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Analysis of Water Quality Based On Phytoplankton Abundance And Number of Nutrients

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ABSTRACT

The process of development has effect on the existing water catchment area, currently the normalization of the water area is being carried out. The water body is passed by various kinds of waste; domestic and industrial waste, causing water bodies to contain nutrients. Nutrients are a food source for existing phytoplankton. The amount of nutrients and phytoplankton affects the level of fertility and trophic status of each of these water bodies. Samples were collected from Epicentrum Pond, Lake Sunter, Citra Lake 6, Lake Citra 8, Setu Rawa Badak Jatijajar, and Situ Cilodong. The result shows that are samples classified in the class II water quality category according to PP No. 82/2001. The classification is based on the concentration of pH parameters, *Dissolved Oxygen* (DO), *Biochemical Oxygen Demand* (BOD), Phosphate and Nitrate. While the classification of aquatic fertility is based on the abundance of phytoplankton. The result shows that Epicentrum Pond, Lake Sunter, Lake Citra 6, Lake Citra 8, and Setu Rawa Badak Jatijajar are included in mesotrophic, while for Situ Cilodong are included in oligotrophic. For the classification of trophic status according to PERMENLH No.28/2009 (based on the parameters of nitrate, phosphate and chlorophyll-a), the Epicentrum Pool is included in the oligotroph to eutroph. Whereas for Lake Sunter, Setu Rawa Badak Jatijajar, and Situ Cilodong are included in oligotrophs to mesotrophs. And for Lake Citra 6 and Danau Citra 8 have trophic status from oligotrophs to hypereutrophs.

Keywords: Nutrients, Phytoplankton Abundance, Aquatic Fertility, Trophic Status.

1. INTRODUCTION

To support the population growth, the development is an inevitable process. Cities are growing, land openings for housing, commercial and industrial area are increase that reduce the area for water absorption. When there is heavy rain, it will cause pools of water, and with less absorption, lead to excess capacity of water that can be accommodated in water bodies. Especially in Jakarta nowadays, the current surface area of Jakarta is only able to absorb at least 15 percent of the water in the soil. For this reason, the government is currently working on it in the construction and normalization of water areas.

The water area researched were lakes, ponds, settlements, reservoirs, or rivers. In this study, the author took the water from Epicentrum Pond that depicts a catchment area in a commercial location, Lake Sunter which depicts catchments that are flanked by industrial and residential areas, Lake Citra 6 and Danau Citra 8 that depict catchments in residential areas, Setu Rawa Badak Jatijajar and Situ Cilodong depict the catchment area in the residential area and also functioning as the tourist facilities. Water areas located in Jakarta are usually passed by the domestic waste from the community around the water body, not infrequently also industrial waste

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that passed to water bodies. The body of water becomes rich of nutrient as an accumulation of various types of liquid waste that enters the water body.

The nutrient is one of the foods of phytoplankton in order to carry out photosynthesis. The commonly needed nutrients are phosphates and nitrates. Phytoplankton in some time will die and will be degraded which in the degradation process requires the help of *dissolved oxygen* (DO). If the amount of nutrients is too much compare to the amount of phytoplankton presented in water, it causes eutrophication. Eutrophication is a condition of water quality that has increased levels of nutrients in water. Based on indicators of phytoplankton abundance, this research reveals the difference in water fertility levels. In addition, the effect of chemical parameters on the level of water fertility in several water bodies in Jakarta is also studied.

2. PURPOSE

The purpose of this study was to analyze the quality of water bodies in terms of indicators of phytoplankton, chlorophyll-a concentration, and chemical parameters. And also to analyze water bodies based on relationships between numbers nutrients in the body of water to the concentration of chlorophyll-a.

3. RESEARCH METODHOLOGY

The stages of research are shown in Figure 1.

