

Question	Response
What type of healthcare services are provided? (e.g., general practice, dental, surgical, diagnostic imaging, inpatient care)	Health centres are the foundation of the primary healthcare system, providing essential preventive and curative services: • Maternal, Newborn, and Child Health Services: This is a major focus, and includes: - o Antenatal care (ANC). - o Postnatal care (PNC) for mothers and newborns. - o Skilled birth attendance (though home births are still common, the government promotes facility deliveries). - o Well-child visits and growth monitoring. - o Childhood vaccinations/immunizations. - o Family planning services. • Communicable Disease Control: Services related to: - o Diagnosis and treatment of common infectious diseases (e.g., malaria, tuberculosis, dengue). - o HIV/AIDS prevention and care. • Non-Communicable Disease (NCD) Management: While often managed at higher levels, health centers may be involved in: - o Screening and basic management of common NCDs like diabetes and hypertension. - o Health education and promotion for NCD prevention. • General Medical Consultation: - o Diagnosis and treatment of common illnesses and injuries (adult and pediatric) - o Wound care and basic surgical procedures (e.g., wound suturing and cleaning) • Health Education and Promotion: Promoting healthy behaviors and preventing diseases within communities. • Basic Diagnostic Services: This typically includes blood tests. • Issuance of Medical Reports or Certificates. • Pharmacy Services: Dispensing essential medicines.
Can the water collection from different facility areas be separated to produce different grades of wastewater – so that water with pathogens and medical waste can be dealt with appropriately, and water from kitchens and other areas with no special	Yes, absolutely! Separating water collection from different facility areas to produce different grades of wastewater for targeted treatment is not only possible but highly recommended, and a standard practice for healthcare facilities. This approach, known as wastewater segregation at the source, offers significant benefits in terms of efficiency, cost-effectiveness, environmental protection, and public health.

treatment requirements be diverted to a more simple treatment system?	
Are there any specialized departments? (e.g., laboratories, dialysis units, operating theatres)	Yes, the Cambodian Ministry of Health (MoH) has several specialized departments: • Laboratories: The MoH has a National Health Products Quality Control Centre, which focuses on drug quality control and analyzes samples from poisoning outbreaks. • Dialysis Units: The MoH supports hemodialysis services, with centers like the Hemodialysis Center in Phnom Penh offering care for kidney problems and performing dialysis. • Operating Theaters: While not explicitly listed as a separate department, operating theaters are a vital part of the services provided by MoH-affiliated hospitals and facilities. The Institute Pasteur du Cambodge, though not part of the government system but widely recognized as a central lab for Cambodia. It supports the health sector by testing a wide range of samples – biological, water, and food. Their work is especially relevant for wastewater and effluent quality, as it can test for pathogens, chemical contamination, and antimicrobial resistance. This makes it valuable resources for public health monitoring and for any projects needing lab support for water or environmental testing.
What kind of waters do they contribute to the wastewater? Toilets or just sinks?	Both toilets and sinks contribute to the wastewater flow. • Health care facilities had a squat flush toilet, indicating that toilet water is a significant part of the wastewater stream. • Sinks are essential for handwashing, cleaning equipment, and other hygiene practices, contributing to the overall wastewater volume. • Many facilities also have secondary water sources like rainwater collection or tube wells, which contribute to the total water usage and thus the wastewater. • Water used for various purposes, such as food preparation, laundry, and gardening, can also contribute to wastewater flow, although this may be less significant in health centers compared to residential areas, according to National Guidelines for WAter, sanitation and hygiene in health. • Delivery and minor surgical room, wastewater from these areas may contain blood, amniotic fluid, and other body fluids released during childbirth, as well from minor surgical or wound care procedures. This type of waste can carry a high microbial load and potential pathogens, making proper containment and treatment essential to prevent environmental contamination and health risks.
How much wastewater needs to be treated in a time period?	Cambodian health centers are mandated by the Ministry of Environment to treat their wastewater to meet national effluent discharge standards. This requirement emphasizes the quality of the treated water, ensuring it is safe

