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Sahmakum Teang Tnaut, a Cambodian Urban NGO

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*by Sahmakum Teang Tnaut (STT)*

# Solid Waste Collection and Management

## The Forgotten Settlements in the capital city of Phnom Penh

**SOLID WASTE COLLECTION AND MANAGEMENT**

**THE FORGOTTEN SETTLEMENTS IN THE CAPITAL CITY OF PHNOM PENH**


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**Sahmakum Teang Tnaut, July 2015**

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## Acronyms

| | |
|---|---|
| CSARO | Community Sanitation and Recycling Organization |
| EDC | Electricité du Cambodge |
| GIS | Geographical Information System |
| JICA | Japan International Cooperation Agency |
| NGO | Non-Governmental Organization |
| STT | Sahmakum Teang Tnaut |

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## Key messages for practitioners, planners and policy makers

- Public services for solid waste collection remain a big concern for residents in Phnom Penh, where 60% of interviewees do not benefit from these necessary services.
- The main waste collection service provider of Phnom Penh, CINTRI (Cambodia), Ltd. fails to make this service available to approximately 72% of residents in the outer Khans. In addition, areas in the outer Khans such as Russey Keo, Mean Chey and Chbar Ampov are not widely equipped with rubbish bins for solid waste collection.
- Some common local practices for solid waste management include burning, dumping in waste piles without waste collection services, and dumping in waste piles with waste collection services. Two different approaches are commonly applied by local residents: (1) ordered waste management, (i.e. reusing, packaging, burning and storing at home temporarily); and, (2) disordered waste management (i.e. dumping on waste piles elsewhere or dumping anywhere on the streets as convenient).
- This study shows that key factors that significantly influence the availability of solid waste collection services are the availability of street lights and of sewage systems; access to electricity for home consumption; and appropriate roads and access for waste collection trucks.

# Introduction

Waste builds up at Phsar Kap Ko market, Khan Chamkar Mon

# Chapter I

## 1. Introduction

In 2009, the Dangkao waste dump site, which is located 15 km from the center of Phnom Penh, was established as the only sanitary site to replace an old dumping area in Stueng Meanchey. In Phnom Penh, solid waste is increasing every day as a result of urbanization and population growth. Yim *et al.* (2014)[1] suggested that more than half (65.6%) of municipal solid waste was derived from individual households whilst 24% was collected from commercial activities. Every day, CINTRI (Cambodia) Ltd. alone collects 1200 tons of waste from households, markets, restaurants, public venues, and buildings (CINTRI, 2015)[2]. In recent years, the composition of solid waste in Phnom Penh has included 56.70% biodegradable waste, 19.32% plastic waste, 14.84% paper waste, 8.14% inorganics waste, 1.25% textile and shoes waste, 0.25% rubber and leather waste, and 0.01% wax waste (Yim *et al.*, 2014). The annual generation of solid waste has gone up to 0.36 million tons in 2008 from 0.14 million tons in 1995; it is predicted to increase to 0.63 million tons in 2015 (JICA, 2005)[3]. It is clear that both now, and in the future, the management of the city's waste is a struggle due to population growth, landfill management, awareness of residents and the reach of services. Overall, waste collection services are not reaching all Khans, especially in urban poor communities throughout Phnom Penh, therefore some residents are managing their waste through traditional methods including burning, burying, and scattering around their houses. These practices cause a range of issues linked to health, environment, and public disorder.

[1] Yim, M., FUJIWARA, T. and Sethy, S. (2014). A study of commercial solid waste generation and composition in Phnom Penh City, CAMBODIA. *Journal of Natural Sciences Research, 4(13), 49-54.*

[2] CINTRI.(2015). About CINTRI (CAMBODIA) LTD. Retrieved from http://www.cintri.com.kh on 15 March 2015.

[3] JICA (2005). *The study on solid waste management in the municipality of Phnom Penh in the Kingdom of Cambodia*. Phnom Penh: Japan International Cooperation Agency.