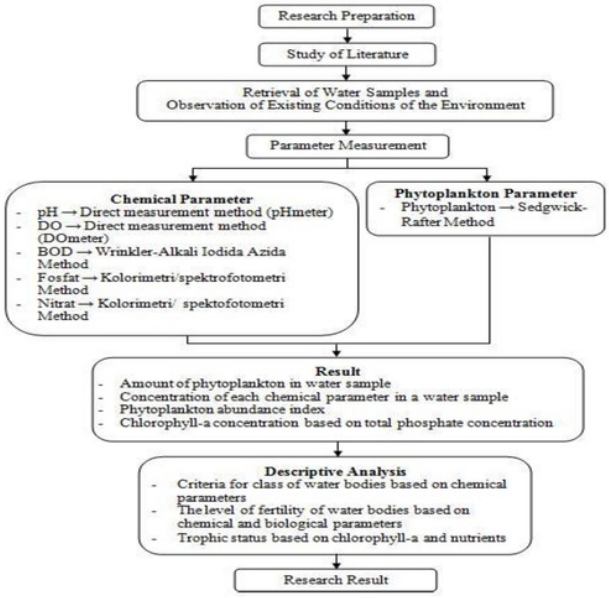

Figure 1. Research Flow Chart

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This study uses data sourced from primary and secondary data. Primary data is obtained from taking water samples in each water body directly. In addition, phytoplankton abundance testing and chemical parameters were conducted at the laboratory. Secondary data is obtained from literature such as books, journals, national, provincial and regional regulations, as well as from the general description of the study area.

The method of data collection is done in two ways, namely field surveys that aim to obtain primary data and literature studies to obtain secondary data. Field surveys are carried out by direct observation/data retrieval that is focused on the parameters to be analyzed, in addition, documentation and interviews were also conducted.

Data analysis was performed to determine the level of water fertility when viewed from the parameters of PH, *Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD),* Phospate, Nitrat, and Total Phytoplankton. In addition, data analysis was carried out to determine trophic status based on parameters of Phosphate, Nitrate, and Chlorophyll-a. Data analysis for water fertility and trophic status was carried out quantitatively and qualitatively.

The method of data collection was carried out by observation and sampling at the study location and the samples were taken and measured at the Laboratory of Environmental Microbiology Trisakti University to determine the number of individual phytoplankton in each milliliter of water present in sedge-rafter. In addition, samples are also measured in the Environmental Laboratory I Trisakti University to process samples to determine the concentration of chemical parameters contained in the sample of the water body. Data analysis for pH parameters using a pH meter, for Dissolved Oxygen (DO) parameters using a DOmeter. BOD analysis was carried out using the azide iodide winkler-alkali method. For phosphate and nitrate parameters, the analysis was carried out by the colorimetric/ spectrophotometric method. In the process, the relationship between total phosphorus levels and chlorophyll-a is obtained, which is illustrated in the following equation:

$$Log(Klorofil - a) = -1{,}09 + 1{,}46LogPt$$

Where:

Chlorophyll-a = Chlorophyll-a concentration (mg/m^3)

Pt: = Phosphorus organics (mg/m3)

Data analysis for phytoplankton parameters is done using the sedgewick- rafter method, using the formula below (Odum, 1971):

$$N = \frac{ns \times Va}{Vs \times Vc}$$

Where:

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N = Number of individuals per liter of sample water

Ns = The number of plankton individuals on a sedgewick-rafter

Va = Volume of water concentrated in vial Bottles

Vs = Volume of water in the Sedgewick-rafter preparation (1 mL)

Vc = Volume of filtered sample water

Analysis of water fertility level data was carried out by comparing 5 parameters such as pH, DO, BOD, Nitrate, and Phosphate to Government Regulation No. 82 of 2001 with aim to determine whether the study location had met the designation of the water quality class water category. To analyze data on water fertility levels based on phytoplankton, research was refer to Basmi (1987). And data analysis for trophic status was carried out by comparing the concentration of nitrate, phosphate and chlorophyll with the Minister of Environment Regulation No. 28 of 2009 and Vollenweider (1969).

