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Water and Sanitation Vulnerability Mapping for Southeast Asia

Learning Brief Cambodia

Brief Overview

Southeast Asia's efforts to achieve universal access to safe water and sanitation are undermined by persistent service gaps in vulnerable communities, **insufficient funding**, and a **lack of adaptive and mitigation strategies** to address escalating climate risks. Despite incremental progress, millions in rural and low-income areas remain underserved, with women disproportionately affected as they continue to shoulder the burden of household water collection and sanitation management. **Fragmented service delivery**, outdated infrastructure, and **underperforming service providers** further compound these challenges, impeding efforts to build resilient water supply and sanitation (WSS) systems.

The Water and Sanitation Vulnerability Mapping study, led by Athena Infonomics in partnership with Water.org, highlights the critical need for **financial investment in adaptive strategies and technological upgrades** across Cambodia, Indonesia, and the Philippines. By assessing systemic vulnerabilities in service delivery and policy frameworks, the study underscores how funding constraints and fragmented service provision perpetuate inequities, limiting the sector's capacity to respond to climate risks. This learning brief, **focused on Cambodia**, presents targeted recommendations aimed to close service gaps, strengthening financial mechanisms, and advancing technological solutions to enhance sector performance and inclusivity. Following summarizes key recommendations for addressing identified vulnerabilities in Cambodia's WSS sector:

The document presents recommendations to strengthen WSS access in Cambodia through Water.org's WaterCredit initiative. It outlines microfinancing solutions for low-income households, including support for desludging, sanitation upgrades, water treatment, and financial literacy—particularly in the nine most vulnerable districts.

At the national level, it proposes systemic reforms such as a standardized PPP framework, simplified licensing for small WASH enterprises, climate-resilient financing, performance-based grants, tariff restructuring, and support for circular economy sanitation models. Finally, it recommends specific water and sanitation technologies for Battambang, Siem Reap, and Stung Treng provinces, along with the estimated funding required for their implementation.

Local Context

In Cambodia, water supply is managed by the Ministry of Industry, Science, Technology, and Innovation in urban areas and delivered through public utilities. In rural areas, it is overseen by the Ministry of Rural Development and provided through community-managed systems and household self-supply. Sanitation is managed by the Ministry of Public Works and Transport in urban areas, which oversees sewer networks and wastewater treatment, while Ministry of Rural Development manages rural sanitation, typically with limited budgets for latrines for vulnerable households. The private sector complements both services through bottled water distribution, latrine construction, and fecal sludge emptying.

87% of dwellings have access to adequate drinking water.
However, only **29%** have access to safely managed drinking water service.

88% of dwellings have access to adequate sanitation.
However, only **37%** of households have access to

12% of the population practice open defecation

Key findings

The following section presents key findings from the province-level analysis of Cambodia, with Battambang, Siem Reap, and Stung Treng identified as priority provinces for in-depth study. Insights are organized thematically across critical dimensions, including **Service Preferences and Coverage, Climate Vulnerability, Gender-Specific Challenges, Household Financial Challenges, and Private Sector Constraints**. Each theme reflects the on-ground realities captured through the primary survey, highlighting prevailing patterns in service access, user preferences, and challenges faced b households and service providers.

1% of households depend on the public piped water supply.

24% opt for bottled or canned water provided by private vendors.

41% utilizes community-managed sources

33% rely on self-managed water systems

Service Preferences and Coverage

A significant portion of the population—41%—relies on community-managed sources such as wells and handpumps, which are often supported by government initiatives and valued for their accessibility and perceived quality, especially for non-

Among private toilets,
43% are connected to open drains

36% to septic tanks

12% to sewer system

7% to single and twin pits

2% directly to water bodies

84% of these septic tanks are never emptied

drinking uses. Additionally, 33% use self-managed water systems, while the remaining 1% depend on other sources.

In terms of sanitation, **69%** of households have individual household **toilets**, while 24% rely on shared toilet facilities with relatives or neighbors, 3% use community toilets, and **4%** practice **open defecation**.

Among the private toilets, **43%** are connected to **open drains, 36%** to **septic tanks, 12**% to a sewer system, **7%** to single and twin pits, and **2%** directly into water bodies. While **84% of these septic tanks are never emptied,** desludging services are accessed by **67%** of households through **manual providers** and by **33%** through **private operators using vacuum trucks**.

