SFD Report

Kampong Chhnang
Cambodia

Final Report

This SFD Report - Comprehensive - was prepared by WaterAid.

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SFD Report Kampong Chhnang, Cambodia, 2018

Produced by:

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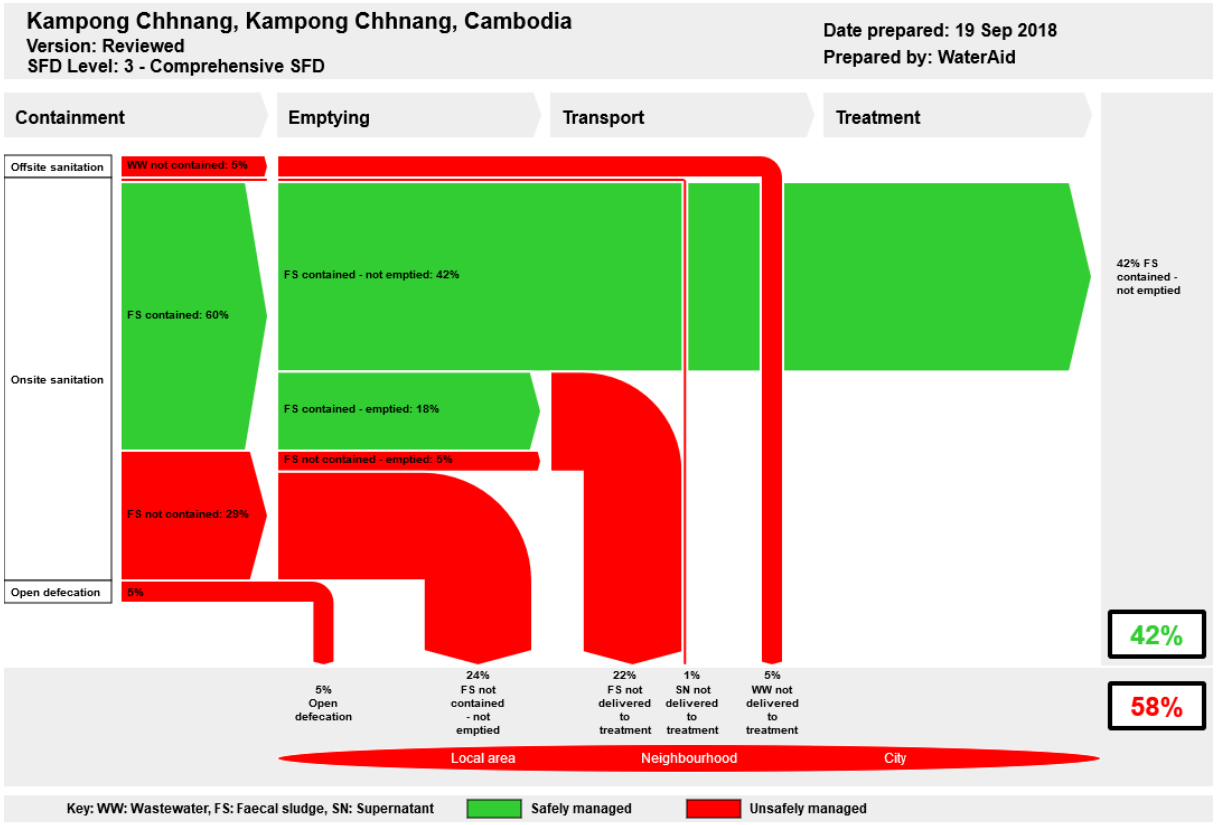
1. The SFD Graphic



Produced with support from the SFD Promotion Initiative with funding from the Bill & Melinda Gates Foundation.
The SFD Promotion Initiative recommends that this graphic is read in conjunction with the city's SFD Report which is available at: sfd.susana.org

2. Diagram information

SFD Level:

Comprehensive

Produced by:

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Collaborating partners:

Royal Government of Cambodia, Ministry of Public Works and Transport

Status:

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3. General city information

The Cambodian town of Kampong Chhnang is the capital of Kampong Chhnang Province. The Province is located to the northwest of Phnom Penh, the country's capital and occupies the south-eastern edge of the Tonle Sap Basin. It borders with Kampong Thom to the North, Kampong Cham to the East, Kampong Speu to the South and Pursat to the West. It is traversed by National Highway #5 and the National Railway.

Covering a land area of 47 km^2, Kampong Chhnang Town is situated at the centre of the province on the west bank of the Tonle Sap river. According to the Kampong Chhnang Municipal Authority, the population of Kampong Chhnang Town in 2018 is 42,082 persons (8,928 families), up from 38,121 persons (7,415 families) registered in the 2008 census (Municipal Authority, 2018). The municipality had a gross population density of 817 persons per square kilometre (ppsk). Ph'er Commune had the highest population density at 2,653 ppsk, followed by Phsar Chhnang Commune at 1,649 ppsk (MPWT, 2014). There is also a population of Vietnamese immigrants living in floating communities and in informal settlements along the banks of the Tonle Sap river within the municipal boundaries. The exact number of immigrants is unknown as they are not included in the census. However, based on a news article the estimated population is around 1,000 persons (Chheng, 2018). Therefore, for the purposes of this SFD report a population of 43,082 is used. The town does not have a significant amount of seasonal or diurnal variation in population.

4. Service outcomes

According to a 2018 water sanitation and hygiene (WASH) survey of Kampong Chhnang province, nearly 90 percent of households in the town of Kampong Chhnang have access to a toilet of some kind. On the other hand, approximately 10 percent of households are practicing unsafe sanitation by open defecating, or using a toilet that discharges directly into a waterbody. (NIS, 2018)

The present study identified six (6) types of containment technologies commonly used by households, businesses and institutions in the town of Kampong Chhnang. All of the containment technologies identified were essentially 'onsite systems', however some (approximately 10 percent) have overflows connected to either an open drain or the town's combined storm water and sewerage system. Kampong Chhnang does not have a wastewater treatment plant. Any wastewater in the sewerage system is conveyed and discharged into the Tonle Sap river untreated.

Most of the town's population uses a concrete cylindrically lined tank with sealed walls and an open bottom. The majority of these systems are connected to a soak pit (58 percent). This type of containment technology is favoured by most households and small business because it allows the supernatant to percolate into the surrounding soil via the open bottom and soak pit. It often takes many years for these types of facilities to become full, and some never become full due to natural decomposition.

This study assumes that the area has a low groundwater table and the dominant soil type is clay. Therefore, this study concludes that there is low risk to groundwater contamination from these onsite sanitation systems. Any faecal sludge kept in the onsite containment is considered safely managed.

On the contrary, risk to surface water contamination is considered high due to the fact that the area is prone to flooding, which often leads to onsite containment tanks becoming full of storm/flood water mixed with supernatant and faecal sludge. This is particularly the case for a significant proportion of the population that lives along the banks of the Tonle Sap river. Due to seasonal flooding these households and small businesses (estimated to be 20 percent of the population) use fully sealed concrete cylindrical tanks installed aboveground directly below, or adjacent, to their stilted houses. Each tank has a valve or plug located near the bottom. During periods of flooding, the valve is kept shut to prevent water from entering the tank; although it is assumed that some floodwater gets into the tank due to poor or damaged waterproofing. As the floodwaters recede the valve is opened to drain the tank of intrusion water as well as septage and, one can also assume, some faecal sludge. The drained contents therefore end up in the Tonle Sap river.

If and when the containment tanks become full, building owners will either remove the contents themselves or hire one of the three pump truck businesses in the area to remove it. In either case, the septage and faecal sludge extracted from the onsite containers is transported nearby and disposed directly into the environment via a waterbody, or agricultural field (WaterAid 2018).

5. Service delivery context

The draft "Water and Sanitation Law of the Kingdom of Cambodia" was released in 2004 and the "National Policy on Water Supply and Sanitation" was adopted by the Council of Ministers (CoM) in 2003. The policies lay out the vision for the sector, and specifies the role of different agencies. To date, neither the draft Water and Sanitation Law nor the National Policy defines the minimum technical or operating standards for household sanitation. (WaterAid, 2015)

Furthermore, the policy on decentralization has not been fully implemented in practice and urban water supply and sanitation remain, essentially, under central government control with minimal involvement from local levels (ESCAP, 2015).

Clarity around the roles and responsibilities for wastewater management has historically been a challenge in Cambodia. In December 2017, a Royal Government of Cambodia (RGC) sub-decree was issued by the Prime Minister's office on *Sewerage and Wastewater Treatment and Management.* The sub-decree officially identified the responsible ministries and their specific roles in the sector.

For wastwater service delivery, with exception of the maintenance of the city's sewerage pipe network – which is the responsibility of the Department of Public Works and Transtport (DPWT) – the responsibilities and associated costs of designing, installing and maintaining sanitation systems fall on individual building owners. Septage and faecal sludge removal services are available through the DPWT and private family owned pump truck companies. The cost for using these services ranges between 20-50 $US depending on negotiation.

For emptying service providers, there are currently no systems in place that require an

official registration or license. Although there are environmental laws stipulating that wastewater must be disposed at a minimum distance of 500 meters away from any dwelling, the law is not currently being enforced. There are no additional safety standards in place, and there are no faecal sludge treatment, disposal or reuse standards in place for pump truck opperators (DPWT, 2018).