# Methods and Study Areas

Waste blocking the Boeung Trabek canal, Khan Chamkar Mon

# Chapter II

## 2. Methods and Study Areas

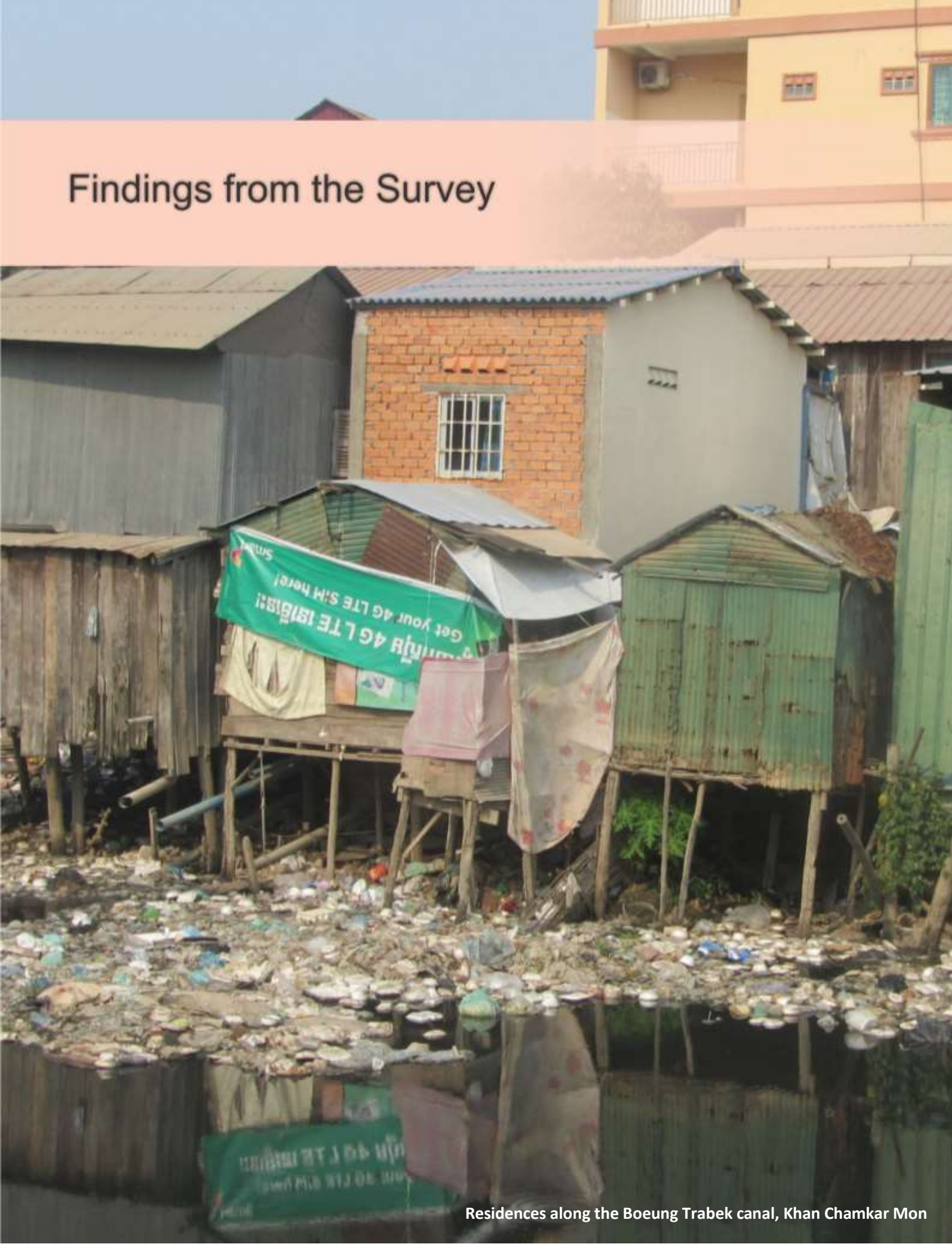
The findings in this *Facts and Figures* are taken from Sahmakum Teang Tnaut's 2014 publication "The Phnom Penh Survey: A Case Study on Urban Poor Settlements in Phnom Penh". This *Facts and Figures* focused upon the availability of public services for solid waste collection and the perception of residents in Phnom Penh regarding their involvement in attempting to keep the city clean. This study used a household survey to collect quantitative data in the nine Khans[4] throughout Phnom Penh between March and July 2013 (now changed to 12 Khans); 340 residents representing each of the 340 urban poor settlements identified in the Phnom Penh Survey were interviewed as part of the study.

In addition, case studies were carried out to collect qualitative data to examine the involvement of Phnom Penh residents in, and their satisfaction with, solid waste collection. The case studies were conducted among 16 residents of Khan Toul Kork, Khan Chamkarmon, Khan Meanchey and Khan Russey Keo. Selection was based upon the equal stratification into: (1) communities with public services and (2) communities without public services. Moreover, interviews were conducted with representatives from both inner Khans (e.g., Toul Kork, Chamkarmon) and outer Khans (e.g., Meanchey and Russey Keo).

