

TARGETING COMMUNITY-LED TOTAL SANITATION (CLTS) TO FAVORABLE CONTEXTS: FACTORS CONTRIBUTING TO THE SUCCESS OF CLTS IN CAMBODIA

Study Findings

- CLTS is not uniformly successful. In Cambodia, of 2,204 villages enrolled in the Rural Sanitation and Hygiene Improvement Program, only 32% had achieved ODF status (i.e., had at least 85% basic sanitation coverage).
- Implementers should focus CLTS programs in areas where local contexts are best suited for the approach. Favorable areas can be determined by leveraging the information collected on program villages as well as publicly available data on local contexts.
- We identified three factors that influence CLTS performance in Cambodia: villages were more likely to achieve ODF status if they had fewer households, had a higher latrine coverage at baseline, or were located in communes with higher literacy (both among men and women).
- Villages with approximately 80 households or less, 60% latrine coverage at baseline or higher, located in communes with over 80% women's literacy or 85% men's literacy were more likely to achieve ODF status than villages not meeting these criteria.

Study Overview

The USAID Water, Sanitation and Hygiene Partnerships and Learning for Sustainability (WASHPaLS) project examined CLTS datasets in four countries to quantify the extent to which environmental, demographic, accessibility, and socioeconomic factors affect ODF achievement. In Cambodia, we examined CLTS performance data from the Rural Sanitation and Hygiene Improvement Program (CRSHIP) coordinated by Plan International with funding from the Global Sanitation Fund of the Water Supply and Sanitation Collaborative Council.¹ The CRSHIP dataset covered the period 2012-2018 and included 2,204 villages from 275 communes (the smallest division of local government) out of 1,431 communes nationally (Figure 1). We note that WaterSHED and iDE have implemented Market Based Sanitation (MBS) activities since 2009 in 9 of the 11 provinces targeted by CRSHIP,^{2,3} though we do not know the extent to which MBS program villages overlapped with CRSHIP's.

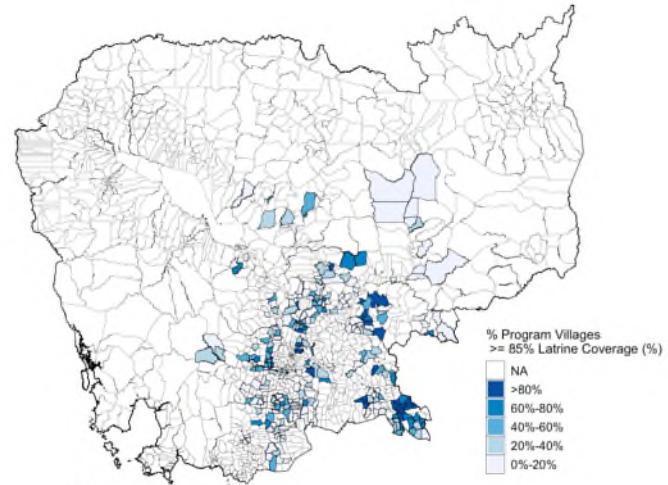


Figure 1. Percent ODF achievement among program villages per commune.
Overall, 32% of study villages had achieved 85% latrine coverage (ODF).

Approach

We assessed CLTS performance based on whether a village had achieved ODF status (“ODF achievement”). We assumed that a village had achieved ODF status if its latrine coverage exceeded 85%, according to national guidelines.⁴

We examined the influence of 11 contextual factors listed in Table I and identified those that were closely associated with ODF achievement. We expressed model results as Odds Ratios (ORs), where values greater than 1 indicate a positive association between explanatory and outcome variables. P-values up to 0.1 can offer insight on general trends, but we deemed p-values greater than 0.05 statistically insignificant. To aid implementers in identifying areas favorable for CLTS, we determined two “split points” delineating three regimes of CLTS favorability (most favorable, somewhat favorable, and least favorable) for each key contextual factor. The first split point identified was the value that maximized the homogeneity of ODF achievement on one side and non-achievement on the other side. The algorithm then used the same methodology to find the second-best split point. We note that these “split points” should not be interpreted as strict thresholds; communities with values just above and below splits are expected to respond similarly. Implementers

can use this information to identify areas most favorable for CLTS and adapt their program accordingly. Detailed methods and limitations are described in a journal publication.⁵