Further study is needed to identify drivers and incentives to strengthen the roles of service providers. Possible factors for future studies to explore may include:

- Opportunities and barriers for continued development and implementation of decentralization policies along with sufficient financial and human capital resources to implement local management plans.
- Strategies to improve environmental policy enforcement with the create a larger customer base for private sector providers and facilitate fair competition in the marketplace.

6. Overview of stakeholders

According to the December 2017 RGC sub-decree, responsibility for urban sanitation lies primarily with three ministries and their associated provincial departments:

- The Ministry of Public Works and Transport (MPWT) is responsible for urban drainage, sewerage, septage and the operation of waste water treatment plants. It's provincial departments, DPWT, undertakes related functions at sub-national levels.
- The Ministry of the Environment (MoE) is responsible for setting standards, monitoring and regulation for effluents discharging into water bodies, including from wastewater treatment plans. It's provincial departments, DoE, undertakes related functions at sub-national levels.
- The Ministry of Interior (MoI) is responsible for supporting coordination between the MPWT and MOE, as well as to ensure that operations and monitoring are sufficiently carried out.

Other key stakeholders are summarised in Table 1.

Key Stakeholders	**Institutions / Organizations /**
Public Institutions	Kampong Chhnang Municipality Ministry of Public Works and Transport; Ministry of Environment Ministry of the Interior; Ministry of Industry and Handicrafts; Ministry of Education, Youth and Sport; Ministry of Health *And all provincial departments of the ministries listed above*
Non-governmental Organizations	WaterAid, WaterSHED
Private Sector	Vacuum Truck Operators, Home building suppliers and workers.
Development Partners, Donors	GIZ, ADB, JICA, World Bank

Table 1: Identified Key Stakeholders

9. Process of SFD development

This draft SFD was developed in four stages:

- Stage 1, consisted of a desk review of existing data sources.
- Stage 2, included consultation meetings with relevant ministeries, provincial departments and field observations.
- Stage 3, was the development of an initial SFD graphic and draft report.
- Stage 4, involved the organising of a workshop to present and verify findings with key stakeholders.

10. Credibility of data

Due to significant interest and potential investment in Cambodia's urban development, there have been several assessments conducted recently which outline the relevant institutions, policies and regulations at the national and sub-national levels. Furthermore, scoping and impact studies conducted in preparations for upgrades to Kampong Chhnang's storm water and flood management, supported by ADB and GIZ, have produced a significant amount of reliable documentation regarding the existing conditions. Most of the reports were developed recently within the last five years, and by reputable sources.

Data on onsite sanitation recently became available due to a survey conducted by NIS on WASH services in Kampong Chhnang Province, with support from WaterAid. The purpose of the survey was two-fold: first, to develop and test survey questions relevant to Sustainable Development Goal 6.2, which could be replicated in other national surveys including the next census; and second, to provide WaterAid and other WASH sector partners working in Kampong Chhnang with more reliable data. Although the survey has yet to be

officially finalized and accepted by NIS, the data set is considered to be the most reliable available.

11. List of data sources

- Chheng. 2018. "Authorities to relocate Tonle Sap Vietnamese." News article. Phnom Penh Post. September 25, 2018. https://m.phnompenhpost.com/national/authorities-relocate-tonle-sap-vietnamese, Accessed October 01, 2018.
- MPWT, 2014. "Integrated Urban Environmental Management in Tonle Sap Basin Project – Kampong Chhnang Urban Area Environment Improvements." Prepared by the Ministry of Public Works and Transport for the Asian Development Bank.
- NIS, 2018. "Kampong Chhnang Province, Water Sanitation and Hygiene Survey." Conducted by the National Institute of Statistics with support from WaterAid.
- RGC, 2017. "Sub-decree on Sewerage and Wastewater Treatment and Management." Issued by the Prime Minister's Office on December, 2017
- WaterAid, 2015. "A Sector Review of the Water Supply, Sanitation and Hygiene (WASH) Situation and Issues for the Urban Poor & Vulnerable Groups, Cambodia."

Kampong Chhnang, Cambodia, 2018

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Abbreviations

ADB	Asia Development Bank
CoM	Council of Ministers
DoE	(Provincial) Department of Environment
DLMUPC	(Provincial) Department of Land Management, Urban Planning and Construction
DoP	(Provincial) Department of Planning
DPWT	(Provincial) Department of Public Works and Transport
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
ESCAP	Economic and Social Commission for Asia and the Pacific
FAO	Food and Agricultural Organization
JICA	Japan International Cooperation Agency
MASL	Meters Above Sea Level
MIH	Ministry of Industry and Handicrafts
NIS	National Institute of Statistics
MLMUPC	Ministry of Land Management Urban Planning and Construction
MoE	Ministry of Environment
MoEYS	Ministry of Education, Youth and Sport
MoI	Ministry of Interior
MPWT	Ministry of Public Works and Transport
O&M	Operation and Maintenance
PSI	Population Services International
RGC	Royal Government of Cambodia
SFD	Shit Flow Diagram
SNCDD	Secretariat of the National Committee for Democratic Development
WWTP	Wastewater Treatment Plant

1 City context

Location: The Cambodian town of Kampong Chhnang is the capital of Kampong Chhnang Province. The Province is located to the northwest of Phnom Penh, the country's capital and occupies the south-eastern edge of the Tonle Sap Basin. It borders with Kampong Thom to the North, Kampong Cham to the East, Kampong Speu to the South and Pursat to the West. It is traversed by the National Highway #5 and the National Railway. Covering a land area of 45 km^2 Kampong Chhnang town is situated at the centre of Kampong Chhnang Province along the west bank of the Tonle Sap river (Figure 1). It is approximately 100 km north of Phnom Penh via National Highway #5 (MPWT, 2014).

Population: According to the Kampong Chhnang Municipal Authority, the population of Kampong Chhnang Town in 2018 is 42,082 persons (8,928 families), up from 38,121 persons (7,415 families) registered in the 2008 census (Municipal Authority, 2018). With a land area of nearly 47 km^2, the Municipality had a gross population density of 817 persons per square kilometre (ppsk). Ph'er Commune had the highest population density at 2,653 ppsk, followed by Phsar Chhnang Commune at 1,649 ppsk (MPWT, 2014). According to the Department of Planning (DoP), the town does not have a significant amount of seasonal or diurnal variation in population (DoP, 2018). There is also a population of Vietnamese immigrants living in floating communities and in informal settlements along the banks of the Tonle Sap river within the municipal boundaries. The exact number of immigrants is unknown as they are not included in the census. However, based on a news article the estimated population is around 1,000 persons (Chheng, 2018). Therefore, for the purposes of this SFD report a population of 43,082 is used.

Climate: Cambodia is situated in a tropical zone, between 10 and 14 degrees latitude north of the equator. Its climate is influenced by the monsoon cycle and has two distinct seasons, the dry and rainy seasons. The dry season starts with cooler temperatures in November through January, and then turns hot from February through April. The rainy season occurs from May through October and accounts for about 80-90 percent of the annual rainfall, varying between 1,200 and 2,000 mm across the country. Average temperature has minimal variation regionally and seasonally (MPWT, 2014).

Topography, Geography and Soils: The Tonle Sap Basin-Mekong Lowlands is the largest topographic region, covering approximately 75% of the country. It consists mainly of plains at elevations of less than 100 meters above sea level (MASL). Kampong Chhnang town lies in the vast plain of this region at an elevation of about 17 MASL. As is the case with most of Cambodia, Kampong Chhnang town is underlain with rock from the quaternary age. The area consists of rolling plains, rivers and tributaries, floodplains and lake bed deposits bordering the Tonle Sap river. There are small portions of granite deposits in the north west, and pediments forming the south west boundary of the town. Soils consist of a mixture of often organic-rich silt, sand and clay, such as lacustrine alluvial soils and red-yellow podzols. The alluvial soils are fresh, deposited annually, relatively young/recent, highly fertile and used mostly for rice farming (MPWT, 2014).

