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An Assessment of Riverbank Waste Disposal and Its Health, Livelihood and Adaptive Implications Among Riverside Communities in Dolowog, Alfonso Lista Ifugao

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Abstract

This study addressed the impact of waste disposal along the riverbanks in terms of environmental and socio-economic conditions affecting the health and livelihood of the residents of Barangay Dolowog, Alfonso Lista, Ifugao. The researchers utilized a quantitative-descriptive approach utilizing structured questionnaires to assess the types and sources of riverbank wastes, possible health problems, impacts on farming and fishing activities, and coping strategies employed by affected households. The findings indicate that plastic packaging, domestic waste, and agricultural wastes primarily contaminate riverbanks due to ineffective enforcement of local waste management policies and inadequate disposal facilities. Furthermore, the findings have shown the existence of a significant relationship between proximity to the river and the health risks, especially from waterborne and skin-related diseases. Additionally, accumulation of wastes was found to adversely impact farm productivity and fishing catch, hence, coming into play as determinants of household income and food security. No significant difference was found in livelihood impact when comparing those living far from the river with those living closer, although the pollution had wider impacts shared by the entire community.

Keywords: riverbank waste, rural sanitation, health risk, livelihood impacts, adaptive strategies, Alfonso Lista, Ifugao

INTRODUCTION

Water is a fundamental resource essential to human survival, ecosystem stability, and socio-economic development (World Health Organization, 2021; Jabeen et al., 2020). Rivers, in particular, play a vital role as sources of domestic water, irrigation, food production, and livelihood, especially in rural and upland communities (Esmael et al., 2025). However, increasing human activities associated with population growth, urbanization, and inadequate waste management have led to the degradation of river systems worldwide, compromising water quality and ecosystem health (Hassan-Rashid et al., 2018; Ed-Idoko et al., 2024).

Communities residing along riverbanks are especially vulnerable to environmental degradation. Routine domestic activities such as bathing, washing clothes, and disposal of household and agricultural waste often contribute to river pollution, particularly in areas with limited waste collection infrastructure (Devgade & Patil, 2023; Ferronato & Torretta, 2019). The accumulation of solid waste along riverbanks introduces biological and chemical contaminants that degrade water quality and increase exposure to health risks, including waterborne and skin-related diseases (Xu et al., 2019; Paul, 2017). Beyond health implications, river pollution also threatens livelihoods that depend on clean water, such as farming and fishing, thereby affecting household income and food security.

At the policy level, sanitation and waste management are central to global development frameworks, including the Sustainable

Development Goals (SDGs), particularly SDG 3 (Good Health and Well-being), SDG 6 (Clean Water and Sanitation), and SDG 11 (Sustainable Cities and Communities) (Kumar et al., 2016; Parikh et al., 2021). In the Philippines, the enactment of Republic Act No. 9003 (Ecological Solid Waste Management Act of 2000) and Republic Act No. 9275 (Clean Water Act) reflects national commitment to improving environmental quality. Despite these policies, evidence suggests that implementation and enforcement remain uneven at the local level, particularly in rural barangays where waste disposal facilities and monitoring mechanisms are limited (Fuentes et al., 2024; Wynne et al., 2018).

Existing studies in the Philippines and other developing contexts have documented associations between river pollution and adverse health and livelihood outcomes among riverside populations (Picardal et al., 2012; Purba et al., 2018). However, many of these studies focus on urban or lowland settings, emphasize water quality measurements, or examine pollution sources without explicitly accounting for spatial factors such as distance from the riverbank or community-level adaptive responses. In upland areas such as Ifugao, where river systems are closely integrated into daily life and agricultural production, empirical evidence linking riverbank waste disposal, residential proximity to rivers, and socio-economic and health outcomes remains limited.

Despite existing national policies, there is limited evidence linking riverbank waste disposal, distance from rivers, and socio-economic and health outcomes in upland communities such as Barangay Dolowog, Alfonso Lista, Ifugao. Addressing this gap, the present study examines the types and sources of riverbank waste, analyzes the relationship between residential proximity to the river and health and livelihood outcomes, and explores the coping and adaptive responses employed by affected households. The findings aim to provide localized evidence to support community-based interventions and context-sensitive waste management strategies aligned with national and global sustainability goals.

Statement of the Problem. Rural communities in the Philippines have in recent times continued to endure environmental problems due to improper disposal of waste along riverbanks. In Dolowog, Alfonso Lista, Ifugao, where household needs and agriculture are closely tied to river systems, solid waste persistence near rivers might be doing a silent massacre on public health and local livelihoods. Despite measures in environmental education and barangay-level interventions, the so-called "riffle effect" could prolong an interlinked rippling through residents' lives.

This study aims to analyze whether the improper disposal of waste on riverbanks or riverbanks along the shores will cause sufficient health and economic harm to the households in Dolowog. The study also aims to provide empirical insights that can be used in the formulation of localized waste management strategies and sustainable community responses. Specifically, the research involves the following questions:

1. What is the profile of the respondents in terms of the following:
   1.1 Gender;
   1.2 Monthly household income; and,
   1.3 Distance from the riverbank?

2. What is the most common type and source of riverbank wastes that are not properly disposed of in Dolowog?

3. Is there a significant relationship between the residence proximity to the riverbank and the incidence of health issues among members of the community?

4. Is there a significant relationship between riverbank waste pollution and changes in income sources such as farming and fishing?