Frequency, Geographical Information System (GIS) and logistic regression were used for the purposes of quantitative analysis. First, frequency was applied to calculate the percentages of overall public services available for waste collection and local practices where services were not available. Second, using GIS, areas were mapped where public services were unavailable. Finally, logistic regressions with dichotomous variables were conducted to estimate key contributors influencing the available services of solid waste collection. In relation to qualitative data, a situation analysis was undertaken to investigate the internal environment of study communities with a focus upon the strengths and weaknesses of the solid waste collection services.

[4] During the data collection conducted for The Phnom Penh Survey in 2013, there were nine khans in Phnom Penh. Since then, three new Khans have been created; they are Khan Chraoy Chongvar, Khan Praek Pnov and Khan Chbar Ampov by sub degree 577, 578 and 579 on 25 December, 2013 respectively.

# Findings from the Survey



Residences along the Boeung Trabek canal, Khan Chamkar Mon

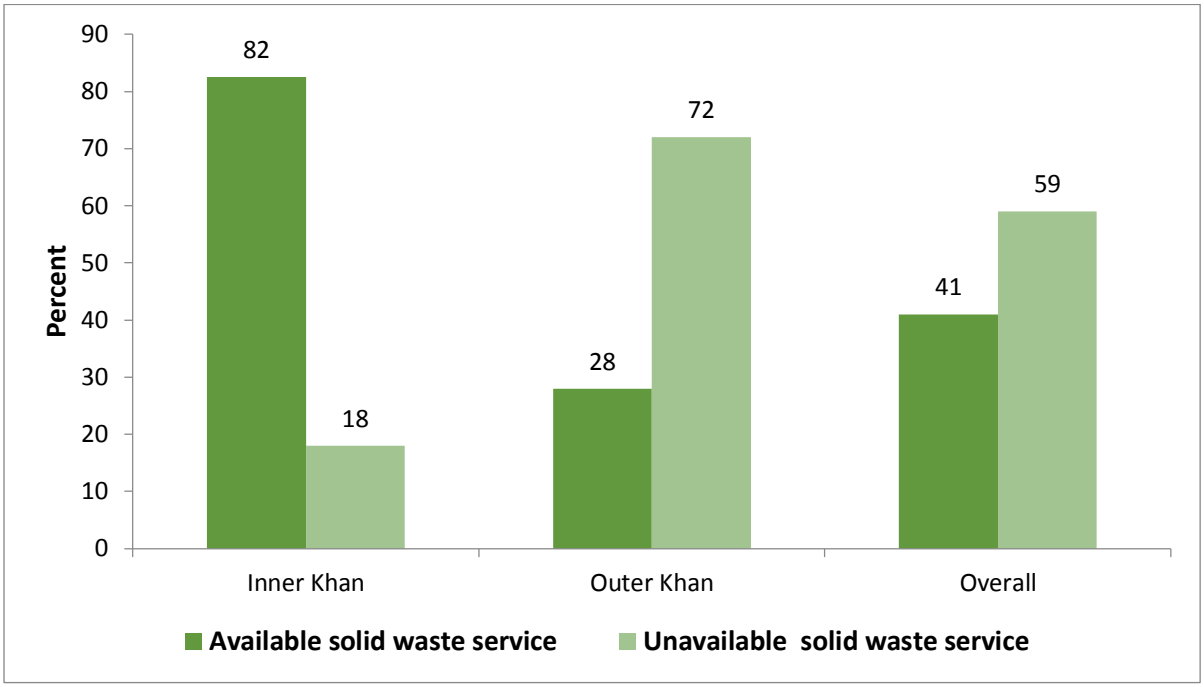
# Chapter III

## 3. Findings from the Survey

### *3.1. Access to public services for solid waste collection*

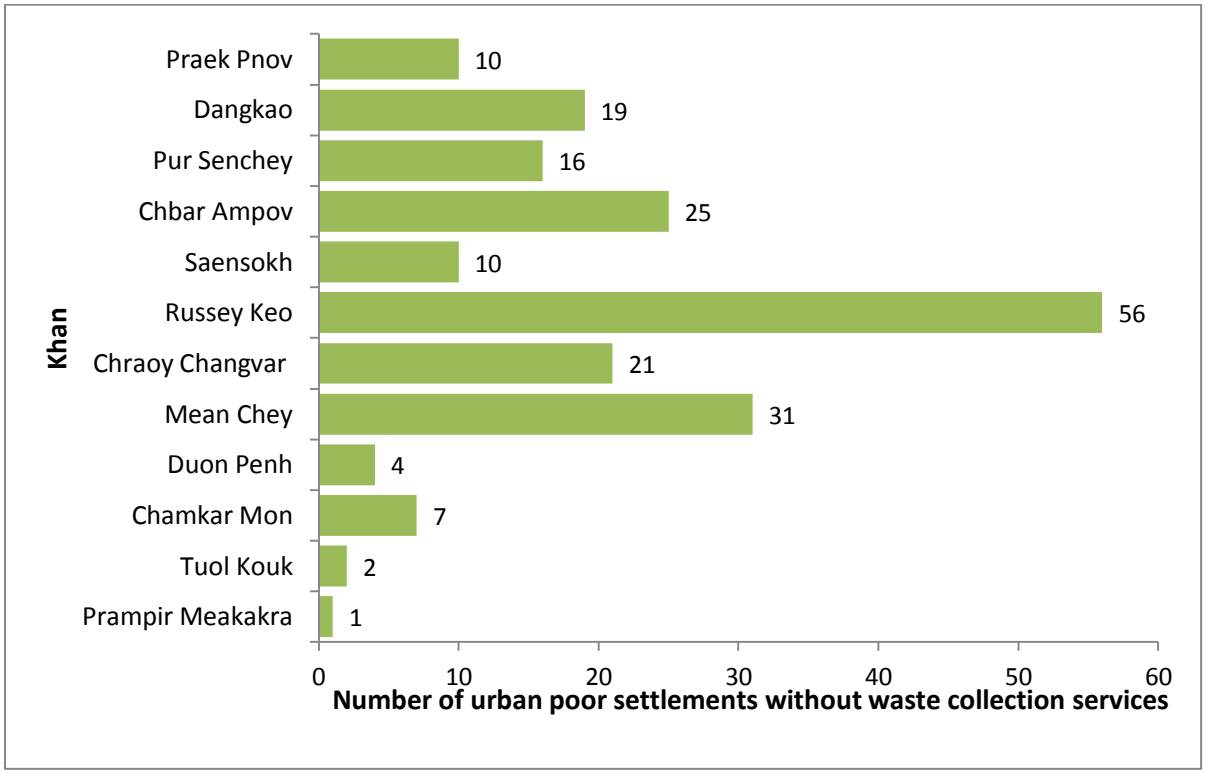
More than half (59%) of the 340 residents interviewed did not receive public services for solid waste collection due to the fact that waste collection services were not available in those areas (see details in **Figure 1**; **Figure 2; Map 1**).

