Gender Perspectives on Rainwater Harvesting Adoption: Exploring Motivations and Barriers in Barangay Manambulan, Davao City, Philippines

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ABSTRACT

Rainwater harvesting represents a critical sustainable water management strategy, yet its adoption remains complex and influenced by multifaceted social dynamics. This study investigates the gendered motivations and barriers to rainwater harvesting adoption in Barangay Manambulan, Davao City. The study examines how traditional gender roles, stereotypes, and household perceptions shape technological engagement with rainwater harvesting systems. Through a qualitative exploratory approach using purposive sampling of eight residents, the research explores the intricate relationships between gender, water resource management, and technological innovation. The findings reveal distinct gender-specific patterns in rainwater harvesting utilization and decision-making. Female respondents mainly used rainwater for bathing and pet hygiene, while male participants demonstrated a more diverse application range, including laundry, bathing, and toilet flushing. The average cost of installing a rainwater harvesting system and relatively recent adoption (3.5 years) highlight economic and technological barriers that intersect with gender dynamics. Water contamination, mosquito breeding, and rainwater quality are key barriers to adopting rainwater harvesting. These apprehensions are rooted in local perceptions of cleanliness and safety. The study demonstrates that water resource management is not a neutral technical intervention but a socially constructed process profoundly influenced by gender roles, local norms, and household decision-making strategies.

Keywords: Rainwater Harvesting, Gender Dynamics, Water Resource Management, Technological Adoption, Davao City

INTRODUCTION

Climate change and the rapid growth of populations have exacerbated the pressing global issue of water scarcity. Natural resources, such as water, are vulnerable to climate change impacts, which can influence current and future water demand and alter the availability of water resources (Koutroulis, Tsanis, Daliakopoulos, & Jacob, 2013). In response, rainwater harvesting has emerged as a sustainable solution to augment water resources (Ali & Sang, 2023), particularly in urban areas like Davao City in the Philippines.

Various factors, including socio-cultural dynamics, influence the adoption of rainwater harvesting practices. Among these factors, gender significantly influences individuals' motivations and barriers to embracing rainwater harvesting technologies (Agarwal, 2019; Peter, 2006). In Davao City, as with many urban centers in the Philippines, traditional gender roles and norms significantly influence residents' daily lives. Men and women often assume different responsibilities within the household, which can dictate their access to resources and opportunities (Alinsunurin, 2018). Women, typically seen as the primary caregivers, are often responsible for household chores, including water-use tasks such as cooking, cleaning, and tending to gardens or livestock (Alinsunurin, 2018). Women are at the forefront of water management due to these responsibilities, making them more sensitive to water scarcity and management practices. Despite their significant role in water utilization within households, women frequently have limited control over decision-making processes regarding water management systems, mainly due to entrenched societal norms prioritizing male leadership and decision-making (Peter, 2006).

These traditional gender dynamics extend to how households in Davao City access, manage, and utilize water resources, particularly in adopting rainwater harvesting practices. Rainwater harvesting ensures water security and sustainability, especially in urban areas prone to water shortages or distribution inequalities (Crider & Ray, 2022). According to Crider and Ray (2022), women often play a significant role in the daily management of water because of their domestic responsibilities. In contrast, men tend to be more involved in collecting rainwater. For instance, while women may be more involved in day-to-day water management due to their domestic roles, men might be more involved in rainwater harvesting systems' acquisition or technical aspects (Tandon, Wallace, Caretta, Vij, & Irvine, 2024). Therefore, to promote sustainable water management in Davao City, inclusive policies and programs must recognize and address these gender-based roles and disparities (Mason, 2014).

Davao City has taken a significant step forward in sustainable water management by approving Ordinance Number 0298-09, commonly known as the Rainwater Ordinance (Araneta, 2014). This ordinance seeks to establish rainwater as a practical alternative water source, especially for non-potable uses, by encouraging the efficient collection, storage, and utilization of rainwater. The adoption of this ordinance is aligned with global trends, highlighting the need for resilient urban water solutions. Rainwater harvesting systems offer a sustainable approach that can reduce the load on municipal water systems and mitigate urban flooding (Ali & Sang, 2023; García-Ávila, Guanoquiza-Suárez, Guzmán-Galarza, Cabello-Torres, & Valdiviezo-Gonzales, 2023; Pala, Pathivada, Velugoti, Yerramsetti, & Veeranki, 2021). Cities like Davao can enhance water supplies by harvesting rainwater, benefiting from environmental sustainability, reducing dependence on treated water, and lowering costs during droughts.

Such an ordinance would encourage households and businesses to utilize rainwater harvesting systems, thus significantly saving water. Studies have shown that if such systems are adopted widely, they can reduce the demand for potable water for irrigation, flushing toilets, and washing, which have dominated the consumption of high-quality water for drinking purposes (Hafizi Md Lani, Yusop, & Syafiuddin, 2018; Matimolane, Strydom, Mathivha, & Chikoore, 2023). The Rainwater Ordinance promotes education and advocacy to encourage sustainable water use in Davao City, fostering community collaboration for this goal. Community involvement is essential for enhancing urban resilience and sustainability, especially given the growing urban population and climate change challenges (Campisano et al., 2017).