Climate vulnerability

Figure 1: Community Toilet (Inside)

Climate-related events significantly impact WSS services, with **46%** of surveyed households affected by **climate phenomena** such as floods. Among these households, **36%** experienced **contamination of water sources**, **19%** reported **reduced availability of clean water**, **16%** faced **increased travel time** to reach water sources, **15%** suffered **infrastructure damage**, and **14%** lost **access to clean water** entirely. In terms of sanitation, **40%** of households reported **increased exposure to unhygienic conditions**, **28%** experienced **overflowing septic tanks or pits (single/twin)**, **21%** reported **damage to sanitation infrastructure**, and 11% faced other challenges. Despite the widespread impact of climate events, external support for households impacted by climate-induced phenomenon remains minimal, with only **4% of households** receiving **assistance for water supply** and just **2%** obtaining **temporary assistance for sanitation**. **Flooding**, **coastal risks**, and **erratic weather patterns** continue to strain water and sanitation systems, underscoring the urgent need for **resilient infrastructure** and **localized adaptation mechanisms.**

46% of surveyed households affected by **climate phenomena** such as floods.

Figure 2: Handpump as source of water supply

In 54% of the households both male and female are responsible for cleaning toilets, while in 43% **of households, only females are responsible for cleaning toilets**, compared to just 3% where only males perform this task.

80.9% of households spend an average of

5 USD

per month on water services, while 85% spend

2.5 USD

monthly on sanitation services, all of which contribute to exceeding the 3% threshold.

Gender-Specific Challenges

Women face disproportionate challenges in accessing WSS services. The **burden of water collection** significantly affects their daily lives, with **24% of women** spending considerable time fetching water and **17% experiencing disruptions** in school or work attendance as a result. Challenges related to **menstrual hygiene management** are significant, with **26% of women** reporting issues such as **high costs of sanitary products** and difficulty accessing them. The consequences of inadequate WSS extend to health, with **31% of women** reporting **increased health risks associated with poor sanitation**, and **27%** highlighting problems stemming from **inadequate sanitation facilities**.

Household Financial Challenges

The study found that Cambodian households **spend an average of 4% of their income on WSS services**, surpassing the World Bank's affordability threshold of 3%.

The **high cost** of sanitation facilities, particularly in **challenging environments** where construction costs may reach approximately **$500 per facility**, further exacerbates financial strain. This burden is even more pronounced for **low-income households**, who are often unable to afford the construction of toilets or the digging of wells, underscoring the need for **targeted financial assistance**.

In addition to the overall cost of WSS services, households face a range of financial challenges. About **8%** report difficulty arranging **collective funding**. Other key issues include limited access to financial products, such as a **lack of financial instruments** for WSS (**11%**), **high loan interest rates** (**11%**), and **complicated administrative procedures** for accessing financial products (**8%**). Furthermore, **8% of households** report **limited information** about available financial products, and **6%** cite **limited access to financial assistance or loans**.

24% **of** households cite **irregular or insufficient income** as a major barrier

14% struggle with the **high costs of sanitation construction,**

10% face difficulties with the **high cost of water supply services**.

24% of households have expressed a need for financial support.

To address these challenges, while **24% of households** have expressed a need for financial support, only **4%** currently receive assistance in the form of **subsidies or grants**.

Private Sector Challenges and Financing Constraints

Complementing public service delivery, the private sector plays a significant role in Cambodia's water supply and sanitation (WSS) landscape, with approximately **44% of household water supply spending** directed toward private providers. Despite this substantial engagement, several structural and financial challenges hinder the sustainability and expansion of private WSS services.

Many providers face **restricted access to affordable financing**, constrained by high interest rates and the absence of government-backed credit lines. Their ability to generate revenue is further weakened by **non-revenue water losses**, inefficient billing systems, and rising electricity and maintenance costs. **Delays in subsidy disbursements** further exacerbate financial pressures, particularly within fragile public-private partnership arrangements.

Government regulations significantly impact operators by imposing rigid tariff frameworks and setting low regulated tariffs, undermining their financial viability. Additionally, complex licensing procedures and inadequate regulatory oversight hinder efficient operations. The lack of blended finance mechanisms and formal partnership models further limits collaboration with government.

In the **water supply sector**, low demand for piped water, seasonal variations in consumption, and household affordability constraints result in unstable revenues, making it difficult to maintain or expand services. **Competition from informal providers**, who operate outside the regulatory framework, places additional operational pressure on compliant operators.

