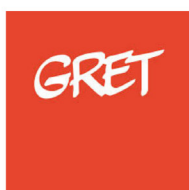




2024

Current Sewerage Situation in Cambodia

Capacity Development
Programme for the Provincial
Water Supply and Sanitation
Project



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Current Sewerage Situation in Cambodia

Capacity Development Programme for the
Provincial Water Supply and Sanitation
Project (PWSSP)

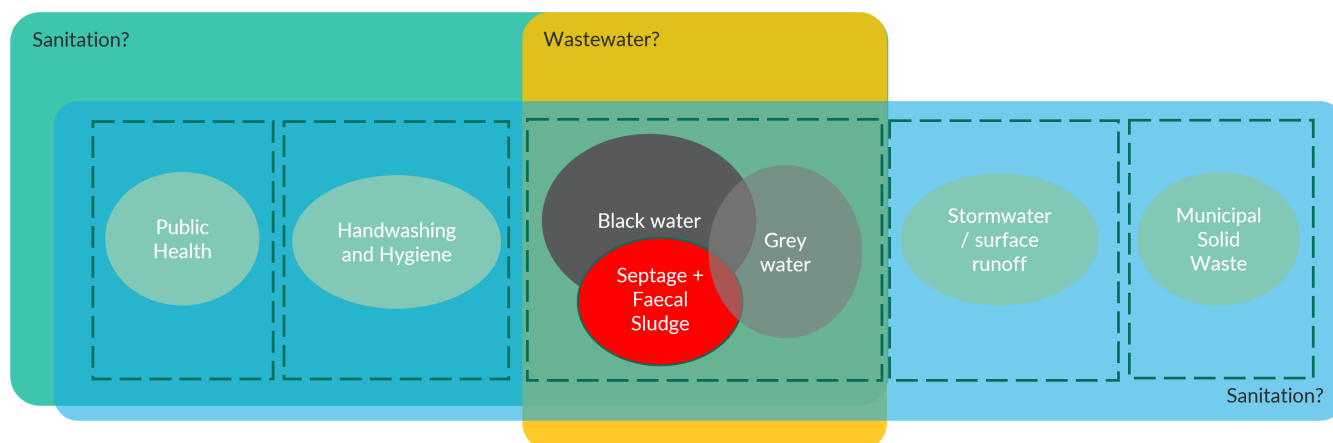
BACKGROUND

The Royal Government of Cambodia (RGC), through the Ministry of Public Works and Transport, has undertaken concerted efforts to improve wastewater¹ management and services in urban areas of the country.

This report aims to present a consolidated overview of the current state of the urban wastewater management sector in Cambodia and map the emerging contours of the policy, regulatory, and institutional framework for managing the sector. The report discusses both onsite and offsite wastewater management systems in Cambodia. The report has been developed based on a review of secondary studies, discussions and interviews with development partners, officials of the Ministry of Public Works and Transport, site visits, and discussions with local authorities.

The report forms the first output of the Capacity Development Program under the Provincial Water Supply and Sanitation Project (PWSSP). This Technical Assistance is funded by the Asian Investment Facility of the European Union (AIF/EU) administered by the Agence Française de Développement (AFD) through the Ministry of Economy and Finance (MEF), who has delegated to the Ministry of Public Works and Transportation (MPWT) for the implementation. It is under the umbrella of the Provincial Water Supply and Sanitation Project (PWSSP) whose water supply and sanitation infrastructure components are led by the Asian Development Bank (ADB) with AFD co-financing.

¹ The terms “Sanitation” and “Wastewater” are often used interchangeably. The Ministry of Rural Development and Ministry of Health use the term Sanitation. Ministry of Public Works and Transport prefers the term “Wastewater”. The recently passed Sewerage Law does not define the term Sanitation but specifies the terms sewerage and sewage. This also likely explains the approach of these ministries to the sector. MRD and MOH focus on health and hence prefer the term “Sanitation” while MPWT tends to focus more on infrastructure and services, hence the preference for Wastewater systems. In MPWT parlance, “wastewater systems” includes both onsite and off-site systems. i.e., Sewerage systems (centralized and decentralized) and Fecal Sludge Management. To be consistent with the terminology used by MPWT, throughout this document, we use the term “Wastewater” and define the term to include both sewerage and non-sewerage systems to manage domestic grey and black water. The study is limited to assessing the urban wastewater management sector and hence does not include industrial wastewater or other forms of non-domestic wastewater.



EXECUTIVE SUMMARY

The urban wastewater management sector in Cambodia is undergoing rapid evolution. Through the concerted efforts of the Ministry of Economy and Finance, the Ministry of Public Works and Transport, provincial governments, and development partners, various initiatives are being implemented to enhance wastewater management systems across Cambodian cities.

A key development in this sector is the shift towards establishing centralized wastewater management systems in Phnom Penh and eleven other cities in Cambodia. To date, there are five completed projects, seven ongoing projects, and four additional projects in the planning stages aimed at developing centralized systems in secondary cities. By 2035, it is anticipated that the total treatment capacity in secondary cities will be 124,000 m³ per day. Phnom Penh also plans to expand its treatment capacity by 282,000 m³ per day between 2031 and 2040, as outlined in the long-term master plan. In addition to these 12 cities with ongoing developments, there are 21 other cities of varying sizes where the government has either assessed or intends to assess appropriate waste water solutions. The majority of secondary cities are either currently involved in projects or are planning to develop centralized wastewater systems, which will enhance service levels. These investments are crucial for achieving Cambodia's goal of treating 45% of urban wastewater by 2030.

However, these systems require significant operations and maintenance (O&M) efforts, strong organizational systems and service delivery frameworks. This represents the most significant challenge facing the wastewater management sector in Cambodia. To ensure the sustainable operation of these new infrastructures, there will need to be significant increase in organizational skills and size and have robust regulatory frameworks to ensure service delivery. Local governments would need to learn to manage significantly larger assets and revenue bases to maintain consistent service provision, presenting substantial administrative challenges given their current operational scale.

Establishing a tariff regime, including the levy, collection and ring-fencing, remains another critical area for the sector. This would secure the necessary financial resources for local authorities to manage routine O&M and capital maintenance of the developing sewerage systems. Without sufficient tariffs, the service delivery is likely to collapse. The upcoming decision on the tariff regime would be one of the most critical decisions by the government in the sector.

Discussions are ongoing between relevant line ministries regarding the adoption of a uniform country-level tariff regime for wastewater services, the updating of regulatory structures (including under the new wastewater law), clarification of the institutional framework, and various other initiatives aimed at building the capacity of local authorities are underway. The Ministry of Public Works and Transport is developing design and operational guidelines for various wastewater management systems to aid local authorities in their management. The success of these reforms and capacity-building initiatives will likely determine the sustainability of ongoing and future wastewater investments in the country.

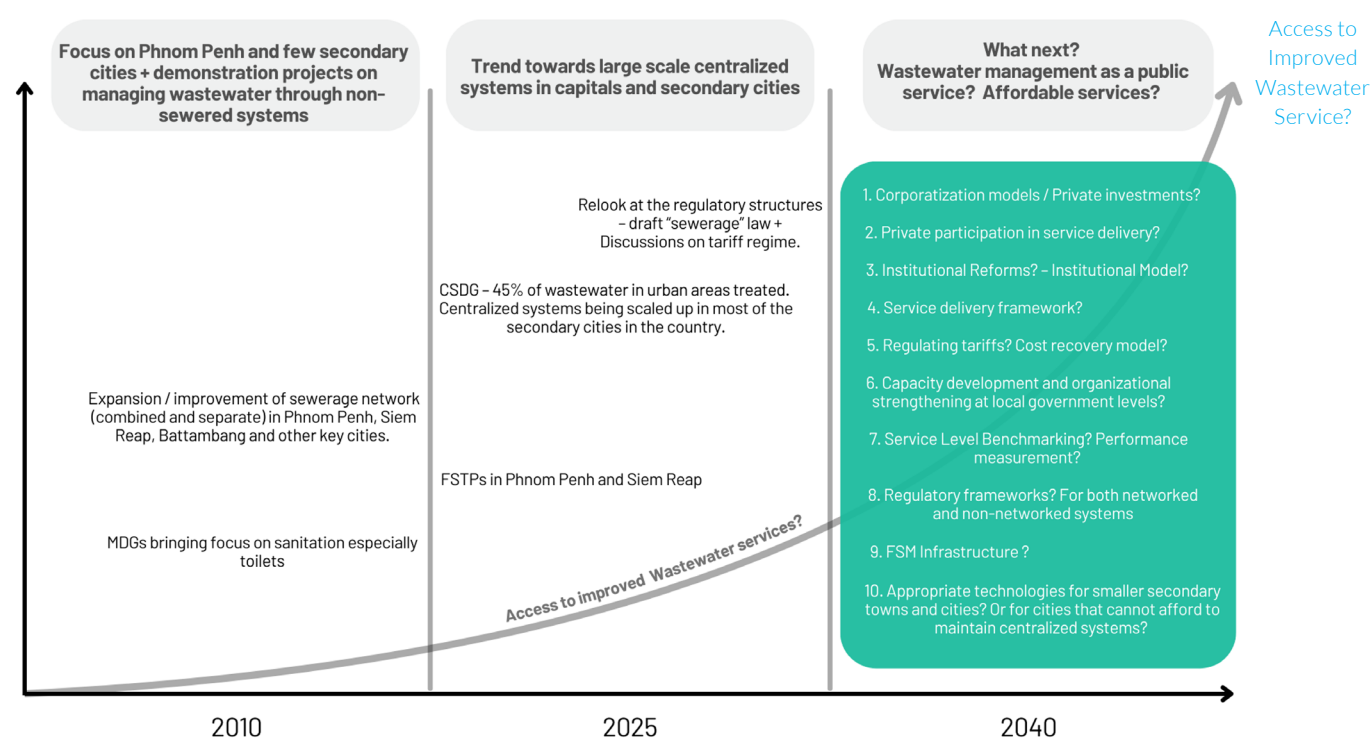
Furthermore, while these investments will aid in achieving Cambodia's target of the "proportion of wastewater treated," it is also vital for the Royal Government of Cambodia to measure "households with access to safely managed wastewater services" as an indicator within its Cambodian Sustainable Development Goals (CSDGs). This measurement will assist in monitoring the properties and households that receive wastewater services and

the quality of these services. This would align with the SDG framework and various global best practices, considering FSM as one of the more affordable and realistic pathways to achieving safely managed sanitation.

Although centralized wastewater management is widely accepted as a pathway towards improved sanitation, Fecal Sludge Management (FSM) has not yet been mainstreamed as an effective and affordable solution for managing wastewater. Phnom Penh and Siem Reap have initiated the development of fecal sludge treatment plants and the regulation of desludging services. However, other cities have yet to adopt this intervention. There is a need for a more comprehensive approach to managing fecal sludge and adopting FSM systems in Cambodia's urban and peri-semi-urban areas. This approach could include broader coverage of FSM-related functions in the regulatory and institutional framework, investments in collection and treatment infrastructure, and increased support from the Ministry of Public Works and Transport for such initiatives by the cities.

FSM should be included in measuring wastewater management targets under Cambodia's Sustainable Development Goals (SDGs). Recognizing FSM services as a valid pathway for improved sanitation is essential. Adopting FSM as a valid pathway and investing in this area would enable Cambodia to achieve more ambitious SDG targets and ensure better wastewater services in urban areas.

A sector in "transition" – lots of changes, and new initiatives, but still some basic building blocks for sector development are missing.



The policy framework in Cambodia is evolving. While the existing policy framework is spread across the new law and various ongoing drafts, there seems to be a consensus among decision-makers and senior leadership regarding the direction the sector would take. This is evident from the nature of support provided by various development partners and ongoing discussions on tariffs, organizational structures, legislative frameworks, investment planning, and support for local authorities in the form of guidelines and manuals. It is crucial for the Ministry to align these ongoing efforts in terms of timelines and direction so that the sector has a broader and more comprehensive sense of direction. It is also essential for development partners to coordinate and align their efforts. The upcoming drafts on septage management policy, wastewater policy, and investment plans should incorporate the various ongoing discussions within the Ministry and establish a cohesive policy direction for the sector.

