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STUDY ON WATER QUALITY OF THE TASIK TITIWANGSA, KUALA LUMPUR, MALAYSIA

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ABSTRACT

The purposes of the study was to determine the current water quality status of the Tasik Titiwangsa (Titiwangsa Lake) and to obtain the water quality classified based on Interim National Water Quality Standard (INWQS) for Malaysia and Water Quality Index (WQI) of the selected sampling station. A total of six sampling station were selected for this study which were named as station 1, 2, 3, 4, 5 and 6. Sixteen water quality parameters were analyzed based on in-situ and ex-situ analysis at the sample were collected on September, October and November. Laboratory analysis was carried out according to the standard method. In-situ water quality parameters were such as pH, dissolve oxygen, electrical conductivity, turbidity, temperature and TDS. For ex-situ water quality parameters included TSS, ammoniacal nitrogen, COD, BOD, nitrate, phosphate, sulphate, total coliform, E-coli and oil and grease. The result showed that the water quality of the Tasik Titiwangsa was classified as Class III based on WQI which suitable for recreational activities and body contact. However, the activities such as wedding ceremony, water sports and equestrian sports venue have taken place in surrounding of the lake consequently affected the water body of Tasik Titiwangsa and it might be cause of the lake pollution and some further action must be considered for the best in future.

ABSTRAK

Tujuan kajian ini ialah untuk menentukan status kualiti air semasa Tasik Titiwangsa (Titiwangsa Lake) dan untuk mendapatkan kualiti air dikelaskan berdasarkan INWQS (Interim National Standard Kualiti Air) bagi Malaysia dan WQI (Indeks Kualiti Air) pada stesen persampelan yang ditentukan. Sebanyak enam stesen persampelan telah dipilih untuk kajian ini yang dinamakan sebagai stesen 1, 2, 3, 4, 5 dan 6. Enam belas parameter kualiti air telah dianalisis berdasarkan in-situ dan analisis ex-situ di akhir bulan September, Oktober dan November. Analisis makmal dijalankan mengikut kaedah Standard. In-situ kualiti air termasuk nilai pH, oksigen terlarut (DO), kekonduksian elektrik (EC), kekeruhan dan suhu, manakala untuk analisis makmal termasuk jumlah pepejal terampai (TSS), ammonikal nitrogen (AN), permintaan oksigen kimia (COD) , permintaan oksigen biologi (BOD), nitrat, fosfat , sulfat , jumlah koliform dan E- coli. Berdasarkan Indeks Kualiti Air (WQI), air di Tasik Titiwangsa diklasifikasikan sebagai kelas III yang mana sesuai untuk aktiviti rekreasi dan hubungan badan. Walau bagaimanapun, aktiviti-aktiviti seperti majlis perkahwinan , sukan air dan tempat sukan berkuda terdapat dan telah berlaku disekitar tasik dan ia mungkin menjadi punca pencemaran tasik dan beberapa tindakan lanjut perlu dipertimbangkan untuk yang terbaik pada masa akan datang.

CONTENTS

		Page
SUPERVISOR'S DECLARATION		ii
STUDENT DECLARATION		iii
DEDICATION		iv
ACKNOWLEDGEMENT		v
ABSTRACT		vi
ABSTRAK		vii
CONTENTS		viii
LIST OF TABLE		xii
LIST OF FIGURES		xiii
NOMENCLATURE		xvi
LIST OF APPENDICES		xviii
CHAPTER 1	**INTRODUCTION**	1
1.1	Introduction	1
1.2	Background of Tasik Titiwangsa	2
1.3	Problem Statement	3
1.4	Research Objectives	4
1.5	Scope of Study	4
1.6	Significant of Study	5
CHAPTER 2	**LITERATURE REVIEW**	6
2.1	Introduction	6
2.2	Lake	7
2.3	Water Pollution	7
2.4	Water Quality Parameter	12
	2.4.1 Physical Water Quality Parameters	13
	2.4.1.1 Total Suspended Solid (TSS)	13
	2.4.1.2 Turbidity	14
	2.4.1.3 Temperature	14

