

The Influence of Concern for Clean Water on Participation in Sanitation Programs with Household Income as a Moderator

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ABSTRACT

This study aims to examine the influence of concern for clean water on participation in sanitation programs with household income as a moderator among urban communities. A quantitative approach with an explanatory survey design was employed. The study is grounded in environmental behavior theory and community participation frameworks, which explain that individual concern for natural resources and socioeconomic conditions influence engagement in collective sanitation initiatives. The sample consisted of 100 residents selected using purposive sampling with consideration of variation in household income levels. Data were collected using a Likert scale questionnaire adapted from established indicators of environmental concern, sanitation participation, and household income. Analysis was conducted using Moderated Regression Analysis with SPSS PROCESS Macro Model 1. The results showed that concern for clean water has a positive and significant influence on participation in sanitation programs. Household income significantly moderates the relationship between concern for clean water and sanitation program participation, where higher income levels strengthen the positive influence of environmental concern on participation behavior. This study confirms that socioeconomic factors should be considered in designing community-based sanitation programs.

INTRODUCTION

Access to clean water and proper sanitation is a basic right for every citizen guaranteed under the constitution. Even so, many people still struggle to access clean water and live in environments with poor sanitary conditions. Sanitation programs run by government bodies and non-government organizations aim to address this problem through participatory approaches that actively involve residents. Community participation in sanitation programs is a key factor in the success of such programs, since without active resident involvement, sanitation programs will not be sustainable. Tseklevs et al. (2022) showed that community engagement in water, sanitation, and hygiene programs is a determining factor for intervention success across various countries. Beyond resident involvement itself, sound leadership and effective management of a program are also considered important in determining whether a public initiative can achieve its intended outcomes (Mardikaningsih et al., 2022; Darmawan, 2024). This principle of equal access is also reflected in health-related regulation, which stresses fairness

in service delivery and protection for economically disadvantaged patients as a baseline standard that public programs, including sanitation, should uphold (Napu et al., 2023; Noor et al., 2023). Participation can take the form of joint clean-up activities, contributing ideas for improving sanitation systems, and consistently maintaining a clean environment independently. Understanding the factors that influence public participation in sanitation programs is therefore important for the success of sustainable development efforts.

Concern for clean water is one of the psychological factors influencing people's willingness to participate in sanitation programs. This concern includes awareness of the importance of protecting water sources, the habit of using water wisely, and sensitivity toward water pollution that can endanger health and the environment. People with a high level of concern for clean water tend to understand the connection between poor sanitation and water pollution more clearly, making them more motivated to take part in programs aimed at improving sanitary conditions. Zhou et al. (2025) found that environmental concern has a significant

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influence on household wastewater management behavior. Aurora et al. (2025) showed that water, sanitation, and hygiene interventions can reduce open defecation through participatory approaches. A similar pattern appears in other pro-environmental behaviors, where the level of concern shown by residents is closely linked to their willingness to take part in environmental programs such as waste management (Mardikaningsih et al., 2025). This tendency is also visible in citizen involvement in ecological matters more broadly, including recycling initiatives and social enterprise efforts directed at environmental conservation (Zulkarnain et al., 2021; Nurmalasari & Mardikaningsih, 2022; Nuraini et al., 2022). A precautionary approach in environmental law, such as that applied to plastic waste management, likewise reflects concern translated into concrete protective measures (Hidayat et al., 2024). When people care about the quality of the water they consume, they tend to be more actively involved in efforts to protect water resources through planned sanitation programs.

