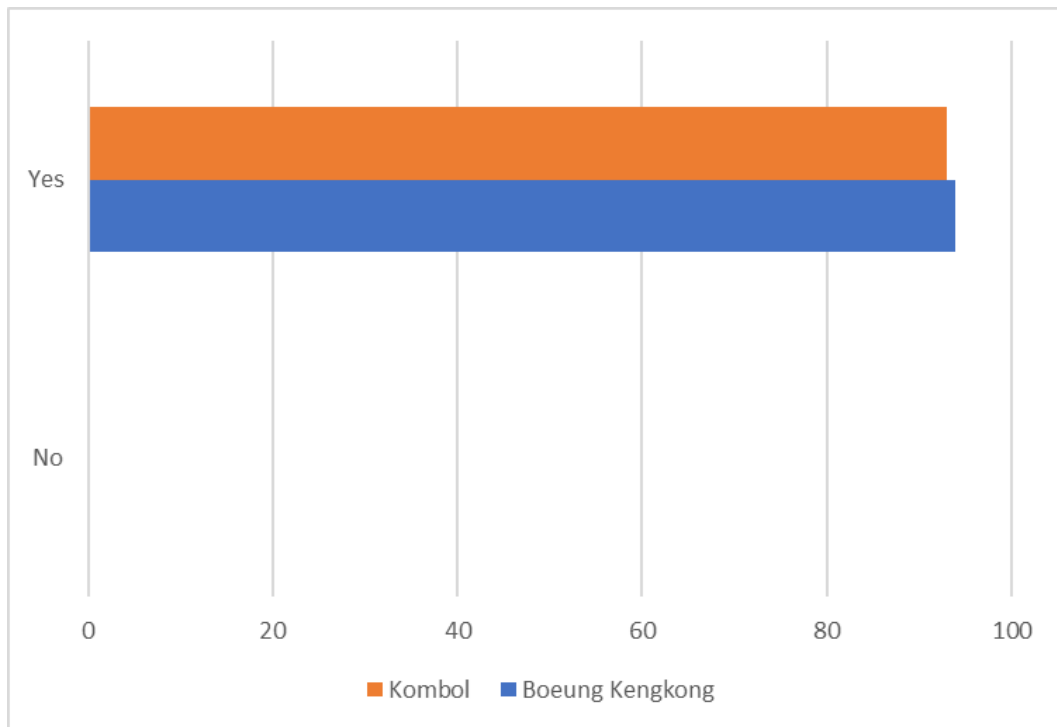


Figure 15: Organic Waste

Related to the organic waste, as it was showed in Fig.15, both districts have known well about it. Yet the answer of making it as organic is significant low, only 10% knows how to make it while almost 90% left it for the pets (dog & cat). Mostly Cambodian people love pet, they fed them not for pleasure but also for security purposes.

Waste Collection Services

Table 6: Waste Collection Service Location

	Service Reached	
	Yes	No
Boeung Kengkong	94	0
Kombol	90	3

As Table 7, it can be concluded that not only inner nor outer district, but collection service can also reach to their home now. This is the result that local authorities are working hard regarding to the waste problem since the government delivered the responsibility to them from 2016.

Table 7: Location Storage

Garbage Store		
	Inside the house	Outside the house
Boeung Kengkong	25	69
Kombol	12	81

Both districts store their garbage outside the house rather than inside as Table 8, 25 respondents in Boeung Kengkong are store inside while Kombol has only 12. They likely store outside the house as 69 in Boeung Kengkong and Kombol 81 people.



Figure 16: Collection Schedule

As Figure 16 shows that even the people did not know about the schedule of waste generation, the collector do not come on time. Generally, inner district can get the service on time rather peripheral area. The respondent in Boeung Kengkong said 44 Yes, 30 No, 20 Late while 32, 31 and 30 in Kombol respectively. This is also the reason behind the Table 8, quantifier of them did not know about it. Thus, it makes the environment along the road and the city are not cleanness at all. Moreover, waste picker can break the plastic bags or bin that store outside the house to look for the recycle items (can, bottle, plastic etc.). In the survey also seen that 90% of household packed the garbage with plastic bags, so it causes easily damage the environment and health too.