In the **sanitation sector**, viability is constrained by low willingness to pay for fecal sludge services, high operating costs, and the lack of timely billing and collection systems. **Limited regulatory support**, the absence of formal engagement models, and weak financial incentives further discourage long-term private sector engagement in sanitation services.

Microfinance Institutions (MFIs)

To understand the landscape of water and sanitation financing in Cambodia, interviews were conducted with five financial institutions: **Chamroeun, Amret, CAMMA Microfinance, Phillip Bank, and CMA.** The findings were as follows:

Aspect	Details
Operational Areas	Phnom Penh, Kandal, Siem Reap, Kampong Speu, Takeo
Financing Models	Group lending, digital credit platforms, collateral-backed SME financing
WASH Loan Portfolios	Household and enterprise-level improvements: toilets, septic tanks, water filters, piped connections, desludging services, PWOs infrastructure
Household Loans	$100 - $1,500 (mostly $200 - $650), 3 - 84 months, 10.8% - 18% per annum
Enterprise Loans	$50,000 - $240,000, up to 10 years, supports water infrastructure and treatment plants
Credit Evaluation	5C framework (Character, Capacity, Capital, Collateral, Conditions), local authority verification
Critical Challenges	High interest rates, small loan sizes with high costs, limited WASH expertise, low borrower repayment capacity, PWO demand for large loans with low collateral
Financial/Regulatory Barriers	Regulatory hurdles for startups, lack of low-cost funding, absence of WASH-focused loan products, collateral requirements, limited lender engagement in WASH
Recommended market enabling forces by MFIs	Blended finance and DFI partnerships to mitigate financial risks, government guarantees (e.g., CGCC) to enhance credit security, and multi-stakeholder collaboration to drive resource sharing and sector innovation.

Bridging the Gaps by Water.org

Amidst the challenges faced by households and private operators in Cambodia's WSS sector, **Water.org** has been actively working to bridge financial and service delivery gaps. In collaboration with **more than ten financial institutions, microfinance entities, and associations**, Water.org has **mobilized $268 million in capital**, disbursed **447,000 loans — 84% to women borrowers and 93% to rural households**, and directly engaged with **over 48 private water operators**. This initiative has reached **2.1 million people**, with **91% of loans targeted at individuals earning under $6.85 per capita per day**. To better understand persistent vulnerabilities and identify pathways for strengthening WSS services, Water.org conducted this study. **Key recommendations to address the identified challenges** are outlined in the final section.

Vulnerability

While the preceding section outlines critical insights emerging from primary surveys and stakeholder consultations, it is imperative to spatially contextualize these findings to identify areas of heightened risk. Accordingly, **a national-level spatial vulnerability assessment** was undertaken to delineate the provinces in Cambodia where these challenges are most pronounced, based on composite indicators including coping capacity, socio-economic conditions, and demographic vulnerability.

