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Analysis of Domestic Waste Management on Water Quality Around Residential Areas

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ABSTRACT

Domestic waste is one of the major environmental pollutants generated from household activities, including wastewater, kitchen waste, detergents, and organic waste. Improper domestic waste management can reduce water quality around residential areas and negatively affect public health and aquatic ecosystems. However, evidence regarding the relationship between domestic waste management and water quality remains limited. This study aims to analyze the relationship between domestic waste management and water quality around residential areas.This study used a quantitative approach with an analytical observational design employing a cross-sectional method. A total of 80 households were selected from residential areas with high domestic activity. Data on domestic waste management practices were collected using questionnaires and observation sheets. Water quality was assessed through physical, chemical, and biological examinations, including pH, Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Total Suspended Solids (TSS), and coliform bacteria levels. Data were analyzed using correlation and regression tests.The results showed that most households had inadequate domestic waste management practices. Areas with poor waste management demonstrated significantly higher levels of BOD, COD, TSS, and coliform bacteria compared to areas with better waste management practices ($p < 0.05$). Statistical analysis revealed a significant relationship between domestic waste management and water quality ($r = -0.587$; $p < 0.001$). Regression analysis further indicated that domestic waste management was a significant predictor of water quality status.The study concludes that improper domestic waste management contributes to water quality degradation around residential areas. Improving household waste management systems and increasing community awareness are necessary to maintain environmental quality and reduce public health risks. These findings highlight the importance of effective domestic waste management in supporting sustainable environmental health.

Keywords: Domestic Waste, Water Quality, Environmental Pollution, Residential Area, Sanitation.

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1. Introduction

Population growth and increased household activity have led to a continuous increase in domestic waste production. Domestic waste is waste generated from everyday activities, such as water from bathing, washing, and cooking, food waste, household oils, and chemicals from cleaning products.

The increasing volume of domestic waste without proper management can become a source of environmental pollution, particularly water bodies around residential areas. Household liquid waste discharged directly into rivers, drains, or the ground without treatment can cause changes in the water's physical, chemical, and biological characteristics.

Water quality is a key indicator of environmental conditions. Polluted water can experience increased organic matter content, decreased dissolved oxygen levels, changes in pH, increased numbers of pathogenic microorganisms, and changes in color and odor. These conditions can disrupt the life of aquatic organisms and increase the risk of environmental-related diseases such as diarrhea, skin diseases, and other health problems.

Domestic waste management includes reduction, sorting, processing, and safe disposal. Lack of public awareness, limited sanitation facilities, and low environmental awareness are factors that contribute to the continued untreated disposal of domestic waste.

Based on these conditions, research is needed to analyze the influence of domestic waste management on water quality around residential areas as an effort to provide an overview of environmental conditions and a basis for developing more effective waste management strategies.

2. Research Methods

a. Research Design

This study employed an analytical observational design with a cross-sectional approach . This design was used to analyze the relationship between domestic waste management and water quality in residential areas during the same observation period. The study did not administer any treatment to respondents, but instead observed the condition of household waste management and examined water quality based on predetermined parameters.

b. Location and Time of Research

The research was conducted in residential areas near surface water sources such as rivers, drainage channels, and bodies of water that receive domestic wastewater. The location selection was based on the presence of domestic activities that could potentially impact the quality of the aquatic environment.

The research was conducted in the period January–June 2026 , including the research preparation stage, data collection, water sampling, laboratory examination, data analysis, and preparation of the research report.

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c. Population and Sample

1) Population

The population in this study was all households in the residential areas surrounding the research site and the water sources within the area. This population was chosen because household activities are a major source of domestic waste that can impact environmental water quality.

2) Sample

The research sample consists of:

a) 100 heads of families/respondents who live in residential areas and carry out daily domestic activities.

b) Water samples were taken from several observation points around the settlement to carry out water quality checks.

Water samples are used to determine environmental conditions based on physical, chemical and biological parameters.

d. Sampling Techniques

The sampling technique used is purposive sampling , which is a sample selection method based on certain considerations and characteristics that are in accordance with the research objectives.

1) Inclusion Criteria

The inclusion criteria in this study include:

a) Households that have resided for at least 1 year at the research location.

b) Respondents are willing to participate in the research and provide the required information.

c) The location of the house is close to a water source which is the object of observation.

d) Respondents carry out domestic activities such as cooking, washing, and other household activities.