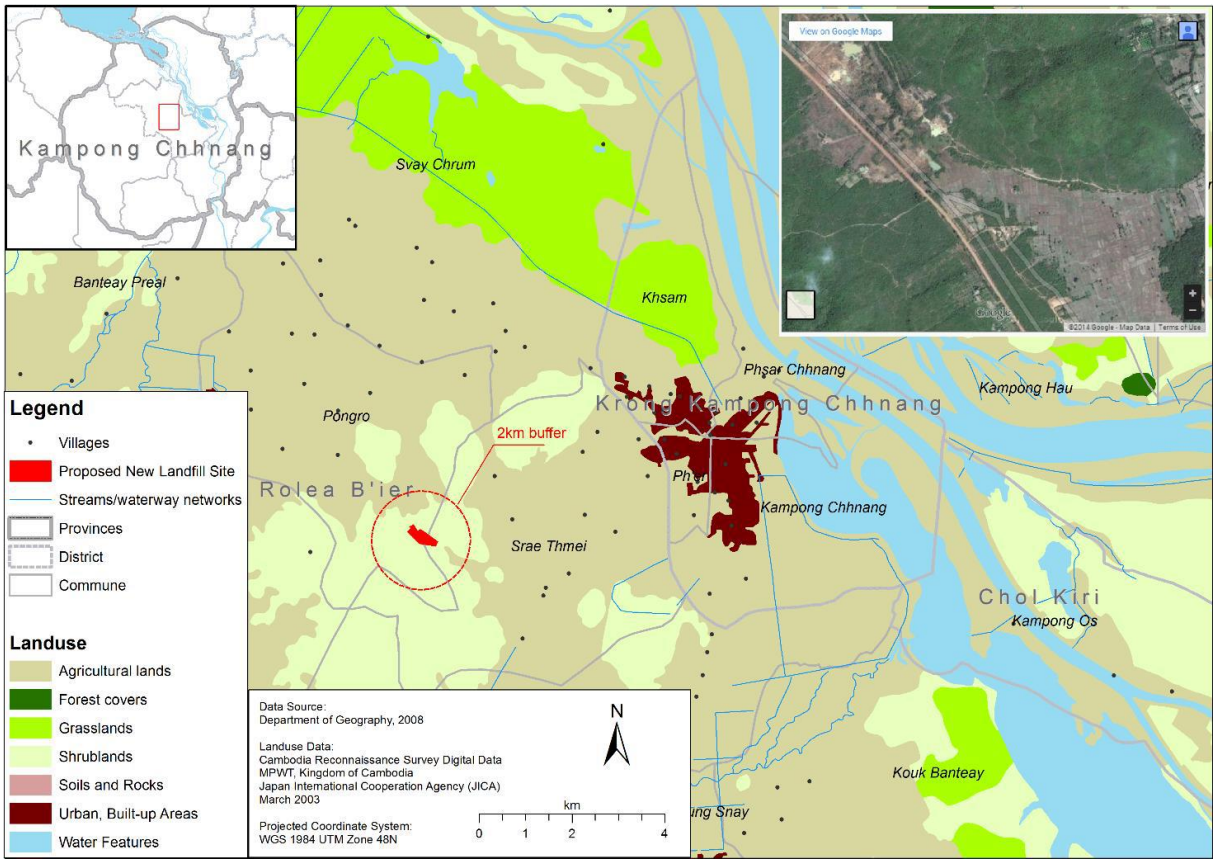


Figure 1: Kampong Chhnang Municipality location and land use (MPWT, 2014)

2 Service Outcomes

2.1 Overview

Policy and Institutional Arrangements: The draft "Water and Sanitation Law of the Kingdom of Cambodia" was released in 2004 and the "National Policy on Water Supply and Sanitation" was adopted by the Council of Ministers in 2003. The policies lay out the vision for the sector, and specify the role of different agencies. It should be noted that neither of these policies define the minimum technical or operating standards for household sanitation. (WaterAid, 2015)

As specified by the Royal Government of Cambodia (RGC) (2017) in a sub-decree issued in December of 2017, the responsibility for urban sanitation service delivery lies primarily with three ministries: i) The Ministry of Public Works and Transport, ii) The Ministry of Environment, and iii) The Ministry of Interior. Their roles are briefly described as follows:

- **The Ministry of Public Works and Transport (MPWT)** is responsible for urban drainage, sewerage, septage and the operation of waste water treatment plants.
- **The Ministry of Environment (MoE)** is responsible for setting standards, monitoring and regulation for effluents discharging into water bodies as defined by the sub-decree on water pollution control issued in 1999.

- **The Ministry of Interior (MoI)** is responsible for supporting coordination between the MPWT and MOE, as well as to ensure that operations and monitoring are sufficiently carried out.

The provincial departments for each of these two ministries are responsible for carrying out their mandate at the sub-national level. Additional information on the related policies and the roles and responsibilities of related institutions can be found in Section 3.

Services: According to a 2018 pilot water sanitation and hygiene (WASH) survey of Kampong Chhnang province conducted by the National Institute of Statistics (NIS), nearly 90 percent of households in the town of Kampong Chhnang have access to a toilet of some kind. On the other hand, nearly 10 percent of households are practicing unsafe sanitation by defecating directly into the environment. An overview of the pilot WASH survey and its methodology is provided in Appendix 1.

Table 1: Household Access to toilet by toilet type in the Town of Kampong Chhnang (NIS, 2018)

Toilet Type	Percent (%) Households with Access
Improved	**89.3**
Pour flush (or flush) connected to sewerage	10.3
Pour flush (or flush) to septic tank or pit	79
Pit latrine with slab	0
Unimproved	**10.7**
Pour flush (or flush) to elsewhere (i.e. not a sewer or pit/tank)	0.8
Pit latrine without slab or open pit	0
Latrine overhanging field or water (drop in the field, pond, lake, river, sea)	3.5
None (assumed to be open defecating)	6.4
Other (specify)	0

As indicated in the SFD Selection Grid (Figure 3), the present study identified six (6) containment technologies commonly used by households, businesses and institutions in the town of Kampong Chhnang. Examples of some of these containment technologies are shown in Figure 2. All of the containment technologies identified are essentially 'onsite systems,' however some (approximately 10 percent) have overflows connected to either an open drain or the town's combined storm water and sewerage system. Many of these systems include a soak pit in-between the tank and the sewerage network; therefore, very little supernatant and even less faecal sludge enters the sewerage network from these systems under normal conditions. It should be noted that the sewerage system was designed to manage only storm water, and Kampong Chhnang does not have a wastewater treatment plant (WWTP). Therefore, any wastewater that makes it into the sewerage/drainage system would be discharged into a nearby waterbody (Tonle Sap river or Boeng Alum wetland) without any treatment. Due to this fact, these connections are not sanctioned by the Provincial Department of Public Works and Transport (DPWT), which is the government institution in charge of regulating connections and maintaining the sewer network.

For each of the technologies identified in the SFD Selection Grid, additional information is provided in Table 2, including a short description of the typical situation in which the technology was found to be used and the estimated percent contribution of each technology to the town's total excreta. Additional information about Kampong Chhnang's sanitation containment technologies is provided in Section 2.2 below.

Photo 1: Open storm water drain (source: WaterAid 2018, credit: J. Dumpert)	Photo 2: Aboveground tank below stilted house (source: WaterAid 2018, credit: J. Dumpert)
	
Photo 3: Square brick septic tank (source: MPWT 2018, credit: Mr. Lun Heng)	Photo 4: Concrete ringed pit (source: MPWT 2018, credit: Mr. Lun Heng)
	

Figure 2: Photo examples of sanitation containment technologies common to Cambodia and Kampong Chhnang

List A: Where does the toilet discharge to? (i.e. what type of containment technology, if any?)	List B: What is the containment technology connected to? (i.e. where does the outlet or overflow discharge to, if anything?)									
	to centralised combined sewer	to centralised foul/separate sewer	to decentralised combined sewer	to decentralised foul/separate sewer	to soakpit	to open drain or storm sewer	to water body	to open ground	to 'don't know where'	no outlet or overflow
No onsite container. Toilet discharges directly to destination given in List B					Significant risk of GW pollution Low risk of GW pollution		T1A1C7			Not Applicable
Septic tank					Significant risk of GW pollution T1A2C5					
Fully lined tank (sealed)					Significant risk of GW pollution T1A3C5		T1A3C7			
Lined tank with impermeable walls and open bottom	Significant risk of GW pollution Low risk of GW pollution	Significant risk of GW pollution Low risk of GW pollution	Significant risk of GW pollution Low risk of GW pollution	Significant risk of GW pollution Low risk of GW pollution	Significant risk of GW pollution T1A4C5	T1A4C6				Significant risk of GW pollution Low risk of GW pollution
Lined pit with semi-permeable walls and open bottom	Not Applicable									Significant risk of GW pollution Low risk of GW pollution
Unlined pit										Significant risk of GW pollution Low risk of GW pollution
Pit (all types), never emptied but abandoned when full and covered with soil										Significant risk of GW pollution Low risk of GW pollution
Pit (all types), never emptied, abandoned when full but NOT adequately covered with soil										
User interface failed, damaged, collapsed or flooded										
Containment (septic tank or tank or pit latrine) failed, damaged, collapsed or flooded										
No toilet. Open defecation	Not Applicable						T1B11 C7 TO C9			Not Applicable

Figure 3: SFD Selection Grid

Table 2: Containment system and estimated contribution to total excreta

SFD Variable Reference #	Description	Use Description	Estimated % Contribution to Total Excreta
T1A1C7	User interface discharges directly to water body	Households and floating communities located on the banks of the river	5%
T1A2C5	Septic tank connected to a soak pit (low risk to groundwater pollution)	Large businesses, industrial areas and institutions (e.g. hotels, large schools, offices, hospitals)	1%
T1A3C5	Fully lined tank (sealed) connected to a soak pit, (low risk to groundwater pollution)	Medium to small businesses, public bathrooms and institutions (e.g. restaurants, guest houses, schools)	1%
T1A3C7	Fully lined tank (sealed) connected to a water body	Households located in flood prone areas	20%
T1A4C5	Lined tank with impermeable walls and open bottom connected to a soak pit (low risk to groundwater pollution)	Households and small businesses	58%
T1A4C6	Lined tank with impermeable walls and open bottom connected to an open drain or storm sewer	Households and small businesses	10%
T1B11 C7 to C9	Open Defecation	Households	5%

2.2 SFD Matrix

This section describes each of the six (6) identified technologies and their related service provisions throughout the sanitation service chain. The information has been organized into two sections: i) Offsite sanitation provision, and ii) Onsite sanitation provision.