2.4.1.4 Total Dissolve Solids (TDS) 15
2.4.1.5 Electrical Conductivity (EC) 16
2.4.1.6 Oil and Grease 17
2.4.2 Chemical Water Quality Parameters 18
2.4.2.1 Chemical Oxygen Demand 18
2.4.2.2 Biological Oxygen Demand 19
2.4.2.3 Dissolve Oxygen 19
2.4.2.4 Ammoniacal Nitrogen 20
2.4.2.5 pH 21
2.4.2.6 Nitrate 22
2.4.2.7 Sulphate 23
2.4.2.8 Phosphate 23
2.4.2 Biological Water Quality Parameters 24
2.4.3.1 Total Coliform and E-coli 24
2.5 Water Quality Standards 25
2.5.1 National Water Quality Standards (NWQS) 25
2.5.2 Water Quality Index (WQI) 26

CHAPTER 3 METHODOLOGY 27
3.1 Introduction 27
3.2 Methodology Flow Chart 27
3.3 Sampling Station 28
3.4 Preparation of Sampling Collect 28
3.5 Sampling Preservation 28
3.6 Study Approaches 30
3.6.1 In-situ Data Collection 31
3.6.2 Laboratory Analysis 31
3.6.2.1 Total Suspended solids (TSS) 31
3.6.2.2 Biochemical Oxygen Demand (BOD) 32
3.6.2.3 Chemical Oxygen Demand (COD) 33
3.6.2.4 Total Coliform and E-coli 34
3.6.2.5 Ammonia Nitrogen 34
3.6.2.6 Sulphate 35

3.6.2.7 Phosphate 35
3.6.2.8 Nitrate 36
3.6.2.9 Oil and Grease (OG) 37
3.7 Data Analysis and Results 38

CHAPTER 4 RESULTS & DISCUSSION 39
4.1 Introduction 39
4.2 Physical Parameters 40
4.2.1 Total Suspended Solid 40
4.2.2 Turbidity 41
4.2.3 Temperature 42
4.2.4 Total Dissolve solids 43
4.2.5 Electrical Conductivity 44
4.3.6 Oil and Grease 44
4.3 Chemical Parameters 45
4.3.1 Chemical Oxygen Demand 45
4.3.2 Biological Oxygen Demand 46
4.3.3 Dissolve Oxygen 47
4.3.4 Ammoniacal Nitrogen 48
4.3.5 pH 49
4.3.6 Nitrate 50
4.3.7 Sulphate 51
4.3.8 Phosphate 52
4.4 Biological Parameters 53
4.4.1 Total Coliform 53
4.4.2 E-coli 54
4.5 Water Quality Index 55
4.6 Comparison of Physical Parameters at Different Location 56
4.6.1 Total Suspended Solid 56
4.6.2 Turbidity 57
4.6.3 Temperature 58
4.6.4 Total Dissolve solids 59
4.6.5 Electrical Conductivity 60

4.7	Comparison of Chemical Parameters at Different Location	61
	4.7.1 Chemical Oxygen Demand	61
	4.7.2 Biological Oxygen Demand	62
	4.7.3 Dissolve Oxygen	63
	4.7.4 Ammoniacal Nitrogen	64
	4.7.5 pH	65
	4.7.6 Nitrate	66
	4.7.7 Sulphate	67
	4.7.8 Phosphate	68
4.8	Comparison of Biological Parameters at Different Location	69
	4.8.1 Total Coliform	69
	4.8.2 E-coli	70
CHAPTER 5	**CONCLUSSIONS AND RECOMMENDATIONS**	71
5.1	Conclusion	71
5.2	Recommendations	72
	5.2.1 Water Conservation	72
	5.2.2 Basin Protection Strategy	73
	5.2.2.1 Lake Management	73
	5.2.2.2 Stakeholder Participation	73
REFERENCES		74
APPENDICES		77

LIST OF TABLES

Table No.	Title	Page
2.1	List of water-borne diseases associated with recreational water in United State in Year 2001	11
2.2	The effect of pH value to the aquatic life	22

LIST OF FIGURES

Figure No.	Title	Page
1.1	Location of Titiwangsa Lake Garden	3
2.1	Waterborne-disease outbreaks of gastroenteritis associated with recreational water, by etiologic agent and type of exposure in United Sates	12
3.1	Methodology flow chart	29
3.2	The points that sample of water are taken	30
4.1	Concentration of TSS of different stations	40
4.2	Concentration of turbidity of different stations	41
4.3	Temperature at different stations	42
4.4	Concentration of TDS of different stations	43
4.5	Electrical conductivity at different stations	44
4.6	Concentration of COD of different stations	45
4.7	Concentration of BOD of different stations	46
4.8	Concentration of DO of different stations	47
4.9	Concentration of AN of different stations	48
4.10	pH at different stations	49
4.11	Concentration of nitrate of different stations	50
4.12	Concentration of sulphate of different stations	51
4.13	Concentration of phosphate of different stations	52
4.14	Total coliform at different stations	53