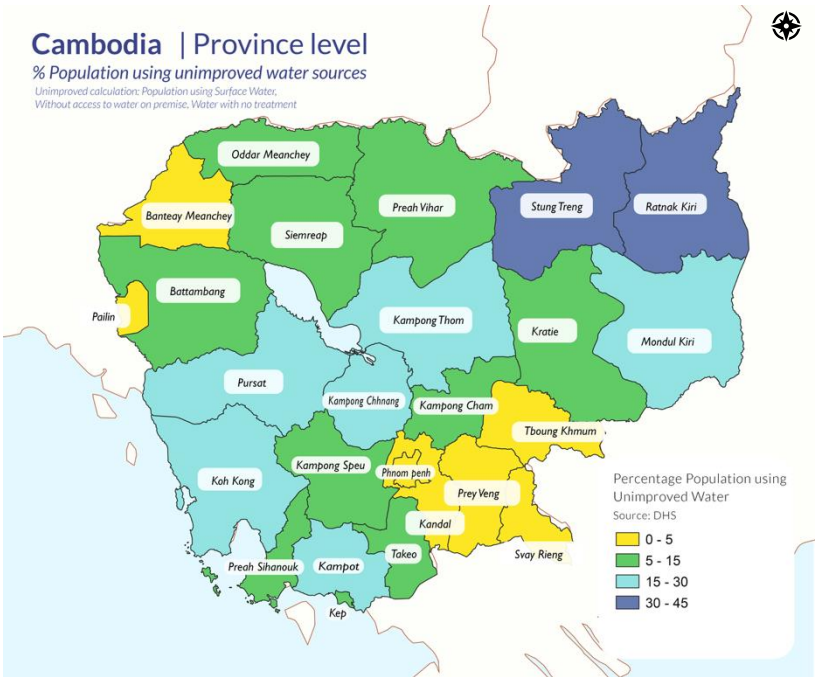


Figure 3: Province-level access to unimproved water sources across Cambodia

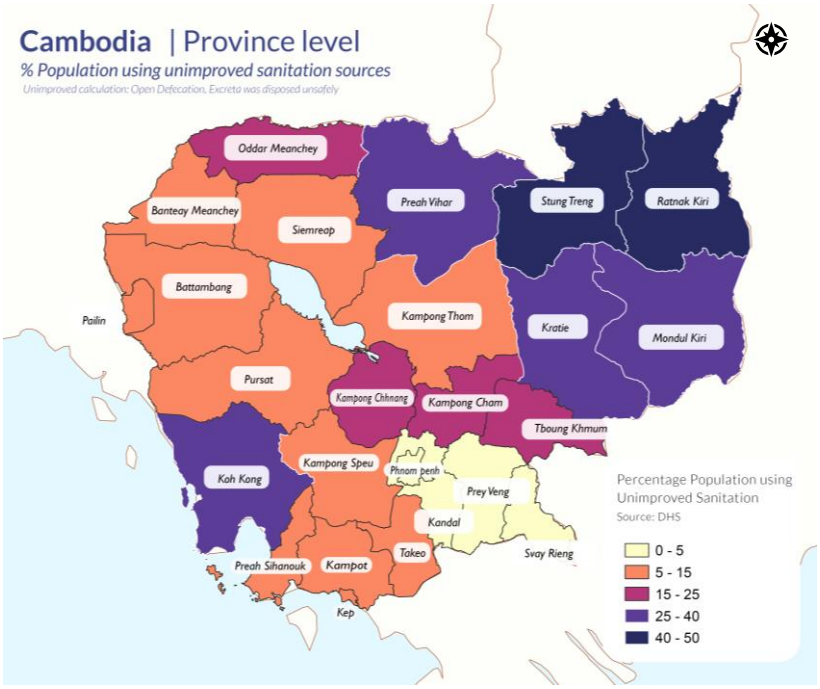


Figure 4: Province-level access to unimproved Sanitation across Cambodia

The analysis presented in the following figures provides an overview of the proportion of the population using unimproved water and sanitation sources across provinces.

Based on this mapping, coupled with **stakeholder consultations and secondary data**, the provinces of **Battambang**, **Siemreap**, and **Stung Treng** were identified as relatively more vulnerable. These provinces were selected for deeper spatial analysis to determine localized vulnerabilities and guide the identification of **priority intervention areas** for WaterCredit.

Province-Level Spatial Assessment:

For the three priority provinces, a granular district-level assessment was conducted using geospatial layers and demand estimation.

