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Analysis of Lake Toba Water Quality In 4 Utilization Zones

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KEY W O R D S

Sample Water, Water Quality Testing, Water Pollution Level, Lake Toba

A B S T R A C T

Lake Toba marines a water-unique ecosystem because 342 rivers input waters of Lake Toba but only one river for water output. Many activities today give various water pollutant matters into Lake Toba. The aim is to determine the pollution categories by several indicators by parameters value of psych and chemical indicators of the pollution level. The Method of this research uses the testing of the water quality sample of Lake Toba by in-situ and ex-situ analysis to determine the pollution categories by pollution level valuation based on the environment standard limit listed by Government Regulation No.82 2001st and Minister of Health Regulations No.492 of 2010st. The results of in-situ and ex-situ analysis of water samples from 4 zones namely the agriculture zone, harbor zone, tourist zone, and aquaculture zone show that all of the zones still not yet to be polluted because the results of water sample analysis value in generally under the limits value of environment standard listed by Government Regulation of PP No.82 2001st and Minister of Health Regulations No.492 of 2010th as the standard reference.

1. INTRODUCTION

Lake Toba as a water landscape has been fixed as a National Strategic Area listed the Government Regulation No.81 of 2014th about Space Planning Regulation as a basic field operationally to ensure the environmental quality control of Lake Toba and around it. An ecotourism area in a big scheme needs an environmental vision that has a goal of local tourists, national tourists, and international tourists. But to reach this goal. It needs the wisdom of water quality monitoring of Lake Toba sustainably (Environmental Agency Samosir, 2015) [1].

Water pollution of Lake Toba can happen as a cause of all activity increasing pollutant matters likely forest concession activity, aquaculture activities, farming activity, industry activity, water transportation activity, etc activity directly influenced to changed water quality of Lake Toba. The pollutant sources will cause negative damage to the water quality of Lake Toba by changing physical and chemical indicators. The water quality changes of Lake Toba will damage the environmental quality of tourism areas usefull tourism better the needs of local communities and the next generation. So, water management of Lake Toba must be endeavored to water and soil conservation to directly support the water sustainability of Lake Toba.

Government regulation no.32 of the 2004th Space Planning Regulation defined that natural resources management and environment

directly depend on increasing capacity and quality of management, stabilized information systems, technologies using optimization of reduced impact environment, and building capacity institution of natural resources and environment managing best of water resources management, coastal resources and sea management and reserved areas [2] So, pollution and break environment will be direction to acts the increasing participated of community in acts and controlling the pollution and break environment. Vary information from the internet who accessed evidenced that the water quality of Lake Toba has changed aspects, especially the fish's different species and quantity over time to be an indicator significantly about unfeasibility Lake Toba water as a fish habitat again especially the familiar fish as Jahir fish, Batak fish, and goldfish.

Based on this condition, the researcher wants to know the changes in Lake Toba with a special point of sampling water analysis in 4 zones namely the agriculture zone, harbor zone, ecotourist zone, and aquaculture zone to evaluate pollution categories by water sample analysis and laboratories testing comparing environment standard limited listed by Government Regulation No.82 2001st and Minister of Health Regulations No.492 of 2010th as legal reference [3].

The water quality of Lake Toba from year to year tends to turn down because there is some activity in and out of Lake Toba marine. The degradation of the water quality of Lake Toba can happen directly or indirectly so it needs to be monitored and evaluated for decision-making what action to be good by conservation or direct control to build a human living system around the lake.

The high-intensity use of water in Lake Toba causes much material of water pollutants on the other hand, Lake Toba is an economic object resulting the profit on a community economic scale although corporation economic scale. To ensure that all activity is formed in the Lake Toba area well so it it is need testing of water as a format to control of changed quality which happened in the water of Lake Toba to know every little change causing disturbance for general activities of the community.

2. METHOD

This research is done at Lake Toba Marine especially at administrative of the Samosir district area of North Sumatera. The point of after taking samples namely given from the area that burdened very human activity. This research held about 6 months from November to February 2017th covered water samples taken, laboratory testing, and results of research report.