4. RESULT AND DISCUSSION

The Epicentrum pool receives a stream from the Cideng River. The river flow is greenish and smelly so that before entering the Epicentrum Pond, the Cideng River flow has been treated in such a way using the Water Treatment Plant. Because previously passed on the water treatment plant, the quality of water entering the Epicentrum Pond is better than the Cideng River flow. The following is the value of chemical parameters which are water quality criteria when viewed from Government Regulations Number 82 of 2001:

Table 1. Chemical Parameter Concentration to Review the Criteria for Epicentrum Pond's Water Quality

Parameter	Class Designation	Unit	Quality Standards	Parameter Concentration	Information
pH	II	-	6 – 9	7,27	Fulfill
Dissolved Oxygen (DO)		mg/L	4 - 6	3,4	Doesn't Fulfill
Biochemical Oxygen Demand (BOD)		mg/L	3 - 2	0,203	Fulfill
Phospate		mg/L	0,2	0,044	Fulfill
Nitrate		mg/L	10	3,134	Fulfill

Source : Author

From the table above, it can be seen that the Epicentrum Pool if viewed from several chemical parameters such as pH, Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD),

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Phosphate, and Nitrate, fulfills the expected water quality according to the water body, Class II although the Dissolved Oxygen (DO) parameter does not meet the quality standards for Class II. This can be because a large number of carp fish living in the pond.

In addition to water quality, it is also necessary to assess the biological parameters through the abundance of phytoplankton contained in the water body. As in the Epicentrum Pond it has a large abundance of phytoplankton 10200 ind/L, so that it fertility is classified as mesotrophic waters. According to Basmi (1987) the fertility of mesotrophic waters has an abundance range of phytoplankton 2000 - 15000 ind/L. These mesotrophic waters are water phases which initially are oligotrophic waters begin to enter the eutrophic waters phase, so that during this phase nutrient enrichment occurs. With increasing nutrient content such as nitrogen, phosphorus and calcium in the waters of the lake, there will also be an increase in biological activity. Organisms such as algae, phytoplankton, zooplankton and organic waste are buried on the surface of the water so that the water's brightness decreases and becomes more turbid. The rate of accumulation of organic matter is then relatively faster.

Whereas if reviewed according to Minister of Environment Regulation No. 28 of 2009 the classification can be done through trophic status of the waters with the parameters Total-N, Total-P, Chlorophyll-a, and Brightness. In this study, classification only uses 2 parameters, namely Total-P and Chlorophyll-a. The following are the parameter values reviewed from the Environment Minister Regulation No. 28 of 2009 (Table 2).

Table 2. Concentration of Parameters for Reviewing Trophic Status of Epicentrum Pond's Water

Parameter	Unit	Parameter Concentration	Information	Source
Nitrate	mg/L	3,134	Mesotrophic	Vollenweider, 1969 in Wetzel, 1975 in Effendi, 2003
Phospate (total-P)	mg/L	0,044	Eutrophic	
	µg/L	44,736	Eutroph	Minister of Environment Regulation No.28 of 2009
Chlorophyll -a	µg/L	1,319	Oligotroph	
			Quiet productive - Mesotrophic	Vollenweider, 1969 in Heriyanto, 2009

Source : Author

From the table above, it can be seen that the trophic status of Epicentrum Pond when viewed from Minister of Environment Regulation No.28 of 2009 based on total-P parameters is included in trophic status of eutrophs, but when viewed from the parameters of chlorophyll-a, it is classified as oligotroph. And if viewed from Volenweider, 1969 in Wetzel, 1975

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in Effendi, 2003, the parameters of nitrate will be included in mesotrophic trophic and phosphate status including eutrophic. Whereas for trophic status based on chlorophyll-a parameters according to Vollenweider, 1969 in Heriyanto, 2009, Epicentrum Pond has quite productive or mesotrophic water fertility. Therefore, the trophic status of the Epicentrum Pond when viewed from Minister of Environment Regulation No.28 of 2009 and Volenweider, 1969 is included in trophic status of oligotrophs to eutrophs. The wide trophic status range can be due to the Epicentrum Pool condition that being a closed water body, with no flow of water, the impurities from fish that live in the water body can increase the amount of nutrients in the water body.