5. Is there a statistically significant difference in livelihood from distance from the riverbank among residents?

6. What coping mechanisms and adaptive practices are employed by residents in response to the effects of riverbank waste pollution?

Hypotheses. In reference to the relationships and differences proposed in the study, the following hypotheses were drawn:

H_0: There is no significant relationship between riverbank waste pollution and changes in income sources, such as farming and fishing.

H_1: There is a significant relationship between riverbank waste pollution and changes in income sources, such as farming and fishing.

Theoretical Framework. The study was anchored from the Social-Ecological Systems (SES) Framework. This framework elucidates how humans relate with natural resources such as rivers. It explains how waste disposal practices, community practices, and government policies can influence both the health of the environment and the well-being of individuals. This is depicted in the conceptual framework in terms of improper waste disposal along riverbanks resulting in health and livelihood problems, and responses by the community through adaptation and coping. These frameworks together illustrate cause, effect, and response to river pollution in Barangay Dolowog.

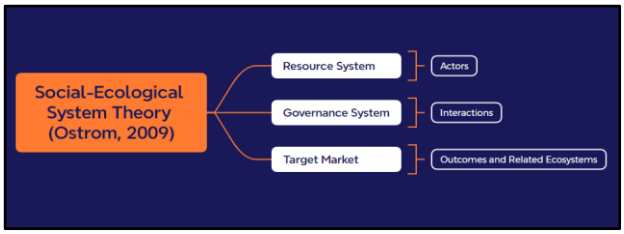


Figure 1
Social-Ecological System Theory (Ostrom, 2009)

A major problem worldwide is the potential loss of fisheries, forests, and water resources. Understanding of the processes that lead to improvements in or deterioration of natural resources is limited, because scientific disciplines use different concepts and languages to describe and explain complex social-ecological systems (SESs). Without a common framework to organize findings, isolated knowledge does not cumulate. Until recently, accepted theory has assumed that resource users will never self-organize to maintain their resources and that governments must impose solutions. Research in multiple disciplines, however, has found that some government policies accelerate resource destruction, whereas some resource users have invested their time and energy to achieve sustainability (Ostrom, 2009).

In the current research, the foundation of the study rests on the Social-Ecological Systems (SES) framework, which provides an overall structure through which one can study the interactive humans and natural ecosystems, especially in rural and riverside settings. Ostrom (2009) and McGinnis and Ostrom (2014) emphasize that the SES framework is investigated in terms of the resource users (e.g., households), governance systems (e.g., local barangays), and ecological systems (e.g., riverbanks) in a dynamic relationship causing varying outcomes, such as environments becoming degraded, health risk factors, and livelihood risks. This applies especially in Dolowog, in which these activities include the dumping of solid wastes in riverine wetlands and adjacent ecosystems that are essential to dependent human populations for their day-to-day survival. This problem-feature-problem has also been evidenced empirically through studies within the Philippines and more developing countries linking the health impact with the use of livelihoods. Disposal of plastic waste in parts of the world has always been disastrous- usually bringing along its tragedy of havoc-like Deb et al. (2021), as poignantly put by the respondents along Old Brahmaputra River: "Pollution bad aspect has on agricultural production and fish catch." The word "first" is cited for referring one to the cause of the densest macroplastic found in an urban river in the Philippines, as cited in a report by Talavera et al. (2024) regarding weak waste collection systems and barangay enforcement. Some examples of this would be rivers primarily in Mindanao, which have an average of around 3.39

objects/m2 of bank litter consisting of food wrappers and packing wastes (Fuentes et al., 2024). Thus, it seems to strengthen the argument that plastic waste, especially single-use plastics, constitutes one of the major detrimental components of pollution in rivers and hence its impact on the health and economy of the community. Wynne et al. (2018) also claimed that strong national policies, e.g., RA 9003, can hardly find their application at the barangay level, thus, limiting the effectiveness of national mandates in this regard. This literature proves that local level assessments like the one in Dolowog are really needed to provide scientific evidence on the link of riverbank waste pollution to health and livelihoods and to point out possible interventions under the sustainable development goals (SDG 3, SDG 6, and SDG 11).

Resource Systems. A Resource System, as defined for this research, pertains to the riverine environment corresponding to Barangay Dolowog, Alphonso Lista, Ifugao. This system includes both the river and its adjoining riverbanks: multiple uses such as source of water, waste disposal place, agricultural input, and place for livelihood (Ostrom, 2009).

Resource Unit. Resource Units are derived from the obvious tangible benefits of such system: clean water, fish, fertile soil, and other ecological goods and services directly important for community well-being (Partelow, 2018). These units are directly affected by pollution, primarily stemming from improperly disposed solid wastes.

Governance system. It comprises both formal and informal institutions, the governance system that manages or influences the use or protection of the river. This is well captured in the Philippines where national policies like Republic Act 9003 (Ecological Solid Waste Management Act) and Republic Act 9275 (Clean Water Act) and the ordinances promulgated by the barangays and municipal LGUs are applicable. The effect of these legal instruments is usually hampered by weak enforcement within the barangay levels (Wynne et al., 2018).

Actors. The Actors consist of local households, farmers, fisherfolk, barangay officials, and environmental groups who are related with the resource system, either as users or managers, or caretakers (McGinnis & Ostrom, 2014).

Interactions. These actors engage in Interactions such as waste disposal and river use for domestic and agricultural needs, clean-up initiatives, or adaptation strategies such as using alternative water sources.

