

Memorandum – Building Capacity for Rural Cambodian Wastewater Managers

To WaterAid
Date 22 August 2025
Copies
Reference number
From Winn-Ove-Ators
File reference
Subject

Context

Healthcare facilities in Kampong Tralach District, Cambodia face critical wastewater management challenges due to inadequate or absent septic systems. Untreated wastewater is seeping into groundwater, posing serious health risks to patients, healthcare workers, and surrounding communities. This issue is particularly acute in rural areas, where infrastructure and technical capacity are limited.

The challenge is rooted in the absence of national technical standards for septic system tailored to healthcare settings. Wastewater is generated not only from toilets but across all points of care, requiring a comprehensive and context-sensitive approach. Climate change further exacerbates the situation, flooding and droughts strain existing systems, while rising temperatures accelerate waste decomposition, undermining sanitation efforts.

The initiative seeks to develop a climate-resilient, cost-effective, and scalable septic system that aligns with Cambodia's healthcare standards and environmental conditions. It also aims to advocate for national guidelines and pilot a model system in Kampong Tralach, contributing to broader improvements in public health and environmental protection.

The Winn-Ove-Ators Team has been tasked with providing a solution to the presented wastewater management challenges, that is culturally appropriate, includes a holistic approach and will make long-last positive change.

Aim

We understand that solving all the problems presented in this challenge in a short timeframe would be difficult, and may be inappropriate, so we have identified a key area where we believe we can make a positive, long-lasting impact.

We aim to strengthen the capacity of organisations responsible for managing septic systems in rural Cambodian healthcare facilities by providing several well researched septic management strategies that have been implemented in similar environments. We will then provide a tried and tested decision-making framework so that partner organisations and stakeholders can develop a context appropriate solution that suits their priorities.

Approach

We are incorporating a strength-based approach to this humanitarian engineering challenge.

One of the gaps we identified during our research was that wastewater managers for rural Cambodian medical facilities may not be informed as to what technologies and practices are available to them. We believe providing a knowledge base would allow our stakeholders to explore several solution pathways and ultimately make an informed decision that prioritises needs set by key project stakeholders.

There are two components to our approach, building a knowledge base, then proposing an inclusive stakeholder engagement plan so that the wastewater managers and their communities feel empowered in their decision making.

Building Knowledge Base

The attached poster aims to inform existing and future wastewater managers about tried and tested septic management strategies that they could implement to combat common challenges. Each strategy is backed by research, and stems from previous best practice examples in similar environments. The poster is not suggesting that wastewater managers implement all of the strategies it proposes, however, its purpose is to serve as a foundation for future decision making and stakeholder engagement.

Inclusive Stakeholder Engagement Plan

We do not have the most complete understanding of the rural Cambodian context, as we do not have the lived experience necessary to make an informed decision on the best path forward. We believe it would be best to involve, collaborate and empower key stakeholders as much as possible, so that the project outcome is culturally sensitive, incorporates appropriate technologies, and has the greatest chance of sustainable success. Figure 1 below illustrates how stakeholder influence and power grow with increasing levels of stakeholder engagement.