Sunter Lake is one of the 5 lakes that are passed by Sunter River. The stream is dark brown and smelly. In this Sunter River flow, there is also domestic waste and industrial waste from the surrounding environment. The following is the value of chemical parameters of Sunter Lake which are water quality criteria viewed from Government Regulations Number 82 of 2001:

Table 3. Chemical Parameter Concentration of Lake Sunter's Water Quality Criteria

Parameter	Class Designation	Unit	Quality Standards	Parameter Concentration	Information
pH	II	-	6 – 9	7,34	Fulfill
Dissolved Oxygen (DO)		mg/L	4 - 6	4,4	Fulfill
Biochemical Oxygen Demand (BOD)		mg/L	3 – 2	0,201	Fulfill
Phospate		mg/L	0,2	-0,002	Fulfill
Nitrate		mg/L	10	1,804	Fulfill

Source : Author

From the table above, it can be seen that Sunter Lake if viewed from several chemical parameters such as pH, Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), Phosphate, and Nitrate, fulfills the Class II water quality. So that in accordance with the class designation, the existing conditions are also suitable for use as tourism and fishing. This condition will be even better if there is no garbage piles up on the edge of the lake.

In addition to water quality, it is also necessary to assess the biological parameters through the abundance of phytoplankton contained in the water body. Lake Sunter has a large abundance of 5500 ind/L phytoplankton, so it belongs to the fertility of mesothropic waters. According to Basmi (1987) the fertility of mesotrophic waters has an abundance range of phytoplankton 2000 - 15000

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ind/L. The following are the parameter values reviewed from the Environment Minister Regulation No. 28 of 2009 for Sunter Lake's water (Table 4).

Table 4. Concentration of Parameters to Review the Trophic Status of Lake Sunter's Water

Parameter	Unit	Parameter Concentration	Information	Source
Nitrate	mg/L	1,804	Mesotrophic	Volenweider, 1969 in Wetzel, 1975 in Effendi, 2003
Phospate (total-P)	mg/L	-0,002	Oligotrophic	
	µg/L	-2,631	Oligotroph	Minister of Environment Regulation No.28 of 2009
Chlorophyll-a	µg/L	0	Oligotroph	
			Not productive - Oligotroph	Vollenweider, 1969 inHeriyanto, 2009

Source : Author

From the table above, it can be seen that trophic status of Sunter Lake water if viewed from Minister of Environment Regulation No.28 of 2009 and seen from the parameters of total-P and chlorophyll-a included in trophic oligotrophic status. And if viewed from Volenweider, 1969 in Wetzel, 1975 in Effendi, 2003, the parameters of nitrate will be included in the mesotrophic trophic and phosphate status included in the oligothropic. Whereas for trophic status based on chlorophyll-a parameters according to Vollenweider, 1969 in Heriyanto, 2009 then Lake Sunter has unproductive waters or oligotrophic fertility. Therefore, the trophic status of Lake Sunter when viewed from Regulation of the Minister of Environment No.28 of 2009 and Volenweider, 1969 is included in trophic status of oligotrophs to mesotrophs. Citra 6 Lake is one of the catchment areas in the Citra Garden City 6. This lake is commercial in nature surrounded by the lake with various kinds of vegetation, jogging tracks, and the existence of mini zoos. Lake Citra 6 is intended as a water catchment because the surrounding area is a residential area, so water reservoirs are needed so that when the rainy season arrives, it can prevent flooding. The following is the value of chemical parameters which are water quality criteria when viewed from Government Regulations Number 82 of 2001(Table 5).