Household income is a socioeconomic factor that affects people's ability and willingness to participate in sanitation programs. Higher-income households have more resources to invest in private sanitation facilities such as proper toilets, wastewater treatment systems, and access to clean water. Lower-income households often face financial constraints that limit their participation in sanitation programs, even when they hold similar concerns about clean water. Afzal et al. (2023) showed that behavior-change interventions in sanitation have different effects across socioeconomic groups. Atengdem et al. (2024) emphasized that community adoption of and participation in sanitation interventions is strongly influenced by socioeconomic factors. Limited income has likewise been shown to affect the quality of public services people can access, including health services, which in turn shapes how actively they engage in community programs (Darmawan et al., 2022). Financial constraints also affect how much attention households can give to preventive health matters, since limited resources are often directed toward treating existing conditions rather than proactive engagement (Issalillah, 2022). A comparable pattern is found in access to therapy for rare diseases and in claims for compensation over defective health products, both of which show that financial capacity shapes how far a person can obtain proper redress or care (Rahmawan et al., 2024; Risman et al., 2024). Misleading health product advertising adds a further layer to this problem, since it tends to affect economically disadvantaged

consumers who have limited means to verify such claims (Mulyono et al., 2024). Household income also affects access to information about sanitation programs and the ability to allocate time for participatory activities.

This study examines the role of household income as a moderator in the relationship between concern for clean water and participation in sanitation programs. As a moderating variable, household income has the potential to strengthen or weaken the influence of concern on participation, depending on income level. Higher-income households may have greater capacity to translate their concern into concrete participatory action, since they have the resources to support their involvement. Lower-income households may face structural barriers that limit their participation even when their level of concern is high. Malima et al. (2022) found that factors such as income, access to information, and social norms influence individual decisions to invest in sanitation facilities. Turning awareness into concrete action generally involves a decision-making process in which individual considerations are eventually weighed against available resources before participation actually takes place (Darmawan, 2024). A similar logic applies to efforts to reduce waste through more efficient operational practices, where the resources at hand determine how far such intentions can actually be carried out (Radjawane et al., 2022). In this study, household income is categorized into three groups low, medium, and high to analyze the moderating effect in greater depth.

The phenomenon of low community participation in sanitation programs remains a challenge in many urban areas of Indonesia. Observations indicate that many sanitation programs fall short because of minimal community involvement, caused by factors such as limited understanding of the importance of sanitation, a weak sense of ownership over the program, and economic barriers faced by lower-income groups. Sanitation programs designed without accounting for differences in residents' socioeconomic conditions tend to fail to reach their intended participation targets. Lower-income households often struggle to allocate time and resources to participation because they are more focused on meeting basic daily needs. Raholiarimanana et al. (2026) showed that household sanitation conditions are significantly related to child welfare, pointing to the importance of an approach sensitive to economic conditions. Lokonon et al. (2022) also found that sanitation factors affect child nutritional status through different mechanisms across socioeconomic groups. Limited access in

certain areas has similarly been observed in other public service sectors, where residents with fewer resources often face greater difficulty reaching services that should be available to everyone (Mohamad et al., 2024). Health-related programs targeting vulnerable groups such as pregnant women also depend heavily on comparable forms of engagement to be effective (Issalillah, 2021). Access barriers of this kind are also apparent in tele-rehabilitation and telepsychiatry services, where clear standards on consent and data protection are needed so that vulnerable patients are not left behind (Widodo et al., 2024; Isnani et al., 2024). Weak legal certainty around consent in emergency care and around sanctions for malpractice in alternative treatment settings further shows how patients with limited bargaining power tend to be the most exposed to harm (Susanti et al., 2024; Sirenden et al., 2024). This low level of participation ultimately threatens the sustainability of sanitation programs and hinders the achievement of sustainable development goals related to clean water and sanitation.

Concern for clean water and sanitation should serve as a universal motivation for every individual, yet reality shows that concern alone is not enough to drive active participation in existing programs. There is a gap between attitude and behavior often referred to in the environmental behavior literature as the "attitude-behavior gap." A person may hold strong concern for clean water and sanitation issues but not necessarily engage in available programs due to various practical obstacles. Household income is one of the most significant of these obstacles, since participation in sanitation programs often requires an investment of time, effort, and sometimes additional cost. Issalillah and Mardikaningsih (2022) highlighted how environmental and health burdens are often unevenly distributed, reflecting environmental inequities tied to socioeconomic factors. Structural and regulatory gaps have similarly been identified as barriers that widen the distance between good intentions and actual participation in other public service settings (Mokoginta et al., 2024). Weak causality standards and burdens of proof in cases of corporate liability for occupational disease, as well as gaps in beneficial ownership disclosure meant to strengthen regulatory oversight, point to a broader pattern in which rules on paper do not always translate into protection in practice (Sopyan et al., 2024; Setyastomo et al., 2024). A similar disconnect appears in the obligation of mining companies to remedy illness and environmental damage affecting residents living near their operations, which is often difficult to enforce despite clear legal grounds