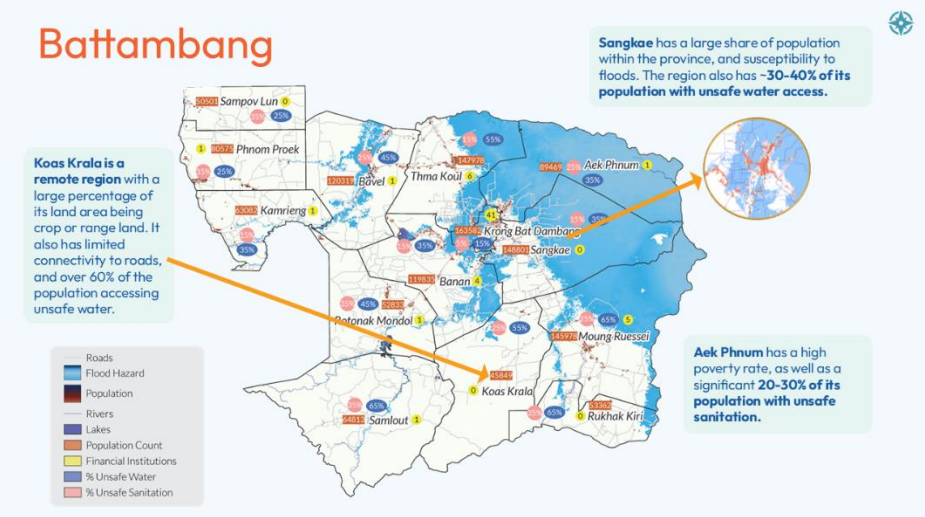


Figure 5: District-level WASH vulnerability mapping in Battambang

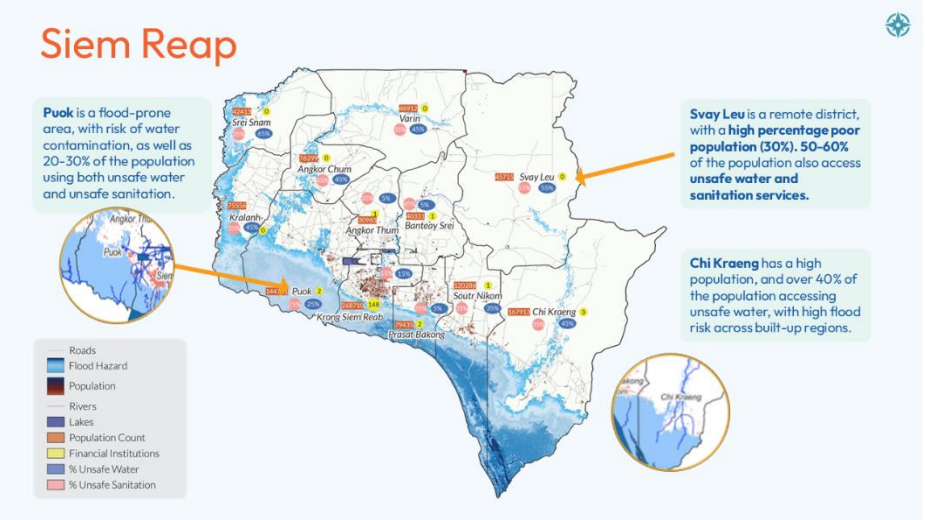
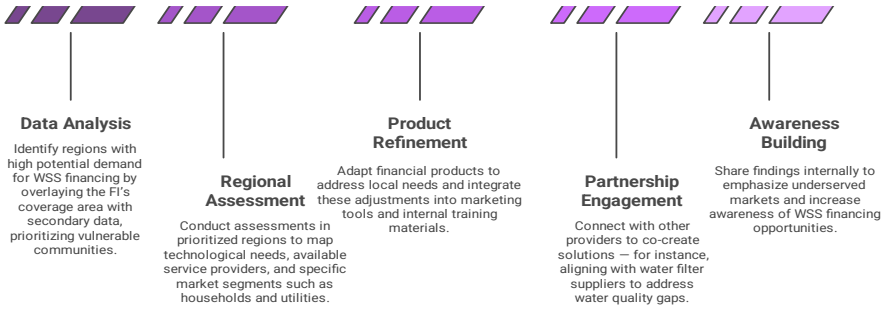


Figure 6: District-level WASH vulnerability mapping in Siemreap

Figure 7: District-level WASH vulnerability mapping in Stunt Treng

Recommendations

Bridging the WSS infrastructure gap requires substantial investment, with Cambodia alone requiring $2 billion. Water.org's WaterCredit program has emerged as a critical initiative to facilitate microloans for low-income households and small enterprises to improve WSS access. For effective implementation of WaterCredit, the following actionable steps are suggested for the financial institutions:



Further, based on the learnings, the recommendations are structured into two categories:

Targeted Interventions for Vulnerable Districts:

For the nine most vulnerable districts, interventions focus on financing mechanisms tailored to local needs. In **Sangkae, Battambang**, where 5,025 households have low access to improved water supply and face frequent flooding that leads to water contamination, the following interventions are recommended:

1. **WaterCredit for Desludging Services** – Support households in desludging as septic tanks are never emptied, leading to overflow and contamination.
2. **WaterCredit for Water Quality** – Provide financing for home water treatment solutions as 67% perceive water as unsafe for drinking.
3. **WaterCredit for Sewer and Septic Tank Upgradation** –Support HHs in upgrading sanitation infrastructure as 60% of toilets are connected to open drains.
4. **Awareness Programs on Financial Products** –Increase awareness as only 13% are aware of loans from MFIs and banks.
5. **Capacity Building for Financial Management** –Support 93% of HHs facing financial challenges due to irregular income with financial literacy programs.

