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Case Study: Trend and Prediction of Water Quality Parameter in Sungai Sg. Petani, Kedah

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Abstract: Recently, water quality in Malaysia has become worse every year as the water pollution increase and the development has rapidly increase. the purpose of this study is to evaluate the characteristic of Sungai Sg. Petani – Kedah. The parameter of water quality that is divided by three which is physical parameter, chemical parameter, biological parameter. The secondary data collected is classified into the water classification. Data analysis and processing of the water quality for 5 years on the river is process into a trend. Trend and prediction of Suspended Solids (SS), Biochemical Oxygen Demand (BOD), Ammonia Nitrogen (AN), Water Quality Index (WQI). Conclusion from this project is that the river is polluted where we can see from water quality index from past 5 years shows the number stays around 50-60 which is in class III. Recommendation for this study is, selection of river location need to be look at aspect of the water quality that need to be observed and analyze.

Keywords: Water Quality, Trend, Sungai Petani

1.   Introduction

Human activity causes and gives the negative effect on the water quality of the river that can harm the human health and damaging the ecosystem [1]. Forest exploration also causes the increases in runoff and increase in the amounts of suspended solids in the water. Besides that, agriculture also affects the river and contributes to the pollution [2].

Water pollution in Sungai Sg. Petani, Kedah has affected the source of water for the people in Sungai Petani, but the ecosystem in the river. In October 2010, the amount of waste in the along the river that has been cleaned is 3,027 ton according to (Jabatan Pengairan dan Saliran Negeri Kedah, 2010). The water pollution has become serious and unsafe. There has been many suggestions and solution to prevent the water quality from getting worse. The simplest solution to build a waste trap, and controlling the building development in Sungai Petani. Those solutions are not effective to help improving the water quality in Sungai Sg. Petani for a long period.

The importance of this study is to provide a secondary data collection of water quality in Sungai Sg. Petani by analysis the trend of the data from year before. Nonpoint source is, wide source of pollution that can come from land use, agricultural and forestry. Sungai Sg. Petani river pollution is a Point Source (PS) [3][4]. Relationship between urbanization, characteristic of river in urban area, rivers, people, and development along river area will clearly determine the problem with water quality in Malaysia including Sungai Sg. Petani[5].

This study also can be used as a reference material regarding the water quality in Sungai Sg. Petani. From this study also can be used to make an improvement and treatment to water quality. The focus of the study is on the water quality index of river and its factor that affect the water quality and to evaluate the characteristic of Sungai Sg. Petani water quality and to justify the factor that influence the water quality of Sungai Sg. Petani.

