Pre-print version of this article can be found from DOI:10.21203/rs.3.rs-2375337/v1

DEVELOPING EVIDENCE ON WATER, SANITATION AND HYGIENE FACILITIES IN THE CLIMATE VULNERABLE SLUMS THROUGH WASH POVERTY INDEX: A CASE STUDY ON SELECTED SLUMS IN RAJSHAHI CITY CORPORATION, BANGLADESH

Tahsin Tabassum[1]*, Fatema-Tuz-Zohora[2], Saief Manzoor-Al-Islam[3], Nazwa Tahsin[4]

[1] Centre for climate change and environmental research, BRAC University, Bangladesh, e-mail: anannatahsin2048@gmail.com
[2] Department of urban and regional planning, Bangladesh University of Engineering and Technology, Dhaka-1000, Bangladesh, e-mail: tuzzohorafatema67@gmail.com
[3] WaterAid Bangladesh, Bangladesh, e-mail: SaiefManzoor@wateraid.org
[4] Wageningen University and Research, Netherlands, e-mail: nazwa.tahsin@gmail.com

1. INTRODUCTION

Many climate migrants from rural vulnerable areas are now choosing to seek refuge in slums of cities in Bangladesh (Rana and Ilina, 2021). This study has identified the WASH condition of the 5 selected slums in Rajshahi district through WASH poverty index which is a powerful tool for planning while targeting and prioritizing WASH challenges (Giné-Garriga et al., 2018). Through integrated analysis of WASH and poverty linkages, the index assists to identify key issues which can guide policymakers towards appropriate action. In a case study of Kenya, a WASH PI has been developed to identify priority areas and guide appropriate action and policy-making towards improved service delivery (Garriga & Foguet,2011). WASH index has been considered as a monitoring and assessment tool to understand the WASH condition of humanitarian refugee camps of Europe too (Tsesmelis, Skondras, Khan, Kolokytha, & Karavitis, 2020).

2. METHODOLOGY

The index is an agglomeration of 3 different indices and few more subindices comprising them. Water poverty index (WPI) accounts for availability, accessibility, water points, use of water and relevant environment, sanitation poverty index (SPI) considers access, capacity, and use, while hygiene poverty index (HPI) deals with water safety plan, food hygiene, personal hygiene, and domestic hygiene. The sub-indices have been fixed from previous studies keeping the context of Bangladesh in mind. The index has been developed by using primary data through a questionnaire survey. Probabilistic sampling has been done here with 95% confidence level,5% margin of error and 50% population proportion using the following formula. The samples were distributed among the slums according to population. The sample size has been found 376.
For the further calculation, weightage of the indices and sub-indices has been fixed through literature review and expert opinion. Then WPI, HPI, SPI have been calculated using the formula 2. The aggregated WASH PI has been calculated using the formula 3.

$$WPI = \prod \mathrm{Xi}^{\mathrm{Wi}},\ HPI = \prod \mathrm{Xi}^{\mathrm{Wi}},\ SPI = \prod \mathrm{Xi}^{\mathrm{Wi}} \quad \text{.....(1)}$$

Where,
Xi=Percentage of household of that indicator
Wi= Weightage applied to the indicator

$$WASH\ PI = \frac{\sum_{i=1}^{n} Wi\,Xi}{\sum_{i=1}^{n} Wi} \quad \text{.....(2)}$$

Where,
Wi =Weightage of sun-indices (WPI,SPI.HPI)
Xi=Value of WPI,SPI,HPI

The closer the value is to 1, the better the condition and the indices closer to 0 indicate poor state

3. RESULT AND DISCUSSION

The WPI, SPI, HPI is the lowest in Char Christan Para (.46557), Ashrayan (.073263) and Ashrayan (0.12925) respectively. It can be said that policymakers should give attention to all three sectors. However, these two slums should be given more attention, though all the slums have poor score. Lack of access to safe water, conflict near supply points, toilets being unhygienic, not treating water, having animal feces on premises etc. are dragging the indices down. Over all, the Ashrayan has the lowest WASH poverty index. So, it should get the highest priority among the slums.

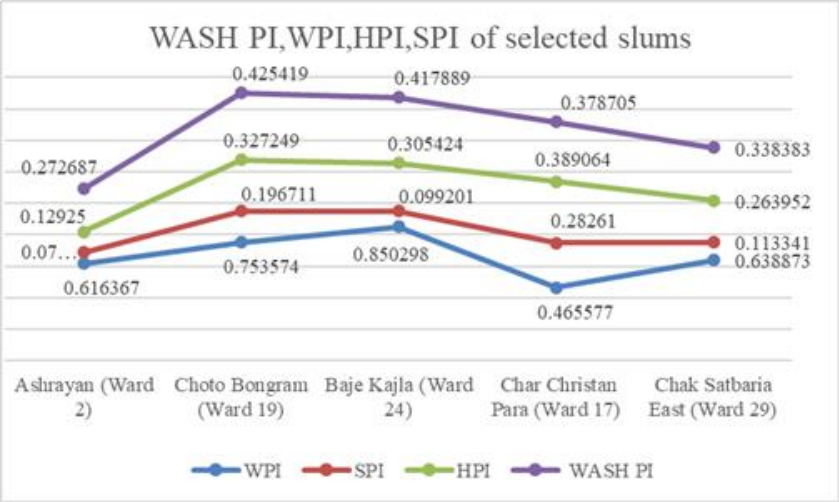

Figure 1 Showing WASH PI, WPI, HPI, SPI of selected slums

4. CONCLUSION

This study identifies where WASH PI shows the arenas to be improved to enable the appropriate use of the index as an advocacy and management tool. In terms of furthering the research and upgrading the index, it is proposed for example a better definition of indicators in which base the components of the index. If more slums can be included and data can be available of that district, an inequity of WASH service provisions can be shown. Wider application and testing of the index will provide the opportunity to promote the effective implementation of WASH PI in poverty alleviation strategies. It will help policymakers to prioritize the neediest area for interventions.

5. REFERENCES

Garriga, R. G., & Foguet, A. P. (2011). Application of a revised Water Poverty Index to target the water poor. *Water Science and technology*, 63(6), 1099-1110. DOI:10.2166/wst.2011.347

Giné-Garriga, R., Requejo, D., Molina, J. L., & Pérez-Foguet, A. (2018). A novel planning approach for the water, sanitation and hygiene (WaSH) sector: The use of object-oriented bayesian networks. *Environmental modelling & software*, 103, 1-15. https://www.sciencedirect.com/science/article/abs/pii/S1364815216311306

Rana, M. M. P., & Ilina, I. N. (2021). Climate change and migration impacts on cities: Lessons from Bangladesh. *Environmental Challenges*, 5, 100242. https://www.sciencedirect.com/science/article/pii/S2667010021002213.

Tsesmelis, D. E., Skondras, N. A., Khan, S. Y. A., Kolokytha, E., & Karavitis, C. A. (2020). Water, sanitation and hygiene (WASH) index: development and application to measure WASH service levels in european humanitarian camps. *Water Resources Management*, 34, 2449-2470