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Household Willingness-to-Pay for Waste Emptying and Collection Services in Bangladeshi Municipalities: Toward a Green Urban Business Model

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Abstract - **Bangladesh's rapid urbanization has exacerbated municipal waste-management challenges, yet few studies examine how household economics shape service uptake. This paper investigates the relationships among household income, expenditure, service costs and willingness-to-pay (WTP) for emptying and collection services in five diverse municipalities—Lakshmipur, Lalmonirhat, Saidpur, Sakhipur, and Teknaf. A structured questionnaire captured: average monthly income; average monthly expenditure; current cost per emptying trip; existing monthly payment for community-based solid-waste collection; WTP a premium for improved emptying services; and desired WTP level. Data were analyzed using SPSS, employing Pearson correlation and multiple regression to identify key economic drivers of WTP, and exploratory factor analysis to uncover latent attitudes toward green service provision. By situating the findings within a municipality-led governance framework, where local authorities can both incentivize green practices and penalize harmful behaviors, this study informs the design of sustainable, revenue-positive service models. We conclude with recommendations for tiered pricing, targeted subsidies, and participatory planning to foster equitable, cost-effective waste management and to advance a viable green business model in resource-constrained urban settings.**

Keywords - **Municipal waste management, SPSS correlation, Green business model, Urban governance, Sustainable service delivery**

I.INTRODUCTION

Rapid urbanization in Bangladesh has outpaced the development of municipal solid waste management (MSWM) systems, leading to environmental degradation, public health risks, and inefficiencies in service delivery. Dhaka alone generates over 4,000 tonnes of municipal solid waste per day, while household-level studies report 1.3 kg/household/day (0.25 kg/person/day), largely composed of organic fractions 5 [8]. Simultaneously, fecal sludge from on-site sanitation accumulates at 0.11 L/person/day in peri-urban areas, necessitating emptying every 3–4 years at considerable cost [12].

Existing research underscores that households' willingness to pay (WTP) for improved waste and sanitation services hinges on socio-economic and attitudinal drivers. In Bangladesh, service charge levels, income, education, and municipal classification significantly influence WTP for basic municipal services [1]. Environmental awareness, income group, and age cohorts predict waste separation and minimization behaviours in Dhaka, with middle-income earners and young adults most responsive to green incentives [6]. Contingent valuation in Dhaka also estimates an aggregate WTP of USD 0.10 million per year for improved waste collection, with only marginal differences between serviced and unserviced areas [7]. Advanced waste management frameworks further identify income, education, and environmental consciousness as key predictors, with 63 percent of households willing to pay BDT 250 or more per month for enhanced services in Bangladesh [2].

Cross-national studies echo these findings. Households in Malaysia are willing to pay 200 percent more for daily morning pick-ups, driven by education, family size, income, and satisfaction levels [3]. Low-income areas in Kuala Lumpur exhibit significant WTP gaps due to service deficits, highlighting the need for participatory infrastructure investment [4]. In Kampala, 48.1 percent of households offered a mean monthly WTP of UGX 5,382 (USD 2.91), achieving near cost recovery at the lowest payment class [9]. Residents of Mekelle City demonstrate WTP linked to income and environmental quality awareness, with municipal fees currently set below residents' actual capacity to pay [10]. Similar dynamics appear in Silchar, India (63 percent WTP; average Rs 127.47) [15] and in Gorkha, Nepal (61 percent WTP; average NRs 73.38) [16]. Within Bangladesh's Dhaka metropolitan region, higher-income wards exhibit significantly greater payment thresholds than lower-income areas [11]. Meanwhile, consumer-behaviour surveys for electronic waste reveal that 37.9 percent of respondents are willing to cover 5–10 percent of recycling costs, driven by income, education, and environmental awareness [13]. Although a PIDE working paper outlines the determinants of WTP for solid waste management in Pakistan, it lacks empirical results to guide Bangladeshi municipalities [14].

Despite this extensive literature, three key gaps remain. First, comparative analyses across multiple Bangladeshi municipalities are scarce, limiting insights into spatial heterogeneity in WTP. Second, the dual challenges of solid waste collection and fecal sludge emptying have not been jointly examined, leaving policymakers without a holistic view of household

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economics across sanitation streams. Third, few studies explicitly frame WTP findings within green urban business models that integrate pricing, governance incentives, and behavioural levers to achieve revenue-positive, sustainable service delivery.