2. Methods

2.1 Methods

Five phases are necessary to address to obtain more organized and systematic research results. Accuracy in the research process and accuracy of the research results must be maintained.
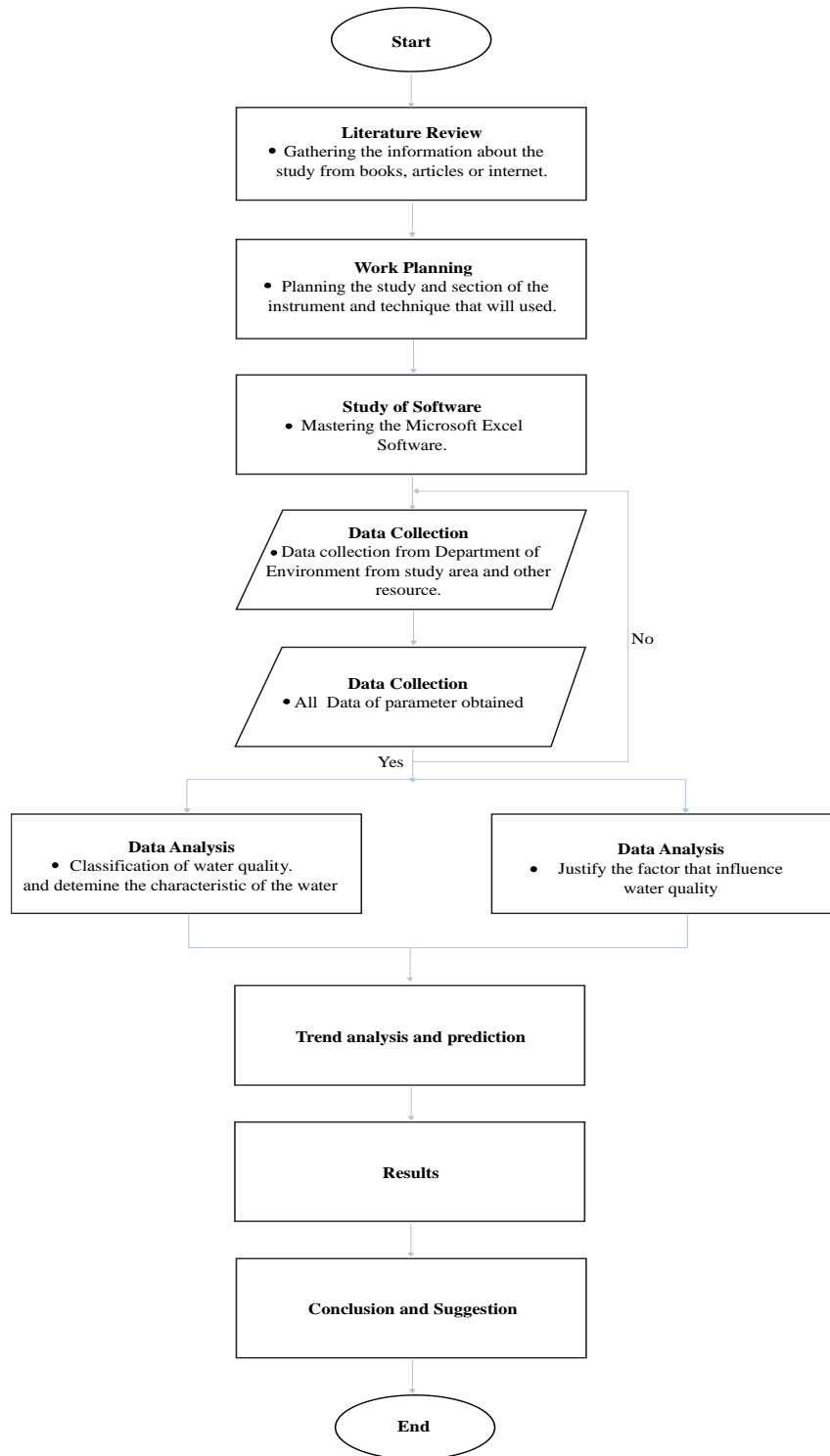
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│  Start  │
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┌──────────────────────────────┐
│ Literature Review            │
│ • Gathering the information  │
│   about the study from books,│
│   articles or internet.      │
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│ Work Planning                │
│ • Planning the study and     │
│   section of the instrument  │
│   and technique that will    │
│   used.                      │
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│ Study of Software            │
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│   Excel Software.            │
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  Data Collection
  • Data collection from Department of
    Environment from study area and other
    resource.
     │
  Data Collection                    No
  • All Data of parameter obtained ────→
     │ Yes
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Data Analysis
• Classification of water quality. and detemine the characteristic of the water

Data Analysis
• Justify the factor that influence water quality

Trend analysis and prediction

Results

Conclusion and Suggestion

End

Figure 1: Flowchart diagram of the Research Methodology

2.2 Specification

By following the National Water Quality Standard (NWQS) This classification is determined by the factor which is, hydrological, land use and physical properties to classified the highest section of a river. The parameters standard of water quality index of river in Malaysia is shown in Table 1 According to the standars NWQS the rivers can be classified into 6 class uses which is I, IIA, IIB, III, IV and V. (Table 2)

Table 1: Classification of Water Quality Index of River in Malaysia

Parameter	Unit	Class				
		I	II	III	IV	V
pH	-	> 7	6 - 7	5- 6	< 5	> 5
Dissolved Oxygen (DO)	mg/L	> 7	5 - 7	3 - 5	1 - 3	< 1
Biochemical Oxygen (BOD)	mg/L	< 1	1 - 3	3- 6	6 - 12	> 12
Chemical Oxygen Demand (COD)	mg/L	< 10	10 - 25	25 - 50	50 - 100	> 100
Suspended Solids (SS)	mg/L	< 25	25 - 50	50 - 150	150 - 100	> 300
Ammonial Nitrogen (AN)	mg/L	< 0.1	0.1 – 0.3	0.3 – 0.9	0.9 – 2.7	> 2.7
Water Quality Index (WQI)	-	< 92.7	76.5 – 92.7	51.9 – 76.5	31.0 – 51.9	> 31.0

Table 2 : Classification of Water Quality of River in Malaysia Based on Type of Uses

