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WATER QUALITY INDEX OF SARANGANI BAY: BASIS FOR POLICY AND WATER QUALITY MANAGEMENT

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ABSTRACT: This study aimed to assess the quality of waters in Sarangani Bay using Water Quality Index (WQI) from 2015 to 2019, 2020 and 2021 was excluded because of incomplete sampling results due to COVID-19, and to determine whether a significant difference exist in its quality. Data on WQI were obtained from DENR- EMB XII and were calculated using Weighted Arithmetic Index.

Findings revealed that the water quality of Sarangani Bay is improving as manifested in its WQI; 2015= poor, 2016= good, 2017= good, 2018= excellent and 2019= excellent. Kolmogorov- Smirnov test further revealed that asymptotic significance is observed in the WQI of Sarangani Bay within the five- year monitoring period, thus, retaining the null hypothesis.

Results of this study may serve as basis for policymakers in formulating plans, programs and activities that will maintain and improve the water quality of Sarangani Bay.

I. Background of the Study

Water resource and environmental stakeholders prioritize evaluating water quality. To manage water quality decrease and promote sustainable water usage, several strategies and standards have been implemented worldwide. Rapid population, urbanization, industry, and agricultural output degrade water quality. Socioeconomic activities pollute and stress the aquatic environment. Water quality index (WQI) models help measure contamination and determine if and how much water resources need repair.

Industrial, urban, and infrastructure development have changed Sarangani and General Santos' coastlines. Since 2010, Sarangani Bay has breached EMB XII's limitations. Lack of technology prevents testing for water quality. Sarangani Bay's impact on marine life and people is unknown. For efficient management, Sarangani Bay's water quality must be indexed (WQI).

II. Statement of the Problem

This study generally aimed to assess the quality of water in Sarangani Bay, Region XII. Specifically, this will;

1. describe the water quality parameters of Sarangani Bay in terms of dissolved oxygen, fecal coliform, pH, total suspended solids, phosphate and nitrate;
2. determine the Water Quality Indices (WQI) of Sarangani Bay from 2015 to 2019; and
3. identify if the water quality results had significant difference in five- year monitoring period.

III. METHODOLOGY

The study focused on Sarangani Bay's 39 sample points. Secondary data came from EMB Region XII's lab. Sarangani bay's water quality index was established using quarterly reports on temperature, total suspended particles, pH, dissolved oxygen, fecal coliform, phosphate, and nitrate from 2015-2019.

In the analysis of data, an IBM SPSS Statistics version 23 software was used. Descriptive analysis was used to identify the results per parameter including range, mean, and percentage of exceedance. The computation for the percentage of exceedance following the expression: $P = (N/T)*100$ where P refers to the percentage of exceedance, N refers to the total number of samples that exceed the standards and T is the total number of samples analyzed.

The Water Quality Index (WQI) was calculated using the Weighted Arithmetic Index method. The quality rating scale for each parameter qi was calculated by using this expression: $q_i = (C_i/S_i)\times 100$. A quality rating scale (q_i) for each parameter is assigned by dividing its concentration (C_i) in each water sample by its respective standard (S_i) and the result multiplied by 100.

Relative weight (W_i) was calculated by a value inversely proportional to the recommended standard (S_i) of the corresponding parameter: $W_i = 1/S_i$.The overall Water Quality Index (WQI) was calculated by aggregating the quality rating (Q_i) with unit weight (W_i) linearly. One-sample Chi Square and One-Sample Kolmogorov-

Smirnov Tests were used to compare WQI results from 2015 to 2019. Comparing and analyzing annual results showed the trend of Sarangani Bay's water quality.The researchers selected 0.05 as the margin of error "cut-off" for assessing the p-value. Any p-value below the cut-off has a very low probability, whereas anything above it has a respectable likelihood. If p-value is high, null hypothesis is true; otherwise, alternative hypothesis is correct.

IV. Results and Discussion

DO, pH, and fecal coliform were within standards in 2016. Despite exceeding regulations, the level dropped from 1270 to 260 MPN/100 mL from 2015 to 2016. This is owing to the Department of Health's (DOH) "Zero Open Defecation Program," which provided more houses with basic toilet facilities and educated the community on the effects of open defecation on water quality in the bay and human health.Additional water quality parameters were assessed in 2017 under DAO 2016-08. DO, fecal coliform, pH, and TSS were also tested. Low DO and high TSS.