Outcomes. These interactions determine the Outcomes of the system, which can either be positive-such as enhanced water quality through concerted efforts on the community's part-or negative, for instance, increased morbidity and decreased productivity of livelihood owing to pollution. Esmael et al. (2025) further found that these human-river interactions in Philippine River communities strongly correlate with morbidities concerned with sanitation.

Related Ecosystems. Related Ecosystems refer to those upstream watersheds, nearby agricultural lands, and downstream aqua-environments affected by wastes and water flow. These systems are interlinked; therefore, any pollution that occurs in Dolowog might lead to further environmental degradation-interlinking with biodiversity and ecosystem services downstream (Cinner et al., 2012; Deb et al., 2021). By integrating all SES components, we understand how local socio-economic behaviors contribute to environmental degradation and how governance and adaptive management provide resilience.

Conceptual Framework. This study examines improper riverbank waste disposal in upland agricultural communities, focusing on Dolowog, Alfonso Lista, Ifugao. It highlights environmental degradation, public health risks, and livelihood disruptions caused by unmanaged household and agricultural wastes, while exploring coping mechanisms and community responses that reflect broader and larger challenges in rural solid waste management.

Improper Riverbank Waste Disposal. Such improper waste disposal along riverbanks, at present, is an unattended environmental and public health problem in several upland agricultural communities of the Philippines. In relation to the above, in the barangay Dolowog, Alfonso Lista, Ifugao, where river systems are both source and conveyor of household and farm life, careless accumulation of plastics, organics, and agro wastes along the riverbanks directly threatens environmental integrity as well as that of human beings. This article looks into health impacts and livelihood disruptions, and local coping mechanisms suggestive of current literature and field observations.

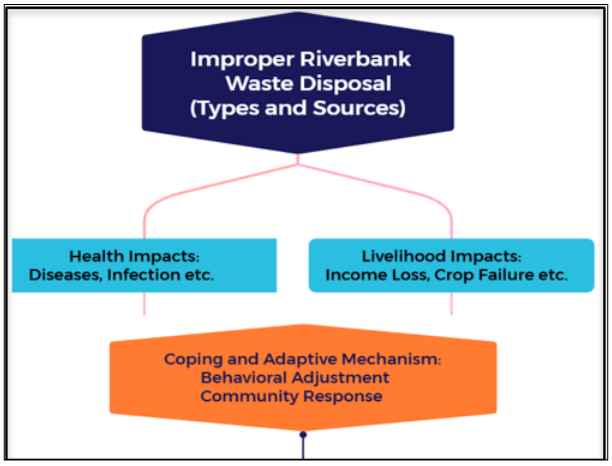


Figure 2
Paradigm of the Study

Types and sources. Most wastes found alongside riverbanks in rural barangays like Dolowog include household discards like plastic sachets, wrappers, diapers, food residues, agricultural wastes such as fertilizer bags, pesticide containers, and crop residues, and sometimes commercial waste from nearby sari-sari stores and markets. These types of waste result from a combination of causes: weak enforcement of barangay-level waste segregation laws, non-existence of functional materials recovery facilities (MRFs), and limited access to proper waste collection routes.

According to a study by Fuentes, D. H., et. al. (2024), on the riverbanks in Southern Mindanao, the inland ones have the densest debris concentration, with plastics and food packaging contributing to over 70% of the waste (Fuentes et al., 2024). The above supports informal observations in Ifugao, such as noting that plastic and agri-waste are usually found scattered along irrigation and river banks. This is especially true during the dry season when piles of garbage are either burned or washed away.

Health Impacts: Infections/Diseases. Waste disposal along riverbanks has had an enormous public health effect. Decomposed waste would emit scent to attract not only mosquitoes but also rodents and flies. Vector-borne diseases, such as dengue and leptospirosis, consequently proliferate. This contaminated water has all the symptoms of diarrheal diseases, skin infections, and gastroenteritis among children and the elderly who come to the rivers to bathe or wash or play.

According to Walag et al. (2018), who studied communities in the Northern Mindanao area, it has been evident that the closer one is to a polluted water source, the greater the incidence of diarrheal and respiratory diseases, as well as skin rashes (Walag et al., 2018). Mendoza and Rivera (2019) also recognized higher cases of typhoid and other water-borne infections in informal settlements on the banks of the San Juan River because of their poor waste management practices. Data for Dolowog may not be conclusive, but testimonies from the health centers in Alfonso Lista claim that fecal illnesses and skin diseases spike seasonally in areas adjacent to rivers.

Livelihood Impacts: Income Loss and Crop Failure. The case study treats the example of the Turag River in Bangladesh in an international perspective, describing how industrial effluent dumped into the river, combined with garbage, sewage, and pesticide runoff, led to lower agricultural yields and a collapse of aquatic ecosystems, along with impacts on community health; although not specifically Philippine, its patterns reflect the lowland fishers' accounts in Alfonso Lista, whose declining catches and secondary vendor income, arise as coping and adaptive

mechanism due to polluted river systems (Manasi, 2013). Residents also near irrigation canals said that Styrofoams, diapers, plastics, and even dead animals are always thrown away because there are no garbage collection services available. They admitted that those things blocked the irrigation and contaminated the farm water, which was harmful to corn and rice production.