While local governments have implemented proactive measures worldwide to encourage rainwater harvesting, several challenges hinder its broad adoption and effectiveness. For instance, the upfront costs associated with installing rainwater harvesting systems can be prohibitively high for many individuals and businesses, especially those in economically disadvantaged areas. These costs encompass the acquisition of tanks, pumps, filtration systems, and ongoing maintenance, which may deter potential users. Furthermore, there needs to be more public awareness regarding the benefits and importance of rainwater harvesting. Despite various public outreach efforts, numerous residents must know how these systems can alleviate pressure on municipal water supplies, reduce flood risks, and contribute to environmental sustainability. A survey conducted by Interface Development Interventions for Sustainability in 2018 revealed that knowledge of Davao City's Rainwater Ordinance could have been much higher, with only 33% of the 100 newly established businesses in the city being aware of it (Lumawag, 2018).

The results of this research can inform policies and initiatives that advocate for gender-inclusive approaches to rainwater collection, thereby enhancing both water security and gender equality in Davao City. Policymakers can formulate more equitable and effective strategies by comprehending the distinct needs and challenges men and women encounter when accessing water resources. Moreover, integrating gender perspectives into water management can yield innovative solutions that address the diverse impacts of climate change, ultimately promoting a more inclusive and sustainable resource management model in urban areas such as Davao City.

Research Objectives

This study explores the complex interplay between gender and the adoption of rainwater harvesting in Davao City. It delves into the underlying motivations influencing individuals, focusing on both women and men, in their acceptance or reluctance towards rainwater harvesting technologies. Additionally, it investigates the

obstacles faced, aiming to uncover gender-specific hurdles and advantages related to advancing sustainable water management practices. The following are the specific objectives of this study:

1. Identify key motivations that drive individuals to embrace rainwater harvesting practices and barriers that hinder their adoption, with a focus on gender-specific differences.

2. Examine the impact of traditional gender roles, stereotypes, and perceptions on the decision-making processes related to rainwater harvesting adoption at the household level.

Theoretical Framework

Sustainable water management entails taking advantage of rainwater harvesting in urban locales like Davao City. Grasping the gender-specific motivations and obstacles in embracing rainwater harvesting systems is paramount to fostering fair and comprehensive water resource accessibility. Gender frameworks, notably the Gender and Development (GAD) approach, assert that gender significantly shapes roles, responsibilities, and decision-making pathways concerning resource management. March, Smyth, and Mukhopadhyay (1999) provide an essential framework for understanding gender as a fundamental social organizing force and emphasize that gender analysis extends beyond essential binary distinctions to expose the intricate power dynamics that underpin social, economic, and technical interactions. Their study indicates that gender is not merely a descriptive property but a dynamic system of social relationships that significantly influences access to resources, decision-making processes, and technological involvement (March et al., 1999).

This framework offers a comprehensive analysis of the factors that influence the acceptability of rainwater harvesting systems in Davao City, where gender dynamics greatly influence environmental decision-making. The GAD approach highlights the significance of understanding societal gender roles, responsibilities, and power dynamics, shaping how men and women engage with and benefit from environmental resources. In the context of rainwater harvesting systems in Davao City, this framework helps identify how gender-specific roles and responsibilities can either facilitate or impede individuals and communities in embracing sustainable practices. For example, women often have the primary role in managing household water needs, making them essential contributors to initiatives concerning rainwater harvesting. Consequently, they may be more motivated to adopt these systems due to their direct involvement in water management to reduce their workload and improve household welfare (Fontana & Wood, 2000; Naiga, Ananga, & Kakumba, 2024). Men, on the other hand, might be motivated by economic incentives or improvements in water security. Moser's groundbreaking work on gender planning conceptualizes development interventions as inherently political processes that reproduce or challenge existing gender inequalities (Moser, 2012). Her framework critically illuminates how technological interventions, such as rainwater harvesting systems, are never neutral but are deeply embedded in complex social structures that systematically mediate access, control, and benefit distribution along gendered lines.

Men and women may experience different challenges when implementing rainwater harvesting systems due to gendered access to information and resources. Women may experience obstacles due to limited opportunities for financial resources. This economic hurdle may limit their capacity to invest in the initial expenditures required to construct rainwater harvesting equipment. Furthermore, women may need more access to knowledge and training on rainwater harvesting technology, limiting their ability to operate and maintain these systems successfully. Alternatively, men might encounter barriers related to their typically limited involvement in domestic water management, resulting in a lack of interest or perceived relevance of rainwater harvesting adoption within household contexts (Naiga et al., 2024).

Moreover, the utilization of rainwater harvesting systems is influenced by societal norms and gender roles. In Davao City, traditional gender norms may dictate that men make infrastructure decisions while women are the principal users. This relationship may cause decision-making processes regarding rainwater harvesting adoption to overlook women's viewpoints and needs. As a result, addressing social norms that stereotype gender roles is critical for removing barriers and encouraging equal involvement in rainwater harvesting system adoption. Empowering women through community engagement programs and ensuring their involvement in decision-making acknowledges their integral role in water management and aligns with broader gender equality goals

(Naiga et al., 2024). While men may have more access to financial resources and technical knowledge, they may not see immediate benefits from rainwater harvesting if they are not directly responsible for water management at home (Cleaver, 2000). Moreover, men might prioritize other income-generating activities over investing time and resources in environmental management practices. However, with targeted educational programs emphasizing the long-term environmental and economic advantages of rainwater harvesting, men's involvement can significantly increase, reducing the strain on conventional water resources and contributing to community resilience (Carr & Thompson, 2014).

