

WATER QUALITY ASSESSMENT FOR AGUSAN RIVER NEAR SANITARY LANDFILL IN BARANGAY POLICARPO, SAN LUIS, AGUSAN DEL SUR: BASIS FOR ENVIRONMENT MANAGEMENT PLAN

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ABSTRACT

This study evaluates the water quality of the Agusan River near the sanitary landfill in Barangay Policarpo, San Luis, Agusan del Sur, to develop an Environmental Management Plan (EMP). The Agusan River serves as the sole water source for the local community, which relies on it for domestic and agricultural needs. Proximity to the landfill raises concerns about potential contamination from leachates containing heavy metals, nitrates, and pathogens. Water quality parameters such as Biochemical Oxygen Demand (BOD), Total Suspended Solids (TSS), pH, Fecal Coliform, Chemical Oxygen Demand (COD), color, and temperature were analyzed following standard methods and compared against the Department of Environment and Natural Resources (DENR) water quality guidelines. Findings highlight the impact of landfill proximity on water quality, emphasizing the urgent need for sustainable management practices. The study identifies specific risks to public health and the aquatic ecosystem and proposes a comprehensive EMP aimed at mitigating pollution and preserving the Agusan River as a vital resource for the community. This research contributes valuable baseline data for environmental monitoring and serves as a foundation for future studies on water quality in similar rural settings.

Keywords: Agusan River, sanitary landfill, water quality assessment, Environmental Management Plan, Biochemical Oxygen Demand (BOD), Fecal Coliform, rural water resources, pollution mitigation, DENR guidelines.

1. INTRODUCTION

The study focuses on assessing the water quality of the Agusan River near the sanitary landfill in Barangay Policarpo, San Luis, Agusan del Sur. The river is the sole water source for the community, which relies on it for drinking, cooking, and agriculture due to the absence of a formal plumbing system. Proximity to the landfill poses a significant risk of contamination from leachates containing harmful substances like heavy metals and pathogens.

The research aims to evaluate water quality parameters, such as Biochemical Oxygen Demand (BOD), Total Suspended Solids (TSS), pH, and Fecal Coliform, to understand the extent of contamination. The findings will provide critical baseline data for formulating an Environmental Management Plan (EMP) to mitigate risks, protect public health, and promote sustainable water resource management. This study highlights the importance of continuous monitoring in areas where communities depend solely on natural water sources, especially those near pollution-prone sites.

2. METHODOLOGY

This chapter outlines the research methods, data sources, instruments of data gathering, the procedures to be followed, and the statistical treatment to be applied in the study.

2.1 Research Design

This study will use a descriptive quantitative research design in looking into the quality of water from the Agusan River at Barangay Policarpo, San Luis Sanitary Landfill. The focus will be given to the physicochemical analysis of the river. Laboratory analysis, not manipulated, will be conducted to obtain the parameters of water quality to be compared to the Water Quality Guidelines of the DENR, specifically DAO 2016-08 and DAO 2021-19.

2.2 Sources of Data

Water samples will be collected from the Agusan River near Barangay Policarpo, San Luis Sanitary Landfill because this river flows directly below the landfill. Sample analyses will be performed at the laboratory, DENR-accredited for accuracy and reliability in water quality analysis.

2.3 Data Gathering Instrument

Using Grab sampling procedures detailed by Standard Methods for the Examination of Water and Wastewater (SMEWW) by Baird et al. will be followed to collect the water samples. Sterile containers of glass or plastic material will be used to hold the samples in a safe way. These samples will then be tested to a DENR-accredited laboratory for the study of water quality analysis. Its physicochemical properties shall identify the degree of contamination.

2.4 Procedure of the Study

A sampling station must first be identified along the Agusan River, preferably close to Barangay Policarpo, San Luis Sanitary Landfill. Prior to sampling, the researcher shall contact Barangay Policarpo's local government for permission. An existing grab sampling method will be applied to collect the water sample based on the procedure used by SMEWW. The samples will be collected oppositely to the river current between the surface and the bottom of the river. Samples will then be transferred to an accredited laboratory facility of DENR at for analysis. The samples will be tested by the laboratory using the appropriate testing equipment and methodologies. Results will then be compared to the DAO 2016-08 and DAO 2021-19 set standards for water quality to establish parameters that exceed accepted limits.

The researcher will request historical monitoring data from EMB XIII for the Agusan River to compare past water quality results with the present findings. Based on such findings, the study will advance recommendations and environmental policies directed towards not allowing the river to deteriorate more.