ABBREVIATIONS

AFD	Asian Development Bank
APIs	Agence Française de Développement
AQI	Asian Investment Facility
AQIP	Air Quality Improvement Project
DAQNVM	Association of Southeast Asian Nations Infrastructure Fund
DMS	Council for Development of Cambodia
EANET	Communal Sewerage Committee
EPA	Cambodia Sustainable Development Goals
GGGI	Combined Sewer Systems
IAT	Department of Public Works and Transport
MOE	Economic Development Corporation Fund
MOs	Economic and Financial Policy Commission
OPC	Emptying and Transport Operators
PSC	European Union
QA	European Union Delegation to Cambodia
QC	Fecal Sludge
SOP	Fecal Sludge Management
TWG	Fecal Sludge Treatment Plant
USD	General Directorate of Sewerage and Wastewater Management
VOC	Global Green Growth Institute
WHO	German Agency for International Cooperation
JICA	Japan International Cooperation Agency
JMP	Joint Monitoring Program
MABR	Membrane Aerated Biofilm Reactor
MEF	Ministry of Economic and Finance
MISTI	Ministry of Industry, Science, Technology, and Innovation
MLMUPC	Ministry of Land Management, Urban Planning and Construction
MoH	Ministry of Health
MoJ	Ministry of Justice
MOI	Ministry of Interior
MRD	Ministry of Rural Development
MPWT	Ministry of Public Works and Transport
NCDD	National Committee for Sub-National Democratic Department

ABBREVIATIONS

NDC	Nationally Determined Contribution
NIC	National Institute of Cambodia
NPRD	National Program of Rehabilitation and Development of Cambodia
NPWSS	National Policy on Water Supply and Sanitation
NSDP	National Sustainable Development Plan
O&M	Operation and Maintenance
P4I	Partner for Infrastructure
PPP	Public Private Partnership
PTF	Pre-Trickling Filter
RGC	Royal Government of Cambodia
SEZ	Special Economic Zone
SSS	Separated Sewer Systems
SWTPU	Sewerage & Wastewater Treatment Plant Unit
VNR	Voluntary National Review
WSH	Water, Sanitation, and Hygiene
WB	World Bank
WWTP	Wastewater Treatment Plant

TABLE OF CONTENTS

Background	IV
Executive Summary	V
Abbreviations	VII
Section 1 - Policy Framework	1
1 - URBAN WASTEWATER SECTOR TARGETS	2
2 - POLICY FRAMEWORK AND ROADMAP FOR URBAN WASTEWATER MANAGEMENT SECTOR	4
Section 2 - Regulatory and Institutional Framework	8
3 - LEGAL FRAMEWORK	9
4 - INSTITUTIONAL FRAMEWORK	12
Section 3 – Wastewater Infrastructure	19
5 - SEWERAGE NETWORKS AND CENTRALIZED SYSTEMS	20
6 - DECENTRALIZED WASTEWATER TREATMENT SYSTEMS	25
7 - FECAL SLUDGE MANAGEMENT	26
8 - REUSE AND RECYCLING OF TREATED WASTEWATER AND FECAL SLUDGE	30
9 - PUBLIC-PRIVATE PARTNERSHIPS (PPP)	30
10 - CLIMATE CHANGE AND SANITATION INFRASTRUCTURE	32
11 - HUMAN RESOURCES	32
Section 4 – Conclusions	34
Section 5 - Annexes	36
12 - ANNEX 2 : URBAN POPULATION PROJECTION	38
13 - ANNEX 3 : COVERAGE OF URBAN SANITATION SERVICES IN THE CITY	39

LIST OF FIGURES

Figure 1 : The legal roles and practices of local government in managing urban wastewater. The roles and practices may differ from each other, indicated by the dash arrows. In Phnom Penh, the management and coordination of fecal sludge are under the responsibility of PPCA. On the other hand, DPWT plays a significant role in fecal sludge management in Siem Reap. Private sector charges directly to households/users for only fecal sludge emptying and transportation service provision. 15

Figure 2 : Flow diagram showing necessary component needs for institutional frameworks. 18

Figure 3 : Flow diagram of necessary components necessary for encouragement of private participation in the urban wastewater sector. 31

LIST OF TABLES

Table 1 :	The targets and indicators of Cambodia's SDG regarding the urban wastewater sector.	3
Table 2 :	The existing and under-development policies and guidelines of the urban wastewater sector.	5
Table 3 :	Detail existing elements of the legal framework regarding the urban wastewater sector.	10
Table 4 :	Roles and responsibilities of ministries involved in urban wastewater management.	13
Table 5 :	Roles and responsibilities of sub-national government in urban wastewater management.	14
Table 6 :	Responsibility of line ministries, provincial, and local government regarding urban wastewater management and service.	16
Table 7 :	Sewerage systems and coverage in Cambodia.	20
Table 8 :	Existing and proposed sewage treatment capacities in selected cities in Cambodia.	23
Table 9 :	Existing DEWATS within various communities.	26
Table 10 :	The current wastewater of on-site sanitation facilities in 9 cities of Cambodia.	27
Table 11 :	The variation of tariff for fecal sludge emptying and transportation service across cities in Cambodia.	28
Table 12 :	Variation of tariff for fecal sludge discharge at the treatment plant/authorized disposal site in selected 9 cities of Cambodia.	29



SECTION 1 POLICY FRAMEWORK

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1. URBAN WASTEWATER SECTOR TARGETS

Since the first national development program of 1994 - National Program of Rehabilitate and Development of Cambodia (NPRD), each subsequent legislature of the National Assembly of Cambodia has adopted development strategies focused on poverty reduction and economic development. Wastewater is usually not explicitly included in the development targets but forms a subcomponent of the urban and health sectors.

In the latest “Pentagonal” strategy¹ (2023 – 2028) adopted by the seventh legislature, resilience, sustainability, and inclusive development form one of the nodes of the strategy. Under this node, urban management and modernization are the key focus areas, including wastewater management.

Cambodia has updated its Nationally Determined Contribution (NDC) targets in 2020 to address climate change-related issues and transition to sustainable development, low-carbon, and climate-resilient development. NDC includes rural water, sanitation and hygiene, industrial wastewater, and water and wastewater management in health center establishments as priority areas for adaptation actions. However, the recent NDC update does not feature urban sanitation and wastewater management.

The Royal Government of Cambodia (RGC) has adopted the sustainable development goals (SDGs) and created its own set of indicators - Cambodia’s SDGs (CSDGs). The CSDGs comprise 18 goals, 88 targets, and 148 indicators. [Table 1](#) below are details of the targets and indicators pertaining to sanitation adopted by RGC. To monitor the progress of CSDGs, the Royal Government of Cambodia (RGC) has published its first Voluntary National Review (VNR)².

1 Looking ahead to the next 25 years, the Pentagonal Strategy-Phase I aims to achieve Cambodia Vision 2050. The vision outlines Cambodia’s goal to become a dynamic society, a high-income nation, and a resilient economy by 2050. The Cambodian people will possess a wealth of knowledge at least one life skill, and live with dignity, happiness, and equal access to social protection, rights, and opportunities. The country will foster harmony, resilience, and inclusive physical and natural environments while balancing development and environmental conservation.

2 Cambodia released its Voluntary National Review (VNR) in June 2019, outlining its progress in implementing the 2030 agenda for sustainable development. The report used a mixed-methods research approach, including stocktaking, desk review, and interviews with key stakeholders. The goal was to evaluate progress, challenges, and key policies needed to accelerate the CSDGs. The report focused on six prioritized goals, namely CSDG 6, CSDG 8, CSDG 10, CSDG 13, CSDG 16, and CSDG 17, which are linked to the High Level Political Forum’s term “Empowering people and ensure inclusion and equality.”

Table 1 : The targets and indicators of Cambodia's SDG regarding the urban wastewater sector

Target	Indicators	baseline (%)		Target (%)			
		2015		2018	2022	2025	2030
4.a Build and upgrade education facilities that are child, disability, and gender sensitive and provide safe, non-violent, inclusive, and effective learning environments for all	4.a.2 Proportion of pre-primary, primary, and secondary schools with basic wastewater facilities	57		68.7	79.1	87	100
6.2 By 2030, 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	6.2.1 Proportion of rural population (rural households) using safely managed sanitation services.	27		30	34	38	50
	6.2.1.1. Proportion of rural population (rural households) have basic access to sanitation services.	44.7		54.4	85	100	100
6.3 By 2030, improve water quality by reducing pollution, eliminating dumping, minimizing the release of hazardous chemicals and materials, halving the proportion of untreated wastewater, and substantially increasing recycling and safe reuse globally.	6.3.1 Proportion of wastewater (industrial wastewater) safely treated (based on national standard)	12		19	29	40	70
	6.3.2 Proportion of wastewater (from capital city municipality and urban areas) safety treated (based on national standard)	12		19	25	30	45

As the above table shows, the CSDG 6 targets measure only one indicator for urban wastewater – “proportion of wastewater treated”. The key aspect missing from CSDG is to distinguish the “proportion of urban households with access to safely managed wastewater services” and the “proportion of urban households with basic access to wastewater service”. More specifically, indicators 6.2.1 and 6.2.1.1 under the CSDG framework³.

The key terms here are “safely managed wastewater services” and “basic access to wastewater service”. The fact that “sanitation” or, in this context, “wastewater”, needs to be delivered as a public service is often overlooked, including here in Cambodia. The lack of these indicators indicates the government’s “infrastructure” oriented approach. While it is essential to develop, this needs to be accompanied by a

³ MOP (2022). Cambodian Sustainable Development Goals Framework 2016-2030

focus on “service delivery” and making sure that each property/household is connected and provided with some form of basic and safely managed wastewater services (either networked or non-networked), which includes the entire sanitation service chain.

The Government would also benefit from developing a data and reporting framework. A robust data reporting framework and clearly laid out process to calculate the indicators would be critical. Without proper reporting systems, reliability of these performance numbers can be questioned and validation becomes difficult.

In addition, MPWT is also considering adopting a more comprehensive set of performance indicators to measure the effectiveness and efficiency of these new “services” being introduced in the cities. This new and complete set of indicators would include organizational efficiency, financial sustainability, tariff collection, maintenance checks, consumer complaint redressals, etc. There are initial discussions on this aspect and this project would develop an initial draft of a performance improvement framework as a part of one of its outputs.

2. POLICY FRAMEWORK AND ROADMAP FOR URBAN WASTEWATER MANAGEMENT SECTOR

In line with the various infrastructure investments, the policy framework of the wastewater management sector is evolving. [Table 2](#) below lists the various policy documents adopted and under discussion/development.

As the [Table 2](#) shows, MPWT has not formally adopted a policy framework/approach to the wastewater management sector and its various components. However, while it has yet to be published officially, there is a broad consensus towards how it envisages the sector to evolve.

Two key policy documents are the National Policy on Water and Sanitation by RGC and the Technical Guidelines for Planning and Design of Sewerage System in Cambodia by MPWT. Apart from these national policy documents, Phnom Penh and Siem Reap have city-level strategies/plans in place. However, these are often project/intervention-specific.

Several key policy decisions are currently being discussed/contemplated. This is visible from the number of developed documents and the various development partners supporting MPWT. The areas being currently worked upon include:

1. Tariff framework for wastewater.
2. Decentralization, organizational structures, and strengthening local governments.
3. Approach towards septage management in urban areas.
4. Approach towards sewerage investments.
5. Manuals and guidelines on various technologies involved.
6. Updated service level measurement and benchmarking approach towards wastewater management services.

While there could be scope for further policy development, it would be critical for MPWT to ensure alignment of these ongoing initiatives in terms of timelines and overall direction of the recommendations. MPWT has several ongoing partnerships with development partners. More frequent partner coordination and an overview of all MPWT activities would help ensure alignment. The quarterly partner coordination meetings could also help in ensuring this alignment.

Table 2 : The existing and under-development policies and guidelines of the urban wastewater sector.

Status	Urban Wastewater Management Policy Framework	
	Policy	Guidelines
Adopted / Approved	Fecal sludge management strategy 2035 for Phnom Penh capital (AIMF, 2022) [Roadmap highlighting the key approaches and decisions required to ensure full coverage of FSM services in Phnom Penh capital. Covers aspects pertaining to management of desludging operators, FSTP and fees.]	- Technical Guideline for Planning and Design of Sewerage System in Cambodia (JICA, 2023) [Guidelines for planning and engineering design of centralized systems for managing wastewater. The guidelines cover network as well as treatment technologies. Focus on system design and planning] - National guideline for the planning, design, construction supervision, commissioning, O&M, and monitoring of the fecal sludge treatment plants (FSTPs) using planted drying beds technology (ADB, 2023) [Covers all aspects of design and maintenance of planted drying beds technology. Reference point for city authorities planning to develop or maintain the FSTPs with planted drying bed.] - Sewerage network operation and maintenance guidelines (GGGI, 2024) [Focused on sewerage networks, guideline laying out process for inspection and maintenance with guidance on suitability of various inspection technologies, maintenance procedures and reporting framework]
Developed and under discussion.	- High-level financing and cost recovery framework for Cambodia's wastewater management (DFAT, 2023) - Regulation on tariff setting for urban sanitation service in Cambodia (WB, 2022)	
Under Development	- Review and update National policy on water supply and sanitation (WB 2023) - National Sewerage Action Plan (AFD, GGGI, GRET, 2024) [under development, aimed at laying out a roadmap for implementation of the sector vision and the new law. Builds on the draft roadmap of GDSWM] - Draft Septage Management Policy (AFD, GGGI, GRET, 2024)	- Report on Decentralized Management Mechanism regarding Sub-Decree 235 (AFD, GGGI, GRET, 2024) <i>[Assessment on requirements / changes that are required to effectively implement sub-decree 235. Linkages with new law]</i> - WB and ADB financed city wide sanitation approaches and associated tools.