Coping Strategies and Adaptive Mechanisms

Behavioral Adjustment. The communities will attempt to adapt their own water use practices by avoiding bathing in the river, filtering or boiling water, and informally burning or burying rubbish that is not biodegradable. Such measures can reduce immediate health threats but do not deal with the causes of the situation and would also impose secondary environmental impacts, such as air pollution.

As noted by Vanzela et al. (2020), in rural Ilocos, families would usually create an emergency pit to bury wastes and avoid using rivers for hygiene. These methods relieve the problem temporarily and, at times, lead to groundwater pollution.

Response of the Community. Barangay officials at Dolowog are constantly involved in cleaning activities according to the season as well as in school-based IECs, but their participation is often too little sporadic. Some hope is found at the barangay associating community members into engaging in solid waste segregation, and much though it does not begin to resemble the current wave of engagement in such an "involvement." "Save the Rivers, Save the Sea" may be the best model. It was launched in Tabaco City in Albay. It proves that education together with government support works magic in the CSWM--that it's through the community that rivers can improve their cleanliness and health within the community, (Wynne et al., 2018). Such frameworks might encourage Dolowog, especially during a joint Barangay Development Council planning process.

LITERATURE REVIEW

Riverbank waste disposal has been widely identified as a major contributor to surface water pollution, particularly in developing countries which lack efficient waste collection systems and effective enforcement mechanisms (Ferronato & Torretta, 2019). The solid waste materials which include plastics and domestic refuse and agricultural residues and sanitary waste have built up along riverbanks and have been washed away during rainstorms to harm aquatic ecosystems (Xu et al., 2019). The studies which researchers conducted on river systems demonstrate that human activities bring about extensive changes which affect both the water body's physical and chemical and biological characteristics, making the water unfit for domestic purposes and agricultural activities and ecological functions (Mustacisa et al., 2017; Son et al., 2020).

Multiple studies have demonstrated that polluted river environments create health risks for people who live near them. Water pollution enables pathogenic microorganisms to spread through contaminated water which leads to increased rates of diarrheal diseases and skin infections and waterborne illnesses (Paul, 2017; Xu et al., 2019). Direct exposure to polluted water exists because communities use rivers for their bathing and washing and domestic work activities which increases their exposure to harmful substances (Devgade & Patil, 2023).

The Philippine river systems have provided scientific proof that establishes the connection between two elements. The team of Picardal and his colleagues discovered through their research that Butuanon River water contained unsafe levels of coliform bacteria which led to human health risks and public health problems for people living near the river. The research conducted by Walag and his team found that residents who lived near polluted water sources in Mindanao showed a higher incidence of illnesses which resulted from poor sanitation practices.

International studies confirm these results because Purba and his team discovered that people living near polluted riverbanks experience worse health conditions and lower life satisfaction despite maintaining their current income. The research findings demonstrate that people living near polluted rivers face health hazards which vary by location because contaminated waterways create dangerous areas throughout their surroundings.

Riverbank pollution creates health risks while it also creates dangerous conditions which threaten the existence of people whose work relies on pure and intact river ecosystems. Agricultural productivity and fishing activities face serious threats from water quality deterioration because polluted water leads to decreased crop yields and damages irrigation systems and decreases fish stocks according to research by Ferronato and Torretta in 2019 and Deb and his team in 2021. River-dependent communities experience these consequences through decreased household income and increased financial instability.

Localized studies are necessary because mixed findings require researchers to evaluate economic effects through spatial analysis and different livelihoods. The level of household distance from rivers determines how households face pollution-related dangers. People who live close to rivers face higher chances of coming into contact with polluted water and garbage which raises their risk of developing health issues (Walag et al., 2018). Research on river pollution shows that areas with defined land-use zoning experience a drop in waste density and contamination levels when people move away from the river (Talavera et al., 2024). The link between distance from a location and its economic impacts shows complex relationships. The health risks of proximity to a river increase for people who live nearby, but riverbank areas share their irrigation systems and fishing grounds and down streaming pollution creates health risks for people who live further away (Purba et al., 2018; Rahman et al., 2022). Distance interacts with other factors which include how much people depend on their jobs, how they use water resources, and how their community operates.

Communities develop coping and adaptive strategies to handle health and livelihood dangers which result from riverbank pollution. Households respond to this situation by two main methods which involve stopping all river activities and treating water through boiling or filtering and using waste disposal methods which include burning and burying garbage (Vanzela et al. 2020). The methods create less danger for people in the short term, yet they produce new environmental problems while failing to solve the main sources of pollution. The waste management system which communities use to handle their waste shows better sustainability for future needs. The study by Wynne et al. (2018) demonstrated that Philippine riverside and coastal regions achieve better solid waste management through community initiatives which receive backing from local government bodies.

The existing research contains a substantial deficit because it lacks studies which evaluate the effects of riverbank waste dumping and residential space near rivers and health results and economic effects and how communities adapt to these factors in upland rural areas like Barangay Dolowog Alfonso Lista Ifugao. The development of evidence-based waste management solutions requires this research because it enables the creation of interventions which address specific community needs while supporting national waste management standards and sustainable development objectives.

METHODOLOGY

Research Design. This study employed a quantitative-descriptive research design using a cross-sectional survey approach to assess the impacts of improper riverbank waste disposal on the health and livelihood of residents in Barangay Dolowog, Alfonso Lista, Ifugao. The descriptive design was appropriate as it enabled the researchers to describe and

quantify the current conditions and practices related to waste management, as well as the corresponding effects experienced by the community.