To encourage the effective adoption of rainwater harvesting systems in Davao City, employing a gender-sensitive strategy that considers the distinct motivations and challenges experienced by men and women is critical. This strategy promotes the development of long-term water management options by involving both men and women in program planning and execution, such as rainwater harvesting. Addressing these gendered aspects can significantly contribute to the city's broader goals of sustainable development and resource efficiency (Cornwall, 2003).

MATERIALS AND METHODS

Study Area and Population

Barangay Manambulan is located in the southern part of Davao City, Philippines. The barangay is closer to the boundary with neighboring towns in Davao del Sur and is situated near the foot of Mt. Talomo in a relatively rural and elevated part of Davao City. Based on data from the Philippine Statistics Authority's 2020 census, the barangay has approximately 698 households with a total population of around 3,493 residents. The dominant anthropogenic activities in the area include small-scale agriculture, small businesses, and service sector employment. The area is connected to the Manambulan Waterworks and Sanitation Association (MAWASA), which serves as the primary water service provider for the community, though not all households have direct connections to this service.

Research Design

We employed a qualitative exploratory research design using purposive sampling. This research design was chosen because our research questions focused on understanding the complex social dynamics of gender and technology adoption, which required in-depth investigation rather than statistical representation. As Vasileiou et al. (2018) noted, qualitative approaches are particularly valuable when exploring complex social phenomena where depth of understanding is prioritized over generalizability. The exploratory nature of this study was appropriate given the limited prior research on gender-specific motivations and barriers to rainwater harvesting adoption in the Philippine context.

Sampling Approach and Justification

Purposive sampling was the most suitable methodology for this study, as it enables researchers to identify and prioritize cases that are abundant in information about the phenomenon of interest (Palinkas et al., 2015). As Campbell et al. (2021) note, purposive sampling is "used to select respondents that are most likely to yield appropriate and useful information" and determines and chooses cases that will optimize the utilization of limited research resources.

Given that our research objectives focused on understanding gender-specific motivations and barriers to rainwater harvesting adoption, we needed to target households that had experience with rainwater harvesting systems specifically. Random sampling would have been inefficient, as many randomly selected households might not have installed rainwater harvesting systems. The purposive approach allowed us to focus our limited resources on participants who could provide rich, detailed information directly relevant to our research questions.

Our sampling population consisted of households in Barangay Manambulan that had adopted rainwater harvesting systems. We identified potential participants through community contacts and local government records of rainwater harvesting system installations. We purposively selected participants from this population

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to ensure diversity in the duration of rainwater harvesting system use, household composition, and socio-economic status.

Sample Size

Our final sample consisted of eight residents (five males and three females) from different households. While small, this sample aligns with recommendations for exploratory qualitative research where depth of analysis is prioritized (Vasileiou et al., 2018). We acknowledge that this small sample size limits the generalizability of our findings, and we present our results as preliminary insights rather than definitive conclusions.

The gender imbalance in our sample (five males and three females) represents a limitation of this study, particularly given our focus on gender dynamics in water management. This imbalance was not intentional but resulted from challenges in participant recruitment, including limited availability of female participants during the study period and some hesitancy among women to participate without male household members. As Khandker et al. (2020) note in their study of gender perspectives in water management, women often have inadequate representation in water institutions despite their significant involvement in water-related activities. Our sample, unfortunately, reflects this broader pattern of female underrepresentation.

Data Collection Methods and Instruments

Data was collected from November 24, 2023, to December 14, 2023. We collected data on the following variables:

1. Socio-demographic characteristics: age, gender, education, occupation, income, marital status, homeownership, length of residence

2. Rainwater harvesting practices: system type, duration of use, water usage patterns, storage capacity, installation cost

3. Motivations for adoption: Economic, environmental, and practical considerations

4. Perceived barriers: technical, economic, social, and environmental concerns

5. Gender-related decision-making processes: Household roles, responsibilities, and power dynamics

Our primary data collection instrument was a semi-structured interview guide administered through the Kobo Toolbox digital platform, which allowed for both quantitative and qualitative responses. The interview guide was developed based on previous literature on water resource management and gender studies, mainly drawing from the Gender and Development (GAD) framework.

Qualitative Approach

We conducted individual semi-structured interviews with each participant, allowing for in-depth exploration of their experiences and perspectives. These interviews lasted approximately 60-90 minutes each and were conducted in the local dialect to ensure participants could express themselves comfortably. The semi-structured format allowed for the exploration of emergent themes while maintaining the consistency of the interview.

Quantitative Data Collection

The quantitative components of our survey included closed-ended questions on demographic information, rainwater harvesting system characteristics (size, cost, duration of use), and attitudes toward various aspects of rainwater harvesting. These variables were generated based on previous literature on water resource management and gender studies, mainly from the Gender and Development (GAD) framework. Secondary data were obtained from current literature and organizational studies that offer contextual insights into gender and rainwater harvesting systems in the Philippines and abroad. These sources provided important background information and theoretical frameworks for our analysis.

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Analytical Techniques

Descriptive statistics (means, percentages, frequencies) have been utilized in Microsoft Excel to analyze quantitative data. The small sample size and exploratory nature of this study made this analytical approach appropriate, enabling us to identify recurring themes in the data without making claims of statistical significance.

Thematic analysis was employed to analyze qualitative data, which entails the identification, analysis, and reporting of patterns within the data. This technique was chosen for its flexibility and ability to provide rich, detailed accounts of complex phenomena (Braun & Clarke, 2006). The process of analysis included the following: familiarization with the data, creating initial codes, searching and assessing for themes, organizing them into categories, and producing the report.