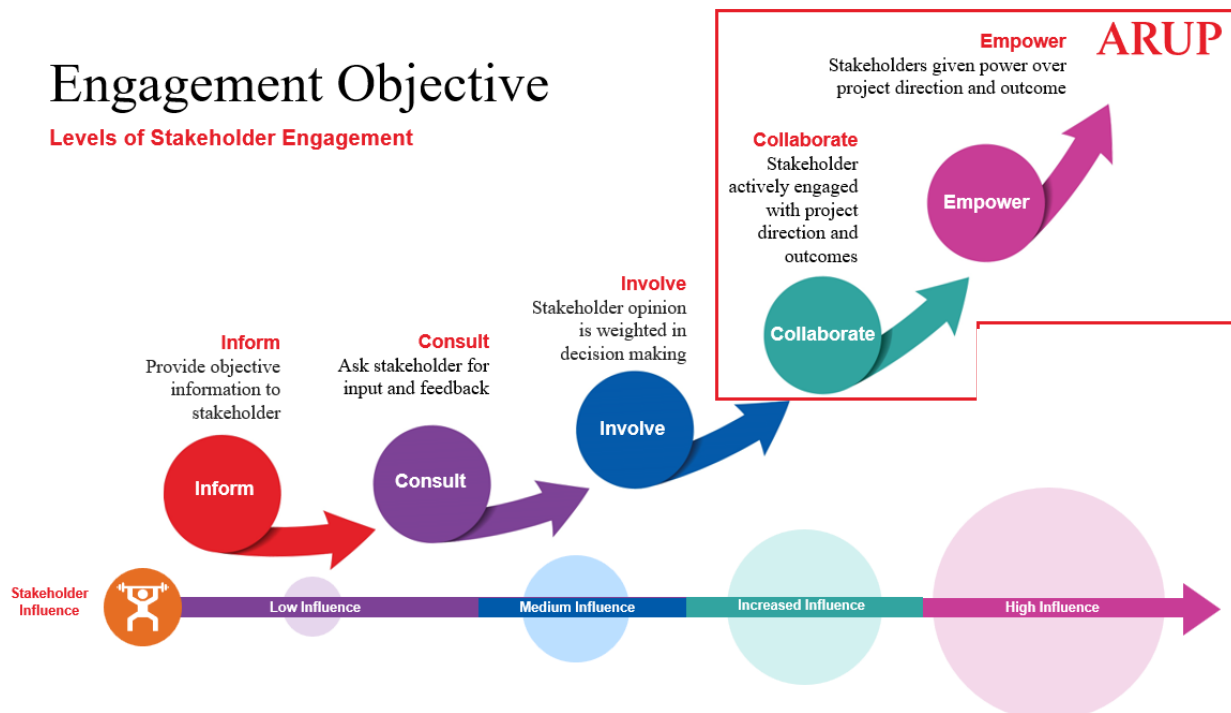


Figure 1 Stakeholder influence & engagement

Our stakeholder engagement plan includes:

- An initiation meeting with key stakeholders
- A stakeholder engagement meeting, focussed on key stakeholder identification and mapping
 - The draft poster will be shared with wastewater managers, key hospital staff, and any other attendees for comment and review
 - In this phase we wish to learn more about the project specific context, this may present the project team unforeseen opportunities and rule out some preconceived ideas and strategies.
 - Key objectives are understanding priorities, challenges and existing relationships between stakeholders
- We can then refine our strategies for optimised wastewater management for rural Cambodian medical facilities based on feedback ad stakeholder engagement meeting.
- After our strategies and options have been refined, we would present our developed options for improved wastewater servicing to the stakeholders and guide them through a decision-making process.

An example of the decision-making process we could adopt in this project is a Multi-Criteria Analysis (MCA), where the criterion and the weighting of each criterion by which the strategies will be judged is determined by the now informed key stakeholders. This will be giving the stakeholders increased agency, allowing them to evaluate the presented wastewater management strategies based on context appropriate criteria. This inclusive process would empower the wastewater managers of rural Cambodian medical facilities to choose an achievable servicing or upgrade pathway that incorporates effective wastewater management ideas, practices and technologies identified by the project team.

A high-level example of how the current septic management strategies proposed in the poster might be evaluated is shown in Table 1 below.

Table 1 Septic Management Strategies

Strategy	Cost	Resource availability	Climate resilience	Operability	Weighted Total
Weighting	4	3	5	2	Product
Wastewater Segregation	2	4	2	3	36
Optimised Septic Tank Design	3	2	5	4	51*
Drain Fields	3	2	2	3	34
Regular Maintenance Schedule	3	4	5	1	51*

*This example scenario has identified climate resilience and cost as stakeholder priorities for this particular medical facility. The MCA results in both optimising the septic tank design and implementing a regular septic maintenance schedule as preferred wastewater management strategies and drain fields may not be suitable for this group/environment.

Poster

Climate Resilient Wastewater Solutions for Healthcare Facilities in Rural Cambodia

A guide to design principles of septic systems tailored to healthcare settings

Maintenance

Regular maintenance is needed to keep septic tanks safe.

- Tanks need to be deslugged every 1-3 years³.
- Regular monitoring of nearby water quality on nearby wells to detect contamination risks⁴.
- Regular inspections (check covers, inlet/outlet, and the seals). Inspect immediately after heavy rain or flooding⁵.
- All O&M activities should be recorded in a logbook⁶.

Wastewater Segregation

Wastewater segregation separates various types of waste that may emerge in a healthcare setting, such as wastewater, stormwater, chemical and radiation waste. While this does increase the capital and operational cost of the septic system, it can also ensure for appropriate treatment of differing wastestreams, minimises cross-contamination and improve overall septic tank efficiency.⁴

Septic Tank Design

This underground tank holds the wastewater collected from the healthcare facility. WHO provides guidelines for climate resilient septic design as follows¹:

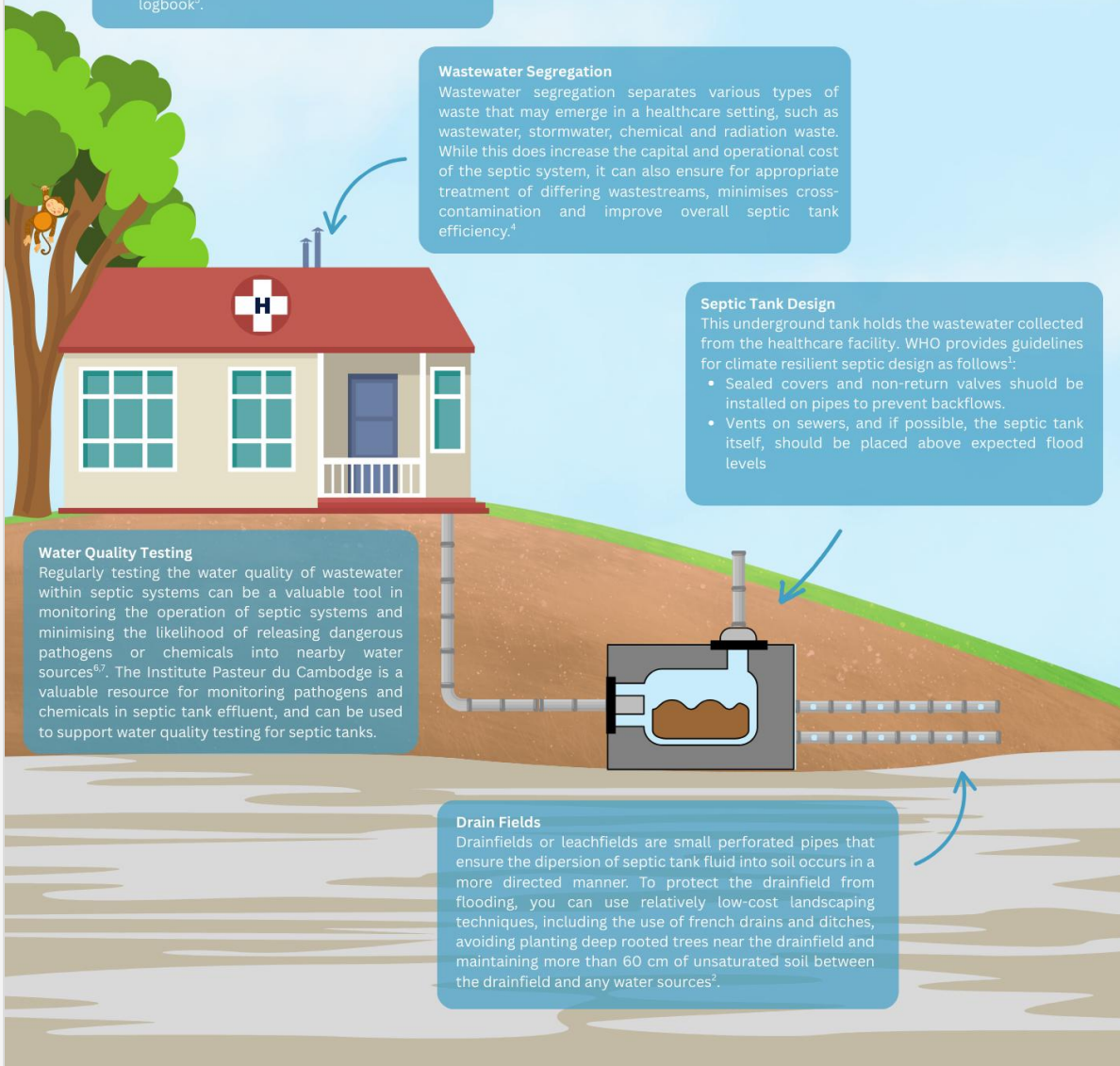
- Sealed covers and non-return valves should be installed on pipes to prevent backflows.
- Vents on sewers, and if possible, the septic tank itself, should be placed above expected flood levels

Water Quality Testing

Regularly testing the water quality of wastewater within septic systems can be a valuable tool in monitoring the operation of septic systems and minimising the likelihood of releasing dangerous pathogens or chemicals into nearby water sources^{6,7}. The Institute Pasteur du Cambodge is a valuable resource for monitoring pathogens and chemicals in septic tank effluent, and can be used to support water quality testing for septic tanks.

Drain Fields

Drainfields or leachfields are small perforated pipes that ensure the dispersion of septic tank fluid into soil occurs in a more directed manner. To protect the drainfield from flooding, you can use relatively low-cost landscaping techniques, including the use of french drains and ditches, avoiding planting deep rooted trees near the drainfield and maintaining more than 60 cm of unsaturated soil between the drainfield and any water sources².



References

1. <https://iris.who.int/bitstream/handle/10665/335909/9789240012226-eng.pdf?sequence=1>
2. What to Do When Septic Systems Are Impacted by Flooding from Storms or Groundwater Rise: AE591, 11/2023 DOI: [10.32473/edis-ae591-2023](https://doi.org/10.32473/edis-ae591-2023)
3. EPA Code of Practice 2021: https://www.epa.ie/publications/compliance--enforcement/waste-water/2021_CodeofPractice_Web.pdf
4. WHO Guidelines of Drinking Water Quality:
<https://apps.who.int/iris/bitstream/handle/10665/352532/9789240045064-eng.pdf?sequence=1&isAllowed=y>
5. <https://www.cdc.gov/floods/safety/guidelines-for-septic-and-onsite-wastewater-systems.html>
6. <https://www.epa.gov/septic/septic-system-impacts-water-sources>
7. <https://www.sciencedirect.com/science/article/pii/S0048969715312353>