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**EQUITABLE AND SUSTAINABLE WASH SERVICES:
FUTURE CHALLENGES IN A RAPIDLY CHANGING WORLD**

**Impacts of climate vulnerable environments on effective
sanitation and FSM in rural Cambodia**

Rana Abdel-Sattar, Chris Nicoletti, Tyler Kozole, James Harper & Touer Veasna

Cambodia

REFERENCE NO. 3215

Introduction

Having achieved a marked expansion of basic sanitation coverage over the past decade, rural Cambodia is now faced with the urgent challenge of safe fecal sludge management (FSM). It is estimated that over 25% of the population in Cambodia is affected by challenging environments that experience floods, high ground water, and other barriers to effective sanitation and FSM. Rural households living in these environments are more vulnerable to climate change and have limited capacity to resist, cope with and recover from climate hazards. With the mission to improve access to safe FSM in rural Cambodia and households' WASH resilience to climate change shocks, iDE explores the link between climate vulnerability, latrine functionality, and FSM intentions and practices.

Methodology

In mid-2019, iDE and the University of Colorado Boulder designed and deployed a survey to better understand FSM behaviors, knowledge, motivations, and preferences in rural Cambodia. The FSM survey reached 1,472 latrine-owning households in five provinces (Kampong Thom, Kandal, Prey Veng, Siem Reap, Svay Rieng). Between 240 and 361 households were surveyed in each province, and a total of 257 villages were visited across 49 districts and 196 communes.

Key survey questions were selected to investigate the complex effects of seasonal variability and living in flood prone environments on latrine functionality, and FSM intentions and practices. The collected data included frequency of latrine overflow/malfunction during the rainy season, frequency of latrine pits filling up, and unsafe FSM practices such as releasing fecal sludge into the open environment (e.g., opening the pit lid during a flood, piercing the pit). Using GIS mapping, the data was compared to average and major flood events to assess the different thresholds of climate change vulnerability. Additionally, to better understand the isolated effect of being in a flood-prone area while, controlling for other confounding factors, a logistic regression model was used to explain latrine functionality as a function of household size, number of pits, depth of pits, poverty status, province and whether or not the household was in a flood prone area.

Results

Climate vulnerable households that lived within the major flood zone were more likely to have had a non-functional latrine during the rainy season [$r(1,472) = .07$, $p < .01$] and were more likely to have a pit fill up [$r(1,472) = .05$, $p < .05$]. Additionally, we found statistically significant differences in unsafe FSM intentions between climate vulnerable households and non-climate vulnerable households [$t(1,472) = .03$, $p < .10$]. We also see significantly more households with pierced pits [$t(1,472) = .04$, $p < .05$]. Of all the factors considered in the logistic regression model to affect pit functionality, household size and being in a flood prone area were

both positive and significant at 1% and 5%, respectively. Interestingly, we did not see a greater proportion of poor households in flood-prone areas.

Wider implications

Results indicate that climate vulnerability is related to the latrine functionality and has additional effects on FSM intentions and practices. With increased flooding across iDE's operational areas, we can expect to see increased challenges with dysfunctional latrines which will amplify the use of unsafe FSM practices. To reduce households' climate vulnerability, these associated unsafe FSM behaviors can be targeted and mitigated. This study proposes a more feasible approach to target household level WASH-climate vulnerability when compared to existing costly and difficult to deploy tools (e.g., groundwater mapping, precipitation models, soil assessments, etc.). Sanitation marketing implementers can use this approach to target households in challenging environments with more resilient FSM products and services. As latrine pits fill, it is recommended that the sector continues to deepen its understanding of behavior, socio-economic vulnerability, and climate change impacts on rural sanitation.

References

- Bukauskas, K., Koolhof, A., Kim, P., & King, M. (2017). Small-Scale Wastewater Treatment Technologies for Challenging Environments.
- UNICEF & GWP (2017). WASH Climate Resilient Development - Strategic Framework.
- World Food Programme (WFP), Cambodia Humanitarian Response Forum (HRF) & OCHA's ROAP (2018). Cambodia Flood Extent in 2013.
- WFP OMB, Asia & the Pacific (2019). Cambodia Flood Extent in 2011.

Contact details

About the author(s): Rana Abdel-Sattar is the WASH Innovation and Partnerships Manager for iDE Cambodia's Marketing Sanitation Scale-Up (SMSU) Program. Chris Nicoletti is iDE's Global Senior Director of Impact and Analytics.

Rana Abdel-Sattar:	Phnom Penh, Cambodia. Telephone: +855 309 5240 Email: rasattar@ideglobal.org Website: https://washmarkets.ideglobal.org/
Chris Nicoletti:	Denver, Colorado, USA. Telephone: +1 720 369 3664 Email: cnicoletti@ideglobal.org