Ethical Considerations

Informed assent was obtained from the participants prior to data collection. We provided an explanation of the study's purpose, the voluntary nature of participation, and the anonymity of their responses. They were reminded that they could discontinue from the study without incurring any consequences. To protect participant privacy, all data were anonymized during analysis and reporting.

Limitations

We acknowledge several limitations of our study. The small sample size (eight participants) limits the generalizability of our findings. The gender imbalance in our sample (five males and three females) may have resulted in the underrepresentation of female perspectives. Additionally, our focus on households that had already adopted rainwater harvesting systems means we did not capture non-adopters perspectives, which could provide valuable insights into barriers to adoption. Finally, the study's cross-sectional design does not allow us to observe changes in attitudes and practices over time.

Despite these limitations, our study provides valuable preliminary insights into the gender dynamics of rainwater harvesting adoption in Barangay Manambulan, which can inform future research and policy development.

RESULTS AND DISCUSSION

Socio-economic Profile of Respondents

The survey conducted in Barangay Manambulan, Davao City, revealed a diverse profile of its residents, capturing a snapshot of their lives, livelihoods, and connections to the community. Among the eight individuals surveyed, five were males and three females, with the average age being 56 years. This age distribution was not intentionally selected but resulted from our sampling approach prioritizing households with rainwater harvesting experience. It is important to note that this does not necessarily indicate that older residents are more engaged in rainwater harvesting than younger residents. Future research should include participants across different age groups to explore whether age influences rainwater harvesting adoption and practices.

Moreover, seven out of eight respondents are married. Regarding educational attainment, the range is quite varied: three completed elementary school, one finished high school, one obtained a vocational education, two are college graduates, and one holds a graduate degree. This diversity in educational backgrounds contributes to various perspectives within the community.

Our data revealed potential correlations between educational attainment and rainwater harvesting practices. Participants with higher education levels (college graduates and those with graduate degrees) demonstrated more diverse applications of harvested rainwater and expressed greater awareness of environmental benefits. For example, the two college graduates and one participant with a graduate degree reported using rainwater for multiple purposes (laundry, bathing, gardening, and toilet flushing) compared to those with elementary education who primarily used rainwater for limited applications such as bathing.

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This pattern aligns with findings from previous studies suggesting that educational attainment can influence environmental awareness and adoption of sustainable practices (Campisano et al., 2017; Pala et al., 2021). Higher education may provide greater exposure to environmental concepts and sustainability principles, potentially influencing how individuals perceive and utilize rainwater harvesting systems. However, given our small sample size, these observations should be considered preliminary and warrant further investigation with larger, more representative samples.

Employment status among the respondents revealed that six are currently employed, while two are retired. Three of the six employed individuals are self-employed, showcasing entrepreneurial inclinations within the community. These self-employed respondents are involved in carpentry, running a food shop, and managing a manicure business, indicating a mix of service and trade occupations. Two individuals remain fully employed in more formal work settings, and one is a seasonal worker whose employment status may reflect the economic opportunities and challenges in the area. The average length of employment among these individuals is eight years. It is also noteworthy that seven of these respondents are the primary decision-makers in their families, highlighting their significant role in household management and decision-making processes.

Residency in Barangay Manambulan ranges widely among these individuals, with an average length of residence at 29 years. Such longstanding ties to the barangay indicate a strong sense of belonging and commitment to the community. However, one individual has resided there for just two years, suggesting recent movement or change.

Our data revealed important relationships between housing characteristics and rainwater harvesting practices. Seven of the eight respondents owned their homes, which appears to facilitate investment in rainwater harvesting infrastructure. Homeowners reported greater willingness to modify their property to accommodate rainwater collection systems, including installing gutters, downspouts, and storage tanks. The single non-homeowner in our sample used a more temporary, portable collection system that required no structural modifications to the dwelling.

Housing structure also influenced the type and capacity of rainwater harvesting systems. Participants with concrete or metal roofing reported higher quality water collection than those with nipa or other organic roofing materials, which were associated with more debris and discoloration in collected water. Additionally, homes with larger roof areas naturally collected more rainwater, allowing for larger storage capacity (averaging 598 cubic meters across systems).

These findings suggest that housing characteristics significantly influence the feasibility and effectiveness of rainwater harvesting systems. Future rainwater harvesting promotion efforts should consider housing type and quality when designing appropriate technologies and implementation strategies.

This profile of respondents paints a picture of a community characterized by stability, resilience, and a rich tapestry of experiences and roles, contributing to the overall dynamic of the barangay.

Table 1. Socio-economic profile of respondents (n = 8)

Profile	Count	Percent
Sex		
• Male	5	62.5
• Female	3	37.5
Marital status		
• Married	7	87.5
• Widow/widower	1	12.5

Educational Attainment		
• Elementary	3	37.5
• High school	1	12.5
• College	2	25
• Vocational	1	12.5
• Masters	1	12.5
Employment		
• Yes	6	75
• No	2	25
Primary decision-maker		
• Yes	7	87.5
• No	1	12.5
Homeownership		
• Yes	7	87.5
• No	1	12.5

Source: Primary data collected by the author through a field survey conducted from November 24, 2023, to December 14, 2023.

Water Sources

The variety in primary water sources highlighted by respondents illustrates the reliance on multiple means to secure adequate water supply for household needs. All participants mentioned collecting rainwater, signifying its prominence as a readily available resource. Five respondents also mentioned getting water from MAWASA, indicating increased access to potable water, especially when rainwater is insufficient or unreliable.