4.15	E-coli at different stations	54
4.16	Water Quality Index of different stations	55
4.17	Comparison of TSS concentration on three different times at different locations	56
4.18	Comparison of turbidity on three different times at different locations	57
4.19	Comparison of temperature on three different times at different locations	58
4.20	Comparison of TDS concentration on three different times at different locations	59
4.21	Comparison of electrical conductivity on three different times at different locations	60
4.22	Comparison of COD concentration on three different times at different locations	61
4.23	Comparison of BOD concentration on three different times at different locations	62
4.24	Comparison of DO concentration on three different times at different locations	63
4.25	Comparison of AN concentration on three different times at different locations	64
4.26	Comparison of pH on three different times at different locations	65
4.27	Comparison of nitrate concentration on three different times at different locations	66
4.28	Comparison of sulphate concentration on three different times at different locations	67

4.29	Comparison of phosphate concentration on three different times at different locations	68
4.30	Comparison of total coliform on three different times at different locations	69
4.31	Comparison of E-coli on three different times at different locations	70

NOMENCLARATURE

Symbol	Meaning
INWQS	Interim National Water Quality Standard
WQI-DOE	Water Quality Index Department of Environment
pH	Acidity and alkalinity
DO	Dissolve Oxygen
TDS	Total Suspended Solid
TSS	Total Suspended Solid
BOD	Biochemical Oxygen Demand
COD	Chemical Oxygen Demand
E-coli	Escherichia coli
AN	Ammonia Nitrogen
OG	Oil and grease
PWTC	Pusat Perdagangan Dunia Putra
H^+	Hydrogen
OH^-	Hydroxide
H_2O	Water molecules
NTU	Nephelometric Turbidity Units
O_2	Oxygen
mg/l or mg/L	milligram per litre
DOE	Department of Environment
ppm	parts per million
mm	millimeter
BOD_5	BOD value of day five
DO_i	DO value of day 1
DO_f	DO value of day 5
P	Coefficient of dilute factor
CH_2O	Lactose
CO_2	Carbon dioxide

FC	Faecal Coliform
APHA	American Public Health Association
WHO	World Health Organization
USEPA	United State Environmental Protection Agency
µg/L	microgram per litre
N	Nitrogen
FAO	Food and Agriculture Organization
S	Sulphate
$BaSO_4$	Barite
$MgSO_4 \cdot 7H_2O$	Epsomite
$CaSO_4 \cdot 2H_2O$	Gypsum
CFC-113	1,1,2-trichloro-1,2,2-trifluoroethane
mid-IR	mid-infrared
EPA	Environmental Protection Agency
CDC	Centers for Disease Control and Prevention
NEEAR	National Epidemiologic and Environmental Assessment of Recreational
MPN	Most Probable Number
SO_4^{2-}	Sulphate
PO_4^{3-}	Phosphate
NO_3^--N	Nitrate

LIST OF APPENDICES

Items	Title	Page
Appendix A	**Results**	78
Table 4.2.1	*Comparison between concentration of TSS for each sampling station for three different time of water sampling*	78
Table 4.2.2	*Comparison between turbidity for each sampling station for three different time of water sampling*	78
Table 4.2.3	*Comparison between temperature for each sampling station for three different time of water sampling*	79
Table 4.2.4	*Comparison between concentration of TDS for each sampling station for three different time of water sampling*	79
Table 4.2.5	*Comparison between EC for each sampling station for three different time of water sampling*	79
Table 4.2.6	*Comparison between oil and grease for each sampling station for three different time of water sampling*	80
Table 4.3.1	*Comparison between concentration of COD for each sampling station for three different time of water sampling*	80
Table 4.3.2	*Comparison between concentration of BOD for each sampling station for three different time of water sampling*	80
Table 4.3.3	*Comparison between concentration of DO for each sampling station for three different time of water sampling*	81
Table 4.3.4	*Comparison between concentration of AN for each sampling station for three different time of water sampling*	81