Ministry of Public Works and Transport, General Directorate of Sewerage and Wastewater Management (GDSWM) has developed a draft roadmap for the sector with five-year action plan and goals till 2040. While this is still in a draft stage and a document internal to GDSWM, this provides an overview of the general alignment of MPWT towards the sector with targets on safe discharge, household connections and coverage of piped network.

Road Map for Wastewater Improvement in Cambodia (Draft)

2024

2025

2030

2040

CHALLENGES

Population growth, climate change, and water scarcity

Population growth, climate change, and water scarcity

GOAL

- One town/city One treatment Plant by 2040
- Achieve 15-30% household connection in urban areas to existing WWTPs.
- Increase safe discharge of wastewater
- Achieve 30-50% household connection in urban areas to existing WWTP.
- Increase safe discharge of wastewater
- Achieve 50-65% household connection in urban areas to existing WWTP
- Increase safe discharge of wastewater
- Achieve 65-85% household connection in urban areas to existing WWTP.

APPROACH

- Anticipate population and urban growth
- Propose a zoning for the city (centralized/decentralized/on-site).
- Design a network to collect WW in centralized/decentralized areas.
- Develop the list of what's required to maintain, improve, expand coverage areas and extend drainage and wastewater systems across the country.
- Finalize draft law on wastewater system.
- Propose treatment options for other cities or towns.
- Propose budget support for operation and maintenance of 04 WWTPs and develop tariffs for cost recovery.
- Monitor current/projected water consumption.
- Expand coverage areas and new construction of WWTPs.
- Review network performance.
- Review institutional arrangement
- Review tariff structure/cost recovery.
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- review institutional arrangement.
- review tariff structure/cost recovery.
- Monitor current/projected water consumption.
- Expand coverage areas and new construction of WWTPs.
- Review network performance.
- review institutional arrangement.
- review tariff structure/cost recovery.

TECHNICAL REQUIREMENT

- Develop sector master plan and identify priority investments
- Prepare and update detailed engineering design and specifications for priority investments (2030)
- Identify/Confirm sites for new WWTP and commence land acquisition
- Capacity building at national, provincial and municipal level.
- Review and update the sector master plan to 2050
- Prepare design for priority investments to meet 2040
- Review rolling replacement/renewals program
- Prepare design for priority investments to meet 2040
- Review and update the sector master plan to 2050
- Prepare design for priority investments to meet 2040
- Review rolling replacement/renewals program

An aerial photograph of a city, likely Phnom Penh, Cambodia. The foreground features a large, prominent building with a star-shaped or flower-like roof structure, surrounded by parking lots and other urban infrastructure. The middle ground is filled with a dense grid of residential and commercial buildings. In the background, a river is visible, and the city skyline extends into the distance under a hazy sky.

SECTION 2 REGULATORY AND INSTITUTIONAL FRAMEWORK

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3. LEGAL FRAMEWORK

The urban wastewater framework in Cambodia is supported by various components, which are Laws, Sub-decrees, Proclamations (“Prakas”), and Agreement Letters, each with its specific focus and scope (Table 3). Some aim to protect the environment and water resources, while others focus on developing infrastructure and services.

In the existing framework, there are a few critical gaps that need to be addressed:

1. Comprehensive coverage of fecal sludge management (in national as well as local level regulations/laws)
2. Clarity on tariffs and management of tariffs (ring-fencing)
3. More pronounced and clearer roles for service delivery at the local government level
4. Institutional models for enabling private sector participation; and
5. A clearer set of responsibilities for citizens and service providers.

While these aspects are covered in one or the other form, these aspects require more clarity and detail either through follow-up proclamations or sub-decrees.

MPWT, in collaboration with JICA, has developed a comprehensive law on wastewater (“sewerage”) covering the development, construction, repair, and maintenance of sewer and non-sewered wastewater management systems. The legislation has been adopted in December 2024 as this document was finalized. Implementation of law would require adjustments in the institutional, financing and management practices at national and local authority level. There would also be a need to follow up this law with sub-decrees and proclamations to support the enforcement and implementation of this law.

Table 3 : Detail existing elements of the legal framework regarding the urban wastewater sector.

Type and Number	Title	Aspects Pertaining to urban Wastewater	Published by and year
Code			
Royal Code	Environment and Natural Resources Code of Cambodia	License for discharging wastewater to surface/ groundwater and public sewer	MOE, 2023
Official Law			
	Environmental Protection and Natural Resources Management	Prevention, reduction and control of water pollution shall be determined by sub-decree following proposal of MOE	MOE, 1996
	Water Resource Management	Licenses for discharge of polluting substances	MOWRAM, 2007
	Administration of the Capital, Provinces, Municipalities, Districts, and Khans or Called Organic Law	Improvement of efficiency of service delivery at the sub-national level	MOI, 2008
	Public Private Partnership	Allow private sector investment in urban wastewater infrastructure	MEF, 2021
	Sewerage Law	Management of wastewater infrastructure	MPWT, 2024
Sub-decree			
86	Construction permit	Included sanitary facilities as one of the conditions for issuance of a building permit	MLMUPC, 1997
27	Water Pollution Control	Aimed to prevent water pollution in Cambodia by controlling and monitoring wastewater discharge from all sources including domestic and industrial sources	MOE, 1999
148	Establishment and Management of Special Economic Zone	Control the wastewater discharge to the environment	CDC, 2005
235	The Management of Drainage System and Wastewater Treatment System	Management and operation of urban wastewater infrastructures	MPWT, MOI, and MOE, 2017
182	Functions and Structure of Municipal Administration	The management structure of municipality-level	NCDD, 2019

Type and Number	Title	Aspects Pertaining to urban Wastewater	Published by and year
Sub-decree			
183	Functions and Structure of Khan Administration of Phnom Penh	The management structure of Khan-level	NCDD, 2019
184	Functions and Structure of District Administration	The management structure of district-level	NCDD, 2019
224 ⁴	Construction Permits	Regulation on septic tank installation	MLMUPC, 2020
103 ⁵	The amendment of Article 4, Article 9, Article 11, Article 12, Article 17, and Table of Annex 2, Annex 3, Annex 4, and Annex 5 of Sub-Decree No. 27	Regulation standard of effluent quality	MOE, 2021
Prakas			
1428	Modification of Lists of Public Services Fees	Public fee for permission letter on fecal sludge investment from septic tank and treatment	MEF and MOE, 2014
Agreement Letter			
11219 MEF.EFPC	Equal Permission for combining wastewater bills with water bills in Cambodia	The application of the principle to combine the bill of water supply and wastewater	MEF, 2022
Proclamation no. 014	The management of the service delivery of fecal sludge emptying and transportation in Phnom Penh	All emptying and transportation operators in Phnom Penh must obtain a license to provide their services	PPCA, 2023

Note: Ministry of Public Works and Transport (MPWT), Ministry of Environment (MOE), Ministry of Interior (MOI), Ministry of Economy and Finance (MEF), Ministry of Land Management, Urban Planning and Construction (MLMUPC), Ministry of Water Resource Meteorology (MOWRAM), and the Council for Development of Cambodia (CDC), and National Committee for Sub-National Democratic Department (NCDD), Phnom Penh City Administration (PPCA).

4 Sub-Decree No. 224 replaces and repeals Sub-Decree No. 86 on Construction Permit dated 19 December 1997.

5 The amendment of Article 4, Article 9, Article 11, Article 12, Article 17, and Table of Annex 2, Annex 3, Annex 4, and Annex 5 of Sub-Decree No. 27 published in 1999.

Another key regulatory measure discussed is a uniform tariff for water and wastewater services in Cambodia between MEF, MPWT, and MISTI. This sub-decree has been drafted and is currently being discussed.

There also seems to be a legal/regulatory gap towards the right to access wastewater/sanitation services in Cambodia. Constitution of Cambodia mentions right of the people to access public and social welfare, under Article 48, to improve their standard of living, education, and health. Right to access safely managed wastewater service is not specified and implied under right to health.

Table 3 also outlines the responsibilities of line ministries in the urban wastewater sector. Following analysis, some ministries must conduct a comprehensive review and update of their respective areas of responsibility to ensure that the legal framework thoroughly covers all urban wastewater value chains. Sub-decree 235, jointly released by the MPWT, MOI, and MOE, broadly covers sewerage and wastewater treatment systems, but an official Prakas of the classification of these systems is still lacking, and insufficient attention is given to FSM. The legal framework also encompasses urban wastewater service, and the MEF has agreed to include the wastewater service fees in water bills upon MPWT's request in 2022. However, the MPWT has not yet released any supporting documents to implement this strategy. Additionally, there is still no official agreement or Prakas between the MPWT and MISTI on this approach. As a result, this strategy is currently only implemented in Phnom Penh and Battambang S, where the income generated is insufficient to cover the O&M costs⁶. The implementation of the PPP law is also limited in this sector⁷, as only one official Prakas regarding public fees for permits on fecal sludge investment was published by MOE and MEF in 2014. Other components, such as the fee for permit or license for business operation and investment conditions, have not yet been published by relevant ministries. However, PPCA has recently proclaimed that all private operators must have a license to provide emptying and transportation services within Phnom Penh.

4. INSTITUTIONAL FRAMEWORK

At a national level, various ministries regulate the infrastructure and services of wastewater. The decisions on infrastructure, nature of services, role of the local authority, funding, tariffs and operating framework are decisions made by the various ministries coordinating the development of systems. Once the systems are developed, the assets are handed over to the provinces / city authorities.

This would be evident from Table 4, where ministries have proclamations and sub-decrees about their institutional mandates. At a national level, MEF, MOE, MOI, and MPWT are key ministries. In addition to these, MISTI is also involved due to the close links between the water and sanitation sectors. MOH is also a stakeholder and looks at urban sanitation from a health perspective. Other line ministries with lesser roles in the sector include the following:

6 World Bank report in 2022 on Task 1- Final report on options and recommendations for the decision makers and key stakeholders. Development of National Regulation on Tariff Setting for Urban Wastewater Service in Cambodia.

7 Development of National Regulation of Tariff Setting for Urban Sanitation Service in Cambodia. There are four tests: Task 1: Final report on options and recommendation for decision-makers and stakeholders, Task 2: Guideline on tariff model, Task 3: Apply the newly developed regulation and tariff calculation model to Siem Reap City, and Task 4: Phasing-in an urban sanitation tariff across the country.

Table 4 :Roles and responsibilities of ministries involved in urban wastewater management

Key Ministries Roles	Roles and responsibilities in urban wastewater
MPWT	Prepares policies, regulations, strategies, and development plans for managing sewerage networks, sewage sludge disposal sites, and sewage treatment plant; coordinate with other relevant stakeholders in investment for sewerage network and sewage treatment plant construction.
MOE	Sets standards, monitoring and regulating the permissible limit for effluent standards before discharging into public water bodies.
MOI	Facilitates and supports sub-national planning and project delivery mechanisms which include improvement in access to basic sanitation.
MEF	Coordinates and manages the use of donor allocations (loans and grants), and government resources based on the request from line ministries.
MOH	Ensure adequate sanitation facilities in health care centers
MISTI	The main responsibility is the provision of adequate potable water to urban populations. However, there is a close link between the water and sanitation sectors.
MLMUPC	It is important to ensure that all buildings, from single households to large-scale constructions, comply with the sanitary facility requirements as indicated in Sub-decree #86 of 1997.
MoEYS	Promote school sanitation and hygiene in the whole country.

Note: Ministry of Land Management, Urban Planning and Construction (MLMUPC), Ministry of Education, Youths and Sports (MoEYS)

Sub-Decree 235 outlines the hierarchy of institutions responsible for urban wastewater service provision, outlining the roles and responsibilities of capital/provincial administration, municipal and districts/Khans administration in providing services to the users. The two relevant provincial departments namely DPWT and DOE in cooperation with relevant specialized units shall play their roles as representatives of the capital/provincial, municipal, and district/Khan administrative on the management of drainage and wastewater treatment systems (Table 5). Following regulation, these service providers can delegate duties to the commune administration or private sectors within their jurisdiction. To ensure the effective operation and management of urban wastewater services, the MOI has introduced Sub-decrees 182, 183, and 184, published in 2019, requiring all service providers to establish a dedicated wastewater office. In addition, to streamline the collection of wastewater service fees, the water supply authority will collect the fees by including this in water bills. Table 6 summarizes the key roles of wastewater agencies at both national and sub-national levels in different service delivery components.