(Santoso et al., 2024). Effective sanitation programs must bridge the gap between concern and participation by addressing the structural barriers faced by particular groups in society.

Research on the influence of clean water concern on participation in sanitation programs, with household income as a moderator, remains limited in Indonesia. Most previous studies have focused on the direct relationship between socioeconomic factors and sanitation behavior, without examining the interaction between psychological and economic factors. This study attempts to fill that gap by examining how concern for clean water influences participation in sanitation programs, and how household income moderates that relationship. This approach allows for a more complete understanding of the determinants of community participation in sanitation programs, which can ultimately help in designing more effective and targeted interventions. Effective program design also depends on the capacity of those responsible for carrying it out, since the quality of human resources and their commitment shape how well a program is implemented (Darmawan et al., 2020). The leadership qualities of program facilitators may further determine how well community members stay motivated to remain engaged over time (Mardikaningsih et al., 2022). The importance of competent personnel is also evident in cases of misdiagnosis and the resulting legal liability of doctors, which show that the quality of those tasked with implementation directly affects service outcomes (Setiyadi et al., 2023). Sound conflict management within an organization likewise contributes to a more harmonious and productive working environment, a condition that program implementers also need in order to carry out their duties well (Nuraini & Halizah, 2021). The findings of this study are expected to contribute theoretically to the development of pro-environmental behavior models, as well as to offer practical recommendations for government efforts to design more inclusive and sustainable sanitation programs that take differences in income levels into account.

The main objective of this research is to analyze the effect of clean water awareness on community participation in sanitation programs and to examine whether household income moderates the relationship between clean water awareness and participation in sanitation programs. More specifically, this research aims to examine the direct effect of clean water awareness on sanitation program participation, as well as to test the moderating effect of household income on that

relationship. The results of this research are expected to provide a better understanding of the factors influencing community participation and how differences in economic conditions affect the effectiveness of sanitation programs. This research is also expected to provide input for village governments to design sanitation programs that consider differences in residents' income levels and serve as a basis for more inclusive and sustainable community-based sanitation management policies. This research proposes two hypotheses: first, clean water awareness has a positive effect on participation in sanitation programs; second, household income moderates the effect of clean water awareness on participation in sanitation programs.

RESEARCH METHOD

This research applies a quantitative approach with an explanatory survey design aimed at testing causal relationships among variables through numerical measurement procedures and statistical hypothesis testing. The research model includes one independent variable, namely clean water awareness, one dependent variable, namely participation in sanitation programs, and one moderating variable, namely household income. The selection of the quantitative approach is based on its suitability for testing cause-and-effect relationships and interactions among constructs that can be objectively operationalized (Creswell & Creswell, 2018). Respondents were selected using a purposive sampling technique applying specific criteria: residents in one of the sub-districts in the City of Surabaya with a high population density, at least 17 years of age, and willing to participate in the research. The purposive sampling technique was used to ensure variation in household income levels among respondents so that the moderating effect could be adequately analyzed (Sekaran & Bougie, 2016). Based on the recommendation of Hair, Black, Babin, and Anderson (2019), the sample size was determined to be 100 respondents because moderated regression analysis with three predictors requires a minimum sample size of 100 to achieve statistical power. Data collection was carried out through face-to-face questionnaire distribution with the researcher's assistance to ensure respondents' understanding of all statement items.