Table 4.3.5	*Comparison between pH for each sampling station for three different time of water sampling*	81
Table 4.3.6	*Comparison between nitrate concentration for each sampling station for three different time of water sampling*	82
Table 4.3.7	*Comparison between sulphate concentration for each sampling station for three different time of water sampling*	82
Table 4.3.8	*Comparison between phosphate concentration for each sampling station for three different time of water sampling*	82
Table 4.4.1	*Comparison between total coliform for each sampling station for three different time of water sampling*	83
Table 4.5	*Water Quality Index of different station*	83
Appendix B	**Formulae of WQI**	84
Appendix C	**INWQS for Malaysia & WQI of DOE**	86
Table 2.5(a)	*Interim National Water Quality Standards for Malaysia*	87
Table 2.5(b)	*DOE Water Quality Index Classification*	88
Table 2.5(c)	*Water Class and Uses*	89
Table 2.5(d)	*DOE Water Quality Classification on Water Quality Index*	89
Table 2.5(e)	*Interim Marine Water Quality Standards*	90
Appendix D	**Figures**	91
Figure 2.4.1.3	*Water temperature of Lake 1 and Lake 2*	91
Figure 2.4.2.8	*Average phosphate concentration*	92
Figure 3.5	*Bottles of water sample with cooler ice box*	92
Figure 3.6.1	*Water Quality Checker HORIBA U10 (left) and Multimeter Water Quality Sonde 6600 V2 (right)*	93

Figure 3.6.2.1	*The process for TSS lab test*	93
Figure 3.6.2.2	*The apparatus used for BOD lab test*	94
Figure 3.6.2.3	*The apparatus used for COD lab test*	94
Figure 3.6.2.4	*Total coliform and E-coli lab test*	95
Figure 3.6.2.9	*Oil and grease lab test*	96
Figure 4.3.8(a)	*Observation from Tasik Titiwangsa (Lake 2)*	97
Figure 4.3.8(b)	*Dead algae from Tasik Titiwangsa*	98

CHAPTER 1

INTRODUCTION

1.1 Introduction

Water is one of the natural resource that has many functions. The survival of humans, animals and plants depend on this resource. However, without other valuable components like hydrogen and oxygen, there can't be any life on the earth because generally the existence of all of this grows and changes according to its nature.

Water can be obtained from various sources such as rivers, lakes, sea, ponds and also groundwater resource. Approximately 70% of the earth consists of water but only 2% of the water can be used as drinking water. Sea is the major source of the water, but due to the high soluble salt content making it unsuitable for the human consumption. Lakes are the unique water bodies that have high water quality properties that make it a high valued resource to society and nature. There are two kinds of lakes which are natural lake and artificial lake. Many lakes in the Malaysia are fresh water like Tasik Bera, Tasik Chini, Tasik Chenderoh and etc. and there are also artificial that that are constructed for hydro-electric power generation, aesthetic purposes, recreational purposes, industrial use, agricultural use or domestic water supply. For example, Tasik Titiwangsa in Kuala Lumpur, Malaysia is one of the artificial lakes that created for recreational purpose. It is popular among the local citizen because of its close proximity to the city centre. Since there are many recreations activity are

organized there like fishing contest, wedding, sports activities and etc; the water quality of the lake will be degraded because of the pollutions.

Even though water is a valuable resource but human sometimes practices hand-off attitude and lack of awareness to protect and conserve this resource. Therefore the water can easily be polluted due to the irresponsible human actions. As be known, water pollution will disrupt ecosystems in the rivers or lakes. The pollution of the water will cause the aquatic die or at least contaminants will enter the food chain. If there is content of pollution in the aquatic bodies such as fish and humans eat the fish, it will cause problems in term of health. Besides that, the effects of the pollution will also cause the change in the aesthetic value of the water. The distortions that can be seen are in terms of turbidity, colour and the odour of the water. In general it is known that the level of turbidity and the level of pollution in natural lake are lower compared to the artificial lake since the quantity of water is higher and it is able to receive and eliminate the pollution.

1.2 Background of Tasik Titiwangsa

Situated in the north-eastern part of Kuala Lumpur which is beside the Jalan Tun Razak, the Titiwangsa Lake Gardens is a kid-friendly attraction and a famous meeting place for city folks. Titiwangsa Lake Garden is a large recreational park highlighted by a lake at the middle where many activities can be done.

Taman Tasik Titiwangsa has an area of 46.13 hectares or 114 acres located 3 miles from the city centre officially opened on February 1, 1980 by the late Tun Hussein Onn. Around the Titiwangsa Lake Gardens are the National Library, Restaurant Nelayan, National Art Gallery, National Theatre (Istana Budaya) and the Sutra Dance Theatre.