Table 5 : Roles and responsibilities of sub-national government in urban wastewater management

Sub-national entity	Roles and responsibilities in urban wastewater	Enforced / Implementation (Fully (F) / Partly (P) / Not implemented (N))
Capital/provincial administration	Facilitate the monitoring and evaluation of the management of drainage and wastewater treatment systems, and mobilize funds from all sources to develop drainage and wastewater treatment systems in towns and districts.	N M&E undertaken jointly with Central ministries. Funding coordinated mostly by MEF.
Municipal and district/ Khan administrations	Carry out construction, reparation, rehabilitation, and O & M of the drainage and wastewater treatment system, approve requests on the drainage and wastewater connection, and carry out the fee collection of the services.	P Development undertaken by MPWT, O&M by local authority but with significant support from Province / Central agencies
Provincial department of public works and transport	Review and provide recommendations on the request for drainage connection, drainage, and wastewater treatment system services	Y
Provincial Department of Environment	Review and provide recommendations on the request for wastewater discharge into public drainage or water areas.	Y

Note: Provincial Department of Public Works and Transport (DPWT), Provincial Department of Environment (DOE)

Urban wastewater service structure appears robust; however, its implementation at the sub-national level could be more effective. Most cities' O&M wastewater facilities are managed by the Sewerage and Wastewater Treatment Plant Unit (SWTPU) an office within the Provincial Departments of Public Works and Transport (DPWT) rather than municipalities, districts, and Khans (Figure 1). In Phnom Penh and Battambang, the collection of service fees has been integrated with water bills while in Siem Reap and Sihanoukville, SWTPU collects service fees separately¹⁰. The rest of the cities have yet to adopt wastewater fees. In the case of fecal sludge management, individuals or private entities are often reported to operate the emptying services without any permit or license, except in Phnom Penh.

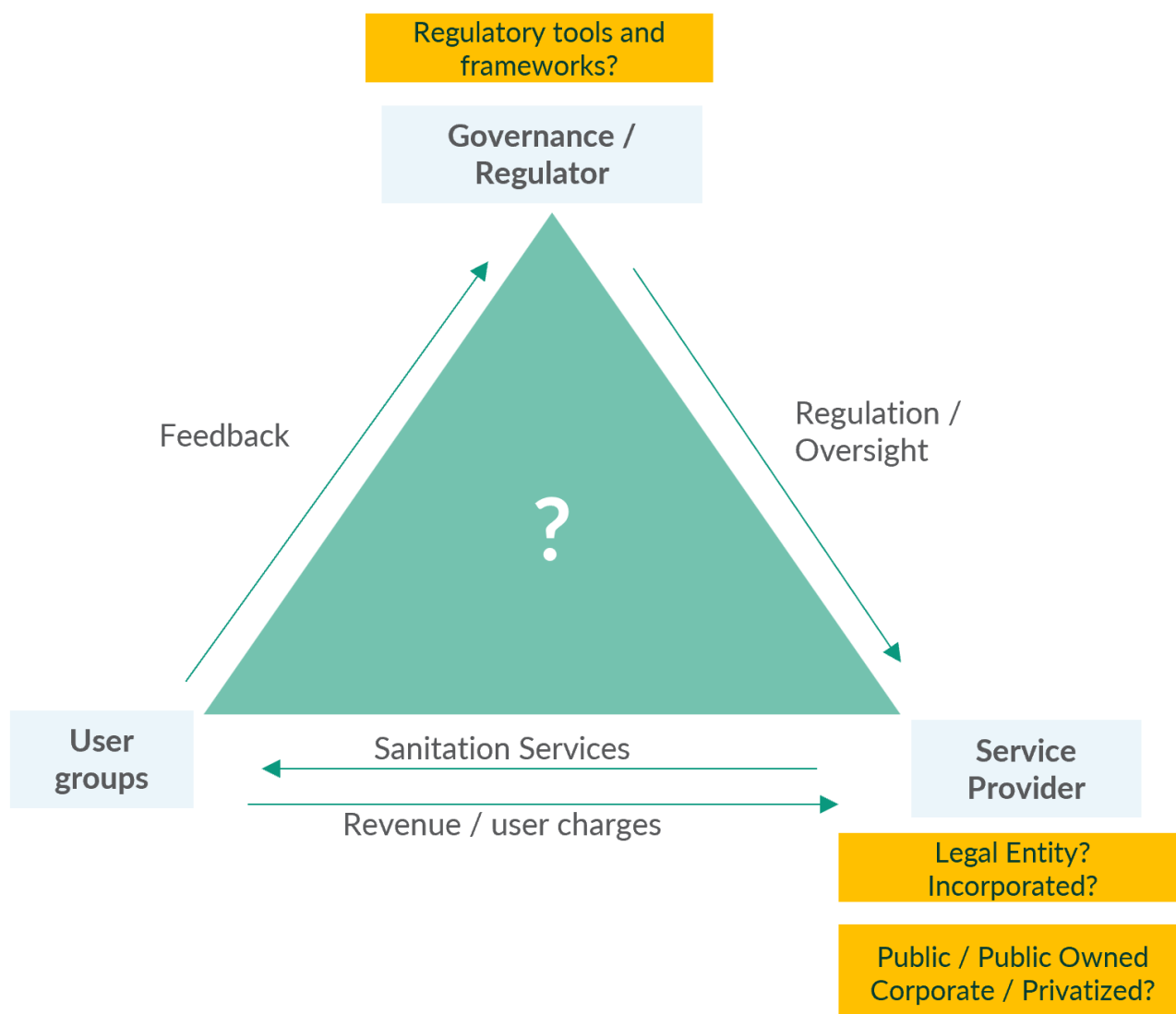


Figure 1 : The legal roles and practices of local government in managing urban wastewater. The roles and practices may differ from each other, indicated by the dash arrows. In Phnom Penh, the management and coordination of fecal sludge are under the responsibility of PPCA. On the other hand, DPWT plays a significant role in fecal sludge management in Siem Reap. Private sector charges directly to households/users for only fecal sludge emptying and transportation service provision.

Table 6 : Responsibility of line ministries, provincial, and local government regarding urban wastewater management and service.

Functions / Roles	National Government			Provincial / Local Government		
	MPWT	MOE	MOI	Capital / Provincial Level	Municipality/ Khan/District	Private Sector
Overall Sector Coordination / Planning	Yes	No	No	No	No	No
Infrastructure Development	Yes	No	No	Yes	No	No
Law and Regulations	Yes	Yes	Yes	Yes	No	No
Performance Monitoring	Yes	Yes	No	Yes	Yes	No
Environmental Monitoring	No	Yes	No	No	No	No
Service Provision - Sanitation Service	No	No	No	No	Yes	Yes
Fecal Sludge Management	No	No	No	No	No	No
O&M of Sanitation Infrastructure	No	No	No	No	Yes	Yes
User Charges	No	No	No	No	Yes	Yes

Sub-decree 235 has shifted the responsibility for the provision, operation, and maintenance (O&M) of wastewater infrastructure to the municipality, Khan, or District administration. However, it has become evident that these local bodies lack the necessary human resources to effectively manage these tasks. In contrast, the Department of Public Works and Transport (DPWT) possesses both the requisite resources and expertise, having been deeply involved in this sector since its inception.

As outlined in agreement 11219 MEF, the wastewater service fee are being proposed to be combined with the water bill. It will be essential to review the sub-decree 235 and update the roles and responsibilities of institutions in service provision and management of service fee. Despite having an established organizational structure and ongoing development of incorporation/registration policy, an institutional framework that outlines a tentative model for service delivery has yet to be included. This gap in the framework requires immediate attention to ensure effective and efficient service delivery (Figure 2).

In addition to the gaps highlighted earlier, it is pertinent for local-level authorities to focus on other areas that may impact the sustainable functioning of wastewater services and the coverage of Fecal Sludge Management (FSM). These areas may include:

1. Regulatory body/boards
2. Independent auditor
3. Service contracts/Performance obligations
4. Enforcement tools & guidelines
5. Recourse mechanisms

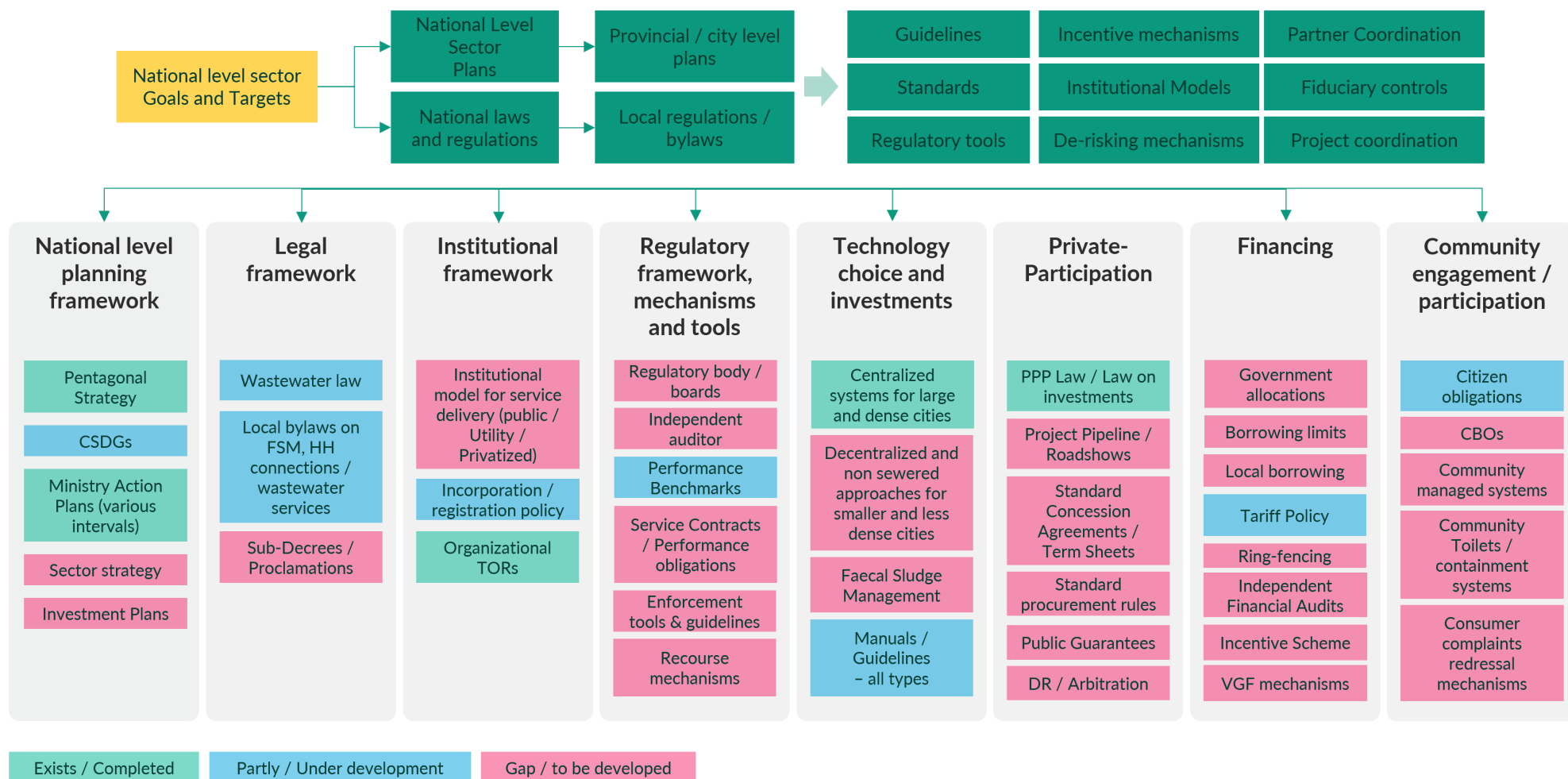


Figure 2: Flow diagram showing necessary component needs for institutional frameworks.