**Figure 1: Solid Waste Collection Stratified by Inner Khan and Outer Khan (in 2014)**

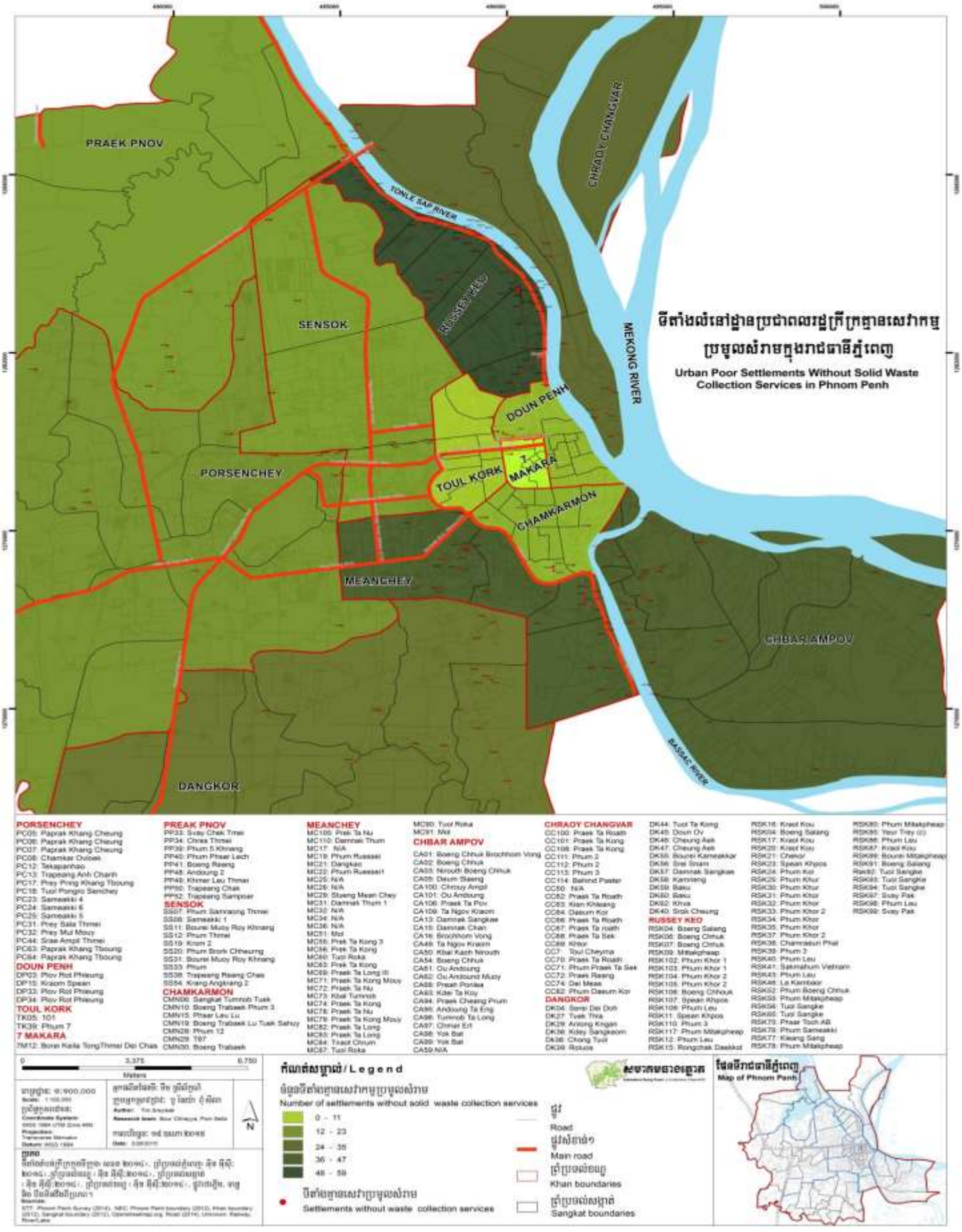



In Phnom Penh's inner Khans it is clear that the leading waste collection companies such as CINTRI (Cambodia), Ltd and Community Sanitation and Recycling Organization (CSARO) were actively providing their services. Comparatively, only few locations in outer Khans (28%) had access to these public services; a large contrast to the locations in the inner Khans (82%). Case studies highlighted some major factors of higher service provision in the inner Khans. These included a larger population, access to physical infrastructure (e.g., roads, schools, and hospitals) and the availability of public services (A village head in Khan Meanchey, personal communication, March 2015). In addition, CINTRI (Cambodia), Ltd uses the state Electricité du Cambodge (EDC) billing system to provide residents with the bill for the CINTRI (Cambodia), Ltd services, meaning that CINTRI services were mostly provided only where state electricity service was available (A community leader in Khan Russey Keo , personal communication, March 2015).

Figure 2: Number of Urban Poor Settlements without Waste Collection Services by Khan (in 2014)