	for discharge into the environment, rather than a specific time period for holding and treatment. The key legal instruments governing this are the Sub-Decree No. 27 on Water Pollution Control (1999) and Sub-Decree No. 235 on the Management of Drainage and Wastewater Treatment System (2017). These regulations set specific limits for various wastewater parameters, which healthcare facilities must adhere to to prevent environmental contamination and protect public health. The Ministry of Environment (MoE) sets Effluent Standards that treated wastewater must comply with. These standards specify allowable limits for various parameters (e.g., pH, BOD5, COD, TSS) for discharge into different types of water bodies (protected public water areas, public water areas and sewers). Healthcare facilities, especially those with high-risk waste, would be subject to these standards to prevent environmental contamination and protect public health.						
What is the expected patient volume and staff size?	A health center in Cambodia is designed to serve a population of 8,000 to 12,000 people, with an optimal size of 10,000. It's expected to be accessible within 10 km, or a 2-hour walk for the catchment area population, and average 10 healthcare staff.						
Are there any hazardous or infectious materials entering the wastewater system?	Yes, hazardous and infectious materials do enter the wastewater system in health centers in Cambodia. This is a well-recognized challenge and a significant concern for public health and environmental protection. Please see the current sewerage situation in Cambodia						
What is the current wastewater infrastructure (if any)?	Comprehensive wastewater treatment specifically for medical wastewater is still an area with limitations. Many facilities may have onsite septic tanks, but advanced treatment for infectious waste is not universally established.						
Are there space or site constraints for installing treatment systems?	Yes, there are definitely space and site constraints when it comes to installing wastewater treatment systems. Their limited land and existing building layouts often make it challenging to fit the larger, more traditional treatment systems that require considerable area for components like ponds, tanks, and filtration beds.						
Are there any pretreatment processes already in place?	For rural health center, the "pretreatment processes" for wastewater are generally quite basic, focusing primarily on on-site containment and preliminary separation, rather than advanced treatment stages.						
Do you have any further information about the wastewater itself i.e. the typical flows and loads at each centre, that we could use as a design basis.	Both ranges and general guidelines based on available information for healthcare facilities in Cambodia context. Typical ranges for key parameters in healthcare wastewater (HWW) in developing countries, which can serve as a design basis, along with the Cambodian effluent standards for comparison: <table><tr><td>Parameter</td><td>Typical HWW Range (Developing Countries)</td><td>Cambodia Effluent Standard (Public</td></tr><tr><td></td><td></td><td></td></tr></table>	Parameter	Typical HWW Range (Developing Countries)	Cambodia Effluent Standard (Public			
Parameter	Typical HWW Range (Developing Countries)	Cambodia Effluent Standard (Public					

			Water Area & Sewer)	
	pH	6.0 - 9.0	6.0-9.0	
	BOD5	120 - 300 mg/L	<80 mg/L	
	COD	250 - 500 mg/L	<100 mg/L	
	TSS	150 - 250 mg/L	<80 mg/L	
	Total N	5 - 80 mg/L	<20 mg/L	
	Total P	0.2 - 13 mg/L	<6.0 mg/L	
	Fecal Coliforms	10 ³ -10 ⁷ MPN/100 mL	(Standard typically very low or absent for discharge)	
Does the area at the healthcare facility flood? How much?	Yes, Kampong Tralach District, Kampong Chhnang Province is seasonal flooding results indicate: • Lowland Flooding: Kampong Tralach District, experiences seasonal flooding, particularly in its lowland areas. This is often linked to the Tonle Sap River and the wet season, which lasts from May to October. • Flood Duration: Some areas near water bodies can be inundated for up to seven months of the year, typically from July to January. • Impact on Sanitation: Flooding can affect sanitation systems. For example, some health centers using sealed concrete tanks may experience intrusion of floodwater, potentially contaminating the tanks. • Water Level Monitoring: The Kampong Chhnang Provincial Department of Water Resources and Meteorology monitors rainfall and river levels to prepare for potential heavy flooding. • Vulnerable Districts: Residents of Kampong Tralach District are advised to be vigilant regarding river water levels due to the risk of flooding.			
Could the medical waste water be collected in a tank and trucked/ taken by boat to Phnom Pehn to be treated professionally?	Yes, in principle, it is possible and often desirable for medical wastewater to be collected in tanks and transported (by truck or boat, depending on the location) to a centralized facility in Phnom Penh for professional treatment.			
Where is the current septic tank effluent discharged? Into the ground or into a waterway?	The health center septic tank effluent is typically discharged into the ground (via a soakaway or drainfield) for further natural filtration or, in many cases, directly into nearby waterways. However, the reality present significant challenge - direct discharge into waterways is common due to poor design, lack of maintenance, or insufficient land for proper soakaways. This directly pollutes canals, streams, and ponds.			
Is there any governance of the current septic tanks?	Several government bodies, including the Ministry of Health (MoH), Ministry of Public Works and Transport (MPWT), and Ministry of Environment (MoE), share responsibility for setting wastewater guidelines and standards. Sub-			