Besides rainwater harvesting, residents of Barangay Manambulan access water through several sources. As mentioned in our findings, five of the eight respondents reported using water from the Manambulan Waterworks and Sanitation Association (MAWASA), the barangay's primary water service provider. Additionally, two respondents reported purchasing water from refilling stations for drinking purposes due to concerns about water quality from other sources.

During the dry season (typically from November to April in Davao City), residents primarily rely on MAWASA for their water needs when rainfall significantly reduces. Those not connected to MAWASA often purchase water from delivery services or collect water from community wells. Rainwater is unavailable year-round in sufficient quantities, with the study area experiencing pronounced wet (May to October) and dry seasons. This seasonality significantly impacts rainwater harvesting practices, with most participants reporting that they can only rely on harvested rainwater during the wet season months.

The seasonal limitation of rainwater availability highlights the complementary rather than replacement role that rainwater harvesting plays in the community's overall water management strategy. Future rainwater harvesting

initiatives in the area should consider these seasonal patterns and promote integrated water resource management approaches that combine multiple water sources to ensure year-round water security.

Furthermore, the usage of water from refilling stations by two respondents, though minimal, highlights growing awareness and concern about water quality. This choice reflects a proactive approach by some to ensure the water they consume is safe, even if it requires additional effort or expense. The reported average household water consumption of 242 cubic meters per month demonstrates the significant demand for water resources across diverse sources. This figure encapsulates the comprehensive use of available options, emphasizing how households strategically combine different sources to satisfy their water needs.

Motivation to Adopting Rainwater Harvesting System

Installing rainwater harvesting systems reflects a growing awareness and commitment to sustainable water management practices. These systems have been in place for approximately 3.5 years among the respondents, indicating a relatively recent adoption of technology. While those respondents not connected to MAWASA were primarily motivated to collect rainwater for domestic use, the remaining wanted to reuse their old containers to capture rainwater and reduce water bills.

Many households have increasingly adopted containers to collect rainwater as a sustainable measure to conserve water resources. According to the pattern observed, a significant portion of respondents, amounting to half, utilize more than three containers for this purpose. The other half employs two containers each. This rainwater collection method exhibits a substantial capacity, aggregating an average of 598 cubic meters across the systems. This substantial volume underscores the potential of rainwater harvesting as a viable supplement to traditional water supplies, particularly among households not connected to MAWASA.

Most rainwater collectors operate as standalone systems, independent of the homes' main water pipes. This setup simplifies installation and maintains separation from the potable water supply, ensuring that rainwater collection remains a sustainable and safe practice. Using standalone systems also allows for greater flexibility in design, enabling users to customize their collection systems to maximize efficiency and meet their specific water needs. The average cost of installing the rainwater harvesting systems was PhP 4,150.

Rainwater harvesting and its subsequent utilization have emerged as a prominent practice within numerous households. Female respondents mentioned that they predominantly employ rainwater for bathing and pet hygiene, attributing this preference to the softness of rainwater, which is more suitable for these purposes due to its relatively low mineral content compared to hard tap water. Conversely, male respondents reported utilizing rainwater primarily for various activities such as laundry washing, personal bathing, and toilet flushing. These applications illustrate pragmatic strategies to conserve piped water supplies for essential uses by leveraging readily available rainwater for routine domestic tasks.

The respondents consistently reported secondary uses of rainwater, particularly emphasizing tasks such as laundry and dishwashing. People choose to use rainwater for laundry because its properties help prevent soap scum buildup and reduce the amount of detergent required. Similarly, utilizing rainwater for washing dishes reflects environmentally conscious practices that contribute to broader efforts in reducing dependency on treated water supply.

Barriers to Adopting Rainwater Harvesting System

A significant concern about utilizing the harvesting system pertains to the contamination of rainwater, which can occur due to various environmental and structural factors. Debris, bird droppings, and other contaminants that accumulate on roof surfaces before a rain event can significantly reduce the quality of the harvested water. This concern aligns with the respondents' hesitance regarding water cleanliness and the common perception that the first collected rainwater is dirty. First-flush diverters or filtration systems can help mitigate this issue by ensuring that the initial flow of rainwater, which contains most of the contaminants, is not collected. Concerns about the quality of materials used in constructing rainwater harvesting systems can also contribute to the unease of water

safety. Low-quality materials may degrade over time or introduce additional contaminants into the water supply, emphasizing the importance of investing in durable and suitable materials for these systems.

Rainwater harvesting stands as an effective method for promoting water conservation and sustainability. However, its practical implementation frequently encounters obstacles, as evidenced by the feedback from respondents. About half of those surveyed reported no difficulties with their systems, indicating that they can operate efficiently without issues when appropriately designed and installed. Conversely, the remaining participants identified several prevalent concerns associated with rainwater harvesting practices, particularly in areas where mosquito populations are abundant. A significant issue is the potential accumulation of standing water in collection areas, attracting mosquitoes and posing health risks through diseases such as dengue fever and malaria.

Davao City's Rainwater Ordinance promotes capture and reuse to alleviate water scarcity and flooding. However, the responses provided by all respondents demonstrate that a lack of public awareness weakens these objectives. The local government's weak dissemination tactics or failure to engage with community groups could cause this issue.