Table 1. Contextual factors examined in this study with data source and resolution			
VARIABLE	PROXY	DATA SOURCE	RESOLUTION
Village size	# of households	CRSHIP	Village
Population density	# of people per square kilometer	Satellite imagery + census ⁶	Commune
Remoteness of village	Time to cities Distance to main roads	Satellite imagery ⁷ Crowd-sourced GPS tracks ⁸	Commune
Literacy level	% literacy among men % literacy among women	Statistical interpolation of DHS survey ⁹	Commune
Baseline latrine coverage	# of latrines per household at baseline	CRSHIP	Village
Water scarcity	Water use divided by water availability	Hydrological model ¹⁰	District
Distance to major waterbodies	Distance to major inland waterways	Satellite imagery ¹¹	Commune
Forest coverage	% coverage of forest per unit area	Satellite imagery ¹²	Commune
Shrubland coverage	% coverage of shrubland per unit area	Satellite imagery ¹³	Commune

Findings

We identified three statistically significant contextual determinants of CLTS performance in Cambodia (Figure 2): villages were more likely to achieve ODF status if they had fewer households, had a higher latrine coverage at baseline, or were located in communes with higher literacy among men and among women.

Higher CLTS success in villages with a smaller population: Smaller villages were more likely to achieve ODF status (Figure 2). A number of reasons may explain this trend. Villages with fewer households are easier for implementers to engage with during triggering events and follow-up.¹⁴ These villages may experience higher social cohesion and stronger local leadership.^{15,16} Stronger relationships between households may also facilitate information transfers about latrine design and available construction materials. Finally, fewer households translates to fewer latrines to be constructed to reach ODF certification benchmarks.

While a smaller village size was generally more favorable, we found that villages with fewer than approximately 80 households were most favorable, achieving ODF status in 44% of cases, substantially higher than the program-wide average of 32% (Figure 3).

ODF achievement was linked to higher baseline latrine coverage: Villages with higher latrine coverage at baseline were more likely to achieve ODF status, as they had a smaller gap to fill to meet ODF requirements. This factor, by far, had the largest association with CLTS performance of those studied (Figure 2). Villages with approximately 60% latrine coverage at baseline or more were most favorable for CLTS, with 68% ODF achievement compared to only 16% achievement in villages with less than 34% latrine coverage at baseline (Figure 3). It is possible that the pre-existence of