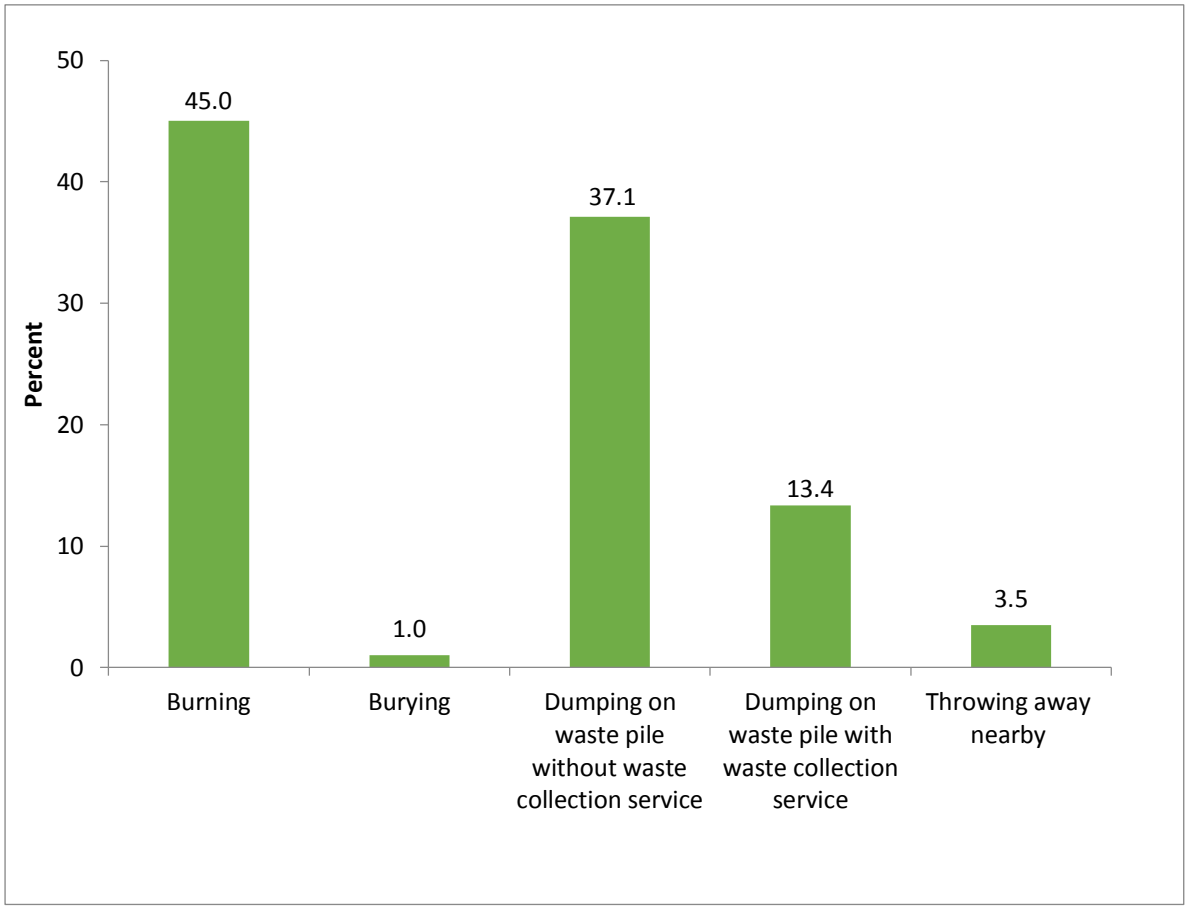
**Map 1.** Urban poor settlements that do not receive waste collection services in Phnom Penh



### *3.2. Local practice for waste collection*

Where public waste collection services were not available, residents used different practices to manage their own solid waste, including burning, dumping (on a waste pile either with or without waste collection services), throwing away nearby, and burying (See detail in **Figure 3**). It appears from the interviews that burning was the most common practice (45%), followed by dumping on a waste pile without waste collection services (37%) and dumping on a waste pile with waste collection services (13%). Some practices, such as throwing away nearby and burying, were not popular among interviewees. They mentioned that these options would be an issue if they applied those practices near their residences (A resident in Khan Chamkar Mon, personal communication, March 2015). Burning was seen as the best option because general living in small and crowded areas means that there is no public space to store the waste (Resident in Khan Meanchey, personal communication, March 2015).

**Figure 3: Local Practices for Waste Management (in 2014)**



### *3.3. Key contributors influencing the availability of solid waste collection services*

A statistical test was applied to investigate which attributes were influencing the availability of solid waste collection services in the Khans studied. A logistic regression model was used to estimate predictors (attributes), i.e. the access to electricity for home consumption, duration of settlement, the availability of street lights, legal status of settlement, the availability of sewage system and gateway to communities, significantly influenced the availability of solid waste collection services (See details in **Table 1**).

The model suggested that the availability of street lights, the availability of sewage systems, and the access to electricity for home consumption, and a bigger gateway to the communities significantly influenced the availability of services. This means that solid waste collection services were mostly found in areas that were also equipped with street lights, sewage systems, electricity for home consumption and a bigger gateway to communities.

The duration of settlement, governance structure of the communities and legal status of settlement were not significant influences; they were therefore unlikely to be the reasons for the absence of waste collection services.

Table 1: Key Contributors Influencing the Available Services for Solid Waste Collection

| **Attribute** | $\beta$ | **SE** | **Odds ratio**[5] | **P-value**[6] |
|---|---|---|---|---|
| Access to electricity for home consumption | 1.102 | 0.429 | 3.011 | **0.01**** |
| Duration of resettlement | 0.018 | 0.015 | 1.018 | 0.241 |
| Governance structure of the communities | 0.329 | 0.304 | 1.39 | 0.28 |
| Access to street light | 2.225 | 1.082 | 9.255 | **0.04*** |
| Legal status of settlement | -0.073 | 0.281 | 0.93 | 0.796 |
| Available to sewage system | 1.97 | 0.302 | 7.173 | **0.000***** |
| A bigger gateway to communities | 0.739 | 0.304 | 2.094 | **0.01**** |
| Constant | -37.879 | 30.321 | 0.00 | 0.212 |

*Note: $X^2$= 115.18, df= 7, N= 340, P< .05*

[5] The odds ratio represents the strength of each predictor in contributing to the dependent variable.
A higher odds ratio is a larger contributor to the dependent variable in the prediction. For example, the odds ratio for the independent variable "Access to street light" is the largest, so it has the highest contribution to the dependent variable of "the availability of solid waste collection".