The last question of this part was unexpected as it shows in Table 9.

Table 8: Service Owner

Waste Collection Service Operation		
	City Hall	Private Company
Boeung Kengkong	34	60
Kombol	30	63

Quantifier of respondent from both districts said that waste collection service is still under control by private company. It is the big problem which should not found in this research. The Cambodia government in late 2019 announced that private company will no longer provide the service anymore since citizens have been complained a lot about it. In contrast, people are still thinking it is private company till now. During this period, solid waste management in Phnom Penh is monitoring and operating by state, City Hall. In other hand, it is the reason why they said the waste collection service is limited. In the Figure 17, only 10% from both districts are satisfy with the service.

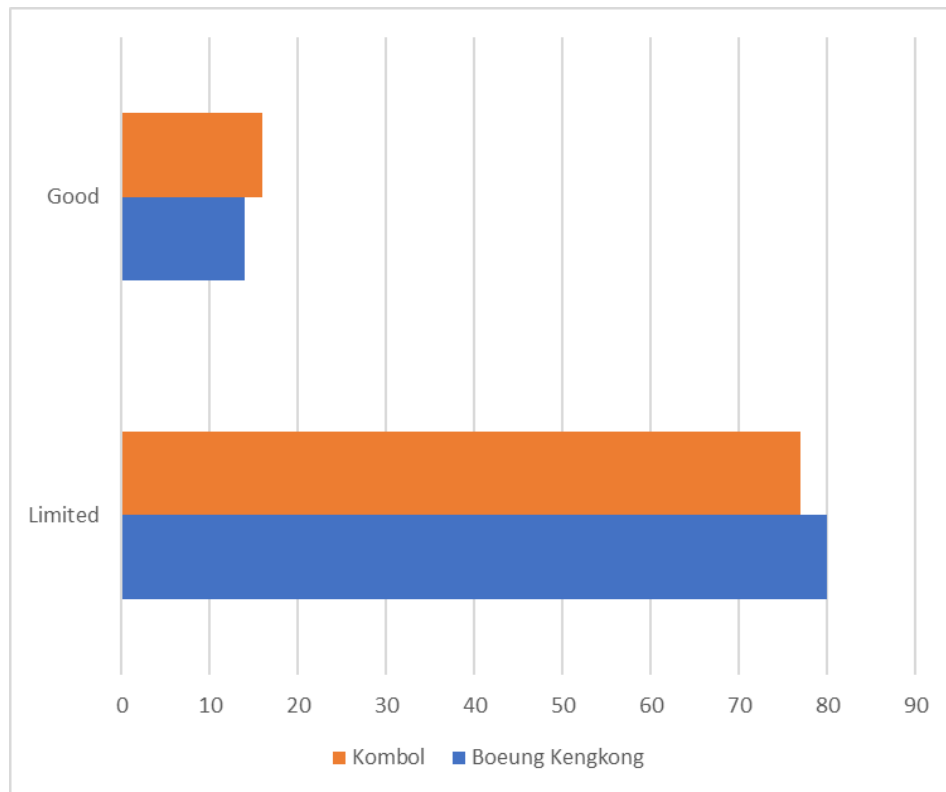


Figure 17: Service Quality

Public Private Partnership in Waste Management

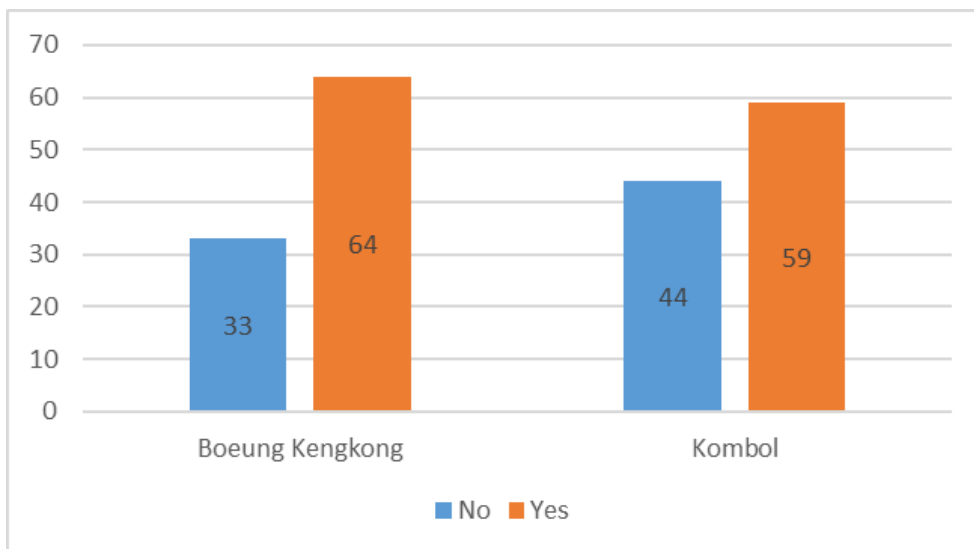


Figure 18: Respondent's opinion about PPP