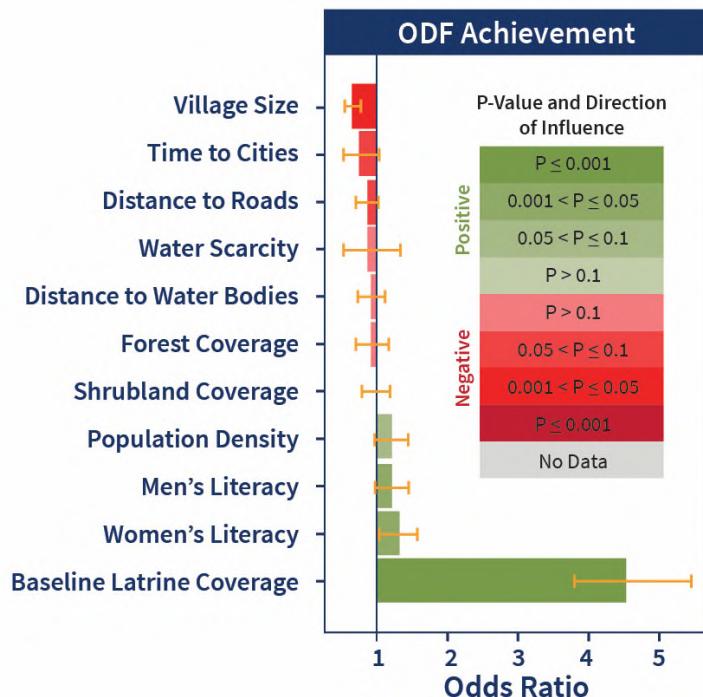


Figure 2. Outputs of logistic regression models in terms of odds ratios (OR). Each bar represents the output of a specific multivariate model, derived for the explanatory variable of interest (rows). Results are displayed as Odds Ratios (length of the bar), p-values (shade, darker=more significant, lighter=less significant), and direction of impact (color, green=positive, red=negative), and 95% confidence intervals (in gold).

MBS interventions have increased baseline coverage in some CRSHIP areas. Thus, implementing CLTS in villages that have received other complementary sanitation interventions in the past, such as MBS, may be more effective.

Communes with higher average literacy were more likely to achieve ODF: Villages were more likely to achieve ODF status in communes with higher literacy levels among women and men (Figure 2). The most favorable context for ODF achievement for men's literacy were communes with higher than 85% literacy. For women's literacy the most favorable regime was actually communes with a mid-range of between 68 to 70% literacy (Figure 3). Households where decision-makers are literate are likely to be more educated and wealthier, possibly with more income-earners, and thus more easily able to access and afford pour-flush latrines and sturdy superstructures, which are the preferred latrine types in Cambodia.¹⁴ These households may also be more informed of the health concerns connected with inadequate sanitation.

More accessible communes were somewhat more successful: Villages located in communes with higher population density and higher proximity to cities and roads were generally more likely to achieve ODF, though these associations were statistically weaker (Figure 2). Such communes likely have easier access to market centers and materials, and may also have higher disposable incomes, again facilitating the construction of high-quality pour-flush latrines and superstructures. High population density may also promote latrine construction as there are fewer suitable locations for OD.¹⁷ Our findings suggest that remote villages, far from market centers and in sparsely populated areas will struggle to achieve ODF targets without dedicated support to access supply chains and masons.

Environmental conditions had no influence on CLTS success: We found that distance to major waterbodies, forest coverage, shrubland coverage, and water scarcity did not influence CLTS performance (Figure 2).

Achieving a higher probability of ODF achievement by considering multiple factors: Using the three significant contextual factors (village size, baseline latrine coverage, and literacy), we identified three types of villages with at least 60% probability of ODF achievement: 1) villages with more than 63% latrine coverage at baseline; 2) villages with less than 63% baseline latrine coverage and more than 83% literacy among men; 3) villages with less than 63% baseline latrine coverage, less than 83% literacy among men, and less than 136 households. CRSHIP villages meeting any of these criteria experienced 60% ODF achievement, which is approximately twice as much as the performance of the overall program of 32%. Targeting villages with a higher probability of success could help improve the cost-effectiveness of CLTS programs.

Data limitations may have affected our results. Specifically, because the CRSHIP dataset did not include the GPS coordinates of program villages, we could not examine contextual factors at the highest resolution.

Implications

This study demonstrates that it is possible to gain insights on the contexts more favorable for the CLTS approach by leveraging publicly available, high-resolution datasets on accessibility and socioeconomic factors. While extensive literature has documented how the quality of CLTS implementation can improve outcomes,^{15,18} our results indicate that implementers should equally focus on targeting geographic areas most suitable for the approach. CLTS programs in Cambodia perform better in smaller villages with higher baseline latrine coverage, and/or in areas with higher literacy and/or accessibility. CLTS implementers would thus benefit from recognizing these influences and incorporating them into their planning.