The materials and tools used in this research are a water sample of Lake Toba as a medium for analyzing covers in situ (local testing) and ex-situ analysis (laboratory testing). The tools needed for this research cover laboratory tools, water quality control maps, tata ruang (zonation) maps, administrative maps, cameras, computers, etc.

The collected data doing from areas for area with high intensity and mobility of human activity with the self the coordinates. So, taking water sample doing to know the water quality parameters of Lake Toba.

The resulting testing of water quality parameters covers pH, level turbidity (NTU), DO (mg/L), temperature (0C), TDS (mg/L), TSS (mg/L), phosphate content (mg/L), Nitrate content (mg/L), Nitrit content (mg/L), Ammonia content (mg/L), free Klorin content (mg/L), Sulfate content (mg/L), COD content (mg/L),

Khlorida content (mg/L), total hardness (mg/L), Ca++ hardness (mg/L), turbidity Mg+(mg/L) and DHL (µS/cm).

Materials pollution concentrated in Lake Toba water result of laboratory testing compared to the standard value of environment listed by Government Regulation No.82 of 2001 and Minister of Health Regulations No.492 of 2010th.

Materials of polluting analysis data of water Lake Toba were done by in situ analysis (water psychically) and ex-situ analysis (water chemically) techniques. The in-situ analysis is done to know the pH, DHL, TDS, Turbidity, and Temperature. However, the laboratory analysis is done to know the DO, Total hardness, Ca++ hardness, Mg++ hardness, Ammonia content, Nitrate content, Nitrit content, Free Chlorine content, phosphate content, and TSS content.

All the parameter values of water quality indicators obtained from the field study compared to the standard value of environment listed by Government Regulation No.82 of 2001 and Minister of Health Regulations No.492 of 2010th and since the quality water of Lake Toba information in time of research.

3. RESULT AND DISCUSSIO

Water Quality at Agriculture Zone

The Agriculture Zone in Lake Toba ecosystem only centered on several areas whereas of farming the intensified by the input of fertility etc. In this research, the sample area measuring of quality of Lake Toba water in the agriculture zone was randomized from the Pardomuan Lontung Simanindo area by coordinate of 02°34´47.9´´ LU dan 098°54´55.3´´.

Based on in situ and ex-situ tested results by environmental dan Forestry Bearau Samosir District can be known that in the agriculture zone compared by the Government Regularity No.82 2001st and Minister of Health Regulations No.492 th 2010 are the averaged of pH 8,43; the level averaged of turbidity is 16,25 NTU; averaged of DO is 7,51 mg/L, averaged of temperature is 24 0C; averaged of TDS is 76,33 mg/L; averaged of TSS is 0,03 mg/L; averaged of phosphate content is 0,23 mg/L; averaged of Nitrate content is 0,00 mg/L; averaged of Nitrite is 0,00 mg/; averaged of Ammonia is 0,00 mg/L; averaged of Free Chlorine is 0,02 mg/L; averaged of Sulfphate content is 11,15 mg/L; averaged of COD content is 16,46 mg/L; averaged of Chlorid content is 3,19 mg/L; averaged of total hardness is 56,0 mg/L; averaged of Calcium (Ca++) hardness is 15,47 mg/L; averaged of Magnesium (Mg++) hardness is 4,21 mg/L dan averaged of water DHL is 148,33 µS/cm (Primary Data of Environmental Agency Samosir, 2018).

Based on this data can be known as an indicator of water pollution of Lake Toba which agriculture zone at Simanindo is under the standard qualities limit based on PP No.82 2001th and Permenkes No.492 2010th. So, we can conclude that the agriculture zone of Lake Toba is not classified into the polluting categories.

In the agriculture zone, we know that the agriculture activities are intensive as discovered in fields where intensive agriculture zone activities with monoculture agriculture, fertilizer intensive used, herbicide and pesticide-intensive application. Based on some facts we found that the water quality of Lake Toba in the agriculture zone is over the standard limit in rainy climate because the chemical matter as a pollutant matter resorches by fertilizer, pesticide, and herbicide brought by the runoff temporarily. Sediments reduced on river flow area to be

interrupt smoothness water flow in to Lake Toba marine.