In Figure 18, the understanding of PPP in Boeung Kengkong is significant larger (64 people) than Kombol (59 people). While 33 and 44 are not aware about respectively. That is why 1 out of 2 among them did not agree with the phrase in the survey talking about “*Investment refers to profit*”.

About their intention to pay the waste collection fee, this is might not accurate 100% since the question was asked during lockdown that cannot go out from the house to earn money for their daily life. In

Figure 19, the questions were asked for a better service in the future, do they have willing to pay more.

And they said No 24 in Boeung Kengkong and 20 in Kombol.

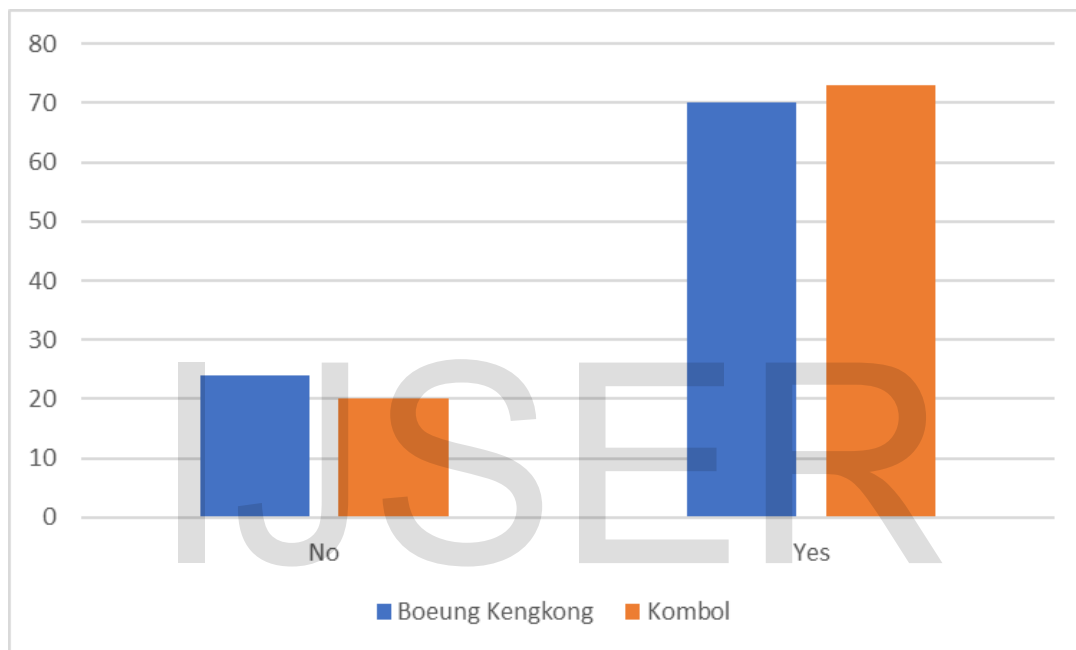


Figure 19: Willing to Pay

The current price is 4000 Riels, and all respondents agreed to increase the price only 1000 Riels more which means 5000 Riels will be the new price. 4000 Riels equals 1 USD, and it is the fix price since the government has been cooperate with private company. This is also another reason which can see frequently that the worker of the private company complained about their salary wage.