SECTION 3

WASTEWATER INFRASTRUCTURE

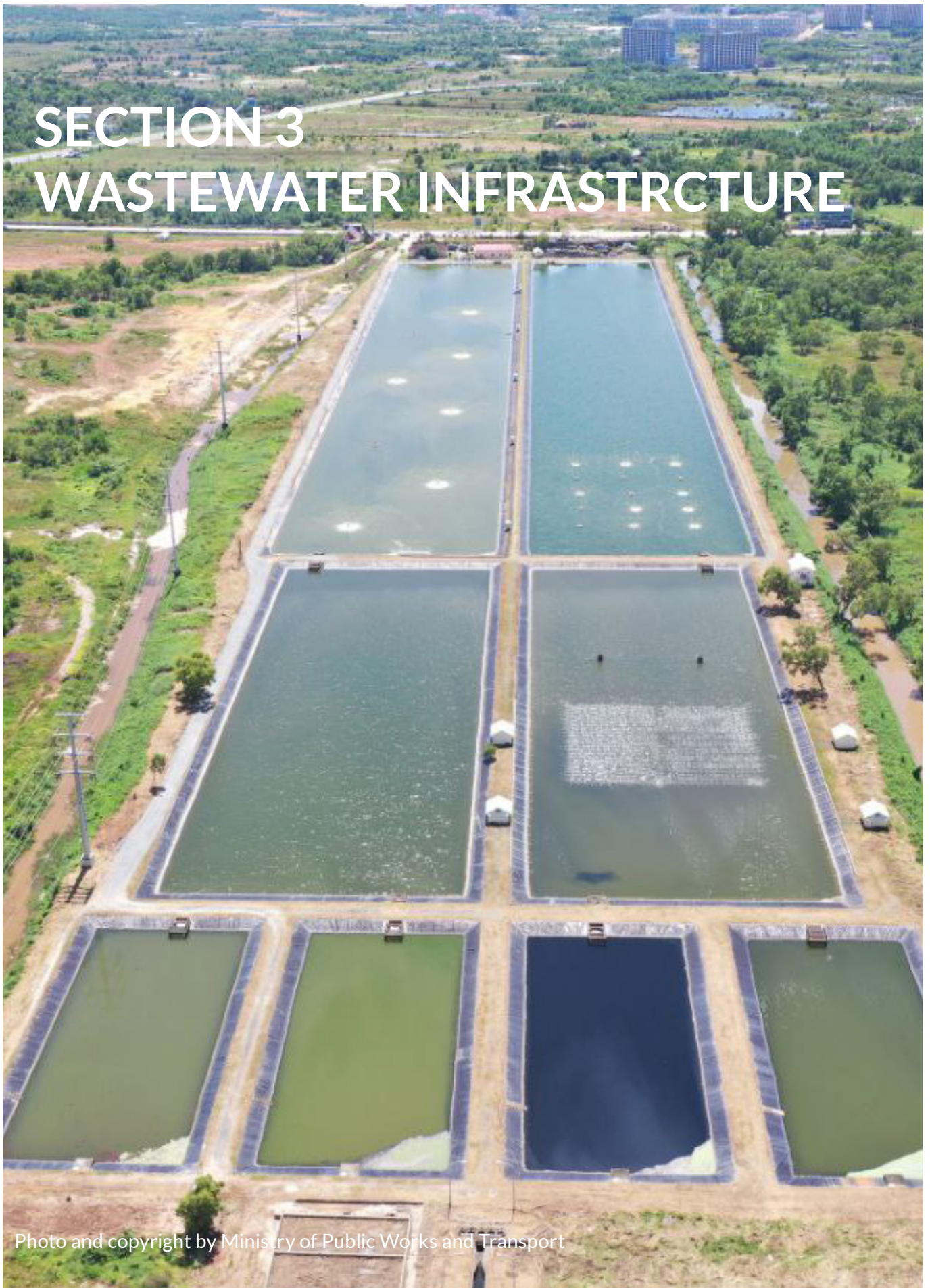


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5. SEWERAGE NETWORKS AND CENTRALIZED SYSTEMS

Urban wastewater facilities in Cambodia have seen significant improvements in recent years. Currently, 13 cities have either installed centralized wastewater systems or are in the process of doing so⁸.

To assess the urban wastewater situation in Cambodia, a comprehensive evaluation of wastewater infrastructure was conducted in 9 cities in Cambodia. The information and data regarding urban wastewater infrastructure and services have been developed based on a review of secondary studies, discussions and interviews with development partners, officials of the Ministry of Public Works and Transport, site visits, and discussions with key local authorities. Most cities in Cambodia still rely on combined sewer systems (CSS), except Siem Reap, Sihanoukville, and Stung Saen. Battambang, which currently relies on CSS, plans to transition to a separate sewer system (SSS) once the ADB project (with co-financing by AFD and EU) is completed. In Sihanoukville, the collected wastewater still discharges into a surface water source before being transported to wastewater treatment plants.

Table 7 shows that the sewer coverage in targeted cities in 2023 is estimated to range from 4% to 63%. The government aims to increase coverage from 12% to 90% by 2030. However, it should be noted that the estimates on the percentage of sewer coverage in each city varies from actual households connected as the estimation also includes the floating population and tourists. The estimates lack data on the number of household connections in the cities making it difficult to do a comparison.

Table 7 : Sewerage systems and coverage in Cambodia.

City	Population Projection in 2023 ⁹	Population Projection in 2030 ¹⁰	Sewer Coverage (% Population)		Type of Sewer System	Funding Agency	Ref.
			Sewer Coverage in 2023	Planned Sewer Coverage in 2023			
Phnom Penh	2,507,803	2,748,953	38.0	NA	CSS	JICA	AMIF, 2022 ¹¹

⁸ The presentation on developing wastewater treatment plants in Cambodia by the General Department of Sewerage and Wastewater Management (GDSWM), Ministry of Public Works and Transport (MPWT), in 2022.

⁹ Urban Population in targeted cities except Phnom Penh, Poipet, and Sihanoukville is obtained from the urban population report from City Halls. Population in Phnom Penh in 2023 is obtained from the Main Report of Phnom Penh Citywide Inclusive Sanitation Master Plan, which is currently published in 2023. The population of Poipet and Sihanoukville in 2023 is predicted based on the population data from the National Report on General Population Census of the Kingdom of Cambodia 2019 and the growth rate from Commune Data-based (NDB) 2019.

¹⁰ Projection population of each city in 2030 is calculated based on population data in 2023 and the growth rate from Commune Data-based (NDB) 2019. Except for Phnom Penh, the Projected population in 2030 is obtained from the Main Report of Phnom Penh Citywide Inclusive Sanitation Master Plan.

¹¹ AMIF, in collaboration with PPCA and GRET, published the Fecal Sludge Management Strategy 2035 for Phnom Penh Capital in 2022. The report also includes current data on sewer coverage percentage.

City	Population Projection in 2023 ⁹	Population Projection in 2030 ¹⁰	Sewer Coverage (% Population)		Type of Sewer System	Funding Agency	Ref.
			Sewer Coverage in 2023	Planned Sewer Coverage in 2023			
Siem Reap	303,333	327,612	41.0	40.0	SSS	ADB, AFD, WB, EDCF, and NB*	DSTR ¹²
Battambang	158,750	155,451	21.0	90.0	CSS & SSS	NB* and ADB	ADB, 2019 ¹³
Poipet	128,520	149,918	4.0	75.0	CSS	ADB	ADB, 2022 ¹⁴
Sihanoukville	90,138	111,982	52.0	52.0	SSS	ADB	DSTR and ADB, 2017 ¹⁵
Pursat	65,479	67,811	5.0	27.0	CSS	ADB and PB**	ADB, 2015 ¹⁶
Strung Saen	59,933	62,943	15.0	34.0	SSS	ADB	ADB, 2019 ¹⁷
Bavet	56,276	59,517	7.0	75.0	CSS	ADB	ADB, 2021 ¹⁸
Kampot	36,890	37,149	12.0	12.0	CSS	ADB	ADB, 2022 ¹⁹

¹² The current sewer network coverage in 2023 and 2030 is based on the data obtained from the Department of Sewerage Technique and Research, General Department of Sewerage and Wastewater Management, Ministry of Public Works and Transport, Cambodia.

¹³ Battambang Wastewater Subproject: Detail Engineering Design. Second Intergradation Urban Environmental Management in the Tonle Sap Basin Project, Asian Development Bank (ADB), 2019.

¹⁴ Feasibility Study for Livable Cities Investment Project in Poipet, Cambodia: Wastewater Management. Regional: Southeast Asia Urban Facility, Asian Development Bank (ADB), 2022

¹⁵ Coverage of the sewer network at Shihanoukville is based on Report on Wastewater Subproject under Cambodia: Provincial Water Supply and Sanitation Project, Asian Development Bank (ADB), 2017, and discussion with the Department of Sewerage Technique and Research, General Department of Sewerage and Wastewater Management, Ministry of Public Works and Transport, Cambodia.

¹⁶ Sewer coverage of Pursat City is estimated based on Technical Feasibility for Pursat Drainage and Embankment under Integrated Urban Environmental Management in the Tonle Sap Basin Project (RRP CAM 42285) by ADB in 2015

¹⁷ Stueng Saen Wastewater Subproject: Detail Engineering Design. Second Intergradation Urban Environmental Management in the Tonle Sap Basin Project, Asian Development Bank (ADB), 2019.

¹⁸ Cambodia: Livable Cities Investment Project Bavet. Asian Development Bank (ADB), 2021.

¹⁹ Kompot Wastewater Collection and Treatment, and Drainage and Sewerage, Cambodia: Second Greater Mekong Subregion Corridor Towns Development Project. Asian Development Bank (ADB), 2022.

Noted: * National budget from the Royal Government of Cambodia (RGC), ** Provincial budget (PB), Combined sewer system (CSS), Separated sewer system (SSS), and Department of Sewerage Technique and Research (DSTR).

According to Table 8, most cities in Cambodia use lagoon-based systems for wastewater treatment, except for Phnom Penh and Sihanoukville, which use a Pre-trickling Filter (PTF) and the membrane aerated biofilm reactor (MABR) in addition to lagoon-based systems. A recent investigation revealed that, the treatment plants are under construction in four cities in Cambodia - Battambang, Pursat, Bavet, and Poipet. Battambang City currently had one WWTP constructed by SAWA in 1993 with a capacity of 450 m³/day²⁰, but it is temporarily out of service due to rehabilitation work on the old pumping station, carried out by the ADB project. For Pursat, Bavet, and Poipet cities, WWTPs are under construction and will be completed by 2025. Thus, after the construction of WWTPs in those cities is complete, the wastewater treatment coverage by 2030 is estimated to range from 20% to 58%. The current wastewater treatment coverage of other cities is 27-73%, except for Phnom Penh, which was estimated at 0.6% equal to a capacity treatment of 5,000 m³/day. The wastewater coverage is expected to increase from 18.3% to 100% by 2030. However, some cities have proposed plans to increase WWTP coverage by 2030, and it is expected that no tentative strategy development plan for urban wastewater will lead to this indicator falling below the CSDG target of 45% by 2030. Noted: *National budget from the Royal Government of Cambodia (RGC), PTF pre-trickling filter, TF trickling filter, MABR membrane aerated biofilm reactor, LS lagoon system, and DSTR Department of Sewerage Technique and Research.

²⁰ Feasibility study of Battambang wastewater treatment developed by ADB in 2012 under Cambodia: GMS corridor towns development project.

Table 8 : Existing and proposed sewage treatment capacities in selected cities in Cambodia.

City	Population in 2023	Population Projection in 2030	Treatment Capacity (m ³ / day)		Coverage (% Population)		Type of WWTP	Fund	Ref.
			2023	2030	2023	2030			
Phnom Penh	2,507,803	2,748,953	5,000	80,489	2.0	18.3	PTF	JICA	ADB, 2023 ²²
Siem Reap	303,333	327,612	12,500	25,000	32.0	40.0	LS	ADB and EDCF	GRET, 2024 ²³
Battambang	158,750	155,451	450	14,500	19.0	58.0	LS & TF	SAWA and ADB (AFD)	ADB, 2019 ¹⁶
Poipet	128,520	149,918	0.0	9,500	56.0	56.0	LS	ADB	ADB, 2022 ¹⁷
Sihanoukville	90,138	111,982	42,400	62,400	25.0	73.0	LS and MABR	ADB & NB*	DSTR & ADB, 2017 ¹⁸
Pursat	65,479	67,811	2,100	2,100	20.0	19.0	LS	ADB	ADB, 2015 ¹⁹
Strung Saen	59,933	62,943	2,613	2,870	27.0	27.0	LS	ADB	ADB, 2015 ²⁰
Bavet	56,276	59,517	0.0	3,930	0.0	41.0	LS	ADB	ADB, 2021 ²¹
Kampot	36,890	37,149	3,300	3,300	70.0	70.0	LS	ADB	ADB, 2022 ²²

Noted: *National budget from the Royal Government of Cambodia (RGC), PTF pre-trickling filter, TF trickling filter, MABR membrane aerated biofilm reactor, LS lagoon system, and DSTR Department of Sewerage Technique and Research.

21 Based on JICA (2019), a total treatment capacity of 282,000 m³/day is included in the long-term master plan for Phnom Penh.

22 Estimations of wastewater coverage in 2023 and 2030 are based on the Main Report of Phnom Penh Citywide Inclusive Sanitation Master Plan, which was published by ADB in 2023.

23 WWTP coverage in Siem Reap City is obtained from the Report of Fecal Sludge Management in Siem Reap, which was conducted by WB cooperating with GRET in 2022.

The RGC with MPWT as the leading institution in this sector, has planned to expand urban wastewater coverage in various cities across Cambodia. Despite progress in improving urban sanitation in Cambodia, there is still a major concern regarding the lack of clarity on the institutional model for service delivery within the legal framework. Sub-decree 235 has clarified the structure of service provision, the O&M of urban wastewater still falls under the responsibility of DPWT in practice, except Phnom Penh. The O&M of fecal sludge treatment plant in Phnom Penh is in charged by city administration. Additionally, the agreed-upon price for wastewater fees in the water bill has not been determined yet, despite an agreement with MEF in 2022. As a result, the wastewater service provision in cities across Cambodia is found inadequate, only four cities have been able to implement wastewater tariffs, and even then, they are applied with different methodologies. Moreover, these models can only cover some expenses related to O&M processes. This variation is also observed in the tariff collection approaches. Along with a standardized methodology for calculating and levying tariffs, there is a lack of regulation on tariffs through tariff reviews, making it unclear if the tariffs are full cost recovery or only cover part of the operations.