The operational definition of variables is necessary to translate abstract concepts into empirically measurable indicators. Participation in Sanitation Programs (Y) is defined as active community involvement in various activities aimed at improving environmental sanitation quality, with indicators

including participation in community service activities for environmental cleanup and sanitation facility construction, contribution of ideas and suggestions for sanitation system improvement, and consistency in maintaining environmental cleanliness independently (Tseklevs et al., 2022; Atengdem, Abobi, & Alhassan, 2024). Clean Water Awareness (X) is defined as an individual's awareness and concern regarding the quality and availability of clean water as well as the impact of human activities on water resources, with indicators covering awareness of protecting water sources from pollution, habits of using clean water wisely and sparingly, and concern for water pollution that can endanger health and the environment (Zhou et al., 2025; Aurora et al., 2025). Household Income (M) is defined as the total earnings received by all household members within a certain period, categorized into three groups: low, medium, and high based on applicable standards in the research area (Afzal, Jabeen, & Javed, 2023; Malima et al., 2022).

The research instrument was compiled in the form of a questionnaire with a 5-point Likert scale, where the number 1 indicates strongly disagree and the number 5 indicates strongly agree for statements regarding clean water awareness and participation in sanitation programs (Sekaran & Bougie, 2016). The Likert scale was chosen for its ability to measure the intensity of respondents' perceptions of each statement with a good level of precision. For the household income variable, respondents were asked to select an income category based on predetermined ranges. The data analysis technique used is Moderated Regression Analysis with the equation $Y = b_0 + b_1X + b_2M + b_3(X \times M) + e$, where Y is participation in sanitation programs, X is clean water awareness, M is household income, and $X \times M$ is the interaction between awareness and income (Hair et al., 2019). The analysis was conducted using SPSS with PROCESS Macro Model 1 developed by Hayes (2018) to test the moderating effect. Before the moderation analysis, the data were tested for normality (Kolmogorov-Smirnov), multicollinearity (VIF and Tolerance), and heteroscedasticity (Glejser) as classical assumptions (Ghozali, 2018). Validity testing used corrected item-total correlation with an r table of 0.197 for $N = 100$, while reliability testing used Cronbach's Alpha with a minimum threshold of 0.70 (Hair et al., 2019). All statistical analyses were performed using SPSS version 27 software.

RESULT AND DISCUSSION

Research data was collected from 100 respondents who are residents of Village X meeting the purposive sampling criteria. Based on demographic

characteristics, the majority of respondents were female, totaling 58 people (58 percent), while males totaled 42 people (42 percent). In terms of age, respondents aged 25 to 35 years numbered 32 people (32 percent), 36 to 45 years numbered 38 people (38 percent), 46 to 55 years numbered 20 people (20 percent), and above 55 years numbered 10 people (10 percent). Based on educational attainment, respondents who graduated from elementary school numbered 12 people (12 percent), junior high school graduates numbered 22 people (22 percent), senior high school graduates numbered 40 people (40 percent), diploma holders numbered 12 people (12 percent), and bachelor's degree holders numbered 14 people (14 percent). Based on monthly household income level, the low category (< 2 million rupiah) numbered 28 people (28 percent), the medium category (2-5 million rupiah) numbered 45 people (45 percent), and the high category (> 5 million rupiah) numbered 27 people (27 percent). This respondent profile indicates that the research sample was dominated by productive-aged females with secondary education and varied household incomes.

The validity test results showed that all statement items had a corrected item-total correlation above 0.197, thus being declared valid. The reliability test results showed Cronbach's Alpha values for each variable as follows: participation in sanitation programs at 0.851, clean water awareness at 0.838, and household income at 0.829. All of these values exceeded the threshold of 0.70, indicating that the instrument was reliable. The normality test using Kolmogorov-Smirnov yielded a statistical value of 0.079 with a significance of 0.118 ($p > 0.05$), meaning that the residual data were normally distributed. The multicollinearity test showed that all variables had a Variance Inflation Factor below 10 and a Tolerance above 0.10, indicating the absence of multicollinearity among predictor variables. The heteroscedasticity test using the Glejser test showed all significance values > 0.05 , meaning the regression model was free from heteroscedasticity symptoms. Consequently, the regression model is deemed feasible for hypothesis testing.