Qualitative data analysis

There were in total 3 participants who agreed to give detailed information about solid waste management in Phnom Penh. There was one officer each from Boeung Kengkong and Kombol district, another one from national level, ministry of environment.

As mentioned above, due to Covid-19 pandemic situation in Cambodia in-depth interview with the focal officers cannot do face to face. Instead of that, the researchers sent the questions through Telegram which is an official application that Cambodian civil servants uses for daily works. To make it logical regarding to research objective questions, it will be divided into 2 level as below:

4.2.1 District Level (Boeung Kengkong and Kombol)

- Kombol (outer) District

- ① What are the current solid waste management practices and associated problems of it?

Regarding to this question, an officer from public works, transport, hygiene, environment and public orders office in Kombol district mentioned that the current situation of solid waste management here is not good yet. First, he mentioned about the organization chart of the district. It was created in the early 2019, it was separate from the old district called Po Senchey. The offices that are under district authorities have been reverse to suit the new reforms.

Although his unit are adequately staffed to deal with the reform, the policies are still vague to implement and adopt the new role/duty which delivered from the city hall to the district. As for the administration work related to waste management operation, activities are going well, but the staffs who work in each village are not effective in implementing the current policies.

In the past each area has only 2 inspectors but after the metropolitan city hall took control all collection fee process, city hall allowed the district to finding more inspectors to deal with the waste problem in the villages.

Second problem is geography of district, the distance from here to landfill is around 25 km, since it is far, waste collections are not regularly, as well as the traffic along the route is always busy all the time, most especially the main road of Kombol district is the special economic zone where most of the

factories are located there. Moreover, the land type is mostly agriculture type which mean there has a lot of free land to develop also infrastructure. Due to the infrastructure is not enough, the collection service cannot reach to destination too.

Finally, he mentioned that citizen is the mainly problem. The perception and participation in term of solid waste management is still limited, authorities need to explain and educate them more.

- ② How public private partnership can help in provision of better waste services and reduction of the health and environmental risks?

For this question, he expressed that PPP is truly help solving the waste services. Even we used to work with the private company only one year in 2019, he observed that the company was also try their best to deliver the truck reach the village. In contrast, as mentioned earlier, the district geographic is not allowed the truck move in yet. Related to the environmental and health risks, PPP is also a part to decrease the risk. For instance, when he found that it has illegal dumping area in a village reported by inspectors, he contacted to private company for help collected and cleaned those area. He added more related to the risk, "*the waste is not bad as the thrower*", it means that we authorities are trying hard every day to slow down the increasing of trash, but citizen is not care much about it. What they care just only inside their household, as it was show it quantitative result, mostly they store it outside the house. Thus, the waste picker could break the waste plastic bag finding some recycle items to earn money for daily life. Last but not least, he still says PPP is the best choice to consider and keep forward dealing with the risk in order to make the environment clean.

- ③ What are the possible prospects and constrains of public private partnership?

To answer the question, he said that generally everything has pro and con not only PPP but also trash. Some trash may affect to environment and heath but other can be recycle and use it again to save the world. His feedback was divided into 2 parts:

- Benefit of PPP: PPP refers to the contract which make by two or more party and agree signing together. For our district, the resource both human and finance are limited. So PPP is the only answer respond it, plus their financial resource is accountability and efficiency if compare to the state.

- Constraint of PPP: Contract can be obstacle of PPP too, if we did not divide role and duty clearly. Mostly in practical, one part frequently pushes their responsible to other. Another one is government intervention. In developing countries like us, even the government did not join directly, it still can be found they use some connection in order to win the procurement stages. Last one is service fee, before 2020 the fee was combined with electricity fee, so it is hard for them to refuse paying back. If the citizen did not pay fee on time, electricity staff has right to cut their electric. Yet, current situation is change, the fee was separate from the electricity bill, citizen has to pay the fee by e-banking or partner that cooperate with the Phnom Penh city hall.