DISCUSSION

The study's findings fit into the bigger picture of Gender and Development theories, which look at how gender relationships are shaped by society and affect development interventions. By building on Moser's (2012) framework for planning gender-related projects and March et al.'s (1999) approach to analyzing gender, the research shows how the adoption of rainwater harvesting in Barangay Manambulan is tied to complex power structures that influence access to and control over water. These theoretical ideas help explain why something like a rainwater harvesting system, which seems neutral, can be a point of negotiation and change in the power dynamics within a household, especially when it comes to gender. Their social and cultural context shapes how people adopt and use this technology, which can significantly impact their daily lives and relationships.

This study uncovers intricate gender-specific patterns in rainwater harvesting practices, reflecting deeply embedded traditional gender roles and household responsibilities. The findings illustrate how perceptions shaped by gender significantly affect water management strategies and technology adoption within a domestic setting. The findings of this study further resonate with Gascon and McIntyre-Mills (2017), revealing how local water management practices in Barangay Manambulan reflect nuanced negotiations of agency within gendered household decision-making structures.

Female respondents primarily used rainwater for activities traditionally associated with feminine domestic responsibilities, including bathing and pet hygiene. Their preference was strategically based on the softness of rainwater, which they regarded as better for personal care and cleaning tasks. This selective usage demonstrates a pragmatic approach that aligns with women's historically assigned roles as household caretakers and managers of domestic hygiene.

Conversely, male respondents demonstrated a broader scope of rainwater usage, incorporating laundry, personal bathing, and toilet flushing applications. This varied utilization pattern indicates that men engage with rainwater harvesting from a more utilitarian viewpoint, emphasizing practical water conservation methods and potential cost-saving strategies. The observed gender-based disparity in water usage underscores the influence of traditional gender roles on technological interactions and resource management approaches. Employing the framework established by March et al. (1999), the results show that complex gendered power dynamics influence how households adopt rainwater harvesting systems, utilize resources, and make decisions.

Installing and maintaining rainwater harvesting systems provided more profound insight into gender dynamics within the surveyed households. Although the survey did not explicitly differentiate decision-making processes by gender, it is noteworthy that seven out of eight respondents identified themselves as primary household decision-makers, indicating a substantial degree of individual autonomy. Nevertheless, with an average system installation cost of PHP 4,150 and a relatively recent adoption timeline averaging 3.5 years, potential economic and technological impediments may influence household decision-making practices differently.

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The discourse surrounding rainwater harvesting systems has intriguingly highlighted gender-specific perceptions of risk and safety. One female respondent's apprehension regarding water contamination, mosquito proliferation, and system integrity reflects broader societal constructs related to protection and care. The local vernacular phrase exemplifies a cultural perception of water purity that intersects with gendered notions of cleanliness and domestic security:

"Abog kaayo ang unang salod sa ulan" (the first collected rainwater is dirty)

The survey results indicate that women are more motivated by the potential for increased water security and environmental benefits, while economic factors and technical considerations influence men. Women reported higher levels of concern about water scarcity and were more likely to adopt rainwater harvesting if they perceived it as a reliable water source. However, women also faced significant barriers, including lack of access to information, limited decision-making power, and socio-cultural constraints. Conversely, men were more concerned about rainwater harvesting systems' initial costs and technical complexity. The survey revealed that gender roles and responsibilities play a crucial role in the adoption process, with women often bearing the burden of household water management. Nussbaum's (2011) framework provides critical insight into the findings, suggesting that the observed gender-differentiated practices in rainwater harvesting represent more than the simple division of labor—they reflect more profound structural limitations on women's and men's capabilities to fully exercise control over their environmental resources and household water management strategies.

The findings of this study underscore the importance of considering gender dynamics in promoting rainwater harvesting systems. Women's higher knowledge and prioritization of water conservation suggests that they could be key agents of change in rainwater harvesting adoption. However, their limited decision-making power and resource access hinder their ability to implement rainwater harvesting systems, which is what Chambers (2014) talked about when he said it is crucial to listen to and empower people often marginalized in development planning. Men's concerns about financial investment and long-term benefits highlight the need for targeted interventions, such as financial incentives and technical support, to encourage rainwater harvesting adoption. The observed variations in water management strategies reveal the nuanced ways gender roles simultaneously constrain and enable individual agency, demonstrating that technological innovation is never a neutral process but a socially negotiated practice fundamentally shaped by gender relations (March et al., 1999).

While our findings provide valuable insights into gender dynamics in rainwater harvesting adoption, we acknowledge the limitations of our small sample size (eight respondents) from a single barangay. This limitation hampers the generalizability of the findings, and we present these results as preliminary insights rather than definitive conclusions. The gender imbalance in our sample (five males, three females) may have resulted in the underrepresentation of female perspectives, particularly given women's significant role in household water management. Future research should employ more targeted recruitment strategies to ensure balanced gender representation and include larger, more representative samples to validate and expand upon these preliminary findings.

The study further underscores the limited efficacy of Davao City's Rainwater Ordinance in fostering widespread adoption. The deficiency in public awareness indicates that communication strategies sensitive to gender and enhanced community engagement may be pivotal in addressing both technological and social obstacles associated with rainwater harvesting.

CONCLUSION

The investigation into the adoption of rainwater harvesting in Barangay Manambulan, Davao City, uncovers a complex interrelationship among gender, technological innovation, and community resource management. This research indicates that rainwater harvesting transcends being solely a technical intervention; it is fundamentally a socially integrated practice significantly shaped by gender roles, household dynamics, and local perceptions.