Class	Uses	Pollution level
I	Conservation of natural environment	Clean
	Water supply I – Practically no treatment required	
	Fishery I – Very Sensitive aquatic species	
IIA	Water supply II – Conventional treatment	Polluted
	Fishery II – sensitive aquatic species	
IIB	Recreational body contact	Polluted
III	Watery supply III – Extensive treatment required	Very Polluted
	Fishery III – Common, of economic value and tolerant species; livestock drinking	
IV	Irrigation	Very Polluted
V	None of the above	Severly contaminated

2.3 Functions

By using Microsoft Excel, the TREND function is used to spot a trend or pattern for a data in a sequential period of time. As past research is using data processing software such as Excel, Data

processing system (DPS), SPSS19 and other software [6]. By using the value of class of uses and water quality index, Microsoft excel can help to process the trend of the future data for the river.

3. Results and Discussion

Four parameters of water quality were analyzed into trend and prediction which is Suspended Solids (SS), Biochemical Oxygen Demand (BOD), Ammonia Nitrogen (AN) and Water Quality Index (WQI). The data from 2016-2020 is obtained from Jabatan Alam Sekitar (JAS).
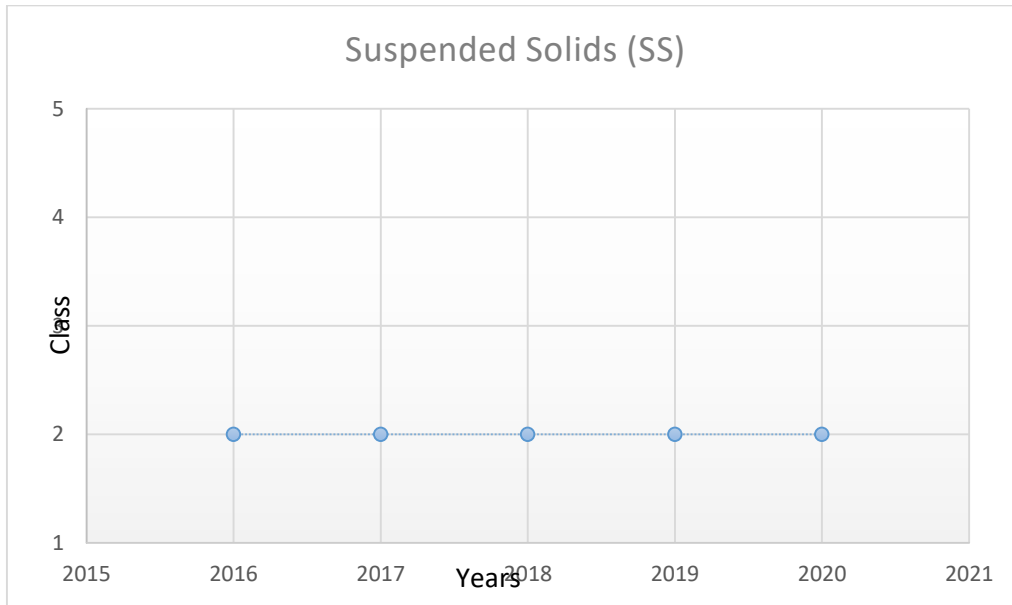
3.1 Results