In Phnom Penh and Battambang, the O&M of wastewater falls under the responsibility of DPWT and the fee for wastewater has been combined with the water bill. This amounts to approximately 10% in Phnom Penh and 6.67% in Battambang. When collected, the water supply authority and city or provincial government each retain a portion of the fee for collection, public lighting, and garden maintenance costs. In total, they keep 20% and 30% respectively. This means that only 50% of the net income goes to the sewerage and wastewater systems, which is only sufficient for minor O&M works.

The SWTPU collects fees in Siem Reap and Sihanoukville followed by Prakas 293, which outlines various wastewater fees based on the type of household or building. The revenue generated from these fees was estimated to be around KHR268-434²⁴ million and KHR800-850 million per year in Siem Reap and Sihanoukville, respectively. However, this income is estimated to be four or five times lower than the actual demand budget required for appropriate O&M expenses.

However, a study by JICA in Phnom Penh proposed a 75% increase in water bills, which is expected to cover only 30% of the city wastewater generated by the city, excluding FSTP and treatment systems outside the city center. In Stueng Saen City, the ADB²⁵ has offered two options for tariffs: differentiated and unified. Under the differentiated tariff, households without a connection would be charged KHR290/m³, while those with a connection would be charged KHR 635-770/m³. The unified tariff proposes setting KHR470/m³ for all households or buildings. Nonetheless, discussions with provincial governments are being conducted to determine an appropriate model for the city's socio-economic conditions.

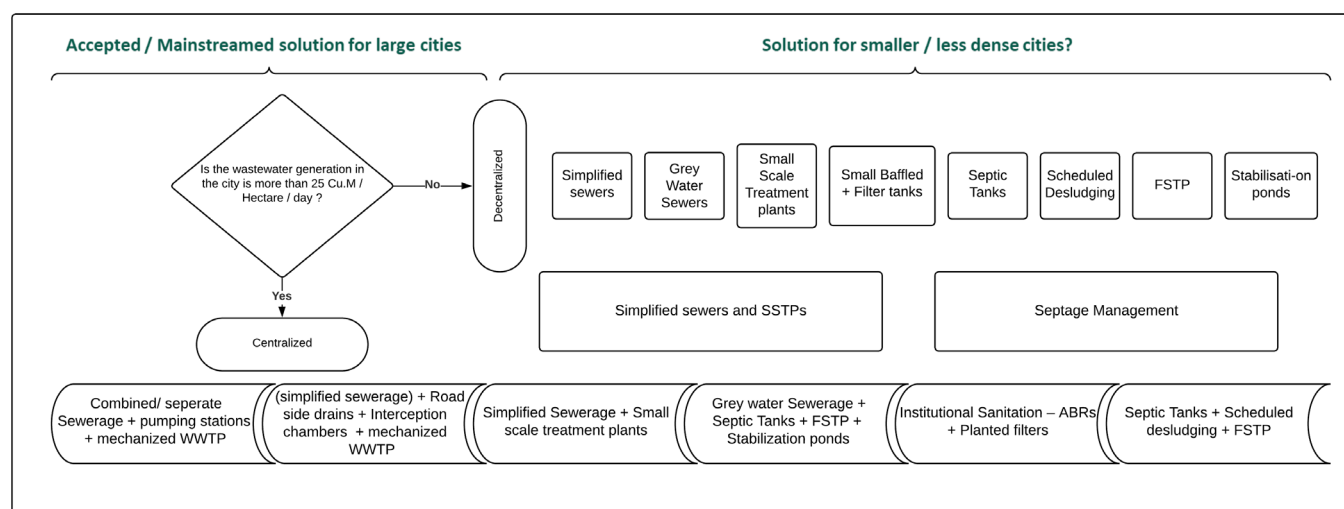
24 The annual report of income from wastewater service in Siem Reap from 2019 to 2022, Sewerage and Wastewater Treatment Office, Department of Public Works and Transport in Siem Reap.

25 Wastewater management in Stueng Saen-10-year cost project, Second Urban Environment Management in the Tonle Sap Basin Project. Asian Development Bank (ADB).

6. DECENTRALIZED WASTEWATER TREATMENT SYSTEMS

Decentralized wastewater treatment systems (DEWATS), as the name suggests, typically consist of multiple small-scale, localized “systems” of collecting and treating wastewater. Usually, it has a small-scale sewerage network and a simplified treatment system. This system is commonly recognized as cost-effective and is typically employed in small communities or sparsely populated urban areas where sewerage networks are absent. This system typically requires more land and has some limitations in treating chemical pollutants as compared to centralized filter-based wastewater treatment systems. However, these systems are significantly less expensive and less complicated to operate and maintain. These characteristics make them appropriate for adoption in areas where there is limited institutional capacity and government is reluctant to levy a full cost recovery tariff. In the case of Cambodia, these systems become appropriate for smaller towns, cities and other areas with lesser density.

Over the past decade, Cambodia has implemented several small scale / institutional DEWATS systems to address wastewater treatment. According to data from the Bremen Overseas Research and Development Association (BORDA), a total of 232 DEWATS projects have been carried out in various locations in Cambodia, serving individual communities, hospitals, schools, and small to medium enterprises (SMEs) (as shown in Table 9). The treatment capacity of these projects has varied from 1 m³/day to 115 m³/day, with a service area that covers a population of fewer than 1500 habitats.



Notably, according to the recorded data from BORDA, small communities and low-density cities in Cambodia still have no access to DEWATS systems. The responsible entity, MPWT, has established national guidelines for centralized systems that primarily cater to large and dense cities. However, there seems to be a lack of emphasis on developing decentralized and non-sewered approaches that are more suitable for smaller and less dense cities. This may be a potential reason for the lack of installation of DEWATS systems in these areas.

Table 9 : Existing DEWATS within various communities.

Type of Areas	Number of Projects	Treatment Capacity (m ³ /day)
Community	3	6-100
Hospital	3	8-40
School	224	1-12.4
SME	2	15-115

Note: SME refers to small and medium enterprises

7. FECAL SLUDGE MANAGEMENT

In Cambodia, septic tanks and pit latrines are the predominant methods for managing wastewater in cities with limited sewerage networks. No specific records or documents from the government measuring the change of this onsite sanitation in cities exist. Based on the data collected from nine cities and presented in [Table 10](#), the number of septic tanks is still relatively low compared to other containment options. However, the prevalence of open defecation in cities is still detected, ranging only from 1% to 3%. In comparison to previous records, the Cambodia Socio-Economic Survey²⁶ in 2021 indicates that 88% of the total population in Cambodia has access to improved wastewater facilities, up from only 34% in 2009. According to the JMP database, basic wastewater services cover 48.4% of urban areas, with 44.7% being safely managed and 6.9% being limited. Additionally, the coverage of septic tanks in urban areas is 54.7%, while sewer coverage is 45.3%. Inconsistencies have been observed in the coverage of open defecation data obtained from site investigations compared to the JMP8 database, indicating that cities have eradicated open defecation. Since no specific national database records such information, further discussions with relevant stakeholders are being considered to rectify these discrepancies.

²⁶ Report of Cambodia Socio-Economic Survey 2021. National Institute of Statistics, Ministry of Planning. Phnom Penh, December 2022.

Table 10 : The current wastewater of on-site sanitation facilities in 9 cities of Cambodia²⁷.

City	Population in 2023	Population Projection in 2023	Percentage Coverage (%)		
			Septic Tank	Other Containment	Open Defecation
Phnom Penh	2,507,803	2,748,953	32	50	1
Siem Reap	303,333	327,612	30	70	3
Battambang	158,750	155,451	1	89	1
Poipet	128,520	149,918	NA	94	2
Sihanoukville	90,138	111,982	34.7	NA	NA
Pursat	65,479	67,811	NA	NA	NA
Strung Saen	59,933	62,943	10	90	1
Bavet	56,276	59,517	NA	3	2
Kampot	36,890	37,149	NA	92	2

Septic tanks and other containment facilities in urban areas result in a substantial generation of fecal sludge which requires proper management. However, there is a misconception that onsite sanitation is simpler than the centralized system, resulting in the absence of clear guideline on fecal sludge management. For instance, private entities or individuals, known as Emptying and Transport Operators (ETOs), are responsible for emptying fecal sludge (FS) from households or buildings informally. But as institutional roles and responsibilities in the sector are ambiguous, ETOs often don't need permits or licenses to operate, except for Phnom Penh.

Without any regulations, it is common for companies to operate using only one or two trucks with a storage capacity of 3-5 m³. However, the ETOs in Takeo and Poipet have higher storage capacities of up to 8-15m³. These trucks are usually imported from Korea or customized by local suppliers, primarily based in Phnom Penh, with a few in Siem Reap. Some modified trucks are reported to face some issues with inadequate installation technology, resulting in difficulties with emptying. Apart from offering services to HHs and buildings, Angkor Enterprise, a private company in Siem Reap, also provides a service for emptying FS from the public toilet in the Angkor temple complex and mobile toilets in the city upon specific requests from authorities. In contrast, Preah Sihanouk provincial government trucks are mainly used for public sewerage network cleaning but also provide households or building emptying services.

There is no uniform tariff or regulation for fecal sludge collection fee. Different tariff-setting rules are applied according to the ETOs in each province. Table 11 shows the variation of tariffs from one city to another. De-slugging typically occurs only when the containment is full, clogged or no longer functioning properly. Household and building owners are responsible for paying a service fee for emptying their

²⁷ All data was investigated through the site investigation of current urban sanitation in Cambodia conducted by GRET. But this report has not been published yet.

containments. The amount charged varies depending on the specific circumstances such as travel distance, amount of sludge emptied, workload and other factors. For example, pit emptiers in Phnom Penh prefer to travel within 9 km from source household and sludge disposal site to save both time and fuel costs²⁸. Therefore, they can offer a more competitive price to households. The service charge in Kampot and Stung Saen is more expensive as there is no ETO operating within these cities. The household or building owners usually call for a service from ETOs in nearby provinces or districts, leading to higher costs. In Kampot, a previous study reported that there were mechanical and manual ETOs in the city. The service charge for mechanical ETOs was 50 USD for bigger containment units (around 2m³) and 25 USD for smaller ring containment unit. However, the charge is by 5 USD increase if the travel distance is far. Similarly, the manual operator charges 12 USD per ring emptied²⁹.

Table 11 : The variation of tariff for fecal sludge emptying and transportation service across cities in Cambodia.

City	Number of Companies	Number of Trucks	Tariff	Note
Phnom Penh	25	42	30-70\$/event	-
Siem Reap	13	16	30-70\$/event	-
Battambang	20	20-25	10-15\$/truck	-
Poipet	2	6	7.5\$/cylinder	
Sihanoukville	10	12	30-40\$/truck for a private company 40\$/event for HH with sewer connection 62.5\$/time for HH without sewer connection	--
Pursat	0	0	NA	ETOs from Battambang
Strung Saen	0	1 (DPWT)	50\$/event	ETOs from Santokh and Baray Districts
Bavet	1	1	10-15\$/truck 100\$/tank for SEZ	-
Kampot	0	0	200\$/event	ETOs from Takeo

28 Eliyan, C., McConville, J.R., Zurbrugg, C., Koottatep, T., Sothea, K., Vinnerås, B., 2022a. Generation and management of fecal sludge quantities and potential for resource recovery in Phnom Penh, Cambodia. *Front. Environ. Sci.* 10.

29 Frenoux, C., Tsitsikalis, A., Corre, M. L., and Carlier, R. (2011). *Landscape Analysis and Business Model Assessment in Fecal Sludge Management: Extraction and Transportation Model-Cambodia1-Main Report*). Phnom Penh, Cambodia: GRET.

It has been noted that Sub-decree 235 and the final draft of the sewerage law do not provide clear details on fecal sludge management. However, some cities like Phnom Penh and Siem Reap have recently installed fecal sludge treatment plants (FTSP) with the support of AIMF. Despite this, inconsistent management of service systems is a significant concern due to the need for more regulations. For example, Phnom Penh's FSTP is managed by the Phnom Penh Capital Administration (PPCA), while the FSTP in Siem Reap is governed by the DPWT. Moreover, the monthly disposal service fee in Phnom Penh is USD 50 per truck, which is higher than the USD 30 per truck charged in Siem Reap (Table 12). In Preah Sihanouk, where there is no FTSP, the FS can be discharged to WWTP by paying a fee of USD 5 per truck. Other cities, such as Steung Sean, Pursat, and Battambang are also planning to adopt the same method used by Preah Sihanouk. However, there is a lack of information on how the FS is disposed of in other cities. FS has been indiscriminately disposed of on public land/drainage, rice fields, or nearby neighborhoods, which is an illegal practice. However, the provincial-level authorities cannot take action against the violators, as there are no FS-authorized disposal sites.

Table 12: Variation of tariff for fecal sludge discharge at the treatment plant/authorized disposal site in selected 9 cities of Cambodia.