The determinants of CLTS performance in Cambodia differed from other countries. For example, in Ghana, ODF achievement was higher in areas with low literacy and low accessibility.⁵ This divergence suggests that cultural preferences

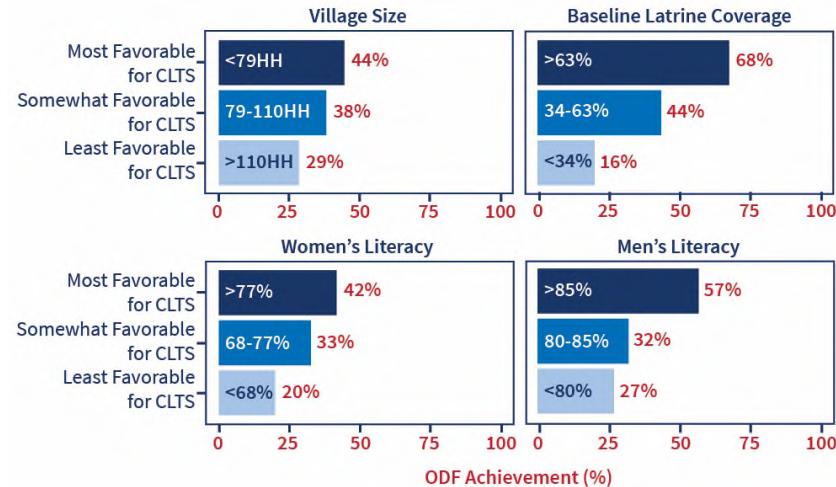


Figure 3. Favorability regimes for ODF achievement. While the split points are the values of the contextual factor corresponding to the largest possible differences in ODF achievement across regimes, they should be interpreted as guidelines rather than strict thresholds.

and co-existing sanitation interventions can affect the “performance envelope” of CLTS. In Cambodia, where intensive MBS interventions have popularized pour-flush toilets made with durable construction materials such as concrete and ceramic, rural sanitation programs, including CLTS, are more successful in accessible areas with higher economic status. In contrast, in locations like Ghana where rudimentary pit latrines made with wood and mud are still widely accepted, remote areas with low economic status may actually be more receptive to CLTS due to stronger social cohesion and fewer prior experiences with sanitation subsidies. While multiple sanitation interventions (such as MBS in conjunction with CLTS) may successfully raise latrine coverage, there is also evidence this can result in “intervention fatigue” and negatively impact long term behavior change.¹⁷ Implementers should examine the data at their disposal (through their own data collection or public datasets) to understand the determinants of CLTS performance in their specific program areas and identify favorable and unfavorable locations for this approach.

We do not suggest that implementers should avoid difficult locations altogether. In fact, the gradual shift to area-wide programming will require that Cambodian implementers address all villages within a given jurisdiction. Nevertheless, implementers can leverage information on favorability to strategically prioritize timing of implementation and evaluate if CLTS should be combined with, or replaced by, other approaches. These types of data-informed decisions could help improve the cost-effectiveness of CLTS interventions.

Finally, we encourage implementers to more systematically collect GPS coordinates of program villages, and continue to collect M&E data post-ODF to further investigate the drivers of ODF sustainability.