Kampong Chhnang, Kampong Chhnang, Cambodia, 19 Sep 2018. SFD Level: 3 - Comprehensive SFD
Population: 43082
Proportion of tanks: septic tanks: 100%, fully lined tanks: 100%, lined, open bottom tanks: 90%

System label	Pop	F3	F4	F5	S4e	S5e
System description	Proportion of population using this type of system	Proportion of this type of system from which faecal sludge is emptied	Proportion of faecal sludge emptied, which is delivered to treatment plants	Proportion of faecal sludge delivered to treatment plants, which is treated	Proportion of supernatant in open drain or storm sewer system, which is delivered to treatment plants	Proportion of supernatant in open drain or storm sewer system that is delivered to treatment plants, which is treated
T1A1C7 User interface discharges directly to water body	5.0					
T1A2C5 Septic tank connected to soak pit	1.0	100.0	0.0	0.0		
T1A3C5 Fully lined tank (sealed) connected to a soak pit	1.0	100.0	0.0	0.0		
T1A3C7 Fully lined tank (sealed) connected to a water body	20.0	10.0	0.0	0.0		
T1A4C5 Lined tank with impermeable walls and open bottom, connected to a soak pit	58.0	30.0	0.0	0.0		
T1A4C6 Lined tank with impermeable walls and open bottom, connected to an open drain or storm sewer	10.0	30.0	0.0	0.0	0.0	0.0
T1B11 C7 TO C9 Open defecation	5.0					

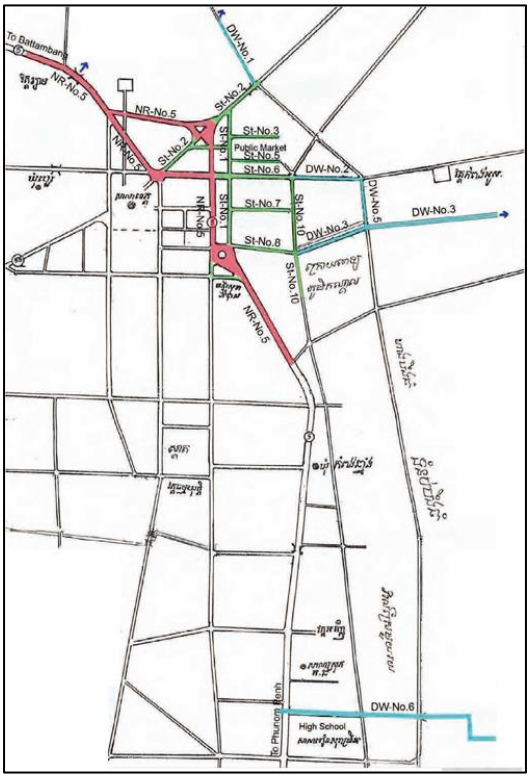
Figure 4: SFD Matrix

2.2.1 Offsite Sanitation Services Provision

As previously noted, there are essentially no offsite sanitation services in Kampong Chhnang. However, the SFD tool categories two of the identified systems as having offsite sanitation elements. First and foremost, an estimated five percent of the population uses a toilet that has virtually no containment system at all (Figure 4, T1A1C7). These toilets are found in houses located on the banks of the Tonle-Sap, or among the population that live on house boats and in floating communities. These types of toilets are often referred to as 'hanging toilets' as they typically are suspended above a water body.

Approximately 10 percent of the population uses an onsite sanitation facility which have an overflow connected to either an open drain or the town's storm water drainage system (Figure 4, T1A4C6). Many of these systems include a soak pit in-between the tank and the sewerage network. According to staff from the DPWT, the purpose of the connection to the sewerage network is for overflow, which occurs at times during the rainy season. Under normal conditions, however, very little wastewater makes it into the sewer network. However, under flood conditions, which occurs almost annually, it is assumed that a significant amount of supernatant and some faecal sludge is flushed out of the containment systems and into the storm water system. Although many of these connections are not considered 'authorized' by the DPWT, there is currently little to no enforcement (DPWT, 2018)

Figure 5: Location of Drainage Facilities in the town of Kampong Chhnang (JICA, 2013)



The existing storm water system in the town centre was built in the 1960s. The network was extended in the 1980s and again more recently in 2013 with support from the Japan International Cooperation Agency (JICA). As shown in Figure 5, the system has multiple outlets that flow towards the Tonle Sap river and discharge untreated into drainage canals. During the dry season, the wastewater within the drainage canals are used by local farmers to irrigate their fields. According to both the DPWT and the Provincial Department of Environment (DoE), one of the biggest challenges maintaining the sewerage system has been the management of large amounts of inorganic (plastic) solid waste that gets swept into the drains and clogs inlets and pipes (DPWT, 2018. DoE, 2018). An assessment conducted by the Ministry of Public Works and Transport (MPWT) in 2014 also noted that inlets are often blocked with solid waste and there are not enough inlets to meet flood demands, resulting in the flooding of streets and adjacent properties.

2.2.2 Onsite Sanitation Service Provision

Containment: As shown in the SFD Matrix (Figure 4), approximately 10 percent of the town's population does not have a toilet, or uses a toilet which discharges directly into a waterbody, thereby contaminating the local environment directly.

At the same time, approximately 90 percent of Kampong Chhnang Town's population has some type of onsite sanitation containment as indicated in Table 1. For the purposes of the SFD matrix's proportion of population estimates, the indicative values in Table 1 were adjusted to take into account non-household systems present in the town (E.g. businesses, institutions, hotels, hospitals).

As shown in the SFD Matrix, most of the population (58 percent) use a cylindrical concrete lined tank with sealed walls and an open bottom connected to a soak pit. In flood prone areas it is also common to find some of these tanks installed aboveground or partially buried (see Photo 2 in Figure 2, and Photo 5). This type of containment technology configuration is favoured by most households and small business because it allows the supernatant to percolate into the surrounding soil out through the bottom, or into the soakaway. Therefore, it often takes many years for these types of facilities to become full. Due to the ability of these unsealed options to remove supernatant, it is assumed that when full 90 percent of the contents is faecal sludge and 10 percent is supernatant.

Along the banks and in the floodplain of the Tonle Sap river it is also common to find sealed cylindrical concrete containment tanks installed aboveground that have a valve/plug located near the bottom of the tank to allow for septage and faecal sludge removal (described in detail under Emptying and Transport). It is estimated that approximately 20 percent of the population uses this type of tank.

Photo 5: Aboveground tank below stilted house (source: WaterAid 2018, credit: J. Dumpert)

Similar to the lined tanks used by households, many of the sealed tanks and septic tanks used predominantly by businesses and institutions (see SFD Matrix, T1A2C5 and T1A3C5, assigned to 2 percent of the population) are designed to allow supernatant to percolate into the surrounding soil using soak pits. Due to their design, both technologies would be expected to evacuate the supernatant from the tank and therefore the proportion of faecal sludge would be 100 percent.

Risk of Groundwater Contamination – The main challenge with some onsite sanitation technologies used in Cambodia are the risks that they potential pose to contaminating the groundwater. This is particularly a concern in Kampong Chhnang as 22.5 percent of the population is dependent on groundwater sources for drinking water (NIA, 2018). Unfortunately, there is currently very little specific data available about Kampong Chhnang's soil and hydro-geological characteristics. However according to the MPWT (2014), the groundwater table is reportedly at 50 meters below the ground surface. Furthermore, the soil is characterised as mostly clay, suggesting a slow permeability rate. Given this information, this study assumes that there is a low risk of groundwater contamination from onsite sanitation systems.

Emptying and Transport – For many of the onsite sanitation technologies, it takes a long time to fill up with faecal sludge (estimated 3-5 years). Some properly designed systems may never require emptying. However, according to DPWT staff it is very common in Kampong Chhnang, particularly during the wet season, for onsite sanitation systems to fill up due to storm water infiltration. This can be caused by tanks not being waterproofed properly, or due to damage and deterioration of the tank walls. (DPWT, 2018)

Information on common emptying and transportation practices was gathered through key informant interviews, a small sample of household interviews, and stakeholder focus group discussions. Furthermore, a recent study commissioned by the World Bank on common pit emptying practices of rural Cambodian households (see Figure 6) was used as an additional reference point to collaborate this study's findings. From these sources, the following information was collected and assumptions were made:

- Participants in the stakeholder focus group discussion estimated that between 25 to 30 percent of all households occasionally need to empty their containment tanks every 3 to 5 years. Some households, however, only clean out the soak pits due in part because the containment tank is difficult to access (WaterAid, 2018). This is aligned with the World Bank's study which found a third of all households in their sample were likely to attempt to empty the entire container (emptying both faecal sludge and supernatant), and many households (28.3%) either partially empty or drain the containment system; removing mostly supernatant (World Bank, 2018). Therefore, a value of 30 percent was used for the proportion from which faecal sludge that is emptied from household systems (Figure 4: SFD Matrix – column F3).