Taman Tasik Titiwangsa is an artificial lake that is constructed for a recreations reason offers outdoor facilities such as children's playground, tennis courts, water sports, tracks for jogging, walking or cycling, exercise area and a floating restaurant at the edge of the lake. Since there are many facilities there, apart from recreational

activities, sometimes there is other event that is organized there like wedding ceremony. Figure 1.1 shows the location of Titiwangsa Lake Garden.

Land use around the Titiwangsa Lake is clearly shown in Figure 1.2 (in Appendix A). Land use of waterbody is important because it will affect the quality of the water. The water of Tasik Titiwangsa is flowing from Lake 2 to Lake 1 since it consists of two lakes that connecting together. Basically, most of the water activities are being done at Lake 1 which is the main lake located near the management office.

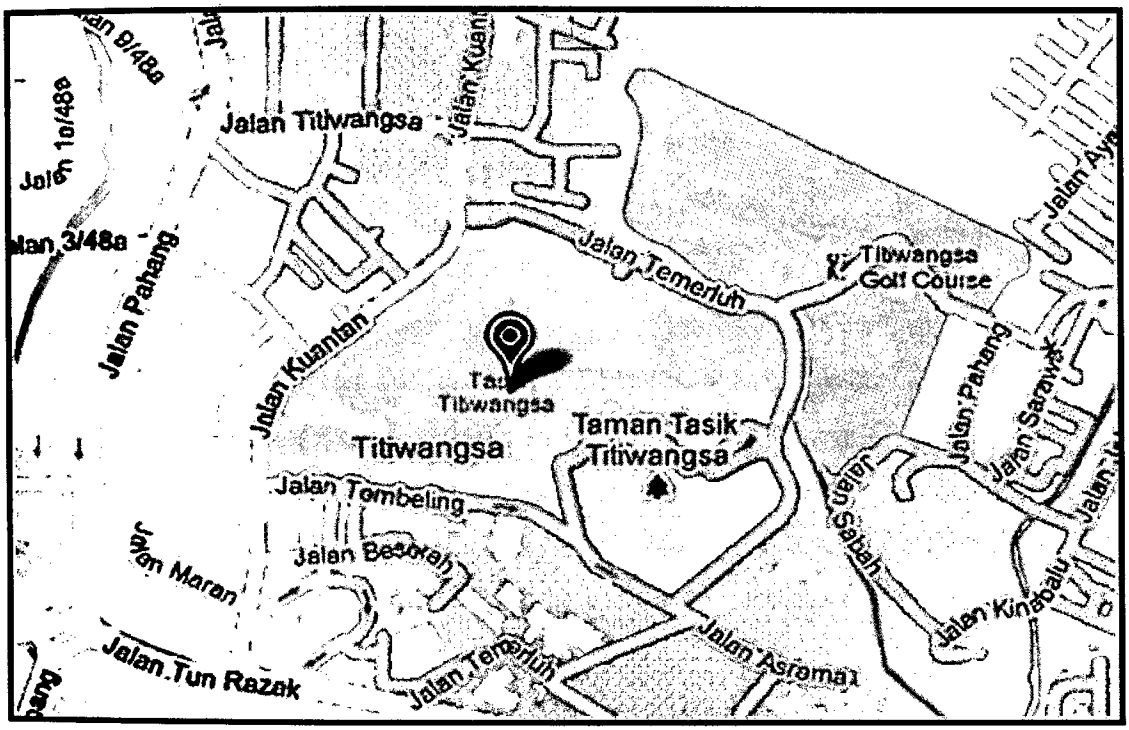

Figure 1.1: Location of Titiwangsa Lake Garden

Source: google.com

1.3 Problem Statement

The water is widely used nowadays and it is not focused on the use of daily needs only but also extends to recreational purposes like swimming, kayaking, diving and many other water-based recreational activities. Therefore, the water quality in a recreation park-specification should meet certain specifications to ensure it does not cause harm to the users.

Thus, the level of water quality at Taman Tasik Titiwangsa should be monitored and maintained in order to create safe environment to the users. The level of water quality at this recreational centre is supposed to be according to the standards and classification of water to allow a secure protection for recreational use. According to the Interim National Water Quality Standard (INWQS), the water for recreational purposes is classified as Class IIB for recreational use with body touching and sensitive aquatic species. This research will review and study the quality of water in the Titiwangsa Lake that is used to as water recreational centre.