To address these gaps, this study analyzes household WTP for both emptying and community-based solid waste collection across five diverse municipalities: Lakshmipur, Lalmonirhat, Saidpur, Sakhipur, and Teknaf using a structured survey to identify socio-economic drivers and latent attitudes underpinning WTP. By situating results within a municipality-led governance framework, actionable recommendations will be offered for tiered pricing, targeted subsidies, and participatory planning that align revenue generation with equitable, sustainable service expansion.

II. METHODOLOGY

This cross-sectional study was conducted in five municipalities: Lakshmipur (n = 255), Lalmonirhat (n = 230), Saidpur (n = 260), Sakhipur (n = 223), and Teknaf (n = 147) selected to represent diverse urbanization gradients in Bangladesh. A multi-stage random sampling procedure was employed at the ward level, followed by systematic selection of households within each ward. Total sample size (n = 1, 115) exceeds common thresholds for household WTP surveys in solid waste management, ensuring adequate statistical power for subgroup analyses [9][11].

A structured questionnaire was developed, drawing on contingent valuation frameworks and socio-economic modules from prior studies on household WTP in waste and sanitation services [3][4]. The instrument captured average monthly household income, average monthly expenditure, cost per emptying trip, existing monthly payments for community-based solid waste collection, premium WTP for improved emptying services, and respondents' desired monthly WTP level. Face-to-face interviews were conducted by trained enumerators between May and July 2024, achieving a response rate above 90 percent.

Key continuous variables include: monthly income (BDT), monthly expenditure on waste collection (BDT), and per-trip emptying cost (BDT). Willingness to pay was elicited using a double-bounded dichotomous choice followed by an open-ended question to capture maximum WTP, in line with best practices for improving valuation accuracy [2][3]. Socio-demographic covariates encompass household size, education level of the head, and tenure status. Latent attitudinal dimensions toward green service provision were probed via Likert-scale items adapted from established environmental attitude scales [6][13].

All data were entered and cleaned in SPSS v.25. Descriptive statistics characterized socio-economic profiles and raw WTP distributions. Pearson correlation coefficients were computed to assess bivariate relationships among income, expenditure, service costs, and WTP [3]. Multiple linear regression models mirroring approaches in contingent valuation literature identified key predictors of premium WTP, with heteroskedasticity-robust standard errors to ensure valid inference [4][11]. Finally, exploratory factor analysis with principal axis extraction and varimax rotation uncovered latent attitudinal constructs underlying green service preferences, facilitating segmentation for targeted policy design [12].

Continuous adherence to these methodological steps provides a robust foundation for interpreting the socio-economic drivers of WTP and for translating findings into a green urban business model tailored to Bangladeshi municipalities.

III. RESULTS

A. Socio-Economic Profile

The final sample (n = 1 115) had a mean household size of 5.2 members (SD = 1.4) and an average monthly income of BDT 25 300 (SD = 8 750). Education levels of household heads were distributed as 28% primary, 52% secondary, and 20% tertiary. Tenure status showed 65% owners and 35% renters.

TABLE I
SOCIO-ECONOMIC PROFILE

Variable	Mean	SD	Range	n (%)
Household size (members)	5.2	1.4	2 – 9	—
Monthly income (BDT)	25,300	8,750	8000 – 60,000	—
Education of head	—	—	—	Primary: 28% Secondary: 52% Tertiary: 20%
Tenure status	—	—	—	Owner: 65% Renter: 35%

B. Willingness-to-Pay Distribution

Overall, 92% of respondents expressed a positive premium WTP for improved emptying services. The mean monthly WTP was BDT 150 (SD 45), with a median of BDT 145. Municipal differences emerged: Teknaf reported the highest mean WTP (BDT 162, SD 50) and Sakhipur the lowest (BDT 138, SD 42).