  Focus group participants and households interviewed described hiring a pump truck as a very common means of emptying and transporting the septage and faecal sludge. There are believed to be three privately owned pump truck removal services in the area, and one pump truck operated by the DPWT. The cost for using these services ranges between 20-50 $US depending on negotiation. When a pump truck is used and able to access the tank, the necessary tools needed to remove 100 percent of the contents are available (WaterAid, 2018). Similarly, nearly half of the households in the World Bank's rural study hired a vacuum truck or someone to manually empty their pit (WorldBank 2018). Given that emptying services are likely more accessible in Kampong Chhnang, it is assumed that the proportion of the population using these services would be higher (85 to 90 percent).

- Only an estimated 2 to 3 percent of households are believed to hire someone else, other than a pump truck, to empty their pits. The pit emptiers are typically local farmers who empty the tanks using plastic buckets and haul the extracted contents to their farms for use a fertilizer (WaterAid, 2018).

- For the 20 percent of the population that uses an aboveground tank, some of them have a unique method of removing septage and faecal sludge. Each tank has a valve or plug located near the bottom to allow the tank to be drained. During periods of flooding, the valve is kept shut to prevent water from entering the tank; although it is assumed that some floodwater gets into the tank due to poor or damaged waterproofing. As the floodwaters recede the valve is opened to drain the tank of intrusion water as well as septage and, one can also assume, some faecal sludge. The

drained contents therefore end up in the Tonle Sap river. One household interviewed noted that the valve is not sufficient to fully empty the tank. They further explained that they tried to hire a pump truck to empty the tank, but the operators were unable to access the tank without breaking it apart. Therefore, the extent to which they can remove faecal sludge is limited. Nevertheless, the same household reported that their tanks was nearly 20 years old and still functioning. Taking this information into consideration a value of 10 percent was used for the proportion from which faecal sludge that is emptied from these systems (Figure 4: SFD Matrix – column F3).

- For institutional systems, which include septic tanks and fully lined tanks, the focus group participants estimated that 100 percent of the contents were emptied annually (WaterAid, 2018). Therefore, a value of 100 percent was used for the proportion from which faecal sludge is emptied from household systems (Figure 4: SFD Matrix – column F3).

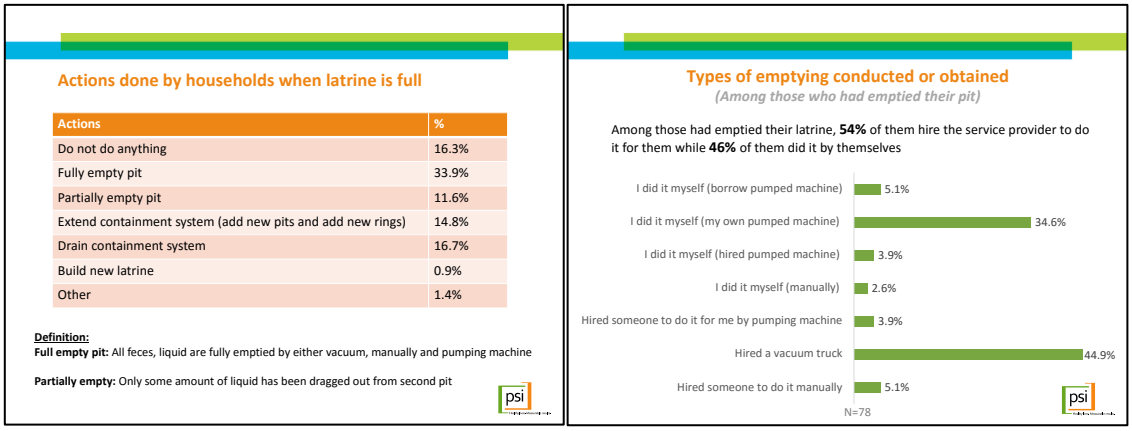


Figure 6: Excerpt of findings from 'Household Pit Emptying and Reuse of Sludge Practices in Rural Cambodia' (World Bank, 2018)

Furthermore, during field visits the SFD preparation team were able to see the one pump truck operated by the DPWT (see Photo 6). The truck model is from circa 1995, and has a capacity of 4m^3. The truck is mostly used by the department for cleaning out the storm water sewer system, and only occasionally does a household or business call to have it come empty their containment system – primarily during the rainy season. There are three other pump truck business in the area, each have a similar model truck as the one shown in Photo 6. (DPWT, 2018)

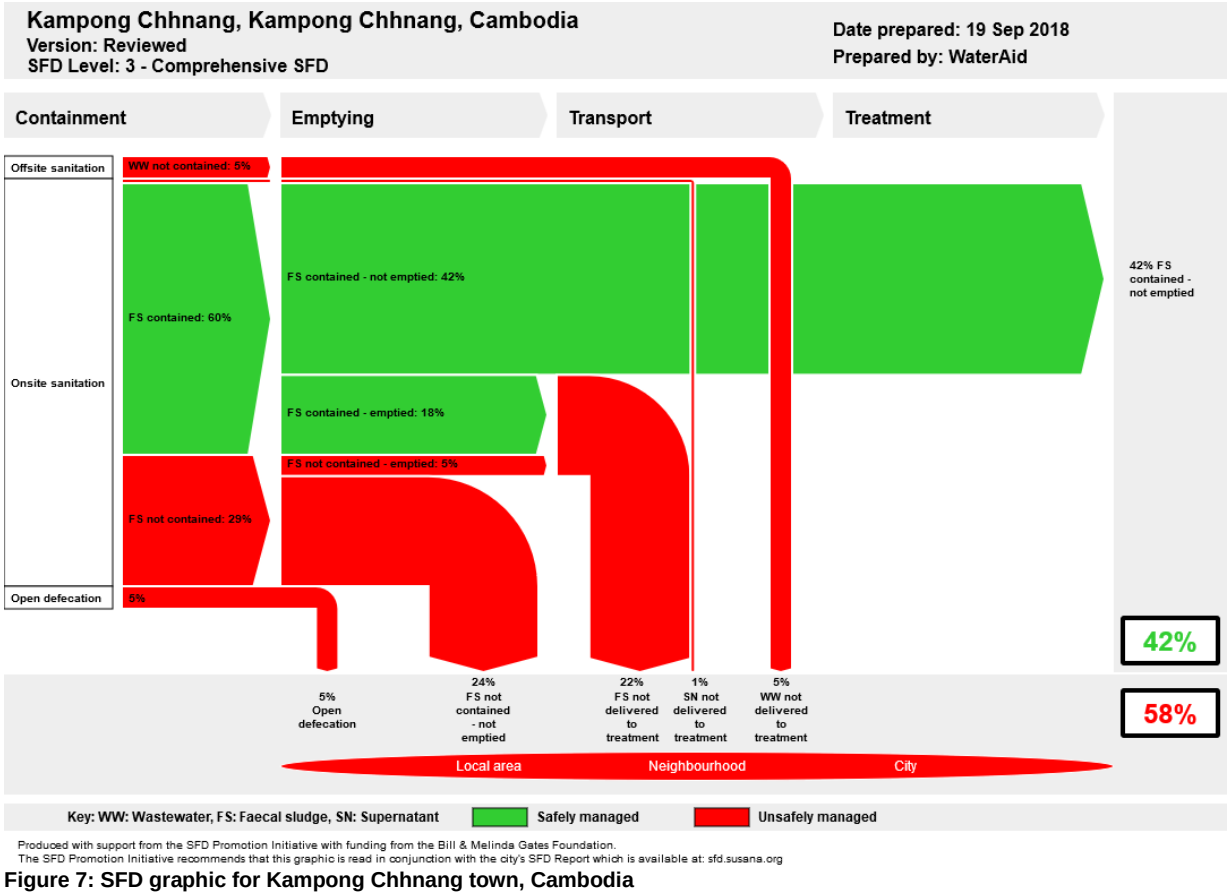
Photo 6: Kampong Chhnang DPWT Vacuum Truck. Credit: J. Dumpert

As there is not a WWTP in Kampong Chhnang, the proportion of faecal sludge emptied which is delivered to the WWTP (SDF Matrix F4) is zero for all identified systems.

Treatment – As there is no WWTP, all faecal sludge and supernatant that is extracted from onsite containment systems are disposed of in either a dug-out pit, or to an agricultural field or waterbody outside of the town.

2.3 Discussion of the resulting SFD graphic

Based on the data and assumptions above, the SFD graphic illustrates that 42 percent of Kampong Chhnang town's wastewater is safely managed (Figure 7).



Produced with support from the SFD Promotion Initiative with funding from the Bill & Melinda Gates Foundation.
The SFD Promotion Initiative recommends that this graphic is read in conjunction with the city's SFD Report which is available at: sfd.susana.org

Figure 7: SFD graphic for Kampong Chhnang town, Cambodia

As shown in the Figure 7, an estimated 5 percent of the population uses 'hanging toilets' which the SFD tool classifies as offsite. Wastewater from these toilets are discharged directly into a waterbody without any treatment. In the case of Kampong Chhnang, the waterbody is the Tonle Sap river.

There is also a small percentage of the population (approximately 10 percent) that uses onsite containment systems that have overflows connected to the city's storm water drainage system. Given that the tanks and soak pits of these systems likely capture most of the faecal sludge and supernatant, it is assumed that only a small amount of supernatant (1%) enters the storm sewer.