Figure 2: Suspended Solids Classes in Sungai Sg. Petani

From The Figure 2, of suspended solids data from year 2016 to 2020 at Sungai Sg.Petani shows that flat graph, which indicates that the suspended solid majorly contributed from inorganic material such as erosion and run-off surface, while organic material such as algae content is feed naturally and with human pollution. Human activity does not contribute as much to the content of suspended solids in the Sg. Petani river. In 5 years from present, the graph would be flat as the urbanization and developement along the rivers does not change as much. Natural pollutants known as suspended solids and cause turbidity in the river water. The higher number of suspended solids, was causes due to higher rates of soil erosion in the catchment areas[7].
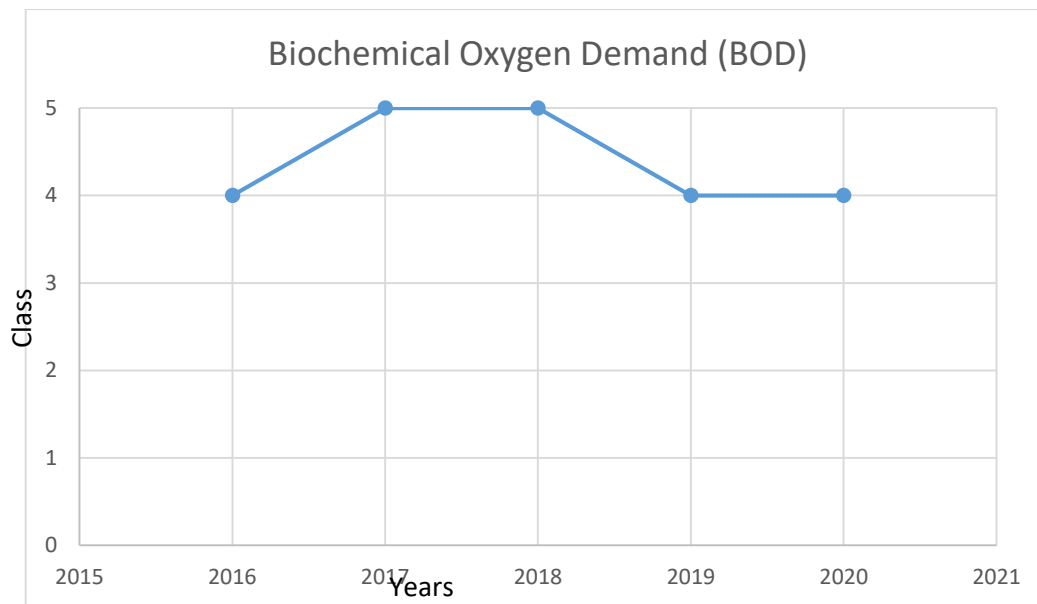
Figure 3: Biochemical Oxygen Demand In Sungai Sg. Petani

Observation from the Figure 3, of biochemical oxygen demand data from year 2016 to 2020 at Sungai Sg.Petani shows that in 2017 and 2018 is on class V. In 2017 the population and urbanization in Sungai Petani increase rapidly, and causes of BOD to increase is because of human activity until 2018 the number of activity of polluting the water being reduce. The activity of garabage disposal in 2017-2018 being reduce because of action by Organization such as JAS and MPSPK[8]. This indicates the level of biochemical oxygen demand in Sungai Sg. Petani through the 5 years period, According to previous findings the BOD in river
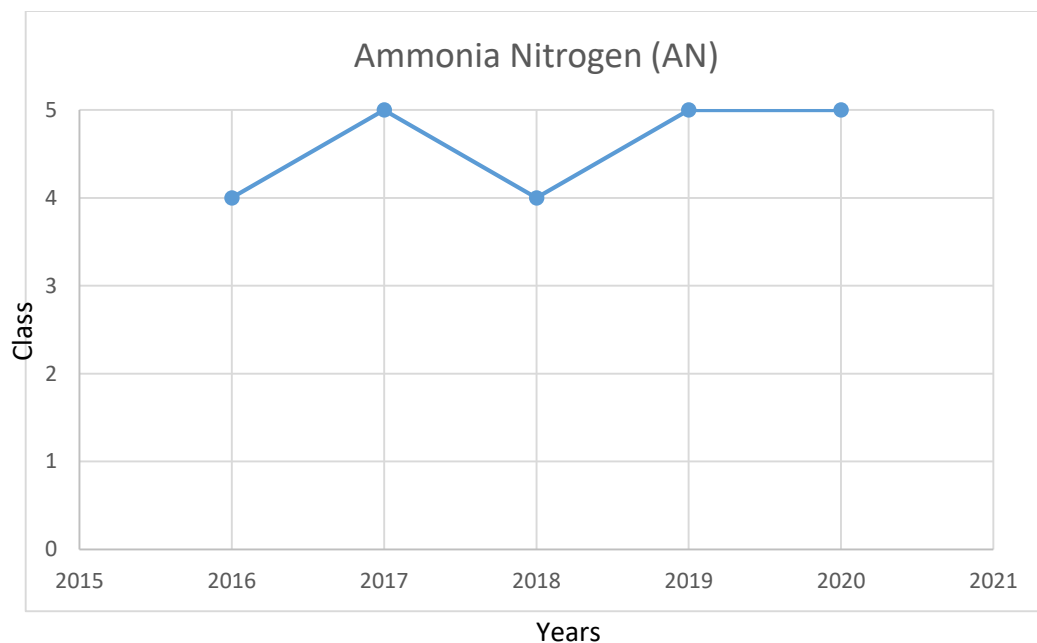