Recent studies have highlighted the relevance of cross-sectional designs in examining the relationship between environmental conditions and human health outcome. These support the appropriateness of using a cross-sectional descriptive design in assessing the health and livelihood effects of improper riverbank waste disposal among residents of Barangay Dolowog, Alfonso Lista, Ifugao.

The cross-sectional nature of the study allowed data to be collected at a single point in time from a selected group of residents, providing a comprehensive snapshot of their awareness, experiences, and coping strategies.

Research Environment. The research was conducted in Barangay Dolowog, located in the municipality of Alfonso Lista, Province of Ifugao. Dolowog is a rural community where most residents rely on farming and fishing as their primary sources of livelihood. The Dolowog River traverses the barangay and serves as an essential natural resource for household activities such as washing, irrigation, and, unfortunately, waste disposal.

Figure 3
Dolowog River System

The study site was chosen because of its proximity to the river system and the visible accumulation of waste materials along the riverbanks, which have raised community concerns regarding health, sanitation, and environmental degradation. The respondents were households located near or along the river area, as these individuals are directly exposed to and affected by the environmental consequences of improper waste disposal.

Research Respondents. The study involved forty (40) respondents residing in Barangay Dolowog who were purposively selected based on their proximity to the riverbank and involvement in river-related activities such as farming, washing, or fishing. The sample included both male and female residents from varying age groups, educational backgrounds, and income levels to ensure diverse perspectives. Inclusion criteria required that respondents be:

1. Permanent residents of Barangay Dolowog.
2. Living within 200 meters of the riverbank.
3. Willing to participate voluntarily in the study.

Research Instrument. The primary instrument used in this study was a structured survey questionnaire, developed by the researchers based on related literature and local environmental issues. The questionnaire consisted of six (6) parts, namely:

1. ***Part I – Demographic Profile***: Collected data on respondents' age, sex, civil status, education, occupation, household income, source of drinking water, livelihood, and distance from the riverbank.
2. ***Part II – Awareness and Waste Management Practices:*** Measured residents' awareness, attitudes, and frequency of waste disposal behaviors using a five-point Likert scale.
3. ***Part III – Perceived Health Impacts:*** Assessed how improper waste disposal affects the health and wellbeing of community.
4. ***Part IV – Perceived Livelihood Impacts:*** Evaluated the effects of river pollution on residents' economic activities and income sources.
5. ***Part V – Community Response and Coping Strategies:*** Examined how individuals and

the community adapt and manage the negative impacts of riverbank waste pollution.

6. Part VI – Open-Ended Question: Solicited qualitative insights from respondents regarding suggested solutions to reduce the effects of improper waste disposal in their locality.

The instrument included both closed-ended and open-ended items. The closed-ended sections utilized Likert-scale items for quantitative analysis, while the open-ended question allowed respondents to freely express opinions and recommendations.

To ensure validity and reliability, the instrument was evaluated by three subject matter experts in environmental science and social research. Minor revisions were made for clarity and cultural relevance. The instrument was also pilot-tested from among five (5) residents of nearby barangay to ensure comprehension and appropriateness.

Data Gathering Procedure. The researchers followed a systematic and ethical process to ensure accuracy, reliability, and the protection of participants throughout the study. Prior to data collection, formal permission was obtained from barangay officials in Dolowog, and informed consent was secured from each participant. The purpose and objectives of the research were clearly explained, along with assurances of confidentiality.

Surveys were administered through face-to-face interviews, which allowed the researchers to guide respondents who had difficulty reading or understanding certain items. This personal approach encouraged honesty and completeness in responses, with each interview lasting around 20 to 30 minutes.

Ethical considerations were strictly observed. Participation was voluntary, and respondents were assured of anonymity and confidentiality. They were informed of their right to withdraw at any time without consequence, and no personal identifiers were included in the data presentation. Throughout the process, the researchers maintained professional conduct, ensuring that participants felt comfortable and respected at all times.

Data Analysis. Data analysis involved both quantitative and qualitative methods to comprehensively interpret the findings.

Quantitative Analysis. The study employed quantitative methods to process and interpret the survey data. Responses from closed-ended and Likert-scale items were systematically coded, tabulated, and analyzed using Microsoft Excel and the Statistical Package for the Social Sciences (SPSS). Descriptive statistics, including frequency and percentage, were used to summarize the demographic profiles of respondents, while mean and standard deviation provided insights into levels of awareness, perceived health and livelihood impacts, and community responses. To test for differences, one-way ANOVA was applied to determine variations in health and livelihood impacts based on respondents' distance from the riverbank. Pearson's correlation coefficient was further utilized to examine the relationship between riverbank waste pollution and changes in livelihood activities such as farming and fishing. A 95% confidence level ($p < 0.05$) was set as the threshold for statistical significance, ensuring the robustness and reliability of the findings.

Qualitative Analysis. The open-ended responses were examined through thematic analysis, a process that allowed the researchers to identify, categorize, and interpret recurring ideas related to community solutions and adaptive measures. This involved repeated reading of the responses to gain familiarity, followed by the initial coding of key phrases and ideas. Similar codes were then grouped into broader themes such as community cooperation, barangay intervention, and waste segregation. Finally, the dominant themes were interpreted to provide deeper insights into local coping strategies, thereby supplementing and validating the quantitative findings.