For 60 percent of the onsite sanitation systems the faecal sludge is contained. Faecal sludge not emptied from these systems (estimated at 42 percent) is considered to be treated in-situ and thus safely managed based on the assumption that there is a low risk to groundwater

contamination. On the other hand, an estimated 18 percent of the faecal sludge is emptied from these systems and transported to a water body or field where it is unsafely discharged.

The SFD diagram shows that 29 percent of faecal sludge from onsite sanitation facilities is not contained. This is predominantly attributed to the containment tanks that have a valve that is opened from time to time to allow the contents to drain into a water body (24 percent). Some (5 percent) of the faecal sludge from these systems is removed and transported away (5%), but is unsafely disposed of in a water body or field.

Last, but not least, it is estimated that 5 percent of the population is still open defecating, resulting in direct contamination of the local environment.

3 Service delivery context

3.1 Policy, legislation and regulation

3.1.1 Policy

Sanitation technical standards: The draft "Water and Sanitation Law of the Kingdom of Cambodia" was released in 2004 and the "National Policy on Water Supply and Sanitation" was adopted by the Council of Ministers (CoM) in 2003. The policies lay out the vision for the sector, and specifies the role of different agencies. To date, neither the draft Water and Sanitation Law nor the National Policy defines the minimum technical or operating standards for household sanitation. (WaterAid, 2015)

Furthermore, the policy on decentralization has not been fully implemented in practice and urban water supply and sanitation remain, essentially, under central government control with minimal involvement from local levels (ESCAP, 2015).

For properties larger than 500 square meters and with more than two floors, the Department of Land Management and Urban Planning (DLMUP) is responsible for providing building permits. This is also relevant for small businesses. In Article 312 of the Sub-Decree #86 on Construction Permit the minimum requirements for "disposal of sewage waters" are set out (IRC, 2016):

- In the absence of a sewer system, building owners shall make provisions to treat and evacuate sewage through a septic tank and a sub-terrain filtering system. In urban areas building owners shall make provisions to connect their septic tank to the sewer system.
- The construction permit application shall include the blue print of the septic tank and the connection to the sewer system.

Effluent standards and compliance: Environmental standards for rivers, lakes and so on are set in the Sub-Decree on Water Pollution Control (April 1999) by the MoE, which is responsible for the conservation of water resources and environmental issues. The Sub-Decree aims to minimise and phase out activities which cause pollution in order to sustain good water quality that is suitable for human usage by improving wastewater management. The Sub-Decree includes:

- Effluent standard for pollution sources discharging wastewater to public water areas or sewers; and
- Type of pollution sources requiring permission from the MoE before discharging or transporting their wastewater. The list includes sewage treatment plants and night soil treatment plants but not sludge emptying and transportation services.

3.1.2 Institutional roles

The roles and responsibilities for wastewater management has historically been a significant challenged in Cambodia. As recently as December of 2017, a sub-decree title *Sewerage and Wastewater Treatment and Management* was signed and released by the Prime Minister's office to try and help address the challenge. The objectives of the sub-decree, as presented in the document itself, are to[1]:

- Prepare and justify the roles and responsibilities of the ministries and sub-national government to ensure quality sewerage and wastewater management.
- Delegate executive roles of sewerage management to municipalities, districts and khans (communes).
- Identify necessary mechanisms to improve sewerage management.
- Increase public awareness and improve community participation.
- Improve development private actors' engagement of infrastructure maintaining investment on sewerage management.

The three primary ministries responsible for urban wastewater management and their roles, as outlined in the sub-decree, are as follows:

1. The Ministry of Public Works and Transport (MPWT):
    - Prepare policies, strategies and master plans for sewerage and WWTP development.
    - Prepare technical aspects on construction management and maintenance.
    - Coordinate with relevant ministries, development actors, and private sector organizations on sewerage and treatment plant investment.
    - Coordinate financial and material contribution to sub-national government on wastewater management.
    - Collaborate with other ministries and sub-national government to raise public awareness on wastewater management.
    - Collaborate with Ministry of Environment and stakeholders to provide capacity building and knowledge sharing on wastewater management to sub-national governments.
    - Enforce local government to manage and maintain sewage and wastewater treatment plants.
    - Conduct monitoring and evaluation of sewage and WWTPs.

2. The Ministry of the Environment (MoE):
    - Prepare policies and strategic plans for the protection of public water bodies from wastewater pollution.

[1] Unofficial translation.

- Set standards, monitor and regulate for effluents discharging into water bodies from wastewater management systems.
- Provide technical assistance on wastewater treatment proposals.
- Monitor and evaluate the pollution control performance of equipment and materials within WWTPs.
- Coordinate with relevant stakeholder, development partners, and private sector actors on sewerage and wastewater treatment investment.
- Support and coordinate with relevant partners and sub-national government to raise awareness on the management of sewerage and wastewater treatment systems with the aim of protecting the environment.

3. Ministry of Interior (MoI):
    - Support and collaborate with relevant ministries to increase capacity and knowledges sharing on sewage and WWTPs.
    - Coordinate and mobilize sub-national government agencies to improve the quality of sewage and wastewater treatment management.
    - Intervene and support the monitoring and evaluation of systems and standards.
    - Reinforce and advise sub-national agencies on sewage and wastewater treatment management.

Provincial departments of these ministries undertake related functions at sub-national levels. The provincial department of MIH are meant to monitor and regulate the 300+ private waste supply operators functioning across the country.

Other central agencies with lesser roles in the sector include the following (WaterAid, 2015):

- The Ministry of Industry and Handicrafts (MIH) for urban water supply; it is also responsible for delivering on the urban component of the Nation Water Supply and Sanitation Policy adopted by CoM in 2004 which has a specific section on urban water and sanitation provisions, approaches and guiding principles.

- The Ministry of Education, Youth and Sport (MoEYS) has responsibility for school sanitation via the School Health Department, though activity in this area has generally been limited to donor-funded construction of facilities with limited attention to hygiene promotion.

- The Ministry of Health (MoH) is responsible for adequate water, sanitation and hand washing facilities in health centres. The Department of Preventive Health also has a role in hygiene promotion and has issued an Environmental Health Action Plan, although its implementation on the ground is limited.

- The Ministry of Land Management, Urban Planning and Construction (MLMUPC) is responsible for (IRC, 2016):
    - Providing building permits to properties larger than 500 square metres and with more than 2 floors. This is also relevant for small businesses. Smaller residential properties (<500 square metres) fall under the responsibility of the City Hall.

- Checking on and approving all urban construction including the requirement for the adequacy and quality of water supplies 'septic tanks for all urban construction. As required by the Construction Sub-Decree 1997. However, technical onsite inspection of onsite sanitation facilities is not carried out by DLMUP. This is the responsibility of DoE and DPWT. Final inspections of buildings can only be carried out if the owner has officially notified the authorities. This often does not happen as the owner is expected to pay the second tranche of the licensing fee.

In addition to MoI's role in the sector presented above, the Secretariat of the National Committee for Democratic Development (SNCDD), plays a role in supporting the implementation of the national decentralization and deconcentrating (D&D) reforms in close coordination with line ministries. While the Organic Law of 2008 formalized the start of decentralization and deconcentrating, current control of financing as well as most technical capacity, remains at central government level. Local authorities, as part of their general mandate for poverty reduction, could - and are already playing to a limited extent –a role in water supply and sanitation (and increasingly will be held responsible for health and hygiene issues) with support from provincial departments, but the capacity for planning implementation and monitoring is weak at sub-national level. (WaterAid, 2015)

3.1.3 Service provision

There is no municipal role in wastewater and drainage at the present time. These services are managed by DPWT through the offices of (i) Administrative, (ii) Public Work and Transport, (iii) Bridge and Drainage Office, and (iv) Planning and Account Office (ADB, 2014).

For the most part the design, installation, maintenance and associated costs of any onsite facility is the responsibility of building owners. In cases of buildings greater than 500 square meters and with more than two floors, a building permit must be obtained from the Provincial Department of Land Management and Urban Planning (DLMUP), which requires submitting blueprints of the building layout and septic system. For most small buildings and houses, there are no sanitation system design requirements. There are, however, unofficial standards based on what local building contractors and local masons are accustomed to.

When wastewater removal services are needed, Kampong Chhnang building owners have many options, including but not limited to, doing it themselves or hiring a service. Based on what is known from focus group discussions with stakeholders and formative research on rural households (see Figure 6), it is likely that most Kampong Chhnang building owners prefer to hire a pump truck to come and remove the septage and faecal sludge when the tank becomes full. According to stakeholders there are three private pump truck companies operating in Kampong Chhnang and the DPWT itself operates a pump truck that is mostly used for cleaning the storm water drainage system. With the exception of DPWT, most of the pump truck companies are believed to be family owned and have only one or two trucks at their disposal, each with a capacity of 4 m^3. These companies post their contact information on electricity poles and notice boards throughout the city. Building owners can hire a pump truck by contacting them directly. The cost for the wastewater removal is negotiated typically between 30-50 US$ per truck load.

3.1.4 Service standards

Offsite Sanitation Service Standards: Cambodia does not have its own standard designs for WWTPs, and relies on the consultative advice of foreign development partners such a JICA, GIZ and ADB.