Pollution matters hypotheses came from the intensive agriculture activities by chemical element content in fertilizer, pesticide, herbicide illuminated and bring among water from rivers to Lake Toba. However, the suitable result of laboratory testing data of water samples of Live Environment Bureau of Samosir shows the input pollutant categories are not to significant pollution because the value is under the standard limit by state regularity of PP No.82 2001st and Minister of Health Regulations No.492 2010th.

Water Quality at Harbor Zone.

Harbor zones in the Lake Toba ecosystem are centered on water transportation by machines using fuels as energy resources. In this research, the sample areas for knowing of Lake Toba water quality on harbor zone setting at Simanindo harbor on coordinated 02°45´29,0´´N and 098°44´76,4´´ E, Sumber Sari harbor on coordinated 02°39´28,6´´ N and 098°51´64,6´´ E and Siallagan harbor on coordinated 02°42´80,0´´ N and 098°50´22,5´´ E.

Based on the result of in situ and ex situ testing was doing with Live Enviroment and Forestry Beaure of Toba Samosir District, so the water Lake Toba quality at harbour zone with quality limit standar by PP No.82 2001th and Minister of Health Regulations No.492 2010th are namely averaged of pH is 8,41; averaged of turbidity is 2,78 NTU; averaged of DO is 7,65 mg/L, average of temperature is 240 C; averaged of TDS is 78,50 mg/L; averaged of TSS is 0,55 mg/L; averaged of Phosphate content is 0,05 mg/L; averaged of Nitrate content is 0,95 mg/L; averaged of Nitrit content is 0,00 mg/; aveaged of Ammonia content is 0,0 mg/L; averaged of Free Clhorine content is 0,04 mg/L; averaged of Sulphate content is 11,33 mg/L; averaged of COD content is 9,33 mg/L; averaged of Chlorida hardness is 4,03 mg/L; averaged of total hargness is 58,0 mg/L; averaged of Calsium (Ca++) hardness is 146,0 mg/L; averaged of Magnesium (Mg++) hardness is 5,83 mg/L and averaged of water DHL 150,50 µS/cm (Primery data of Environmental Agency, Samosir, 2018).

Based on that data can be seen that the water pollution Lake Toba indicator on port zone is generally under the value of the standard quality limit fixed by the regularity of Government Regularity No.82 2001 and Minister of Health Regulations No.492 2010th. So, we can conclude that the water quality of Lake Toba in the harbor zone is still not in the pollution categories.

Based on the observation field on the harbor zone can be know that the burning of materials in put or pollution matter in the port zone occurred from a spill of fuel, like solar and machine oil from ships around the lake. Based on facts, we can make sure exactly that the water quality of Lake Toba happened because there is not human awareness of all stakeholders who are involved in lake transportation. The direct effect was happened turbidity of water of long recovered because came from chemical matter which is difficult.

The pollutant matter of polluted port zones hypothesis came from transportation-intensive businesses such as ship maintenance or oil leaks. However, avaliabelility with result data of water sample testing by the Environment and Forestry Laboratory Samosir district indicated that the put level of pollutants still not causing water pollution significantly caused it is still under the value of standard environment limit by Government Regularity No.82 2001st and Minister of Health Regulations No.492 2010th.