The integration of quantitative and qualitative data provided a holistic understanding of how riverbank waste disposal affects the health, livelihood, and adaptive responses of the residents of Barangay Dolowog.

Ethical Considerations. Ethical protocols were strictly observed throughout the study. All participants were informed of the purpose, procedures, and voluntary nature of the research. The confidentiality of respondents' identities and data was maintained, and no personal information was disclosed in the results. The researchers ensured that participation would not cause harm, pressure, or discomfort to any respondent.

RESULT AND DISCUSSION

The data presented in this section is organized according to the research questions. Following the administration and completion of the survey, the collected data were evaluated and analyzed.

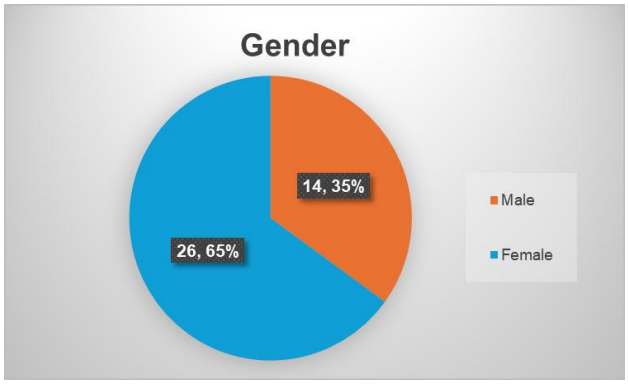


Figure 4
Frequency and Percentage of the Gender

Profile of respondents. The data in Figure 4 shows that among the 40 randomly chosen respondents of the study, there were 14 (35%) males and 26 (65%) females. In this way, the filtered sample consisted of more females than males, comprising almost two-thirds of the respondents. Because the respondents were randomly selected, this gender distribution could mean that simply more females were available or accessible from the population frame during the selection process. This could be considered fairly a representation of the study even though the increased number of females may have influenced the slightly biased opinion reflected in the results.

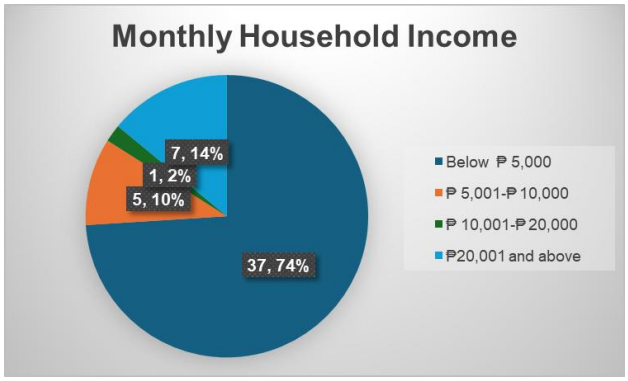


Figure 5
Frequency and percentage of monthly household income

In Figure 5, the data reveals that a large majority of respondents were 37 households (74%), earning below ₱5,000 a month. This would mean that many of the study population are classified under the low-income bracket, which may determine their access to the basic needs and services. Meanwhile, 5 households (10%) earn between ₱5,001–₱10,000, and only 1 household (2%) reported an income between ₱10,001–₱20,000. A relatively small group, 7 households (14%), reported earning higher than ₱20,001 a month.

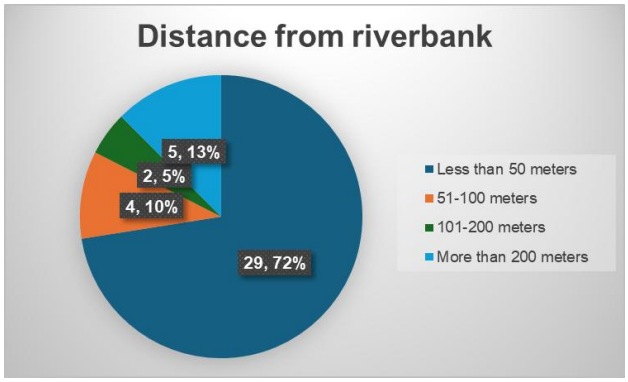


Figure 6
Frequency and percentage of the distance from the riverbank

The greatest number of respondents (Figure 6) are residents within 50 meters of the riverbank (29, or 72 percent). Most of the study population live in proximity to the river and, as such, is likely to be exposed to environmental hazards.

Meanwhile, 4 respondents (10%) are located at a distance of 51–100 m, while 5 respondents (13%) were found to be located beyond 200 m, which shows that fewer lives are at a relatively safer distance, while only 2 (5%) respondents live between the distances of 101–200 m, making this group the second least represented.

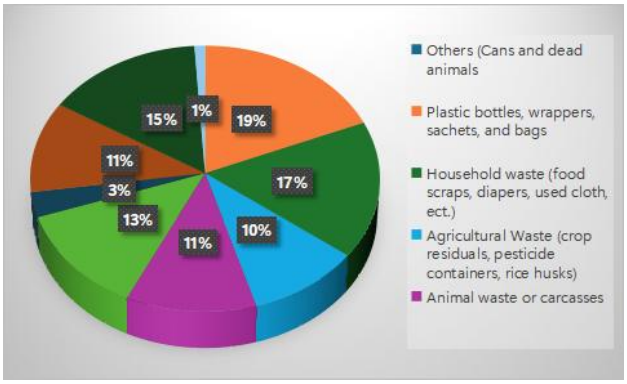


Figure 7
Checklist: Types of Waste Commonly Found Along the Riverbank

Most common type and source of riverbank wastes that are not properly disposed. In Figure 7, the data shows the different types of waste generated in the households of the respondents. The largest share is plastic bottles, wrappers, sachets, and bags (19%), indicating a high dependence on single-use plastics and packaged goods. Household waste (17%), including food scraps, used cloth, and diapers, reflects daily domestic activities that produce organic and inorganic waste. Used sanitary napkins and disposable diapers (15%) highlight the need for proper disposal of health-related waste. Agricultural waste (13%), such as crop residues and pesticide containers, suggests that many respondents are engaged in farming, while animal manure and carcasses (11%) indicate livestock activities. Minor categories include other wastes (3%) and cans and dead animals (1%).