- **Boeung Kengkong (inner) District**

- ① What are the current solid waste management practices and associated problems of it?

The interviewee was a woman who work in public works, transport, hygiene, environment and public orders office of Boeung Kengkong district. Answer the question she said that her district was just created in early 2019, it was separate from the old district called Chamkamorn. Her office has enough staff to deal with the new reform that the government transfer the new role/duty to respond the current social context. She mentioned that citizen is the cause of the problem. Her district location has a big opened-drainage tunnel, and in the early creation of district, it was hard for district governor dealing with them. People who are living around the tunnel having a bad habit, if they found no people around, they will throw the trash into the tunnel. She added more that it took half year to adjust the citizen character. First, district announced the restriction to the people surrounding, yet people still were neglect on it. After that, governor decided to use CCTV recording the illegal actions. From then, the tunnel is starting to become cleaner since they are afraid that the district will post their action in public using social media.

- ② How public private partnership can help in provision of better waste services and reduction of the health and environmental risks?

Even she worked with private company in giving the waste service only one year, she noticed that PPP can help solving the waste problem well in her district. Especially during rainy season, private company

worked together with the inspector of the village collect the waste on time before the level of water reached to top of the road. If it reached the road level, the waste would flow along tunnel making drainage stuck or flooding. Moreover, the smell of tunnel affects to environment and health surrounding area. Some people but less amount now are still neglect this point like she said the phrase “*out of sight, out of mind*”. When their area is clean that enough, in contrast it is not the right idea. The perception of the regarding to waste issues is limited, we live in one environment, it can affect us all the time when the right time come.

③ What are the possible prospects and constrains of public private partnership?

She explained that PPP has a lot of benefit, but she focused on only experiences. Even with one year of working together she got many ideas about how to control and process the collection trucks reaching the destination. The private company has resource to install GPs in the truck, thus they can track the location of the trucks. Did it reach the right place designated or not?

Disadvantage of PPP are in two aspect. First, since Phnom Penh has only 6 districts until late 2019 extended the size to 14 districts, only one company is engaged to provide waste collection service. Second is paying waste fee. Either, waste fees are paid or not, it does not matter for normal household. They are dump in other neighbor nearby or illegal dumping in abandon area. There are no adequate staff who can track the households that have paid or not. Though there are schedule to trash generated waste, however collector do not pay attention to effectively adhered to the schedule due to time constrain and finance.

National Level (Ministry of Environment)

Based on the research objective questions, he feedbacked as the following:

He is a Deputy Director of Solid Waste Management in General Directorate of Environment Protection, Ministry of Environment. He noticed that current happening of solid waste in Phnom Penh has problems because:

- The rapidly increasing amount of waste due to the population growth, economic growth, modern technology, and the standard of living
- Collection services is limited

- The intention to pay the fee is still low amount
- The institutions who respond the situation are lacking both resources, human and finance
- Recycling awareness is also lacking
- In the landfill, there is no technical standard which can operate yet
- Law implementation is not working well too

He added more about the causes which make the problem above are:

- Lack of legal and policy framework
- If it has legal to implement, the authorities are not knowledgeable to do it
- Institution responsibility
- Citizen and staff perception regarding to waste management
- Public Private Partnership is still limited
- Practice 3Rs in daily life more
- Strategy about the person who destroy the environment must paid did not application yet
- Pay depend on volume base fee (VBF) is also not applicated

For PPP that was practiced before has pro and con both together. He described that PPP is an approach to monitor and fill the missing role which have to working altogether in order to find an efficient solid waste management. The reason behind the obstacle facing before is the process of procurement. The contract do not clearly state the role and duty of each parties, no competition, and the intension to implement the contract. To have a clean environment, he deeply focused on the citizen. Citizen is the only waste generator while the local authority is the monitor.

In the next future, both city hall and private company, he suggested that PPP should be following the main points below:

- Be honest and do not focus on only profit
- Make a competition broader that national also international company can join
- In the contract have to mention clearly about role and duty of each part and have to revise each year since the global warming is keeping change.