Table 5. Chemical Parameter Concentration to Review Lake Citra 6's Water Quality Criteria

Parameter	Class Designation	Unit	Quality Standards	Parameter Concentration	Information
pH	II	-	6 – 9	7,3	Fulfill
Dissolved Oxygen (DO)		mg/L	4 - 6	7,6	Fulfill
Biochemical Oxygen Demand (BOD)		mg/L	3 – 2	1,677	Fulfill
Phospate		mg/L	0,2	0,189	Fulfill
Nitrate		mg/L	10	3,548	Fulfill

Source : Author

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From the table above, it can be seen that Lake Citra 6 if viewed from a number of chemical parameters such as pH, Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), Phosphate and Nitrate, fulfills the expected water quality according to the water body namely Class II. So that in accordance with the designation of the class, the existing conditions are also suitable. Citra Lake 6 is intended as class II because Citra Lake 6 is located in a residential area, so it is expected to have good water quality.

In addition to water quality, it is also necessary to assess the biological parameters through the abundance of phytoplankton contained in the body of water. As in Lake Citra 6 has an abundance of phytoplankton 2200 ind/L, so that it is classified as fertility of mesotrophic waters. According to Basmi (1987) the fertility of mesotrophic waters has an abundance range of ph ytoplankton 2000 - 15000 ind/L. The following are the parameter values reviewed from the Environment Minister Regulation No. 28 of 2009 (Table 6).

Table 6. Concentration of Parameters to Review the Trophic Status of Lake Citra 6's Water

Parameter	Unit	Parameter Concentration	Information	Source
Nitrate	mg/L	1,804	Mesotrophic	Volenweider, 1969 in Wetzel, 1975 in Effendi, 2003
Phospate (total-P)	mg/L	0,189	-	
	µg/L	189,475	Hipereutroph	Minister of Environment Regulation No.28 of 2009
Chlorophyll -a	µg/L	0	Oligotroph	
			Not productive - Oligotroph	Vollenweider, 1969 dalam Heriyanto, 2009

Source : Author

From the table above, it can be seen that trophic status of Lake Citra 6 if viewed from Minister of Environment Regulation No.28 of 2009 and seen from total P is included in Hypereutrophic status, but when viewed from the parameters of chlorophyll-a, it is classified as oligotroph. And if viewed from Volenweider, 1969 in Wetzel, 1975 in Effendi, 2003, the parameters of nitrate will be included in the mesotrophic and phosphate trophic status not included in the classification, because the classification limit for eutrophic is 0.031-0.1 mg / L. Whereas for trophic status based on chlorophyll-a parameters according to Vollenweider, 1969 in Heriyanto, 2009 then Lake Citra 6 has unproductive or oligotrophic fertility. Therefore, the trophic status of Lake Citra 6 when viewed from Minister of Environment Regulation No.28 of 2009 and

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Volenweider (1969) is included in trophic status of oligotrophs to hypereutrophs. The wide trophic status range can be due to high population of fish in the lake that cause an increase in the value of nutrients in the water body that comes from existing fish feces.

Danau Citra 8 is one of the catchment areas in the Aeroworld Citra 8 area. This lake is still untouched like Citra Lake 6. This is because development around Lake Citra 8 is still being carried out, so that the land around the lake is still in the form of grassland. The following is the value of chemical parameters which are water quality criteria when viewed from Government Regulations Number 82 of 2001(Table 7).