[6] ***, ** or * is a symbol of statistical significance, with *** being the most significant, * being the least significant (whilst the absence of * represents no significance at all). Any variable which is significant is a contributor to the dependent variable of "the availability of solid waste collection".

The model clearly provides information suggesting that an area equipped with street lights, sewage systems, electricity for home consumption, and a bigger gateway to communities is the most likely to receive waste collection services. Some other indicators, such as the governance structure of the communities, the length of settlement and the legal status of the settlement did not influence the decision of waste collection companies to provide their services. Variables such as establishment of community representatives, legal or insecure tenure status or length of settlement did not influence the availability of waste collection services.

# Results from Case Studies

Residences at Kbal Tumnop 1 village, Khan Mean Chey

# Chapter IV

## 4. Results from Case Studies

### *4.1. The availability of services*

In general, rubbish bins were not available in both communities with and without waste collection services. Where differences existed, this was due to the fact that the residents in the communities with services were required to have their individual bins posted in front their residencies for truck to collect them. For those residents of communities without services, they tended to transport their waste to nearby communities with services or they applied the common practice of burning.

***A Resident With Services***

*"I pay the monthly waste collection services to CINTRI along with my EDC bill, but the CINTRI truck only comes to collect solid wastes every two weeks. When the truck is approaching, they do not sound the horn to let us know about their arrival. There is no set time and day for them to come. The problem is that food and other waste rots before collection and it smells bad and could lead to disease". (A housewife in Meanchey, 12 March 2015).*

***A Resident Without Services***

*"I was very surprised to see that our electricity bill from EDC included the fee of waste collection services from CINTRI, as we simply do not receive any services from CINTRI. I tried to negotiate with the EDC about having the fee removed, or to receive the services from CINTRI but to no avail." (A motordub driver in Meanchey, 13 March 2015).*

### *4.2. Behavior, attitude and local practices*

Case studies of 16 residents of four Khans of Phnom Penh were conducted to explore perception of and satisfaction with solid waste management services. The case studies served as a comparative analysis between communities with services and communities without services, and were divided into: behavior and attitude, and local practices (See detail in **Table 2**).

Table 2: Behavior, Attitude and Local Practices of Residents around Solid Waste Management

| Attributes | Services | |
|---|---|---|
| | Without | With |
| ***Behaviour and Attitude*** | | |
| Willingness to bring waste to bin | 8 | 8 |
| Has thrown out waste in a disordered way | 8 | 4 |
| ***Local practices*** | | |
| Reusing | 0 | 1 |
| Packaging | 5 | 8 |
| Burning | 8 | 1 |
| Storing at home temporarily | 4 | 8 |
| Dumping on a waste pile elsewhere | 1 | 5 |
| Throwing anywhere convenient | 6 | 3 |

Even though waste collection services are key to ensuring that the city is kept clean, and that residents' living conditions are decent, the attitude and behavior of residents themselves plays an important role. The study showed that although all the interviewed residents agreed to bring their waste to the available rubbish bins, in reality, all of the interviewed residents without collection services threw out their waste in a disorderly way; while half of the residents with collection services also admitted to not throwing their waste in the bins.