Environmental standards for rivers, lakes and other public water bodies are set in the Sub-Decree on Water Pollution Control (April 1999). The sub-decree clarifies that MoE is responsible for the conservation of water resources and environmental issues. However, without a wastewater treatment plant, and limited financial and technical support for monitoring, there is no effluent monitoring occurring in Kampong Chhnang.

Onsite Sanitation Service Standards There is a lack of standard designs for onsite wastewater facilities. Building drawings are expected to include technical details of the onsite facilities, however there is a general lack of expertise to check the designs within DLMUP and Municipality. The DPWT and the DoE are expected to provide this expertise and advise the DLMUP on the proposed designs. However, such guidance has yet to be officially disseminated.

For emptying services, there are currently no systems in place that requires pit emptying service providers to register or obtain a license to run this specific business. Emptying charges range from 20-50 $US per trip. Furthermore, there are currently no safety standards in place or being practiced by pump truck operators, or faecal sludge disposal or reuse standards in place (IRC/WA, 2016).

3.2 Planning

A Master Plan for Kampong Chhnang has been drafted by MLMUPC. However, it has been waiting approval for some time, and has already been overtaken by development on the ground. As part of their long-term programme with MLMUPC, GIZ are supporting Provincial Department of Land Management, Urban Planning and Construction (DLMUPC) in Kampong Chhnang. This involves a review of the master plan as well as other ongoing technical assistance (ADB, 2014).

3.2.1 Service targets

Cambodia's *National Strategic Development Plan, 2014 - 2018* set the target to achieve sustain greater than 80 percent access to improved sanitation for the urban population (RGC, 2014a). The target was achieved; however, it does not use the Sustainable Development Goals (SDGs) new service level categories, notably the service level of 'safely managed' sanitation. According to the most recent the WHO/UNICEF JMP estimates for Cambodia (2015), 88 percent of the urban population has access to basic services and no access to safely managed. There are currently no plans to include the service level categories in the Cambodia's localized SDGs indicators for urban sanitation, but are expected to be included in the rural indicators.

In addition to the target set under the strategic development plan, the MPWT and other relevant ministries have been referencing the RGC's *National Strategic Plan for Rural Water Supply, Sanitation and Hygiene 2014 – 2025*, and using the objectives and targets set within as the de

facto urban targets beyond 2018. The high-level vision of the Strategic plan is to “ensure that every person in a rural community has sustained access to safe water supply and sanitation services and lives in a hygienic environment by 2025” (RGC, 2014b).

For Kampong Chhnang specifically, assessment prepared for ADB’s project, *Integrated Urban Environmental Management in the Tonle Sap Basin,* mention an ‘urban development strategy.’ However, the SFD preparation team were unable to locate the strategy.

3.2.2 Investments

According to the Provincial Department of Planning, the development of a WWTP for the town is included in their Provincial Investment Plan (PIP) 2018-2023. Financing for the WWTP was expected to be included in ADB’s project, *Integrated Urban Environmental Management in the Tonle Sap Basin.* However, due to challenges with finding a suitable location for the WWTP and its proposed high costs, plans for the WWTP were dropped from the project. MLMUPC and the DLMUPS are currently searching for new investors for the WWTP.

3.3 Equity

3.3.1 Current choice of services for the urban poor

As demonstrated in the access data presented in Section 2, most households, including those living below the MoP’s poverty threshold have access to sanitation of some form. This is believed to be due to the low cost and high accessibility of a basic pour-flush toilet in the area.

On the other hand, it is assumed that most, if not all, of the 10 percent of Kampong Chhnang’s population that do not have a toilet, or who use a toilet which discharges directly into a field or waterbody, are among the town’s poorest and most marginalized groups. Based on field observations and discussions with staff from the DPWT, the highest concentration of the town’s urban poor resides along the banks, and on houseboats on the Tonle Sap river. A significant proportion of them are believed to be Vietnamizes immigrants. Their poverty status, location in a challenging environment, as well as legal status in Cambodia makes their situation particularly difficult to help improve sanitation services.

3.3.2 Plans and measures to reduce inequity

Some households living along the Tonle Sap river may be relocated temporarily or permanently as part of the *Integrated Urban Environmental Management in the Tonle Sap Basin,* ADB project. These households are expected to receive compensation and, if properly managed, be resettled in areas that are not flood-prone. Optimistically, these measures will come with improved access to sanitation services as well.

With regards to the Vietnamese immigrants living on the Tonle Sap river, the local government is currently in the process of carrying out an operation to relocate them to a 40-hectare plot of land. Worth noting, the provincial governor of Kampong Chhang gave a statement to the press that the relocation was “necessary to maintain the water quality” (Chheng, 2018).

Furthermore, the Ministry of Planning is currently in the process of expanding its Identification of Poor Households Program (ID-Poor). The program, previously available only in rural areas, is now being rolled out in urban areas as well starting with the biggest urban areas first (i.e.

Phnom Penh, Siem Reap). The ID-Poor program helps to improve the targeting of health and human services for Cambodia's poorest, including WASH services. However, the urban program is in its early stages, and it may be many years before it reaches Kampong Chhnang.

3.4 Outputs

3.4.1 Capacity to meet service needs, demands and targets

The DPWT has a total staff of 55, including eight women. Six staff have a Masters Decree, and two staff hold Engineering Degrees although these two staff do not work in engineering positions (ADB, 2014). Historically the DPWT has received a significant amount of technical assistance from international development organizations such as JICA and GIZ. Due to the simplicity of the current sanitation systems in use, capacity and resources to operate and maintain them is negligible. However, in order to meet the 2025 target, more complex systems are needed that will require a larger more skilled labour force to operate, monitor and maintain them. It is worth noting, that in the three Cambodian cities that have more complex waste water treatment systems – Siem Riep, Battambang, and Sihanoukville – none of them are currently fully functioning at designed in part due to capacity constraints.

3.4.2 Monitoring and reporting access to services

Due to significant interest and potential investment in Cambodia's urban development, there have been several assessments conducted recently which outline the relevant institutions, policies and regulations at the national and sub-national levels. Furthermore, scoping and impact studies conducted in preparations for upgrades to Kampong Chhnang's storm water and flood management, supported by ADB and GIZ, have produced a significant amount of reliable documentation regarding the existing conditions. Most of the reports were developed recently within the last five years, and by reputable sources. These secondary sources are considered to be reliable and were used significantly to prepare this SFD report.

Data on onsite sanitation recently became available due to a survey conducted by NIS on WASH services in Kampong Chhnang Province, with support from WaterAid. The purpose of the survey was two-fold: first, to develop and test survey questions relevant to Sustainable Development Goal 6.2, which could be replicated in other national surveys including the next census; and second, to provide WaterAid and other WASH sector partners working in Kampong Chhnang with more reliable data. Although the survey has yet to be officially finalized and accepted by NIS, these data are considered to be the most reliable and current available.

3.5 Expansion

3.5.1 Stimulating demand for services

Further study is needed to identify drivers and incentives to encourage uptake. Possible factors to explore may include:

- Additional public awareness of the benefits of safely managed sanitation.
- Improve access to affordable and safe products and sanitation services.

- Increase financial support for the poorest households (using the ID-Poor System) to overcome cost constraints.

3.5.2 Strengthening service provider roles

Further study is needed to identify drivers and incentives to strengthen the roles of service providers. Possible factors to explore may include:

- Continue to roll out D&D reforms in order to transfer jurisdiction and sufficient financial resources to implement the local management plans.
- Improve environmental policy enforcement to create a larger customer base for private sector providers and facilitate fair competition in the marketplace.

4 Stakeholder Engagement

This SFD report was prepared with a significant level of stakeholder engagement. To help ensure cooperation and support for this study and its findings, the SFD team engaged staff from the MPWT's Sewerage Management and Construction Department. After an introduction and consultation meeting with department heads held on July 24th, 2018, two staff members from the MPWT were assigned to accompany the SFD team to learn about and participate in the SFD development process.

On August 16th and 17th, 2018 the SFD team, along with the MPWT partners, conducted meetings with the following provincial departments:

- Aug 16 – Department of Environment
- Aug 16 – Department of Land Management, Urban Planning and Construction
- Aug 16 – Provincial Health Department
- Aug 16 – Department of Planning
- Aug 17 – Department of Industry and Handicrafts
- Aug 17 – Department of Public Works and Transport
- Aug 17 – Kampong Chhnang Municipality

In addition to the meetings, observations were made of Kampong Chhnang's storm water and sanitation management systems. This included connecting canals and outflows as well as the sanitation technologies used by households and businesses. While making these observations, casual conversation was made with households and business owners regarding their wastewater containment systems and any experiences removing the waste.

Furthermore, the SFD team also had limited engagement with private sector pump truck owners/operators. Seeing an advertisement for wastewater removal services, the SFD team called the listed phone number and conducted a short interview (with permission) with the pump truck owner.

As a final step to verify findings and gather additional information, a workshop was held with key stakeholders on September 19th, 2018. Representatives in attendance at the workshop included the following:

- Ministry of Public Works and Transport,
- Department of Public Works and Transport (including DPWT's pump truck operator),

- Kampong Chhnang Municipality,
- Department of Environment,
- Department of Planning,
- a local sanitation marketing NGO (WaterSHED), and
- a toilet supplier from the local private sector

During the workshop, the SFD preparation team presented their preliminary findings to the participants, and then collected feedback and additional information through breakout focus group discussions.