The findings underscore the significant influence of gender on water resource strategies. The differing approaches between male and female respondents regarding rainwater utilization emphasize the enduring impact of traditional gender roles. Women predominantly used rainwater for personal care and pet-related activities,

whereas men demonstrated a more diverse range of applications. This aspect reflects broader patterns concerning household responsibilities and engagement with technology.

Our analysis revealed important correlations between educational attainment and rainwater harvesting practices, with more educated participants demonstrating more diverse applications and greater environmental awareness. Similarly, housing characteristics significantly influenced both the feasibility and effectiveness of rainwater harvesting systems, with homeownership facilitating more significant investment in infrastructure and housing structure, affecting water quality and collection capacity.

The study reveals substantial obstacles to adopting rainwater harvesting, including water contamination, mosquito breeding, and system quality issues. These concerns are not uniformly perceived but mediated through gendered perspectives regarding safety, cleanliness, and domestic management. The economic aspects of adopting rainwater harvesting systems are substantial and warrant careful consideration. With an average installation cost of PHP 4,150 and a typical system lifespan of 3.5 years, investing in this technology presents a considerable financial commitment for households. This economic challenge intersects with gender dynamics, potentially restricting access to rainwater harvesting systems among more economically vulnerable families.

The seasonal rainfall in Davao City means that rainwater harvesting plays a complementary rather than replacement role in the community's overall water management strategy. During the dry season (November to April), residents must rely on alternative sources such as MAWASA, water delivery services, or community wells. This seasonality highlights the need for integrated water resource management approaches that combine multiple water sources to ensure year-round water security.

The study indicates a significant need for more public awareness and community involvement despite the objectives of the Davao City Rainwater Ordinance. The restricted adoption and comprehension of rainwater harvesting systems highlight a need for more focused, gender-sensitive strategies in technology dissemination and educational efforts.

This study offers significant insights into the gender-specific aspects of rainwater harvesting, although it recognizes certain limitations. The modest sample size (eight participants) and concentration in a single barangay require careful consideration when interpreting the results. The gender imbalance in our sample (five males, three females) may have resulted in the underrepresentation of female perspectives, particularly given women's significant role in household water management. We present these findings as preliminary insights rather than definitive conclusions.

Future research endeavors should expand the scope and depth of understanding in Davao City by including more extensive, representative samples with balanced gender representation. Studies should also explore non-adopters perspectives to understand barriers to adoption better and examine changes in attitudes and practices over time through longitudinal research designs. Such expanded research would contribute to more effective and inclusive strategies for managing water resources and promoting sustainable water management practices in urban areas like Davao City.

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REFERENCES

1. Agarwal, B. (2019). The gender and environment debate: Lessons from India. In Population and environment (pp. 87-124): Routledge.
2. Ali, S., & Sang, Y.-F. (2023). Implementing rainwater harvesting systems as a novel approach for saving water and energy in flat urban areas. Sustainable Cities and Society, 89, 104304. https://doi.org/10.1016/j.scs.2022.104304.

3. Alinsunurin, M. K. (2018). Gendered Relations and Time-use: Perspectives from Selected Households of Philippines' Pantawid Pamilyang Pilipino Program in Calauan and San Pablo City, Laguna. Journal of Public Affairs and Development, 5, 89-113. https://tinyurl.com/44mtz2mc.
4. Araneta, T. G. (2014). IRR for rainwater ordinance signed. Sunstar Davao. Retrieved from https://www.sunstar.com.ph/more-articles/irr-for-rainwater-ordinance-signed.
5. Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. Qualitative Research in Psychology, 3(2), 77–101. https://doi.org/10.1191/1478088706qp063oa.
6. Campbell, S., Greenwood, M., Prior, S., Shearer, T., Walkem, K., Young, S., Bywaters, D., & Walker, K. (2021). Purposive sampling: complex or simple? Research case examples. Journal of Research in Nursing, 26(8), 652–661. https://doi.org/10.1177/1744987120927206.
7. Campisano, A., Butler, D., Ward, S., Burns, M. J., Friedler, E., DeBusk, K., Fisher-Jeffes, L. N., Ghisi, E., Rahman, A., & Furumai, H. (2017). Urban rainwater harvesting systems: Research, implementation and future perspectives. Water Research, 115, 195-209. doi:https://doi.org/10.1016/j.watres.2017.02.056.
8. Carr, E. R., & Thompson, M. C. (2014). Gender and climate change adaptation in agrarian settings: Current thinking, new directions, and research frontiers. Geography Compass, 8(3), 182–197. https://doi.org/10.1111/gec3.12121.
9. Chambers, R. (2014). Rural development: Putting the last first. Routledge. https://doi.org/10.4324/9781315835815.
10. Cleaver, F. (2000). Analysing gender roles in community natural resource management: Negotiation, lifecourses and social inclusion. IDS Bulletin, 31(2), 60–67. https://doi.org/10.1111/j.1759-5436.2000.mp31002008.x.
11. Cornwall, A. (2003). Whose voices? Whose choices? Reflections on gender and participatory development. World Development, 31(8), 1325–1342. https://doi.org/10.1016/S0305-750X(03)00086-X.
12. Crider, Y., & Ray, I. (2022). Water and Development: A Gender Perspective. Oxford Research Encyclopedia of Environmental Science. https://doi.org/10.1093/acrefore/9780199389414.013.685.
13. De Guzman, K., Stone, G., Yang, A. R., Schaffer, K. E., Lo, S., Kojok, R., . . . DePledge, L. (2023). Drinking water and the implications for gender equity and empowerment: A systematic review of qualitative and quantitative evidence. International Journal of Hygiene and Environmental Health, 247, 114044. https://doi.org/10.1016/j.ijheh.2022.114044.
14. Fontana, M., & Wood, A. (2000). Modeling the effects of trade on women, at work and at home. World Development, 28(7), 1173–1190. https://doi.org/10.1016/S0305-750X(00)00033-4.
15. García-Ávila, F., Guanoquiza-Suárez, M., Guzmán-Galarza, J., Cabello-Torres, R., & Valdiviezo-Gonzales, L. (2023). Rainwater harvesting and storage systems for domestic supply: An overview of research for water scarcity management in rural areas. Results in Engineering, 18, 101153. https://doi.org/10.1016/j.rineng.2023.101153.
16. Gascon, M., & McIntyre-Mills, J. (2017). Empowering indigenous people: Voice, choice and agency in rural development planning in Mindanao. In Balancing Individualism and Collectivism: Social and Environmental Justice (pp. 319–386). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-319-58014-2_17.
17. Hafizi Md Lani, N., Yusop, Z., & Syafiuddin, A. (2018). A review of rainwater harvesting in Malaysia: Prospects and challenges. Water, 10(4), 506. https://doi.org/10.3390/w10040506.
18. Khandker, V., Gandhi, V. P., & Johnson, N. (2020). Gender perspective in water management: The involvement of women in participatory water institutions of eastern India. Water, 12(1), 196. https://doi.org/10.3390/w12010196.
19. Koutroulis, A. G., Tsanis, I. K., Daliakopoulos, I. N., & Jacob, D. (2013). Impact of climate change on water resources status: A case study for Crete Island, Greece. Journal of Hydrology, 479, 146-158. https://doi.org/10.1016/j.jhydrol.2012.11.055.
20. Lumawag, R. J. F. (2018). Raising awareness on rainwater harvesting. Sunstar Davao. Retrieved from https://www.sunstar.com.ph/davao/feature/raising-awareness-on-rainwater-harvesting
21. March, C., Smyth, I. A., & Mukhopadhyay, M. (1999). A guide to gender-analysis frameworks. Oxfam.
22. Mason, L. R. (2014). Examining relationships between household resources and water security in an urban Philippine community. Journal of the Society for Social Work and Research, 5(4), 489–512. https://tinyurl.com/2uvnh5e2.