Table 7. Chemical Parameter Concentration to Review Lake Citra 8's Water Quality Criteria

Parameter	Class Designation	Unit	Quality Standards	Parameter Concentration	Information
pH	II	-	6 – 9	7,3	Fulfill
Dissolved Oxygen (DO)		mg/L	4 - 6	6,2	Fulfill
Biochemical Oxygen Demand (BOD)		mg/L	3 – 2	0,872	Fulfill
Phospate		mg/L	0,2	0,165	Fulfill
Nitrate		mg/L	10	2,829	Fulfill

Source : Author

From the table above, it can be seen that Lake Citra 8 if viewed from a number of chemical parameters such as pH, Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), Phosphate and Nitrate, fulfills the expected water quality according to the water body namely Class II. So that in accordance with the designation of the class, the existing conditions are also suitable. Lake Citra 8 is intended as class II because Lake Citra 8 will also be used as a residential area, so it is expected to have good water quality. But for existing conditions, surrounding of Lake Citra 8 is still in the development stage, so that the natural conditions are still maintained.

In addition to water quality, it is also necessary to assess the biological parameters through the abundance of phytoplankton contained in the body of water. As in Lake Citra 8 has an abundance of phytoplankton 2700 ind/L, so that it is classified as fertility of mesotrophic waters. According to Basmi (1987) the fertility of mesotrophic waters has an abundance range of phytoplankton 2000 - 15000 ind/L. Whereas if reviewed according to Minister of Environment Regulation No. 28 of 2009 the classification can be done through trophic status of the waters with the parameters Total-N, Total-P, Chlorophyll-a, and Brightness. In this study, classification only uses 2 parameters, namely Total-P and Chlorophyll-a. The following are the parameter values reviewed from the Environment Minister Regulation No. 28 of 2009 (Table 8).

Table 8. Concentration of Parameters to Review the Trophic Status of Lake Citra 8's Water

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Parameter	Unit	Parameter Concentration	Information	Source
Nitrate	mg/L	2,829	Mesotrophic	Volenweider, 1969 in Wetzel, 1975 inEffendi, 2003
Phospate (total-P)	mg/L	0,165	-	
	µg/L	165,794	Hipereutroph	Minister of Environment Regulation No.28 of 2009
Chlorophyll -a	µg/L	0	Oligotroph	
			Not productive - Oligotroph	Vollenweider, 1969 in Heriyanto, 2009

Source : Author

From the table above, it can be seen that trophic status of Lake Citra 8 if viewed from Minister of Environment Regulation No.28 of 2009 and seen from total-P included in Hypereutrophic status, but if seen from the parameters of chlorophyll-a, it is classified as oligotroph. And if viewed from Volenweider, 1969 in Wetzel, 1975 in Effendi, 2003, the parameters of nitrate will be included in the mesotrophic and phosphate trophic status not included in the classification, because it exceeds the classification limit for eutrophic which is 0.031-0.1 mg/L. Whereas for trophic status based on chlorophyll-a parameters according to Vollenweider, 1969 in Heriyanto, 2009 then Lake Citra 8 has unproductive or oligotrophic water fertility. Therefore, the trophic status of Lake Citra 8 when viewed from Minister of Environment Regulation No.28 of 2009 and Volenweider (1969) is included in trophic status of oligotrophs to hypereutrophs. The wide trophic status range can be due to high population of fish in the lake.

Setu Rawa Badak Jatijajar or commonly called Setu Jatijajar is one of the Catchment Areas in the Depok. This lake is commercial because the lake is used as a recreational place by the surrounding community. Setu Jatijajar aims to absorb water to accommodate runoff in the rainy season. The following is the value of chemical parameters which are water quality criteria when viewed from Government Regulations Number 82 of 2001(Table 9).

Table 9. Chemical Parameter Concentration to Review the Criteria for Setu Rawa Badak Jatijajar's Water Quality

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Parameter	Class Designation	Unit	Quality Standards	Parameter Concentration	Information
pH	II	-	6 – 9	7,27	Fulfill
Dissolved Oxygen (DO)		mg/L	4 - 6	4,2	Fulfill
Biochemical Oxygen Demand (BOD)		mg/L	3 – 2	0,134	Fulfill
Phospate		mg/L	0,2	0	Fulfill
Nitrate		mg/L	10	1,573	Fulfill

Source : Author

From the table above, it can be seen that Setu Rawa Badak Jatijajar if viewed from several chemical parameters such as pH, Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), Phosphate, and Nitrate fulfills the expected water quality according to the water body, namely Class II. So that in accordance with the designation of the class, the existing conditions are also suitable. Because Setu Rawa Badak Jatijajar is currently used as a recreational facility for local residents. In Setu Rawa Badak Jatijajar there are also various kinds of water games and locations for fishing.