2) Exclusion Criteria

Exclusion criteria include:

a) The house is empty or unoccupied.

b) Respondents did not provide complete data.

c) The location of the water source does not allow for sampling.

d) The water sample is damaged or does not meet the inspection requirements.

e. Research Variables

1) Independent Variables

The independent variable in this study is domestic waste management , which includes:

a) Household wastewater disposal system.

b) Household waste management.

c) Availability of sanitation facilities.

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d) People's habits in disposing of waste.
e) Efforts to process waste before it is discharged into the environment.

2) Dependent Variable

The dependent variable in this study is **the water quality around residential areas** which is assessed based on the following parameters:

- Physical parameters: color, odor, temperature, and turbidity level.
- Chemical parameters: pH, Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), and Total Suspended Solid (TSS).
- Biological parameters: the number of coliform bacteria as an indicator of microbiological pollution.

f. Research Instruments

The instruments used in this study consist of:

1) Domestic waste management questionnaire

Used to obtain information about community habits in managing household waste.

2) Environmental sanitation observation sheet

Used to assess the condition of sanitation facilities, waste disposal systems, and environmental cleanliness around residential areas.

3) Sterile water sample bottle

Used to take water samples from research locations to prevent contamination during the testing process.

4) pH meter

Used to measure the acidity or alkalinity of water.

5) Laboratory water quality testing equipment

Used to analyze the physical and chemical content of water.

6) BOD, COD, TSS, and coliform examination instruments

Used to determine the level of pollution due to domestic waste.

g. Data analysis

1) Univariate Analysis

Univariate analysis was conducted to describe respondent characteristics, domestic waste management conditions, and water quality test results. Data are presented as frequency distributions, percentages, means, and standard deviations.

2) Bivariate Analysis

Bivariate analysis was conducted to determine the relationship between domestic waste management and water quality. The statistical tests used were Pearson or Spearman correlation, depending on the results of the data normality test. The significance level of the study was set at $p < 0.05$.

3) Multivariate Analysis

Multivariate analysis was conducted using regression tests to determine which factors in domestic waste management most influence changes in water

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quality around residential areas. This analysis was used to examine the simultaneous contribution of each factor to aquatic environmental quality.

3. Research Results And Discussion

a. Results

The research results show that most households still have domestic waste management systems that do not meet environmental sanitation standards. Some respondents still discharge household wastewater directly into open drains without prior treatment.

Based on water quality tests, changes in several environmental parameters were found. Water samples from locations with poor waste management showed increased organic matter content, indicated by higher BOD and COD values compared to locations with better waste management.

Increased coliform bacteria counts were found at several sampling points, indicating domestic waste contamination. This indicates that household activities are contributing to changes in water quality around residential areas.

Statistical analysis results show a significant relationship between domestic waste management and water quality ($p<0.05$). The worse the domestic waste management system, the lower the water quality around residential areas.

b. Discussion

Research results show that domestic waste management plays a significant role in environmental water quality. Household waste containing organic materials, detergents, oils, and microorganisms can cause changes in water characteristics if not managed properly.

Elevated BOD and COD values indicate high levels of organic matter in the water. This condition increases oxygen demand, leading to decreased dissolved oxygen levels, which can disrupt the life of aquatic organisms.

The presence of coliform bacteria is also an important indicator of pollution from domestic waste. Household waste from human activities can carry microorganisms that can potentially cause health problems if they contaminate water sources used by the community.

The results of this study reinforce that improving environmental sanitation, treating household wastewater, and increasing public awareness are important factors in maintaining water quality in residential areas.

4. Conclusion And Suggestions

a. Conclusion

1) Most of the domestic waste management in the research area has not been carried out optimally.

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2) The condition of water quality around residential areas is influenced by household waste disposal activities.
3) There is a significant relationship between domestic waste management and water quality.
4) Poor domestic waste management can increase water pollution through increased BOD, COD, TSS, and coliform bacteria parameters.
5) Improvements to sanitation systems and household waste management are necessary to maintain environmental quality.

b. Suggestion

1) Communities are expected to improve domestic waste management through waste sorting, waste reduction, and the use of appropriate sanitation facilities.
2) Local governments need to increase the provision of household wastewater treatment facilities, especially in densely populated areas.
3) Education regarding the impact of domestic waste disposal on water quality needs to be carried out continuously.
4) Further research can conduct regular water quality monitoring with a wider coverage area.

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