City	Tariff	FSTP/authorized Disposal Site
Phnom Penh	50\$/month	FSTP @ 160m ³ /day
Siem Reap	30\$/month	FSTP @ 35m ³ /day
Battambang	No	public lands or rice fields
Poipet	No	NA
Sihanoukville	5\$/truck	Anaerobic WWTP
Pursat	No	Anaerobic lagoon (in plan)
Strung Saen	No	Anaerobic lagoon (in plan)
Bavet	No	NA
Kampot	No	Open environment/owner's field ²⁹

8. REUSE AND RECYCLING OF TREATED WASTEWATER AND FECAL SLUDGE

It is essential to establish a legal framework that facilitates the reuse and recycling of treated wastewater and fecal sludge. This approach has an economic benefits and can protect the environment and public health. Different reuse products could be recovered from fecal sludge, such as biogas through anaerobic digestion, soil amendment in crop production, building materials, protein for animal feedstock, and water for irrigation³⁰. However, to ensure safe reuse, fecal sludge needs to be properly treated to meet the guidelines of organizations like the World Health Organization (WHO)³¹ and the United States Environmental Protection Agency (USEPA)³² for using treated biosolids.

According to GRET, sludge reuse has not yet been extensively practiced in the country. Two fecal sludge treatment plants (FSTP) are located in Phnom Penh and Siem Reap, and there is currently no available data on the reuse of the treated sludge as both systems just started operation³³. While there are examples of treated sludge from FSTPs used as soil conditioner / input to fertilizers in Vientiane, for instance, such applications have not yet been found in Cambodia.

9. PUBLIC-PRIVATE PARTNERSHIPS (PPP)

Under PPP law, the private sector can invest in urban wastewater infrastructure with a minimum investment scale of 10 Million USD, while sub-decree 235 and draft sewerage law allow sub-national levels to delegate the rights of urban wastewater service provision to private companies, aside from emptying and transportation services which have been operated by private operators.

Private companies possess the legal right to invest in urban wastewater systems. However, relying solely on existing legislation may be inadequate in ensuring effective implementation. Apart from ETOs, there has yet to be private-public partnership (PPP) investment in Cambodia's urban wastewater sector. Only a few investments have been made in O&M, but it cannot be considered a PPP investment. For example, in 2008, Mr. Srey Sokkhom won a concession contract to provide wastewater services in two villages of Takeo Province. Under the contract terms, the company is responsible for the O&M of the systems and fee collection from HHs, or buildings based on the number of connections. In contrast, X-water Technology Co. Ltd was granted the authority to run the O&M of MABR systems in Sihanoukville with a one-year contract. However, the revenue generated from this service depends on the municipality's budgetary support, which is estimated at KHR4000 million per year.

Similarly, Green Profertil is operating the FSTP in Siem Reap City, even though the 10-15-year contract is still under negotiation. Despite the lack of clear guidance, this company has agreed to provide support for one year for the O&M and marketing of humus sales. Once the support period is over, the system is

30 Tayler, K. (2018). Fecal Sludge and Septage Treatment: A Guide for Low and Middle Income Countries. Practical Action: Publishing Ltd., UK.

31 WHO (2006). WHO Guidelines for the Safe Use of Wastewater, Excreta and Greywater (France)

32 USEPA (1994). A Plain English Guide to the EPA Part 503 Biosolids Rule, United States Environmental Protection Agency, Washington, DC.

33 GRET (2024). System Assessment/Technical Analysis Report: Review and Update of the National Policy for Water Supply and Sanitation. Water Supply and Sanitation Improvement Project (WASSIP).

expected to generate revenue through the sale of humus and in addition to the disposal fees of FS which contribute only 5% of the total O & M cost. Based on the analysis, the operators will be concerned with the revenue from humus sales and the contract period if there is no policy regarding financing support incentives. This is because the feasibility study conducted in 2018 revealed a low-profit estimation of 10 years from these sources.

Therefore, RGC shall consider updating investment laws by emphasizing urban wastewater infrastructure investment. PPPs encouraged and recognized in this sector shall be promoted, and exploring alternative solutions and strategies to encourage private investment in Cambodia's urban wastewater infrastructure is imperative. By doing so, additional policy measures and financial-risking strategies need to be implemented. In particular, the development of a project pipeline, standard concession agreements, standard procurement rules, public guarantees, and arbitration must be considered, as shown in [Figure 3](#). In addition, it is imperative to devise a coherent financial strategy to supplement the proposed undertaking. Even though the tariff policy is currently being formulated with the assistance of international organizations in Cambodia, several aspects warrant inclusion, such as:

1. Governmental Allocations
2. Borrowing Limits
3. Local borrowing
4. Urban wastewater ring-fencing
5. Autonomous financial audits
6. incentive schemes
7. Viability Gap Financing (VGF) mechanisms

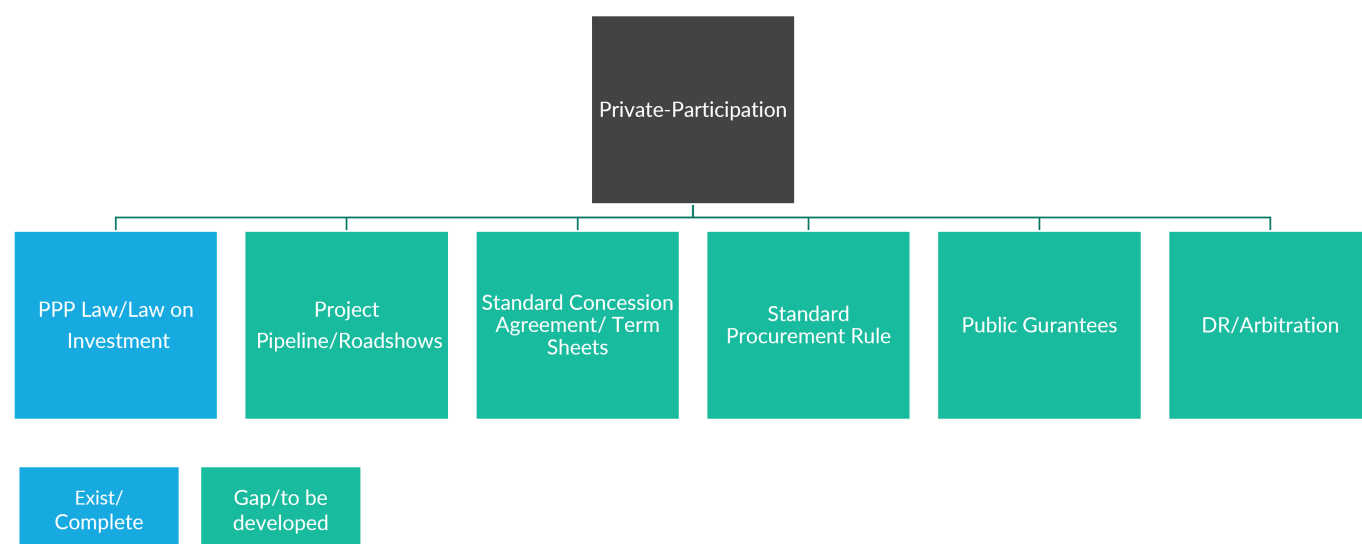


Figure 3 : Flow diagram of necessary components necessary for encouragement of private participation in the urban wastewater sector

10. CLIMATE CHANGE AND SANITATION INFRASTRUCTURE

Cambodia is considered one of the countries most vulnerable to climate change, ranking 13th out of 181 on the Climate Risk Index for its susceptibility to extreme weather events from 1996 to 2015³⁴. Emerging climate change trends indicate that the country will face more severe floods and droughts in the future, which have the potential to impact its Gross Domestic Product (GDP) significantly. It is estimated that by 2050, Cambodia's GDP could decline by 10% due to the adverse effects of climate change³⁵. The National Council for Sustainable Development reported an increase in the annual budget for repairing and maintaining roads and related infrastructure from 36 million USD in 2010 to 90 million USD in 2017. With insufficient resilient infrastructure, an ADB report published in 2021 revealed that Cambodia is also exposed to water-related diseases. In this case, diarrheal disease is a significant health risk to children in Cambodia, accounting for about 6% of all under-five deaths in the country.

As climate change continues to take its toll on urban wastewater infrastructure in Cambodia, the situation has become increasingly dire. So far, no development projects have been initiated to address this problem. In terms of mitigation, there is no activity or plan to reduce or neutralize greenhouse gas (GHG) emissions from existing WWTP or other containments. This is due to the lack of explicit indicators of resilient urban wastewater infrastructure in NDC 2020. In this case, the Pentagon Strategy Phase 1 has identified the need to develop sanitation infrastructure master plans to ensure resilience. Considering this, the existing framework must be realigned to include resilient urban wastewater infrastructure as a main indicator in the urban wastewater value chain. Several gaps in technology solutions for flood-prone areas, resilient urban wastewater, and climate resilience WASH will be addressed.

11. HUMAN RESOURCES

A low and middle-income country like Cambodia faces challenges in accelerating progress towards achieving SDGs 6 by 2030. One of the constraints is the shortage of trained professionals in the sector. There is a lack of professionals, and the sector is generally not seen as an attractive career option. Additionally, there are limited training and professional development opportunities in the sector³⁶. A study on sustainability assessment of fecal sludge treatment technologies in Cambodia revealed that stakeholders lacked background knowledge about certain treatment technologies, potentially due to the novelty of fecal sludge management in the country³⁷.

One way to speed up the progress in reaching targets 6.2 and 6.3 of SDGs 20230 is by focusing on building a strong human resources base in the sector. Collaborating with universities and integrating sanitation-related courses into their existing curriculum is an approach that can help in developing high-quality human resources in this sector. This can be achieved through knowledge exchange and collaboration initiatives³⁴. There needs a concerted effort in building capacity across both technical vocational training

34 German Watch 2016. <https://germanwatch.org/sites/germanwatch.org/files/publication/13503.pdf>

35 Department of Climate Change 2018. <http://www.camclimate.org.kh/en/policies/ncsd-news/445-445>

36 Virak et al. (Unpublished report). Bridging the gap: Building Human Resource Capacity in Cambodia for Sustainable Development in WASH. Retrieved on June 14, 2014. Paper Preparation Guidelines (wordpress.com)

37 Eliyan et al. (2023). Sustainability assessment of fecal sludge treatment technologies for resource recovery in Phnom Penh, Cambodia. Environmental Technology and Innovation 32-103384. <https://doi.org/10.1016/j.eti.2023.103384>

as well as engineering and management of wastewater systems. Areas requiring capacity development and training include:

1. Targeted exchange programs for existing local authority staff towards managing wastewater utilities and operations. These could be in countries in the global south to have a relatable experience.
2. Vocational training and certification courses for plumbers and operators in sanitation works
3. Hire and deploy skilled and trained operators to help maintain the new assets being developed in the various cities.
4. Include operations and skill transfer agreements as a part of all PPP contracts where there is some handholding of the staff on operations and asset management.