All in all, according to the three feedbacks above, it was clearly seeing that Phnom Penh solid waste management still a big issue for the government. It seems that the authorities do not want to

blame each other rather than try to deal with the problem by themselves. Like the case in those two districts, one installed the CCTV and another one run the mini trucks to reach the small blocks where the private company truck does not enter there.

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CONCLUSIONS

The study on the improving working capacity of PPP in Phnom Penh Municipal solid waste management is a necessary way to find an alternative approach for Phnom Penh city in order to make the environment clean and become a green city as the government strategy plan 2017-2026.

Based on literature review, case study in west zone of Delhi city-India, and data collection from survey and interview, researcher believe that strengthening the capacity building of the public and private sectors are the crucial way which can do in short term action plan. But, people awareness and perception on waste concerns have to do in long term action plan due to they care only their surrounding area. In overall, even it has many legal and policy frameworks, the current situation of waste management is still not going well yet. As Fig. 14, the result is clearly seen almost 70% (60 respondents) did not separate the waste while separate has only 30% (34 respondents). The reason of it is the less amount of waste, but if they really care about the environment, less or not it does matter. Since it has mentioned above 100% of respondent think that waste can affect them, why do not they change their behavior too. Another significant finding is the current service operator, in Table 9 it was showed that two-third of citizen is still operate by private company. In fact, they can see the old private company still mobilize providing the service. But the story behind is not like what they seen, after the end of 2019 city hall takes over all monitor and operate the waste collection service, also collect the fee. In this transition period, city hall has no ability to respond all the actions yet, thus the government allows the old company helping collection service. For this point it can conclude that even city hall from then till now is trying to announce that the solid waste management is fully control by state via mass media (TV, radio, ...) and social media, citizen is less attention on it. Like officer from Boeung Kengong said “*out of sight, out of mind*”. Another problem also found in Fig. 19 willing to pay. The current fee for normal household is 4000 Riels; this price is fix since 2002 while the GDP, population and area are keep growing. And the result was shown that 2/3 of them want to increase 1000 Riels more, if the government think about the price, how can they attract the private company to invest more on the waste management. This is main constrain that PPP in Cambodia is facing. Anyway, from the district and ministry expert they still claimed PPP is the only alternative for Phnom Penh in providing the waste collection service.

According to the annual report of Dangko Landfill, in 2019 the private company, an operator of waste collection service, collected the trash around 14 districts having 960,635.07 tons/year, while in 2020 the city hall collected the trash only 961,666.42 tons/ year. There can be explained that nothing much different between public or private sectors that they have full experience for the last two decades.

In the conclusion above, it has described a strong evident to answer the research objective. So, this part will find the way to support the main goal of the study. The main goal is talking about how PPP can improve the solid waste management, thus institutional upgrading needs to take place first.

Institutional upgrading, based on the case study of west zone of Delhi city, it is not quite different from Phnom Penh City. The PPP problem in Phnom Penh is happening just because it has only one private company who respond to all the collection service. In other hand, the government consider the waste management problems is the first priorities target which needs to be solved faster. That is why it has many legal and policy frameworks recent year.

Even the word PPP has no people (citizen) in it, citizen is still having to follow some guides too since they are the waste generator. According to Liisa Perjo, a research fellow at Nordregio, she mentioned that *“Typically, city administrations’ cooperation with companies on one hand and citizen participation on the other hand is discussed separately although they both are expected to influence the same planning process. The concept of Public-Private-People partnership (4P) is one emerging way of highlighting the need for developing the involvement of private actors and the general public in a joint process”*. Thus, citizen have their own responsibilities too regarding to solid waste management.

This study was conducted to fill the gap in capacity building of public private partnership in solid waste management. But it is just a pilot instrument for decision maker, if another researcher want to study more, you can focus on the work in local level especially inspector in each district. Inspector was created during 2015 since city hall had meeting with the private company talking about the issue on that time. Until 2021, each village has only two inspectors who work with the collection service provider. Moreover, it has no clear regulation that write about their role and duty yet. As Figure 20, it shows that Phnom Penh city hall give one mini truck to inspector in each village. This mini truck plays as important role to collect the waste where the truck of private company cannot access the destination.

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