Who maintains them, how is this funded?	national administrations and health center staff are theoretically tasked with day-to-day oversight. While there is a recognized need and existing high-level governance frameworks for water and sanitation, the practical governance, maintenance, and funding of septic tanks in health centers face significant challenges due to limited resources, capacity gaps, and the absence of robust, formalized systems for on-site wastewater management and fecal sludge management.
What resources are there for effluent quality testing? Temp, pH, TSS, BOD5, COD, nitrate, phosphorous, e. coli?	There are several resources available for effluent quality testing, including the parameters listed (Temp, pH, TSS, BOD5, COD, nitrate, phosphorous, e. coli). the types of resources and considerations: 1. Academic and Research Institutions (Phnom Penh-based): MoE Laboratory: The MoE operates a laboratory where effluent samples, collected during their monitoring and inspection activities, are analyzed. Effluent Standards: The key legal instrument is the Sub-Decree No. 27 ANKr/BK on Water Pollution Control (amended by Sub-Decree No. 103 ANKr/BK dated June 29, 2021). This sub-decree specifies the allowable limits for various pollutant substances in effluent discharged to different categories of water bodies (e.g., protected public water areas, public water areas and sewers, or central wastewater treatment plants). Parameters covered by the Sub-Decree include: - Temperature (Temp) - pH - Total Suspended Solids (TSS) - BOD5 (5 days at 20°C) - COD (Cr2O7-2) - Nitrate (NO3-) as N - Phosphate (PO4-3) - Many other chemical and heavy metal parameters. Institute of Technology of Cambodia (ITC): ITC has dedicated laboratories that conduct environmental analysis. Environmental Observation Lab: Focuses on physicochemical water quality testing and field investigations, including basic water quality measurements (pH, temperature, turbidity). Environmental Chemistry Lab: Equipped to detect and evaluate chemical contaminants, including major ions (which would include nitrate and phosphate), and total organic carbon (related to BOD/COD). Water Environment Lab: Another relevant lab at ITC.



- **Contact:** Asst. Prof. Dr. PENG Chanthol (peng@itc.edu.kh / pengchanthol@gmail.com, Phone: 089 994 291) appears to be a key contact for these labs.

- **Institut Pasteur du Cambodge (IPC) - Laboratory for Environment and Food Safety (LEFS):**

- LEFS is an accredited laboratory (ISO/IEC 17025:2017) and offers microbiological and physico-chemical controls of water. They explicitly list **E. coli** and other microbiological tests. They also conduct chemical testing relevant to water quality.
- **Contact:** ima@pasteur-kh.org, Phone: (+855) 11 777 195.

2. Commercial/Private Laboratories (Phnom Penh and potentially regional):

- **RIKREAY Water Testing Lab (Water For Cambodia):** This lab provides a range of water testing services, including many of your specified parameters as single tests:
 - pH, TSS, Nitrate, Phosphate.
 - They also offer **E. Coli & Total Coliform** bacterial tests.
 - While they list "Complete Water Test," it's best to confirm if it includes BOD5 and COD, as these are typically more specialized.
 - **Contact:** Phone: +855 (0)97 714 8811, Email: waterlab@waterforcambodia.org.
- **ALS Global (Water Industry Solutions):** ALS is a large, international analytical services provider with operations in Cambodia. They specialize in water and wastewater testing to meet effluent limits and regulatory requirements. They would almost certainly offer all the parameters you listed (Temp, pH, TSS, BOD5, COD, nitrate, phosphorous, e. coli). They also offer sampling services.
 - **Contact:** You'd need to contact their Cambodia office or regional hub for specific service details and quotes.
- **Wil-Kh (Water Innovation Lab):** Based in Kampong Cham, this lab also offers water quality testing services, including chemical and microbiological parameters. They explicitly list "Water quality testing" and "E. Coli & Total Coliform" testing.
 - **Contact:** lab@wil-kh.com, Phone: +855-16-668 900. (Note: Saturday does not accept E. coli & Total Coliforms testing).
- **Eurofins MTS Phnom Penh:** Primarily focuses on textile and consumer product testing, but given their international nature and range of services, it's worth inquiring if they have environmental or wastewater testing capabilities.

3. Equipment Suppliers for On-site Testing (Less comprehensive but good for basic checks):

	• Watermech Technologies Co., Ltd.: This company supplies water testing equipment in Phnom Penh. While not a lab for comprehensive analysis, they could potentially provide simpler, portable kits or meters for basic parameters like pH and temperature for rapid on-site checks. This is more for screening than for regulatory compliance.
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