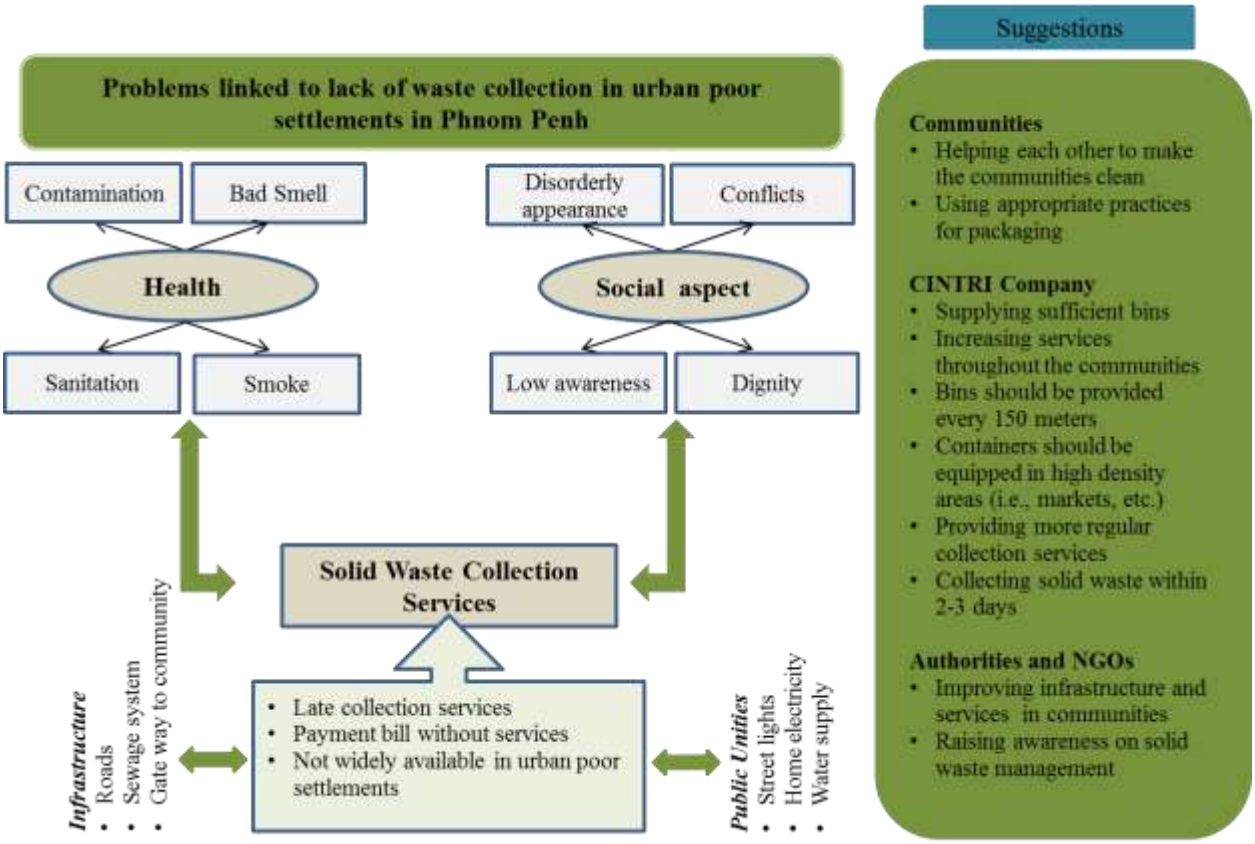
Local practices including reusing, packaging, burning, storing at home temporarily, dumping on a waste pile elsewhere, and throwing anywhere convenient were more commonly applied by those in the communities without services. Two different approaches were commonly applied by local residents: (1) ordered waste management, (i.e. reusing, packaging, burning and storing at home temporarily); and, (2) disordered waste management (i.e. dumping on waste piles elsewhere or dumping anywhere on the streets as convenient).

Some residents from communities with services also applied local practices, especially packaging, storing at home temporarily, and dumping on waste piles elsewhere. This was due to the fact that waste collection trucks do not collect waste regularly, meaning they could not wait for the services.

### *4.3. Problems faced by and suggestions provided by residents*

During interviews, residents identified problems related to waste collection in two main areas: health and social issues. In order to improve solid waste management in Phnom Penh, the residents in the communities with and without services also provided the following suggestions for civil society, CINTRI (Cambodia), Ltd, planners and policy makers as detailed in **Figure 4**.

**Figure 4: Problems and Suggestions for Better Solid Waste Management**



# Chapter V

## 5. Conclusion

Based on the findings of the Phnom Penh Survey, and additional research on solid waste collection services in Phnom Penh, it is concluded that: (1) the availability of solid waste collection services remain very limited. Only 60% of interviewees had access to the services, with a relatively high proportion of those who did not access solid waste collection services located in outer Khans (72%). (2) Phnom Penh residents applied some local waste management practices if the collection services were absent; these included burning, dumping in waste piles without waste collection services, and dumping in waste piles with waste collection services. (3) Key factors that significantly influence the availability of solid waste collection services are the availability of street lights and of sewage systems; access to electricity for home consumption, and appropriate roads and access for waste collection trucks.

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