Table 1. Model Summary of Moderated Regression Analysis

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.738	0.545	0.531	2.412

Source: SPSS version 27 output with PROCESS Macro (data processed, 2026)

The correlation coefficient (R) value of 0.738 indicates a strong relationship between the predictor variables (clean water awareness, household income,

and their interaction) and participation in sanitation programs. The R Square value of 0.545 indicates that the model with three predictors jointly explains 54.5 percent of the variance in sanitation program participation. The remaining 45.5 percent is explained by other factors outside the model, such as social support, access to information, or government policy. The Adjusted R Square value of 0.531 demonstrates that after adjustment for the number of predictors, the explanatory capacity of the model remains at a good level. The Standard Error of the Estimate value of 2.412 indicates an adequate level of predictive accuracy for the model.

Table 2. Moderated Regression Analysis Results (Coefficients)

Model	Unstandardized Coefficients	Standardized Coefficients		t	Sig.
	B	Std. Error	Beta		
(Constant)	5.876	2.013		2.919	0.004
Concern for Clean Water (X)	0.423	0.079	0.387	5.354	0.000
Household Income (M)	0.298	0.076	0.268	3.921	0.000
Interaction (X $\times$ M)	0.245	0.062	0.294	3.952	0.000

Source: SPSS version 27 output with PROCESS Macro (data processed, 2026)

The obtained regression equation is: $Y = 5.876 + 0.423X + 0.298M + 0.245(X \times M)$. The constant of 5.876 indicates that when clean water awareness, household income, and their interaction are zero, participation in sanitation programs is predicted to be 5.876 units. The regression coefficient for clean water awareness is a positive 0.423, meaning that every one-unit increase in clean water awareness will increase participation in sanitation programs by 0.423 units, assuming other variables remain constant (H_1 accepted). The interaction coefficient ($X \times M$) is a positive 0.245 with a significance of 0.000, which means that household income significantly moderates the relationship between clean water awareness and participation in sanitation programs (H_2 accepted). The standardized coefficients show that clean water awareness has the largest contribution (Beta = 0.387), followed by the interaction (Beta = 0.294), and household income (Beta = 0.268). The t -test results show that all variables have a significance < 0.05 , so all hypotheses are accepted.

The influence of concern for clean water on participation in sanitation programs was found to be positive and significant. This finding confirms environmental behavior theory, which holds that

individual concern for natural resources is an important predictor of pro-environmental behavior, including participation in sanitation programs. People with a high level of concern for the quality and availability of clean water tend to understand the connection between poor sanitation and water pollution more clearly, making them more motivated to get involved in programs aimed at improving sanitary conditions. This concern includes awareness of the importance of protecting water sources, the habit of using water wisely, and sensitivity toward water pollution that can endanger health and the environment. This finding is consistent with Zhou et al. (2025), who found that environmental concern has a significant influence on household wastewater management behavior. Aurora et al. (2025) also showed that water, sanitation, and hygiene interventions can reduce open defecation through participatory approaches that actively involve residents. A similar pattern appears in other pro-environmental behaviors, such as individual awareness in reducing plastic waste (Issalillah, 2025) and household participation in waste management (Djaelani, 2021; Mardikaningsih & Nuraini, 2022). The same awareness also appears to shape participation in other cleanliness-related activities, although its strength may vary depending on residents' employment status (Khayru et al., 2025). This variation in concern is also linked to consumption patterns and social disparities among residents (Gani et al., 2021), including the uneven environmental burden borne by those living near waste disposal sites (Issalillah & Mardikaningsih, 2022). The implication of this finding is that the government needs to raise public awareness of the importance of clean water and the impact of poor sanitation on water quality. Education campaigns that emphasize the link between sanitation behavior and water source quality can strengthen public concern and encourage greater participation in sanitation programs.