Water Quality in Tourist Zone

Based on in situ and uji ex situ testing datas by Environment and Forestry Laboratory Samosir we knowing that water quality of Lake Toba on tourist zone by environment qualities limit based on Government Regularity No.82 2001th and Minister of Health Regulations No.492 2010th indicated that water qualitiy of Lake Toba are the averaged of pH is 8,43; averaged of turbidity is 16,25 NTU; averaged of DO is 7,51 mg/L, averaged of temperatur is 24 0C; averaged of TDS is 76,33 mg/L; averaged of TSS is 0,03 mg/L; averaged of phosphate content is 0,23 mg/L; averaged of Nitrate content is 0,00 mg/L; averaged of Nitrite content is 0,00 mg/; averaged of Ammonia content is 0,00 mg/L; averaged of Free Clhorine content is 0,02 mg/L; averaged of Sulphate content is 11,15 mg/L; averaged of COD content is 16,46 mg/L; averaged of Chlorid content is 3,19 mg/L; averaged of total hardness is 56,0 mg/L; averaged of Calsium (Ca++) hardness is 15,47 mg/L; averaged of Magnesium (Mg++) hardness is 4,21 mg/L and averaged of water DHL is 148,33 µS/cm (Primer Data of Environmental Agency, Samosir (2018)).

Based on that data can be seen that water pollution in Lake Toba indicator on tourist zones in generally under the value of the environment quality limit fixed by the regularity of PP No.82 2001th and Permenkes No.492 of 2010. So, we can conclude that the water quality of Lake Toba in the tourist zone is still not in the pollution categories. Based on observation and field surveys on tourist zones can know that happening on tourist areas are generally visited by regular holiday visitors and on a working day there is less visiting. The polluting matter polluted the tourist zone and it allegedly covered visitors in wasted organic and inorganic forms.

However, as a result of water sample testing data by Environment and Forestry Laboratories Beraue Samisir indicated that input pollution matters level came into Lake Toba of on tourist zone still not happened significant pollution caused under the value of environmental standard limit fixed by Government Regularity No.82 2001st and Minister of Health Regulations No.492 2010st.

Water Quality in Fishery Culture Zone

Based on in situ and uji ex situ testing datas by Environment and Forestry Laboratory Samosir we knowing that water quality of Lake Toba on marine zone by environment qualities limit based on Government Regularity No.82 2001th and Minister of Health Regulations No.492 2010th indicated that water qualitiy of Lake Toba are the averaged of pH is 8,41; averaged of turbidity is 2,78 NTU; averaged of DO is 7,65 mg/L, averaged of temperatur is 24 0C; averaged of TDS content is 78,50 mg/L; averaged of TSS content is 0,55 mg/L; averaged of phosphate content is 0,05 mg/L; averaged of Nitrate content is 0,95 mg/L; averaged of Nitrite content is 0,00 mg/; averaged of Ammonia content is 0,00 mg/L; averaged od Free Clhorine content is 0,04 mg/L; averaged of Sulphate content is 11,33 mg/L; averaged of COD content is 9,33 mg/L; averaged of Chlorid content is 4,03 mg/L; averaged of total hardness is 58,0 mg/L; averaged of Calsium (Ca++) hardness is 146,0 mg/L; averaged of Magnesium (Mg++) hardness is 5,83 mg/L dan averaged of water DHL is 150,50 µS/cm (Primery Data of Envirinmental Agency Samosir, 2018).

Based on that data can be seen that water pollution Lake Toba indicators on fishery culture zone generally under value of environmental quality limit fixed by regularity of Government Regularity No.82 2001th and Minister of Health Regulations No.492 2010th. So, we can conclude that the water quality of Lake Toba in the tourist zone is still not in the pollution categories. Based

on observation and field survey on fishery culture zone can see unmanaged fish eat caused significant formed the water turbidity. The pollution matters came from intensive fish culture activity especially fish-eating waste.

However, as result of water sample testing data by Environment and Forestry Laboratories Beraue Samosir indicated that put polluted matter level came into Lake Toba of on fishery culture zone still not significant pollution caused under the value of environmental standards limit fixed by the regularity of Government Regulations of No.82 2001st and Minister of Health Regulations No.492 2010th.

4. CONCLUSION

Based on physical and chemical analysis of 4 zones as a sample water point analysis in Lake Toba by the Environment and Forestry Department of the Republic of Indonesia analysis can be confusing that the water quality of Lake Toba is generally still no polluted because there is not significantly difference in about physical and chemical indicators from all zones. But there is the differenced value on one chemical indicator that happened is temporary and not permanent.

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