5 Acknowledgements

The SFD preparation team would like to thank the many MPWT and DPWT staff for their generous time and support, specifically: Director Chao, Deputy Director Lim, Department Deputy Director Sopary, and Mr. Sem.

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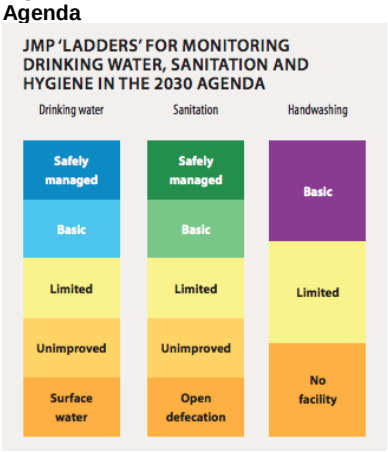
7 Appendix

7.1 Appendix 1: Overview of the 2018 WASH Data Pilot Survey for Kampong Chhnang Province

Background

As part of its National Strategy for Rural Water Supply, Sanitation and Hygiene 2011- 2025[2], The Royal Government of Cambodia envisions to provide access to improved water supply and sanitation and ensure the practice of basic hygienic behavior to 100% of rural communities by 2025. This vision falls in line with the United Nation's (UN) updated Sustainable Development Goal (SDG) related to WASH: ensure availability and sustainable management of water and sanitation for all (SGD 6). SDG 6 defines two WASH-related targets: By 2030, achieve universal and equitable access to safe and affordable drinking water for all (target 6.1) and achieve access to adequate and equitable sanitation and hygiene for all, and end open defecation, paying special attention to the needs of women and girls, and those in vulnerable situations (target 6.2)[3]. The SDGs place emphasis on the level of sanitation, water supply and hygiene services, including a new category for 'safely managed' water and sanitation services, and breaking down 'unimproved' and 'improved' categories more precisely.

Figure 1: JMP Ladders in the 2030 Agenda



In this context, the Royal Government's Ministry of Planning (MOP) has been working alongside other government departments and development partners to develop the Cambodian Sustainable Development Goals (CSDGs) and the indicators used to monitor their progress. In order to do this, certain information needs to be collected at household level to measure baseline indicators such as availability of water supply and where households dispose of excreta.

Moreover, throughout the course of 2018, the Ministry of Rural Development (MRD) is reviewing the 2014-2018 National Action Plan for Rural Water Supply, Sanitation and Hygiene (NAP) and its associated Provincial Action Plans (PAP). A subsequent Phase 2 NAP will then be developed. Included in the NAP are outcome level indicators such as percentage of rural population with access to improved water supply. The baseline data for the NAP and PAPs comes from the Cambodia Socio-Economic Survey (CSES), which is conducted at a national level annually, but does not provide provincial or district specific data.

As part of its Sustainable WASH program, which seeks to strengthen the enabling environment for WASH at commune, district and provincial level in Kampong Chhnang province, WaterAid is supporting the Kampong Chhnang Provincial Department of Rural Development (PDRD) to

[2] Ministry of Rural Development, Brief National Strategy for Rural Water Supply, Sanitation and Hygiene 2011-2025, December 2012, accessible at: https://www.unicef.org/cambodia/Summary_V7_Low.pdf
[3] Sustainable Development Goals website: https://sustainabledevelopment.un.org/sdg6

review their current PAP and develop the next phase PAP. To do so, WaterAid worked with the National Institute of Statistic (NIS), the Ministry of Rural Development (MRD), the Provincial Department of Rural Development (PDRD), and the Provincial Department of Planning (PDP) and the survey teams to conduct a 2018 WASH Data Pilot Survey in Kampong Chhnang province. The findings enable provincial level authorities to measure WASH indicators at sub-national level and feed into the next phase PAP.

Field data collection was completed through individual household interviews with 2,460 sampled households in 164 villages across all districts in Kampong Chhnang province. In total, 50 enumerators and supervisors from PDP, PDRP, DPOs (District Planning Offices) and DRDOs (District Rural Development Offices) were recruited by WaterAid and trained on data collection by NIS with support from WaterAid and MRD. NIS, MRD and WaterAid also ensured quality control of the data collection process. Upon completion of the survey field work, the questionnaires were processed and validated by NIS.

This report will analyze both (i) the WASH Pilot Survey findings on access to safely managed water sources, sanitation, and current hygiene behaviors, and (ii) the multi-stakeholder data collection process which aims to increase the capacity of authorities at subnational level to collect and monitor WASH data.

WASH Survey Objectives

The WASH Pilot Survey objectives are two-fold:

1. To provide the first province-wide baseline of WASH service levels, which will feed into the annual review of the PAP and NAP, support the development of the next phase PAP, and inform WASH program priorities;
2. Beyond data collection, the pilot survey aims to build the capacity of authorities at the provincial and district level to collect and monitor data on safely managed water and sanitation, as well as build collective action and engagement of WASH sector stakeholders around WASH data monitoring.

Methodology

A Multi-Stakeholder Approach

The WASH Pilot Survey is the result of a novel multi-stakeholder approach including NIS and MRD at national level; PDRD and PDP at provincial level; DRDO and DPOs at district level, as well as students and WaterAid staff at central and provincial offices. NIS took the lead in designing the survey questions, supported by WaterAid who provided JMP / SDG related questions, and facilitated two consultative workshops with technical officers from NIS, MRD, PDRD, and PDP. WaterAid was responsible for the recruitment of 50 enumerators and supervisors for the data collection, drawn from PDP, PDRP, DPOs, DRDOs and students. NIS took the lead on training the enumerators and supervisors with technical support from MRD and WaterAid. The supervisors (PDP and PDRD) coordinated the data collection teams and supported them in the household interviews. NIS, MRD and WaterAid worked together to ensure field supervision and data quality control during data collection through regular monitoring visits and spot checks. Upon field work completion, NIS processed the data. This

level of cooperation at national and subnational level is one of the key successes of the Pilot WASH Survey.

Scope and Coverage

The pilot WASH survey was conducted to provide reliable estimates of variables relating to WASH indicators at provincial and district level, both urban and rural. The survey covers all of the villages and normal households in Kampong Chhnang Province. The survey involved a sample of 2,460 households from 164 sampled villages. The 164 villages are located across all districts in the province, and a sub-sample of 15 households in each selected village was distributed across all 164 villages.

Sampling Design

The list of villages was taken from the 2008 Population Census with updated information from the Commune Data Base (CDB) provided by PDP. The frame was partitioned into eight separate frames so as to provide data by district. The sample sizes of villages were then determined according to the consideration of minimum required precision, budget constraint, as well as the number of villages per district. The district size and its allocated sample size of villages are summarized in Table 1.

Table 1: Sample sizes according to district

Dist. Code	District Name	Dist. Size (No. of Villages) (N_d)	No. of Households (X_d)	No. of Sampled Villages (n_d)	No. of Sampled Households per Village (m)	Total No. of Sampled Households (mn_d)
01	Baribour	64	14,555	20	15	300
02	Chol Kiri	29	8,024	16	15	240
03	Kampong Chhnang Town	26	8,974	16	15	240
04	Kampong Leaeng	44	12,418	16	15	240
05	Kampong Tralach	103	23,970	30	15	450
06	Rolea B'ier	135	27,122	30	15	450
07	Sameakki Mean Chey	90	19,579	20	15	300
08	Tuek Phos	78	16,192	16	15	240
Total		**569**	**130,834**	**164**		**2,460**

Sampling Strategy

The survey was conducted via a stratified two-stage sampling design: selection of villages, followed by selection of households. Villages were selected using the Systematic Probability Proportional to Size sampling technique with the number of households in each village as the size of measure. 15 households were selected in each previously selected village, using the Circular Systematic Random Sampling scheme, using a principal landmark as the starting point in the selection process.

Questionnaire

The National Institute of Statistics (NIS) developed the questionnaire through two consultative workshops with technical officers from NIS, MRD, PDRD, PDP and WaterAid. WaterAid supported NIS in questionnaire development and workshop organization and facilitation.

The questionnaire is based on SGD 6 targets related to WASH, updated JMP indicators, Cambodian Socio-Economic Survey, the Cambodia Demographic Health Survey 2014, the Population Census 2008, as well as the WATSAN section for the upcoming 2019 Population Census.

Summary of WASH Data Pilot Survey Results

Overall, the Pilot WASH Survey findings show an urban-rural and income-level divide in access to improved water supply and sanitation across the eight districts in Kampong Chhnang Province. Households located in rural / remote areas and floating villages and low-income households (ID Poor 1) show lower levels of access to improved drinking water, lower levels of water treatment and higher levels of difficulty accessing water.

They also show higher levels of open defecation, lower access to improved sanitation, namely sanitation that is accessible during the wet season, and lower levels of safe disposal of latrine pits, children's faeces, and menstrual hygiene products.

Self-reported hand washing habits are similar across districts: they are high after using the toilet and before eating food, and low after changing a baby's diaper and after touching animals.