In addition to water quality, it is also necessary to assess the biological parameters through the abundance of phytoplankton contained in the water body. Jatijajar Rawa Badak Setu has a large abundance of 2800 ind/L phytoplankton, which is classified as fertility of mesotrophic waters. According to Minister of Environment Regulation No. 28 of 2009, the classification can be done through trophic status of the waters with the parameters Total-N, Total-P, Chlorophyll-a, and Brightness. In this study, classification only uses 2 parameters, namely Total-P and Chlorophyll-a. The following are the parameter values reviewed from the Environment Minister Regulation No. 28 of 2009 (Table 10).

Table 10. Concentration of Parameters to Review the Trophic Status of Setu Rawa Badak Jatijajar's Water

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Parameter	Unit	Parameter Concentration	Information	Source
Nitrate	mg/L	1,573	Mesotrophic	Volenweider, 1969 in Wetzel, 1975 in Effendi, 2003
Phospate (total-P)	mg/L	0	Oligotrophic	
	µg/L	0	Oligotroph	Minister of Environment Regulation No.28 of 2009
Chlorophyll -a	µg/L	0	Oligotroph	
			Not productive - Oligotroph	Vollenweider, 1969 in Heriyanto, 2009

Source : Author

From the table above, it can be seen that the trophic status of Setu Rawa Badak Jatijajar when viewed from Minister of Environment Regulation No.28 of 2009 and seen from total-P is included in trophic status of oligotrophs, but when viewed from the parameters of chlorophyll-a, it is classified as oligotroph. And if viewed from Volenweider (1969) in Wetzel, (1975) in Effendi (2003), the nitrate parameters will be included in the mesotrophic trophic status and phosphate parameters included in the oligotrophic. Whereas for trophic status based on chlorophyll-a parameters according to Vollenweider (1969) in Heriyanto (2009), Setu Rawa Badak Jatijajar has unproductive waters or oligotrophic fertility. Therefore, the trophic status of Setu Rawa Badak Jatijajar when viewed from Regulation of the Minister of Enironment No.28 of 2009 and Volenweide (1969) is included in trophic status of oligotrophs to mesotrophs.

Situ Cilodong is one of the catchment areas in the Depok area. This lake is commercial because the lake is used as a recreational suggestion by the surrounding community. Situ Cilodong aims to absorb run off water in the rainy season. The following is the value of chemical parameters which are water quality criteria when viewed from Government Regulations Number 82 of 2001 (Table 11).

Table 11. Chemical Parameter Concentration to Review the Criteria for Situ Cilodong's Water Quality

Parameter	Class Designation	Unit	Quality Standards	Parameter Concentration	Information
pH	II	-	6 – 9	7,27	Fulfill
Dissolved Oxygen (DO)		mg/L	4 - 6	4,3	Fulfill
Biochemical Oxygen Demand (BOD)		mg/L	3 – 2	0,697	Fulfill
Phospate		mg/L	0,2	-0,005	Fulfill
Nitrate		mg/L	10	1,560	Fulfill

Source : Author

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From the table above, it can be seen that Situ Cilodong if viewed from several chemical parameters such as pH, Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), Phosphate and Nitrate, fulfills the expected water quality according to the water body namely Class II. So that in accordance with the designation of the class, the existing conditions are also suitable. Because Situ Cilodong is currently used as a recreational facility for local resident. At Situ Cilodong there are also various kinds of water games and locations for fishing.