Similarly, Awasthi et al. found that household waste in Kirtipur, Nepal, is mainly organic (44%), followed by plastic (13%) and other materials. Talavera et al. (2024) also reported that plastics dominate riverbank litter, ranging from 30%–41% residuals. These findings highlight the need for improved solid waste management, plastic reduction, recycling, and proper disposal practices to reduce environmental and health impacts.

Table 1
Waste Sources and Frequencies

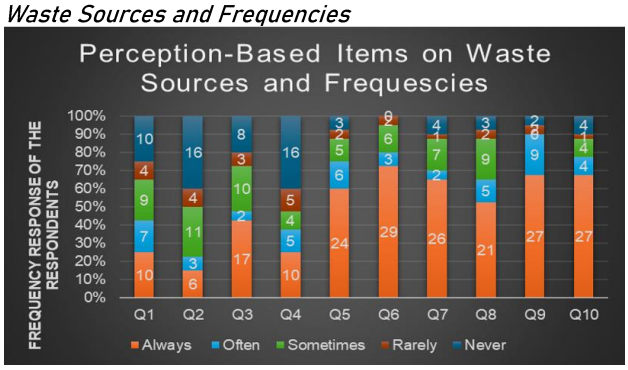


Table 1 represents the frequency of disposal methods and garbage sources in Barangay Dolowog's riverbanks perceived by respondents. The largest percentage are items Q6, Q9, Q10 which indicates "Always" about 27-29% which indicates improper waste disposal such as trash, student litter, and plastics packaging occurs frequently. This can be associated with the findings of Fuentes et al. (2024), which states that plastic wastes predominated inland riverbanks of Mindanao and those by Esmael et al. (2025) that found a relationship of poor sanitation practices near rivers with greater risks of contaminations. But, there is more variety in items such as Q2 and Q4 that significant "Never" or "Sometimes" answers were recorded for unusual but quite prevalent sources such as commercial or agricultural waste. Such patterns agree with that of Ferronato and Torretta (2019) regarding the correlation between waste generation and availability and activity related infrastructure in rural areas. As Wynne et al. (2018) noted, the data highlighted a noticeable and persistent garbage problem in Dolowog, thus evidencing the need for community-based waste management approaches and stricter barangay-level enforcement of Republic Act 9003.

Relationship between the residence proximity to the riverbank and the incidence of health issues among members of the community. The results

in Table 2 show that the factor distance from the riverbank has a p-value of 0.009, an F-value of 4.52, and a Mean Square of 0.751. The distance from the riverbank was found to be associated with the prevalence of health-related problems in the neighborhood, with a p-value below the 0.05 significance cut-off, indicating a statistically significant link.

Table 2
Pearson r test analysis on the relationship between the residential proximity to the riverbank and the prevalence of health-related issues among community members.

	Mean Square	F-value	P-value
Distance from Riverbank	.751	4.452	.009
Health Issues	.169		

According Ferronato and Torretta (2019), poor waste management, especially in developing countries, induces serious threats to public health. On the contrary, Fuentes et al. (2024) have supported that the clustering of unmanaged waste on the banks of rivers increases the incidence of waterborne diseases. The findings of Rahman et al. (2022) suggest that there is some cognizance of the hazard among the larger population, but risk perception is swayed somewhat by livelihood-associated factors emerging from the dynamics of displacement and resettlement. Such perceived health hazards create an urgent need for health interventions and improved waste management practices in rural communities such as Dolowog.

Relationship between riverbank waste pollution and changes in income sources such as farming and fishing. Table 3 shows the perception-based items. Respondents got a mean score of 3.53 (SD = 0.6098), indicating that, generally, the respondents agreed that riverbank waste pollution is a concern. The impact on livelihood variables had a mean score of 2.53 (SD = 1.281), which indicated some moderate perceived effect on livelihood activities. The 0.393 Pearson correlation coefficient shows that there is a moderate positive relationship between riverbank waste pollution which has an impact on livelihood. Important to take note that, the p-value of 0.012 is lower than the normal significant level of 0.05, which indicates that this correlation is indeed significant.

Table 3
Pearson r test analysis on the relationship between riverbank waste pollution and changes in livelihood activities, such as farming and fishing.

	N	Mean	SD	Pearson Correlation	P-value
Perception-Based Items	40	3.530	.6098	.393	.012
Livelihood impact	40	2.53	1.281		

This pattern found in the study shows concurrence with Ferronato and Torretta (2019), emphasizing that the intrusion of unmanaged waste into waterways can damage agricultural productivity and stability. Besides, Fuentes and others (2024) note that environmentally relevant changes due to waste affect resource-dependent communities the most, often leading to loss of food, hazardous working conditions, or reduced household incomes. Onyima et al. (2025) also showed that findings assert that degraded urban rivers have severely affected river-associated livelihoods, especially those in food processing, poultry, livestock farming, and small-scale brick making for construction.