23. Matimolane, S., Strydom, S., Mathivha, F. I., & Chikoore, H. (2023). Determinants of rainwater harvesting practices in rural communities of Limpopo Province, South Africa. Water Science, 37(1), 276-289. https://doi.org/10.1080/23570008.2023.2244784.
24. Moser, C. O. (2012). Gender planning and development: Theory, practice, and training. Routledge.
25. Mukarram, M. M. T., Kafy, A. A., Mukarram, M. M. T., Rukiya, Q. U., Almulhim, A. I., Das, A., . . . Chowdhury, M. A. (2023). Perception of coastal citizens on the prospect of community-based rainwater harvesting system for sustainable water resource management. Resources, Conservation and Recycling, 198, 107196. https://doi.org/10.1016/j.resconrec.2023.107196.
26. Naiga, R., Ananga, E. O., & Kakumba, U. (2024). Gendered participation in water governance: implications for successful community-based water management and women empowerment. International Journal of Rural Management, 20(2), 255-270. https://doi.org/10.1177/09730052231202567.
27. Nussbaum, M. C. (2011). Creating capabilities: The human development approach. Cambridge, MA: Belknap Press of Harvard. https://tinyurl.com/bdhakd8b.
28. Pala, G. K., Pathivada, A. P., Velugoti, S. J. H., Yerramsetti, C., & Veeranki, S. (2021). Rainwater harvesting review on conservation, creation, and cost-effectiveness. Materials Today: Proceedings, 45, 6567–6571. https://doi.org/10.1016/j.matpr.2020.11.593.
29. Palinkas, L. A., Horwitz, S. M., Green, C. A., Wisdom, J. P., Duan, N., & Hoagwood, K. (2015). Purposeful sampling for qualitative data collection and analysis in mixed method implementation research. Administration and Policy in Mental Health and Mental Health Services Research, 42, 533–544. https://doi.org/10.1007/s10488-013-0528-y.
30. Peter, G. (2006). Gender roles and relationships: Implications for water management. Physics and Chemistry of the Earth, Parts A/B/C, 31(15-16), 723–730. https://doi.org/10.1016/j.pce.2006.08.035.
31. Singh, N. (2006). Women's participation in local water governance: Understanding institutional contradictions. Gender, Technology and Development, 10(1), 61–76. https://doi.org/10.1177/097185240501000104.
32. Tandon, I., Wallace, C., Caretta, M. A., Vij, S., & Irvine, A. (2024). Urban water insecurity and its gendered impacts: on the gaps in climate change adaptation and Sustainable Development Goals. Climate and development, 16(3), 187–198. https://doi.org/10.1080/17565529.2022.2051418.
33. Vasileiou, K., Barnett, J., Thorpe, S., & Young, T. (2018). Characterising and justifying sample size sufficiency in interview-based studies: systematic analysis of qualitative health research over a 15-year period. BMC Medical Research Methodology, 18(1), 148. https://doi.org/10.1186/s12874-018-0594-7.
34. Zwarteveen, M. Z. (1997). Water: From basic need to commodity: A discussion on gender and water rights in irrigation. World Development, 25(8), 1335-1349. https://doi.org/10.1016/S0305-750X(97)00032-6.