References

- (1) CRSHIP Program | Plan International USA <https://www.planusa.org/cambodia-rural-sanitation-and-hygiene-improvement-program> (accessed Nov 4, 2019).
- (2) Kozole, T.; Dauguet, M.; Goodwin-Kucinsky, M.; Yi Wei, G. E.-C.; Veasna, T.; Rose, R. *Cambodia Sanitation Marketing Scale-Up Program (SMSU): Learnings from a Decade of Implementation*; 2019.
- (3) Jenkins, M. W.; McLennan, L.; Revell, G.; Salinger, A. *Strengthening the Sanitation Market System: WaterSHED’s Hands-Off Experience Paper for the WASH Systems Symposium*; 2019.
- (4) UNICEF/EAPRO. *Community-Led Total Sanitation in the East Asia and Pacific Region: Regional Report*; 2015.
- (5) Stuart, K.; Albert, J.; Peletz, R.; Khush, R.; Delaire, C. Where Does CLTS Work Best? Quantifying Determinants of CLTS Performance with Evidence from Four Countries. *Unpublished 2020*.
- (6) WorldPop Project <http://www.worldpop.org.uk/> (accessed Nov 14, 2018).
- (7) Weiss, D. J.; Nelson, A.; Gibson, H. S.; Temperley, W.; Peedell, S.; Lieber, A.; Hancher, M.; Poyart, E.; Belchior, S.; Fullman, N.; et al. A Global Map of Travel Time to Cities to Assess Inequalities in Accessibility in 2015. *Nature* **2018**, 553 (7688), 333–336. <https://doi.org/10.1038/nature25181>.
- (8) Cambodia Road Network (main roads) cambodia: https://geonode.wfp.org/layers/ogcserver.gis.wfp.org%3Ageonode%3Azmb_trs_roads_osm (accessed Jan 17, 2020).
- (9) Spatial Data Repository, T. D. and H. S. P. *Modeled Surfaces*; 2020.
- (10) Mekonnen, M. M.; Hoekstra, A. Y. Four Billion People Facing Severe Water Scarcity. *Sci. Adv.* **2016**, 2 (2). <https://doi.org/10.1126/sciadv.1500323>.
- (11) United Nations Office for the Coordination of Humanitarian Affairs. Cambodia - Rivers <https://data.humdata.org/dataset/cambodia-water-courses-0> (accessed Jan 17, 2020).
- (12) Hansen, M. C.; Potapov, P. V.; Moore, R.; Hancher, M.; Turubanova, S. A.; Tyukavina, A.; Thau, D.; Stehman, S. V.; Goetz, S. J.; Loveland, T. R.; et al. High-Resolution Global Maps of 21st-Century Forest Cover Change. *Science (80-.).* **2013**, 342 (6160), 850–853. <https://doi.org/10.1126/science.1244693>.
- (13) Corpenicus; ECMWF. Land cover classification gridded maps from 1992 to present derived from satellite observations <https://cds.climate.copernicus.eu/cdsapp#!/home> (accessed Jan 23, 2020).
- (14) Cambodia Project Coordinator. Phone Interview. Plan International 2019.
- (15) Mukherjee, N. Factors Associated with Achieving and Sustaining Open Defecation Free Communities: Learning from East Java. *WSP Res. Br.* **2011**.
- (16) Venkataraman, V.; Crocker, J.; Karon, A.; Bartram, J. Community-Led Total Sanitation: A Mixed-Methods Systematic Review of Evidence and Its Quality. *Environ. Health Perspect.* **2018**, 126 (2), 17. <https://doi.org/10.1289/EHP1965>.
- (17) USAID. *Community-Led Total Sanitation (CLTS) Research Summary: Performance Envelope Cambodia*. Unpublished Report.
- (18) Venkataraman, V. *Testing CLTS Approaches for Scalability: Systematic Literature Review*; Chapel Hill, NC, 2012.

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About USAID/WASHPaLS

The USAID Water, Sanitation and Hygiene Partnerships and Learning for Sustainability Project (USAID/WASHPaLS) is a five-year task order funded by the Bureau for Global Health that identifies and shares best practices for achieving sustainability, scale, and impact of evidence-based environmental health and WASH interventions. Through extensive desk reviews, key informant interviews, and field-based implementation research, USAID/WASHPaLS works with implementing partners to broaden the evidence base on the use and effectiveness of sanitation interventions, including Community-Led Total Sanitation (CLTS), market-based sanitation (MBS), and hygienic environments for infants and young children. For further information about this and other aspects of the project, as well as to access our knowledge products, please visit globalwaters.org/washpals.