SECTION 4 CONCLUSIONS

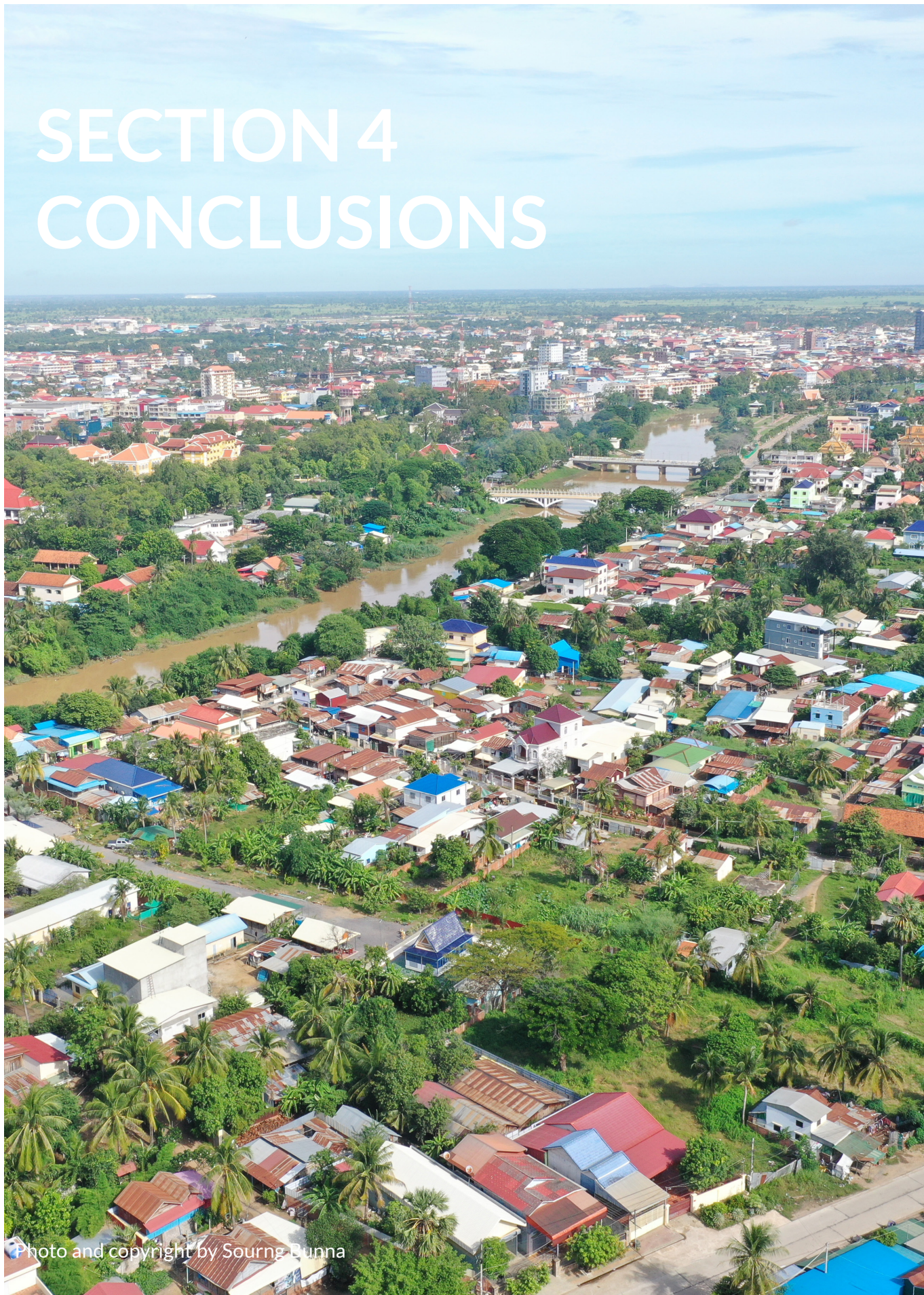


Photo and copyright by Sourng Bunna

The urban wastewater and sanitation sector in Cambodia has experienced significant advancements in recent years. A variety of initiatives have been created by multiple agencies to expedite the sector's progress towards meeting the Sustainable Development Goal 6 (SDG 6) targets. The Ministry of Public Works and Transport is taking on a crucial and central role in executing these initiatives with the objective of improving wastewater management nationwide.

Several policy frameworks aimed at environmental protection and the development of infrastructure and services have been approved and others are currently in the process of being developed. For example, there is a comprehensive law on sewerage that covers whole all aspect of wastewater management, from construction to operation and maintenance, which is at nearing its final stage of approval. However, it has been noted that there are some existing gaps in legal and regulatory frameworks. One area of concern in the right to access to wastewater and sanitation services in Cambodia, which is currently lacking adequate provisions in the existing policies.

Cambodia has been making significant progress in the installation of wastewater treatment plants, with several plants already in operation, under construction, or in the planning phase throughout the country. This shift indicates a move towards centralized wastewater management. As of now, two projects have been completed, nine are ongoing, and two are still in the planning stage. The total wastewater treatment capacity is anticipated to reach 124,000 m³/day, marking a crucial investment in achieving Cambodia's target of treating 45% of urban wastewater by 2030.

The implementation of the new wastewater treatment system requires increased effort in operation and maintenance by local governments. This effort includes budget allocation for system operation and maintenance, as well as the need for skilled personnel for routine operations. In the medium term, the cities would also need to look at capital replacement / re-investments in the infrastructure and would need to plan from the very beginning of the operations. Some local governments may need to augment their current assets and revenue bases to ensure consistent service provision, posing notable administrative challenges given their existing operational scale.

In spite of advancements in the installation of centralized wastewater treatment plants, there has been a lack of focus on the management of fecal sludge, even though the majority of residents rely on onsite sanitation. This underscores the crucial need for proper fecal sludge management. At present, only two fecal sludge treatment facilities exist in the entire country, located in Phnom Penh and Siem Reap. These facilities have recently begun operations, and initiatives are underway in both cities to establish the necessary permits for emptying and transportation operators. Consequently, there is a clear imperative for a more comprehensive approach to fecal sludge management, and the implementation of suitable systems across the entire nation is necessary of implementation significantly, providing a solid foundation for the law's success.

SECTION 5 ANNEX

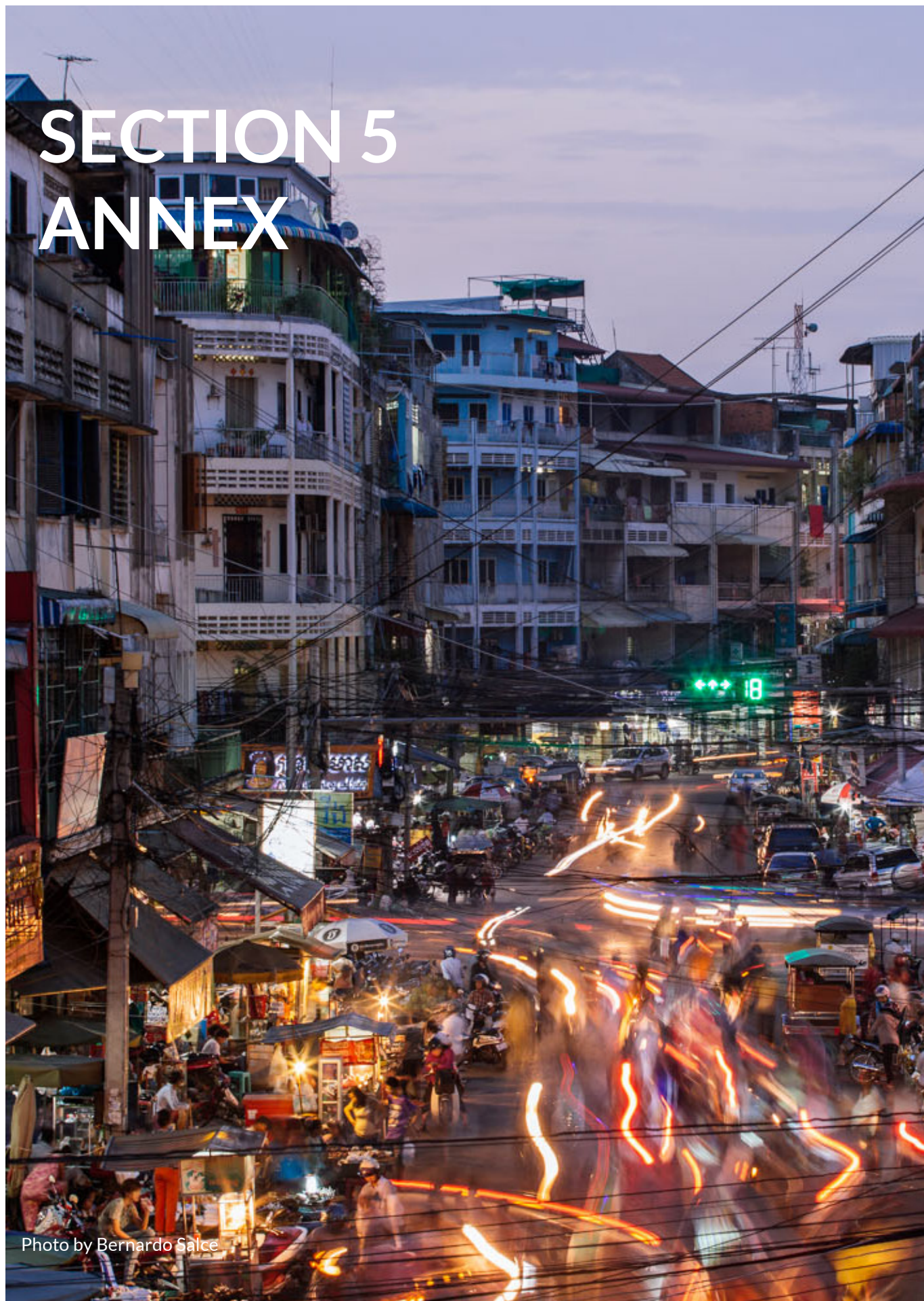


Photo by Bernardo Salce

Appendix 1 - Table 1 All proposed Prakases or Inter-Ministries Prakases link to Sewerage Law.

No.	Title of Proposed Prakas	Relevant Ministry or Inter-Ministries
1	The classification of treatment facilities	MPWT and MOE
2	The sewer system classification (type and size)	MPWT
3	The construction condition of the purification tank and sewer network for building	MPWT and MLMUPC
4	Technical condition of calculation of purification tank, sewer system, or sewer network	MPWT
5	The registration form for the connection to the sewer	MPWT
6	The condition and technical specification of the connection to the public sewer	
7	The intersection point, bend point, and up-down the slope point of the sewer pipe connection	MPWT
8	The facilities, materials, and fittings used for sewer connection	MPWT
9	Sewer connection fee	MPWT and MEF
10	The process and form of the contract for sewer use	MPWT
11	The technical installation or construction and renovation of a septic tank	MPWT
12	The process and procedure of sewerage system maintenance	MPWT
13	The condition and training of sewerage system maintenance	MPWT
14	The standard of the sewerage system	MPWT
15	The fee for a permit or license for a sewerage business operation	MPWT and MEF
16	The guiding principle for necessary conditions and health and safety measures for the pumping and transport business	MPWT and MOE
17	The guiding principle of using safety material	MPWT
18	The forms and procedures for granting the qualification to the inspector of the sewerage system	MPWT and MOJ
19	Procedure for inspecting the sewerage system	MPWT
20	The procedures of transactional fines, payment of fines, receipt management for payment of fines, and administration of income from a fine for the offense as stipulated in the provision of the law	MPWT, MEF, and MOJ

Noted: Ministry of Public Works and Transport (MPWT), Ministry of Environment (MOE), Ministry of Economic and Finance (MEF), Ministry of Land Management, Urban Planning and Construction (MLMUPC), and Ministry of Justice (MOJ).

12. ANNEX 2: URBAN POPULATION PROJECTION

Appendix 2 - Table 2 Population projection in 9 cities across Cambodia.

City	Growth Rate %*	2023	2025	2030	2040
Phnom Penh ³⁸	-	2,507,803	2,579,157	2,748,953	2,977,905
Siem Reap	1.10%	303,333	310,080	327,612	365,707
Battambang	-0.30%	158,750	157,800	155,451	150,857
Poipet**	2.20%	128,520	134,302	149,918	186,809
Sihanoukville**	3.10%	90,138	95,903	111,982	152,679
Pursat	0.50%	65,479	66,137	67,811	71,288
Stung Saen	0.70%	59,933	60,778	62,943	67,507
Bavet	0.80%	56,276	57,184	59,517	64,474
Kamptot	0.10%	36,890	36,964	37,149	37,522

Noted: * Growth rate is based on the report from the National Commune Data Base of Cambodia in 2019, and ** population project at Poipet and Sihanoukville cities are calculated based on the urban population from the National Report on General Population Census of the Kingdom of Cambodia 2019 and growth rates from the National Commune Data Base of Cambodia in 2019.

Appendix 3 - Figure 1 Formular use for forecasting urban population in targeted cities.

Population Growth Formula

$$P = P_0 e^{rt}$$

- P : Total population after time "t"
- P_0 : Starting population
- r : Growth rate

- t : Time in hours or years
- e : Euler's number = 2.71828 ...

38 The data of projected population in Phnom Penh City is obtained from the Main Report of Phnom Penh Citywide Inclusive Sanitation Master Plan, which is currently published in 2023.

13. ANNEX 3: COVERAGE OF URBAN SANITATION SERVICES IN THE CITY³⁹

Appendix 4 - Table 3 Coverage percentage of sanitation service level in the city of Cambodia

Service Level	2015	2019	2020	2022
Basic service (%)	41.9	45.8	46.8	48.4
Safely managed service (%)	39.0	42.4	43.2	44.7
Open defecation (%)	9.5	7.3	7.2	0.0
Limited service (%)	6.9	2.7	1.8	0.0
Unimproved (%)	2.0	1.7	1.0	0.0

Appendix 5 - Table 4 Coverage percentage of sanitation facility type in the city of Cambodia

Facility Type	2015	2019	2020	2022
Septic tank (%)	45.3	51.2	52.6	54.7
Sewer (%)	43.0	44.3	44.6	45.3
Improved latrine and other (%)	0.2	0.0	0.0	0.0

Appendix 6 - Table 5 Coverage percentage of safely managed sanitation in the city of Cambodia.

Safely Managed Element	2015	2019	2020	2022
Disposed in situ (%)	19.4	21.9	22.6	23.6
Sewage treated (%)	19.6	20.5	20.7	21.1
Fecal sludge treated (%)	0.0	0.0	0.0	0.0

³⁹ The WHO/UNICEF JMP has reported on WASH progress at country, regional, and global levels. It's the leading source for comparable estimates. The 2015 update marked the end of the MDG period, and the 2017 update established baseline estimates for monitoring the new SDG targets. <https://washdata.org/data/household#!/khm>



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