TABLE I I
WILLINGNESS TO PAY DISTRIBUTION

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Municipality	n	Mean WTP (BDT)	SD (BDT)	Median WTP (BDT)	% WTP > 0
Lakshmipur	255	155	48	150	93%
Lalmonirhat	230	148	44	142	91%
Saidpur	260	152	46	148	94%
Sakhipur	223	138	42	135	89%
Teknaf	147	162	50	158	95%
Overall	1 115	150	45	145	92%

Determinants of Premium WTP

A multiple linear regression ($R^2 = 0.42$) identified key predictors of premium WTP. Monthly income ($\beta = 0.45$, $p < 0.001$), education level ($\beta = 0.12$, $p = 0.002$), and environmental responsibility factor score ($\beta = 0.28$, $p < 0.001$) were all positively associated. Renters paid on average BDT –9 less than owners ($p = 0.03$). Heteroskedasticity-robust standard errors were applied.

TABLE I I I
DETERMINANTS OF PREMIUM WTP

Predictor	β	SE (robust)	t-value	p-value
Constant	42.1	5.3	7.94	< 0.001
Monthly income (per BDT 1 000)	0.45	0.05	9.00	< 0.001
Education (primary ref.)				
– Secondary	8.3	2.7	3.07	0.002
– Tertiary	12.5	3.1	4.03	< 0.001
Tenure (owner ref.)				
– Renter	–9.0	4.1	–2.19	0.030
Environmental responsibility	0.28	0.04	7.00	< 0.001
Trust in service provider	0.11	0.05	2.20	0.028

IV. DISCUSSION

The study confirms a robust positive relationship between household income and premium WTP for improved emptying services, aligning with global contingent valuation studies in urban sanitation. Environmental responsibility emerged as a strong attitudinal driver, reinforcing evidence that green-service uptake hinges not only on ability but also on values. Municipal variability highest WTP in Teknaf and, lowest in Sakhipur reflects differing local norms, service performance, and possibly past exposure to environmental campaigns.

These insights suggest a twofold policy approach: a. Implement income-sensitive tariff structures, offering targeted subsidies to lower-income households while maintaining full-cost recovery from higher-income segments. b. Integrate environmental awareness campaigns tied directly to service branding to leverage strong green attitudes and build trust in providers. c. Develop performance indicators (timeliness, transparent billing) to bolster confidence among renters, who otherwise show lower WTP.

Key limitations include cross-sectional design, preventing dynamic assessment of WTP changes over time. Seasonal variations in waste generation and payment capacity were not captured. A longitudinal panel or mixed-methods follow-up would clarify causality and temporal shifts in household preferences. Expanding the sample to include peri-urban and rural areas could test the generalizability of municipal-level findings. Beyond the current scope, exploring digital payment platforms could streamline billing transparency and build provider trust, especially among tech-savvy younger households. Integrating GIS mapping of service routes may optimize collection logistics, reducing operational costs and potentially lowering user fees. Finally, piloting a performance-based contracting model with clear environmental targets can create market incentives for private operators to deliver greener service

V. CONCLUSION

This study assesses household willingness to pay (WTP) for improved faecal sludge emptying services in five Bangladeshi municipalities. Using a cross-sectional contingent valuation survey (n = 1,115), we applied a double-bounded dichotomous choice followed by an open-ended question to elicit maximum monthly premium WTP. Socio-demographic data, service cost perceptions, and attitudinal scales on environmental responsibility and provider trust were also collected.

Results show that 92 percent of households are willing to pay a premium, with a mean WTP of BDT 150 (SD 45). Multiple regression ($R^2 = 0.42$) identifies income, education, and environmental responsibility as the strongest positive predictors, while renters exhibit a modestly lower WTP. Exploratory factor analysis reveals two latent constructs environmental responsibility and provider trust explaining 56 percent of attitude variance. These findings inform income-sensitive tariff design, targeted subsidies, and awareness campaigns to optimize green service uptake in urban sanitation.

The analysis demonstrates that both economic capacity and pro-environmental attitudes drive household WTP for enhanced emptying services. Municipal differences suggest that local norms and past exposure to environmental messaging shape demand, with Teknaf's highest and Sakhipur's lowest WTP reflecting this variation.

Policy interventions should combine graduated tariff structures—offering subsidies to lower-income households—and branding that highlights environmental benefits to leverage strong green attitudes. Enhancing transparency and service reliability will further engage renters and build trust. Performance-based contracts with explicit environmental targets can incentivize private operators to deliver cost-effective, eco-friendly services.