Table 4
ANOVA test analysis on the difference of livelihood among residents based on their distance from the riverbank.

	Mean Square	F-value	P-value
Distance from Riverbank	1.476	.892	.454
Livelihood Impact	1.654		

The data shows the ANOVA test results (F = 0.892, p = 0.454), there was no significant difference between residents concerning the impact on their livelihoods according to distance from the river, indicating that distance alone is not a critical factor in influencing how their farming, fishing, or other income-generating activities are affected.

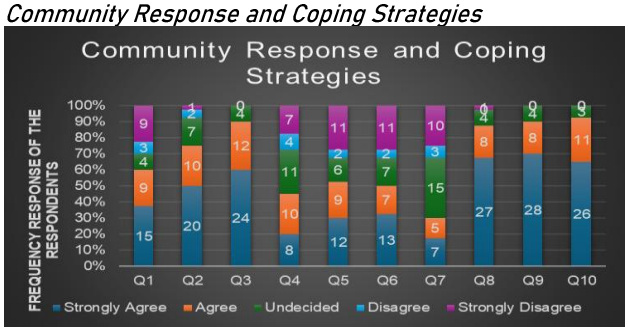
The above-mentioned result concurs well with some studies affirming that when rivers are

largely intermixed with agriculture, aquaculture, and household needs, any pollution impacts or environmental degradation are shared quite generally by the communities, no matter how far they lie from these rivers (Hossain et al., 2023; Mamun et al., 2022). For instance, Rahman et al. (2023) found that riverbank erosion in Bangladesh led to the displacement and disruption of livelihoods, not just among those immediately neighboring the water, but also among those situated further inland, as agricultural fields, fishing grounds, and grazing lands all depended upon the same river system. This finding, however, runs counter to other evidence suggesting a greater level of vulnerability among households closest to the riverbanks. Along similar lines, Manasi (2013) reported that the fisherfolk closest to the polluted stretches of river were most affected, the first to suffer economic decline due to fish kills and poor water quality.

Coping mechanisms and adaptive practices are employed by residents in response to the effects of riverbank waste pollution. Table 5 indicates the respondents' perception of coping strategies and people's attitude towards riverside disposal of garbage in Dolowog, Alfonso Lista, Ifugao, are illustrated in the table. In most of the issues, a considerable percentage of the respondents indicated a strong agreement, particularly with Q8, Q9, and Q10, where over 50% affirmed the presence of group activities and coping strategies.

Table 5

Community Response and Coping Strategies



This suggests that residents are well aware of environmental issues and proactively engaged in addressing them through campaigns such as trash segregation, sanitation drives, and policy advocacy. Meanwhile, moderate levels of vagueness and conflict in the earlier items (Q1–Q5) indicate discrepancies in terms of leadership, infrastructure, or availability of information that facilitate these activities. The importance of community actions is being echoed by research conducted by Agyeman et al. (2016), which highlighted the essentiality of environmental justice and people's involvement in sustainable waste management. Similarly, in rural Philippine settings, Almario et al. (2021) emphasized the importance of community-based adaptation processes and solidarity of the people in preventing localized environmental decline.

Conclusion. This study concludes that riverbank waste disposal in Barangay Dolowog has significant implications for community health, livelihood conditions, and adaptive responses. The findings reveal that plastic, domestic, and agricultural wastes are the predominant pollutants along riverbanks, and a statistically significant relationship was established between residential proximity to the river and the incidence of health problems, thereby supporting the hypothesis that closer exposure increases health risks. In contrast, the analysis found no statistically significant difference in livelihood outcomes based on distance from the riverbank, indicating that the null hypothesis regarding livelihood differences was accepted, as the economic impacts of pollution were experienced broadly across the community. Despite these challenges, the community demonstrates strong environmental awareness and active engagement through clean-up drives, waste segregation, and advocacy, confirming the presence of adaptive coping mechanisms; however, the effectiveness of these initiatives is constrained by inadequate infrastructure, limited leadership support, and insufficient information dissemination. Overall, the results underscore the need for strengthened waste management facilities, stricter enforcement of environmental policies, enhanced education campaigns, and inclusive livelihood support to translate community engagement into sustainable environmental and public health outcomes.

Recommendation. Based on the community survey and document review, it is recommended that consistent and ongoing cleanup initiatives be coordinated among barangay, civic groups, and local schools to enhance environmental cleanliness and foster active community involvement every month. To improve responsible waste management practices, awareness initiatives grounded in the concept of "Your waste, your duty," highlighting the 4Rs: Reduce, Reuse, Recycle, and Recover should be reinforced via school presentations and barangay-level outreach programs. Additionally, trash bins with clear and suitable signage must be strategically positioned in important locations like schools, sari-sari stores, and public pathways leading to the river to promote proper waste segregation and deter careless disposal. The placement of prominent warning signs along riverbanks, specifying penalties for unlawful dumping, is also highly advised to enhance adherence to environmental regulations. Additionally, the barangay, working alongside local educational institutions, ought to establish school-centered waste management initiatives that promote eco-friendly practices among students and incorporate ongoing assessments of waste produced in the school setting to ensure lasting sustainability.

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