In addition to water quality, it is also necessary to assess the biological parameters through the abundance of phytoplankton contained in the body of water. As in Situ Cilodong has a large abundance of phytoplankton 1800 ind/L, so it is classified as fertility of mesotrophic waters. According to Basmi (1987) the fertility of oligotrophic waters has a range of abundance of phytoplankton <2000 ind/L. Oligotrophic waters are waters that contain little food or nutrients (Goldman and Alexander, 1983). Burgis and Morris (1987) state that the low content of nutrients such as nitrogen, phosphorus, phosphate and calcium in oligotrophic waters is due to the still young waters so that the amount of nutrients accumulated from the input of river water and the environment Oligotrophic waters are waters that contain little food or nutrients (Horne & Goldman, 1983). Burgis and Morris (1987) states that the low content of nutrient such as nitrogen, phosphorus, phosphate and calcium in the waters of oligotrophic is because the amount of nutrients accumulated from the input of river water and the environment is still very small, and generally organisms which is very tolerant of low nutrient content.

Whereas if reviewed according to Minister of Environment Regulation No. 28 of 2009 the classification can be done through trophic status of the waters with the parameters Total-N, Total-P, Chlorophyll-a, and Brightness. In this study, classification only uses 2 parameters, namely Total-P and Chlorophyll-a. The following are the parameter values reviewed from the Environment Minister Regulation No. 28 of 2009 (Table 12).

Table 12. Concentration of Parameters for Reviewing Trophic Status of Situ Cilodong's Water

Parameter	Unit	Parameter Concentration	Information	Source
Nitrate	mg/L	1,560	Mesotrophic	Volenweider, 1969 in Wetzel, 1975 in Effendi, 2003
Phospate (total-P)	mg/L	-0,005	Oligotrophic	
	µg/L	-5,26	Oligotroph	Minister of Environment Regulation No.28 of 2009
Chlorophyll -a	µg/L	0	Oligotroph	
			Not prouctive - Oligotroph	Vollenweider, 1969 in Heriyanto, 2009

Source: Author

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From the table above, it can be seen that trophic status of Situ Cilodong is reviewed from Minister of Environment Regulation No.28 of 2009 and seen from total-P included in trophic status of oligotrophs, but when seen from the parameters of chlorophyll-a, it is classified as oligotroph. And if viewed from Volenweider (1969) in Wetzel (1975) in Effendi (2003), the nitrate parameters will be included in the mesotrophic trophic status and phosphate parameters included in the oligotrophic. Whereas for trophic status based on chlorophyll-a parameters according to Vollenweider (1969) in Heriyanto (2009) then Situ Cilodong has unproductive waters or oligotrophic fertility. Therefore, the trophic status of Situ Cilodong when viewed from Regulation of the Minister of Environment No.28 of 2009 and Volenweider (1969) is included in trophic status of oligotrophs to mesotrophs.

5. CONCLUSION

1. According to Government Regulation No. 82 of 2001 based on parameters of pH, Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), Phosphate and Nitrate, the six lakes have met the class II water quality criteria. The classification and the existing conditions of the six lakes are in accordance with the designation, namely as a means of water recreation, cultivation of freshwater fish, or water to irrigate crops.
2. According to Basmi (1987), fertility is given based on the abundance of phytoplankton in Epicentrum Pond, Lake Sunter, Lake Citra 6, Lake Citra 8, and Jatijajar Setu Rawa Badak including mesotrophic fertility, while Situ Cilodong belongs to oligotrophic fertility.
3. Based on Minister of Environment Regulation No.28 of 2009 and Volenweider (1969) on parameters of nitrate, phosphate and chlorophyll-a, Epicentrum Pond is included in trophic oligotrophic status to eutroph. For Lake Sunter, Setu Rawa Badak Jatijajar, and Situ Cilodong included in trophic status of oligotrophs to mesotrophs. And for Lake Citra 6 and Danau Citra 8 have trophic status from oligotrophs to hypereutrophs.

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