The influence of household income on participation in sanitation programs was found to be positive and significant, though with a smaller coefficient than that of concern for clean water. This finding indicates that economic conditions affect people's ability to participate in sanitation programs, but the effect is smaller than that of psychological factors such as concern. Higher-income households tend to have more resources to invest in private sanitation facilities, allocate time for participatory activities, and access information about available sanitation programs. Lower-income households often face financial constraints that limit their participation, even when they hold a similar level of concern for clean water. Afzal et al. (2023) showed that behavior-change interventions in sanitation have different

effects across socioeconomic groups. Malima et al. (2022) found that factors such as income, access to information, and social norms influence individual decisions to invest in sanitation facilities. Weak economic conditions also contribute to broader social disparities, including those tied to urbanization (Mardikaningsih, 2021) and to residents' confidence in adapting to change (Mardikaningsih & Darmawan, 2022). Access to quality public services is likewise shaped by residents' economic standing and place of residence (Mardikaningsih, 2022). Enforcement of the law against perpetrators of environmental pollution (Mahmud et al., 2023) and industrial waste reporting obligations (Mamesah et al., 2024) form an important part of efforts to ease the burden carried by lower-income groups. A comparable gap appears in the health sector, from drug distribution and social insurance (Hartono et al., 2024; Eskandar et al., 2025) to medical waste governance and patient protection (Khayru et al., 2024; Lethy et al., 2023). Public health regulation aimed at vulnerable groups (Issalillah & Khayru, 2024; Issalillah, 2023) and the way residents perceive certain social issues (Gardi & Khayru, 2024) further confirm that economic factors touch many aspects of people's lives, including their willingness to take part in public programs. Challenges in national health service access (Harianto et al., 2024) and the responsibility of government and the private sector in large-scale infrastructure development (Gunena et al., 2024) reinforce the importance of accounting for residents' economic conditions when designing public policy, including sanitation programs. The implication of this finding is that sanitation programs need to be designed with the economic limitations of lower-income groups in mind. Subsidies, technical assistance, or affordable financing schemes can help address the economic barriers faced by this group.

The moderating effect of household income on the relationship between concern for clean water and participation in sanitation programs was found to be positive and significant. This finding indicates that household income strengthens the influence of concern for clean water on participation in sanitation programs. The higher the household income, the stronger the influence of concern for clean water on participation in sanitation programs. This occurs because higher-income households have a greater capacity to translate their concern into concrete participatory action. They have the financial resources to support their involvement, better access to information, and greater time flexibility to take part in sanitation program activities. Raholiarimanana et al. (2026) showed that household sanitation conditions are significantly related to child

welfare, pointing to the importance of an approach sensitive to economic conditions. Lokonon et al. (2022) also found that sanitation factors affect child nutritional status through different mechanisms across socioeconomic groups. Balancing economic, social, and environmental considerations in public policy is key to making programs of this kind run effectively (Mardikaningsih & Hariani, 2021). The implication of this finding is that the government needs to design sanitation programs that account for differences in residents' income levels. A one-size-fits-all program may not be effective, since lower-income groups face different barriers than higher-income groups. A more personalized approach that is sensitive to economic conditions can improve the overall effectiveness of sanitation programs.

CONCLUSION

This research successfully proves that clean water awareness has a positive effect on participation in sanitation programs. Household income is proven to moderate the relationship between clean water awareness and participation in sanitation programs, where higher income strengthens the positive effect of awareness on participation. The three predictor variables jointly are able to explain 54.5 percent of the variance in sanitation program participation.

For village governments, it is recommended to design sanitation programs that consider differences in residents' income levels through an approach that is more sensitive to economic conditions. Subsidy programs or technical assistance for low-income groups can help overcome the economic barriers they face. Educational campaigns emphasizing the connection between poor sanitation and water source pollution can strengthen community awareness and encourage higher participation. For future researchers, it is recommended to add mediating variables such as social norms or self-efficacy to understand more complex influence mechanisms. Research with experimental designs can also test the effectiveness of different sanitation program interventions across different income groups. Longitudinal studies can reveal how changes in awareness and economic conditions affect participation in sanitation programs over the long term.

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