1.4 Research Objectives

Based on the research, there are a few things that have to be studied and analysed. Two objectives are expected in the end of the research:

I. To determine current water quality status of the Tasik Titiwangsa.
II. To classify the water quality based on Interim National Water Quality Standard (INWQS) for Malaysia and Water Quality Index Department of Environment (WQI-DOE).

1.5 Scope of Study

The scope in this research is to focus on the water quality at Titiwangsa Lake. The samples of water at Titiwangsa Lake are collected for the testing to determine the level of water quality there. Six stations are chosen to collect the sample of water at Titiwangsa Lake. This study consists of two types of test which are in-situ and laboratory testing (ex-situ). The laboratory testing is conducted to determine the physical, chemical and biological condition of the water samples based on the parameter tested. Water quality data are used to determine whether the water quality status of clean, moderately polluted or contaminated which can be determined by the class specified by the WQI-DOE and INWQS. The water quality index is calculated based on the parameters that are stated in Chapter 3.

taken in order to protect and preserve the water resource from the pollution since the water is very important in the daily life.

2.2 Lake

A lake can be define as "a body of relatively still water of considerable size, localized in a basin, that is surrounded by land apart from a river, stream, or other form of moving water that serves to feed or drain the lake" (Wikipedia, 2013). Lake is one of water resources that are available in Malaysia instead of sea and river which extensively being used for many different reasons. There are two types of lake which are natural lake (freshwater lake) and artificial lake (man-made lake). Generally, natural lakes are found in mountainous areas which form as an apart of swamp and wetland and there are a few naturally lake in Malaysia like Tasik Bera (Pahang), Tasik Chenderoh (Perak), Tasik Paya Bungor (Pahang), Tasik Chini (Pahang) and Tasik Ulu Lepar (Pahang). Many lakes in Malaysia are artificial and constructed for hydro-electric power generation, recreational purposes, industrial use, agricultural use or domestic water supply for example Tasik Titiwangsa, Tasik Putrajaya, Tasik Perdana, Tasik Pedu, Tasik Kenyir, Tasik Temenggor and etc. There are numerous features of lake such as drainage basin, inflow and outflow, nutrient content, dissolve oxygen, pollutants, pH, and sedimentation. This study is conducted to measure these features of Titiwangsa Lake. Basically, human activities around the lake will change the condition of the lake and indirectly pollute the water in the lake. Therefore, water quality of the Titiwangsa Lake need to be measured in order to ensure that it safe for recreational purposes.

2.3 Water Pollution

A healthy environment is a key factor for a better life. Nowadays, the world is getting polluted and this pollution will give negative effect to the human health as well as causing the earth become imbalanced in the future. The rapid developments of industrial activity recently not only bring development to the country but it also gives some side effects if there are unplanned developments. This is due to the developments

that are carried out without the preservation of the environment. Environmental pollution is including contamination of soil, air, water and noise. Environmental pollution means unwanted changes to the environment, where it is the result of human action, through the effect of directly or indirectly, to changes in energy patterns, radiation levels, and chemical physical formation and increase the organism (Cornwell and Davis, 1991).

Water pollution is a major global issue that is leading worldwide cause of deaths and diseases. The contamination of water body is called water pollution. It occurs when the pollutants are directly or indirectly discharged into the water bodies without adequate treatment to remove harmful compounds. The pollution of the water not only damages the individual species and populations but also harm the natural biological communities. The major cause of water pollution problem is human activities which can produce the bodily wastes into the water bodies. Apart from that, natural activities for example volcanoes, algae blooms, storms, earthquakes and etc also can pollute the water. Water is considered polluted when its quality or composition gets changed either naturally or due to the human activities and it becomes less suitable for drinking, wildlife or other uses. The ecological status of the water also will change.

The water pollution can be classified as two sources which are groundwater pollution and surface water pollution. Ground water pollution is referred to the groundwater contamination and it may not directly affect the surface of water bodies. The groundwater contamination can be focus on the soil characteristics and site geology, hydrogeology, hydrology and the natural contaminations. The surface water pollution can be grouped into two categories based on their origin which are point sources (PS) and non-point sources (NPS). PS is the pollution that is originates from a single identifiable source like pipe, ditch or well. There are various types of point source pollutants like discharge from sewage treatment plant, a factory or city storm drain. On the other hand, NPS pollution refers to diffuse contamination that does not originate from a single source. Usually, NPS pollution is the cumulative effect 0f small amounts of contaminants gathered from a large area. The example of NPS pollution is leaching out of nitrogen compound from fertilized agricultural land, urban runoff, contaminated storm water washed off of parking lots and etc.