2.5 Statistical Analysis

The study will use the descriptive statistical analysis to explain the laboratory findings. This analysis will help in determining how the water quality parameters of the Agusan River near the Barangay Policarpo, San Luis Sanitary Landfill compare with the limits for Class C water bodies as defined by DAO 2016-08 and DAO 2021-19. Use descriptive statistics to summarize the average, range, and distribution of the parameters to determine the acceptability of river water quality for the protection of aquatic life, agriculture, and related uses.

3. MODELING AND ANALYSIS

This study employs a systematic framework to evaluate the water quality of the Agusan River near the sanitary landfill in Barangay Policarpo, San Luis, Agusan del Sur, and to develop an Environmental Management Plan (EMP) based on the findings. The conceptual model focuses on understanding the relationship between landfill leachates and their impact on key water quality parameters. It is structured to integrate scientific assessment with regulatory standards to ensure a comprehensive analysis of the river's condition.

The water quality assessment revolves around measuring critical parameters such as Biochemical Oxygen Demand (BOD), Total Suspended Solids (TSS), pH, Fecal Coliform, Chemical Oxygen Demand (COD), color, and temperature. These parameters were selected because they provide a holistic view of the river's physicochemical and biological characteristics. Using the grab sampling method, water samples were collected from locations near the landfill to capture both surface and subsurface conditions. The samples were then analyzed in a DENR-accredited laboratory using standardized methods as outlined in the Standard Methods for the Examination of Water and Wastewater (SMEWW).

Table 1.

DENR Water Body Classification and Intended Beneficial Use

Classification	Intended Beneficial Use
Class AA	Public Water Supply Class I – Intended primarily for waters having watersheds, which are uninhabited and/or otherwise declared as protected areas, and which require only approved disinfection to meet the latest PNSDW.
Class A	Public Water Supply Class II – Intended as sources of water supply requiring conventional treatment (coagulation, sedimentation, filtration, and disinfection) to meet the latest PNSDW.
Class B	Recreational Water Class I – Intended for primary contact recreation (bathing, swimming, etc.)
Class C	1. Fishery Water for the propagation and growth of fish and other aquatic resources 2. Recreational Water Class II – For boating, fishing, or similar activities 3. For agriculture, irrigation, and livestock watering
Class D	Navigable waters

Source: DAO 2016-08 and DAO 2021-19

Moreover, Table 2 shows the water quality guidelines for each parameter in every water body classification.

Parameters	Unit	Water Body Classification				
		AA	A	B	C	D
Biological Oxygen Demand (BOD)	mg/L	1	3	5	7	15
Total Suspended Solid (TSS)	mg/L	25	50	65	80	110
pH (Range)		6.5-8.5	6.5-8.5	6.5-8.5	6.5-9.0	6.5-9.0
Color	TCU	5	50	50	75	150
Fecal Coliform	MPN/100ml	20	50	100	200	400
Chemical Oxygen Demand (COD)	mg/L	NDA	60	60	100	200
Temperature	°C	NDA	26-30	26-30	25-31	25-32

Source: DAO 2016-08 and DAO 2021-19

The collected data were compared against the DENR Water Quality Guidelines (DAO 2016-08 and DAO 2021-19) for Class C water bodies, which serve as the regulatory benchmark for the study. Parameters exceeding the permissible limits indicate contamination and potential risks to public health and the aquatic ecosystem. To enhance the depth of analysis, historical water quality data from the Environmental Management Bureau (EMB) Region XIII were integrated, enabling the study to identify temporal trends in water quality and assess whether the landfill's activities have exacerbated pollution levels over time.

Descriptive statistical methods were employed to analyze the data. This approach summarized the mean, range, and distribution of the measured parameters, providing insights into spatial and temporal variations in water quality. The findings highlighted areas of concern, such as elevated BOD and Fecal Coliform levels, which directly impact the river's suitability for aquatic life, agriculture, and domestic use.

The modeling process extends to risk assessment, identifying specific threats posed by contaminated water to the local community and ecosystem. These findings informed the development of a comprehensive Environmental Management Plan (EMP). The EMP includes measures such as the installation of leachate containment systems, riparian zone rehabilitation, and regular water quality monitoring to mitigate pollution and promote sustainable management practices. Community engagement is also emphasized, as the active participation of local residents is vital for the plan's success. Overall, this study's modeling and analysis approach integrates scientific rigor with practical application, ensuring that the proposed solutions are both evidence-based and actionable.

The framework serves not only to address immediate concerns but also to lay the groundwork for long-term environmental sustainability in Barangay Policarpo.

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