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Looking ahead, integrating real-payment pilots and longitudinal panels will validate stated preferences and track dynamic shifts in WTP. Incorporating GIS-based route optimization and mobile billing platforms can reduce operational costs and improve user experience. Ultimately, these insights pave the way for a scalable green urban business model that balances financial sustainability with equitable access.

REFERENCES

[1] S. H. Rahman and N. F. Pabon, "Payment behaviour to municipal service provision in Bangladesh," Bangladesh Dev. Stud., vol. 41, no. 3, pp. 35–56, Jun. 2019.

[2] S. Ali, S. Akter, A. Boros, and I. Temesi, "Factors influencing households' willingness to pay for advanced waste management services in an emerging nation," Urban Sci., vol. 9, no. 7, art. no. 270, Jul. 2025.

[3] M. Djayasinga and R. Virsa, "Willingness to pay by contingent valuation method (case study: waste management services)," Int. J. GEOMATE, vol. 17, no. 62, pp. 59–64, Oct. 2019.

[4] M. W. Murad, M. A. Raquib, and C. Siwar, "Willingness of the poor to pay for improved access to solid waste collection and disposal services," J. Environ. Dev., vol. 16, no. 1, pp. 84–101, Mar. 2007.

[5] R. Afroz, "Sustainable household waste management improvement in Dhaka city, Bangladesh," Int. J. Environ. Sustain. Dev., vol. 10, no. 4, pp. 433–448, 2011.

[6] R. Afroz, R. Tudin, K. Hanaki, and M. M. Masud, "Selected socio-economic factors affecting the willingness to minimise solid waste in Dhaka city, Bangladesh," J. Environ. Plan. Manage., vol. 54, no. 7, pp. 865–888, Jul. 2011.

[7] R. Afroz, K. Hanaki, and K. Hasegawa-Kurisu, "Willingness to pay for waste management improvement in Dhaka City, Bangladesh," J. Environ. Manage., vol. 90, pp. 492–503, 2009.

[8] M. Sujauddin, S. M. S. Huda, and A. T. M. Rafiqul Hoque, "Household solid waste characteristics and management in Chittagong, Bangladesh," Waste Manag., vol. 28, no. 9, pp. 1688–1695, Jul. 2008.

[9] J. Ojok, M. K. Koech, M. Tole, and J. Okot-Okumu, "Households' willingness to pay for improved municipal solid waste management services in Kampala, Uganda," Sci. J. Environ. Eng. Res., vol. 2013, Art. ID sjeer-143, 8 pp., 2013.

[10] D. Hagos, A. Mekonnen, and Z. Gebreegziabher, "Households' willingness to pay for improved urban waste management in Mekelle City, Ethiopia," Environ. Dev. Discuss. Pap. Ser., EfD DP 12-06, Apr. 2012.

[11] B. K. Barmon, K. Mohiuddin, G. E. Islam, and N. Laila, "Willingness to pay for solid waste management system in Dhaka City, Bangladesh: A socio-economic analysis," East West J. Bus. Soc. Stud., vol. 4, art. no. 114, 2015.

[12] S. Balasubramanya et al., "Towards sustainable sanitation management: Establishing the costs and willingness to pay for emptying and transporting sludge in rural districts with high rates of access to latrines," PLoS One, vol. 12, no. 3, art. no. e0171735, Mar. 2017.

[13] A. A. Ananno, M. H. Masud, P. Dabnichki, M. Mahjabeen, and S. A. Chowdhury, "Survey and analysis of consumers' behaviour for electronic waste management in Bangladesh," J. Environ. Manage., vol. 282, art. no. 111943, Jan. 2021.

[14] U. Mustafa, I. Ahmad, and M. ul-Haq, "Capturing willingness to pay and its determinants for improved solid waste management," PIDE Work. Pap., Pakistan Inst. Dev. Econ., Islamabad, 2014.

[15] A. T. Roy and U. Deb, "Households' willingness to pay for improved waste management in Silchar municipal area: A case study in Cachar District, Assam," IOSR J. Humanit. Soc. Sci., vol. 6, no. 5, pp. 21–31, Jan.–Feb. 2013.

[16] B. Maskey and M. Singh, "Households' willingness to pay for improved waste collection service in Gorkha Municipality of Nepal," Environments, vol. 4, no. 4, art. no. 77, Nov. 2017

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