National-Level Interventions

To ensure the long-term viability of WaterCredit and strengthen the overall WSS financing ecosystem, the following national-level interventions are recommended:

1. **Standardized PPP Framework with Cost Recovery and Risk Allocation**
   Establish a legally binding SOP ensuring tariff-linked cost recovery, equitable risk-sharing, and investor safeguards to enable private participation in WSS services. Example: Dhaka WASA's PPP initiatives in bulk water supply and NRW reduction

2. **Fast-Track Licensing & Tiered Accreditation for Small WSS Enterprises**
   Introduce a tiered regulatory and financing system with simplified licensing, credit-linked certifications, and performance-based compliance for small-scale service providers. Example: India's SBM facilitated fast-track approvals for desludging operators

3. **Climate-Resilient WaterCredit for Sanitation and Recharge**
   Design targeted micro-financing for sanitation retrofitting, sludge treatment compliance, and groundwater recharge infrastructure with integrated monitoring.

4. **Performance-Based Grants for Community-Managed Services**
   Provide conditional grants tied to cost recovery and service improvements, supported by digital payments and utility co-financing to ensure long-term viability. Example: Ethiopia's One WASH National Program

5. **Revised Tariff Structures for Private Sector Viability**
   Reform water and sanitation tariffs to be cost-reflective, inflation-indexed, and inclusive of treatment costs, enabling sustainable private sector operations. Example: China's urban water tariff reforms

6. **Blended Finance for Fecal Sludge and Reuse Infrastructure**
   Identify blended financing models by partnering with financial institutions to de-risk investments through

credit guarantees, interest rate subsidies, or loan amount grants.
Example: Kenya Pooled Water Fund

7 **Circular Economy Financing for Sanitation Enterprises**
Support business models that convert waste into saleable products like biochar and biogas through targeted loans, enabling resource recovery and cost reduction.
Example: Cambodia HandyPod initiative

8 **Develop Technology Supplier Database**
Establish and maintain an updated database of quality service providers for targeted WSS technologies, accessible to financial institutions to facilitate supplier identification.

Figure 8: Images from household field survey

Funding Requirement:

Estimated total funding requirement for water supply, sanitation, and hygiene under scenario-based modeling for each identified vulnerable province:

Province		Battambang	Siemreap	Stung Treng
Estimated Demand (HH)		**$26,369**	**$22,688**	**$20,411**
Funding Requirement for Water Supply	Scenario 1: All Urban households to be connected to Municipal Piped Water Supply + All Rural households to be connected to STW	$1,09,69,545	$94,38,178	$84,90,934
	Scenario 2: Mini Piped Water System with RO for Medium Fourth and Highest Quintile + Protected Shallow Tubewell for Lowest and Second Lowest Quintile	$1,05,15,997	$89,70,807	$92,31,849
Funding Requirement for Sanitation	Scenario 1: Single Pit with Offset and FilTo for Lowest and Second Lowest Quintile + Twin Pit for Medium Quintile + Adaptive Septic Tank considering Flood Resilience for Fourth and Highest Quintile	$62,31,018	$57,07,148	$39,35,221
	Scenario 2: Single Pit with Offset and FilTo for Lowest and Second Lowest Quintile + Twin Pit for Medium Quintile + Septic Tank with Soak Pit without consideration of flood for Fourth and Highest Quintile	$78,39,533	$74,17,818	$45,59,795
Funding Requirement for Hygiene	Installation of Handwashing Station (Basin)	$7,91,073	$6,80,638	$6,12,939

** Both twin-pit and single-pit latrines are recommended to be constructed with a raised platform and a secure lid to enhance climate resilience*

MFI Funding Requirement

- **Fourth and Highest Quintiles**: Excluded — can afford services without support.
- **Lowest and Second Quintiles**: Not suitable for MFIs — better targeted by DFIs and subsidies.
- **Middle Quintile**: Ideal target for MFIs — capable of borrowing and repaying.

Funding Requirement for Medium Quintile		Battambang	Siemreap	Stung Treng
Water Supply Technology	MPWS, If available	$7,95,028	$4,96,865.63	$2,69,423.86
	Mini Piped Water System with RO, if MPWS not available	$15,90,057	$9,93,731.25	$5,38,847.72
Sanitation Technology	Twin Pits	$10,60,038	$6,62,487.50	$3,59,231.81
Hygiene Technology	Handwashing Stations	$1,59,006	$99,373.13	$53,884.77
Total		**$36,04,128**	**$22,52,458**	**$12,21,388**