The trend of WQI over five-year monitoring periods is improving (2015=poor, 2016=good, 2017=good, 2018=excellent, 2019=excellent), indicating that issues concerning water quality in the bay are being addressed. Policymakers and agencies are working hard to improve Sarangani Bay's water quality. The WQI calculation summarizes water quality. Tyagi et al. (2013) found comparable results in their WQI investigation. WQI compresses the intricate findings of different parameters into a single value or expression, making the water body's state easier to read.

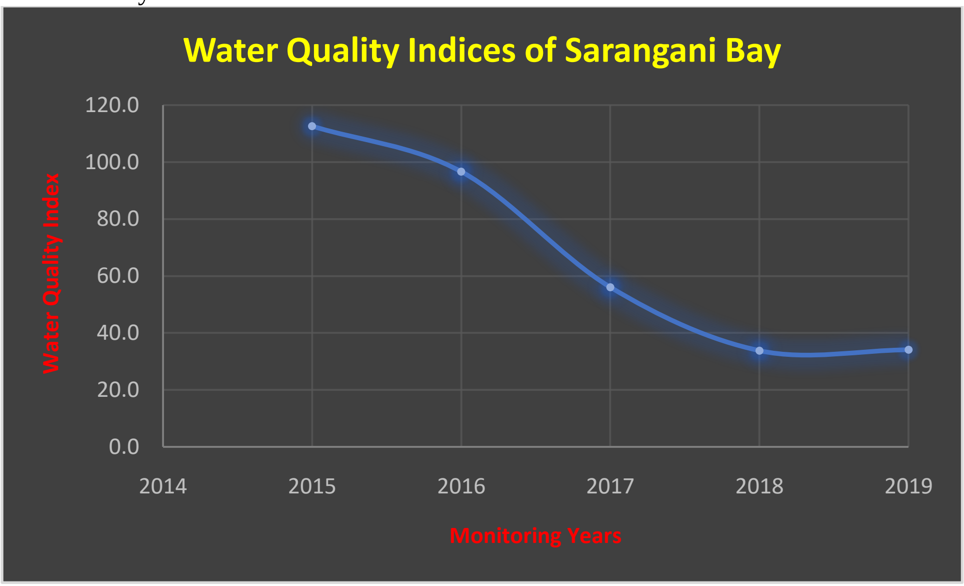

Figure 1 Graphical Presentation of WQI of Sarangani Bay from 2015-2019

The result of the statistical analysis showed that asymptotic significance at 0.05 level of confidence is observed in the annual WQI results of the Sarangani Bay from 2015- 2019 with a mean of 66.64 and a standard deviation 36.257. This implies that the WQI for the five- year monitoring period is statistically insignificant, normally distributed and is numerically close in values.

V. Summary, Conclusions and Recommendations

Sarangani Bay's water quality has improved over the past five years (2015 = poor, 2016 = good, 2017 = good, 2018 = excellent, and 201 = extraordinary). The WQI in the five-year monitoring period showed the impact of varied activities, as noted by Al-Mutairi et al. (2014), including effluents from nearby resorts and other facilities. DO, fecal coliform, and TSS exceeded DENR limits, affecting water quality. High temperatures, sample time, and marine plant density or volume raised Class SC DO levels. Xu et. al (2022) discussed that domestic wastewater and sewage were determined to be the watershed's principal sources of Fecal Coliform. Sarangani Bay may be polluted by businesses, resorts, and households. Total suspended solids (TSS) are affected by high temperatures because solids absorb more sun. The bay's WQI showed asymptotic importance during a five-year period.

Since fecal coliform exceeds standards, the government must focus on household compliance. Sarangani and General Santos City are doing well to eliminate open defecation. All residences having septic tanks reduces fecal contamination in water bodies. Septic tanks should be fully enclosed and not open-bottomed. It's also advised to examine the factors affecting Sarangani Bay's water quality. This involves studying rivers flowing out of the bay and commercial and industrial areas in General Santos City that pollute the water. Small and large vessels must be regulated to prevent oil spills and other pollutants.

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