Figure 4: Ammonia Nitrogen In Sungai Sg. Petani

From The Figure 4, of Ammonia Nitrogen data from year 2016 to 2020 at Sungai Sg.Petani shows that in 2016 and 2018 is on class IV, which indicates the level of Ammonia nitrogen dropped and back up to its amount again in Sungai Sg. Petani through the 5 years period. In 2017, the crisis of garbage disposal it also involve crop production and farm fertilizer being thrown into the river and polluting the river. But the agriculture activities still going on around the river that cannot be avoid. Along the river

there are mangrove, this is also contribute to a higher value of ammonia nitrogen in the river. Mangroves is a part of agriculture activity that use the product that contain chemical that help increases the content of ammonia nitrate[9]. 5 years in the future, the graph would be the same pattern, from previous 5 years trend because of how the activity around affecting it. According to previous findings the the amount of ammonia nitrate in the river is because of organic compound or from industrial [10].
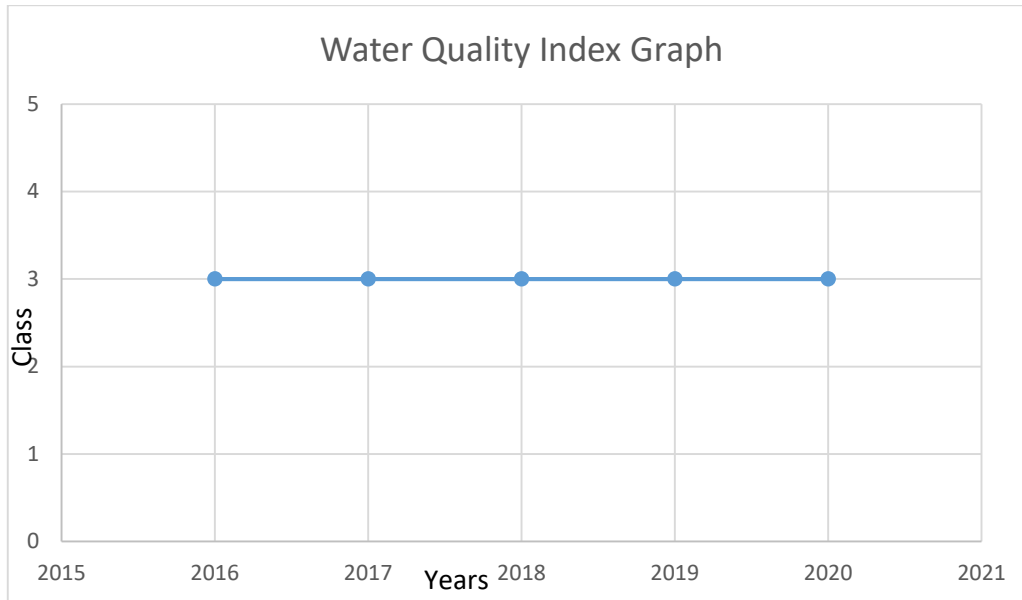

Figure 5: Water Quality Index In Sungai Sg. Petani

Table 3: Biochemical Oxygen Demand In Sungai Sg. Petani

YEARS	2016	2017	2018	2019	2020
CLASS	3	3	3	3	3
WQI	54	60	56	54	54

From The Figure 5, of Ammonia Nitrogen data from year 2016 to 2020 at Sungai Sg.Petani shows through out 5 years it was in class III, which indicates that the river quality is very polluted. **Table 3** shows the value of wqi which starting 2018 its getting consistent at 54. In 2017 the pollution on the river getting worse because the increase in Ammonia Nitrogen and Biochemical Oxygen Demand. After 2018 the value of WQI dropped because SAHABAT Alam Malaysia(SAM) have ordered the MPSPK and JAS to take an action of anything involve pollution on the river. With the laws and regulation from SAM the value of WQI will stay consistent and reduced as the pollution being prevented.

4. Conclusion

From the parameters collected and processed into trend. The water quality in Sungai Sg. Petani will be at class III. For Ammonia Nitrate and Biochemical demand oxygen would be at class IV. Conclusion from this project is that the river is polluted where we can see from water quality index from past 5 years shows the number stays around 50-60 which is in class III. Based on the result it shows that the amount of ammonia nitrate is the main contribution to pollution because it is in class III, which indicates that on this river there are nitrate is major in farm fertilizer and it is needed for crop production because the area along the river is close to farm activities.

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