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Water Pollution Analysis in Yogyakarta Special Region In 2019

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ABSTRACT

The environment and natural resources are inputs in economic activities that have an impact on economic growth. On the other hand, economic activity can cause economic externalities. One form of environmental pollution is water pollution. Water pollution is a change in conditions in a water reservoir such as lakes, rivers, oceans and groundwater due to human activities. WHO (2019) globally, 15% of patients experience disease infections due to polluted water? Furthermore, WHO (2019) stated that around 829,000 people are estimated to die every year due to diarrhea and of them 297,000 children under 5 years old die from consuming unhealthy drinking water. The purpose of this study was to analyze water pollution in the Province of the Special Region of Yogyakarta (DIY) Indonesia. The research method used is a descriptive qualitative approach, the selection of this method aims to analyze the situation descriptively about the water quality index in DIY. The results showed that the water quality index of the Special Region of Yogyakarta was 38.43 or entered the alert category. The rivers in DIY in 2019 that have an alert category are Gajahwong, Kuning, Conteng, Belik, and Bulus. The policy implication that can be done is tightening the regulation of river functions.

Keywords: Environment, Water Pollution, Yogyakarta

JEL Classification: M00, M20, M29

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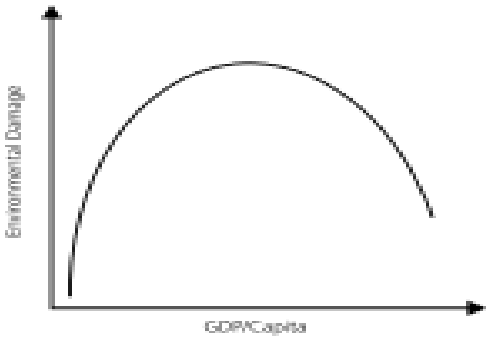
INTRODUCTION

Over time, the relationship between economic development and the environment has become an issue that is increasingly debated on a national and even global scale. Efforts to fulfill the needs of human life which are increasingly increasing give a signal to the industry to carry out the production of the necessities of life which is increasing. The goal of an industry is to maximize profits, this profit maximization effort encourages the industry to dispose of waste directly in order to cut production costs. Efforts to improve the economy carried out by the government for the welfare of the community have a negative relationship with the quality of the environment. Developing countries with low incomes are not concerned with environmental damage, they are more concerned with meeting basic consumption needs. The correlation between the environment and economic growth is described by the Environmental Kuznets Curve (EKC) (Everett et al., 2010)



The Environmental Kuznets Curve illustrates that in low incomes, environmental pollution is not really cared for, people are more concerned with how to fulfill their daily needs. When income begins to enter the upper middle income, environmental pollution issues are starting to be cared for but are still in the middle stage. At high incomes where environmental pollution has begun to be considered, consumers begin to think about how to fulfill the needs of a sustainable life.

One form of environmental pollution is water pollution. Water pollution is a condition that changes in water reservoirs such as rivers, reservoirs, lakes, oceans and groundwater due to human activities. Water pollution is a global problem today, around 1,400 people die every day as a result of water pollution (FN & MF, 2017). WHO (2019) Globally, 15% of patients experience infectious diseases due to polluted water such as cholera, diarrhea, dysentery, hepatitis A, typhoid and polio, with the proportion of developing countries having higher scores. Furthermore, WHO (2019) stated that approximately 829,000 people died within one year, this was due to diarrheal diseases and of them 297,000 children under 5 years of age died from consuming unsafe drinking water.

Indonesia is a country that is ranked 132 out of 180 countries with safe drinking water quality, with a growth of 5 points from the last ten years (EPI, 2020). The national water quality index from 2015 to 2017 was included in the fairly good quality category, then in 2018 it increased with a value of 72.77 or entered the good quality category. However, the water quality index in 2019 has decreased with a value of 52.62 which is included in the poor category (Ministry of Environment and Forestry RI, 2020). Based on these data, it can be said that the water quality index in Indonesia is not good for consumption.

The Province of the DIY is a province that has the lowest Water Quality Index value among 34 provinces in Indonesia with a value of 35.37 or is included in the very poor category (Ministry of Environment and Forestry RI, 2020). This shows that the Water Quality Index of the DIY the worst water quality in Indonesia. Activities carried out on how upstream rivers such as industrial activities, resettlement, agriculture and mining are factors that contribute to water pollution (Hanisa et al., 2017). The existence of a pattern of land use into agricultural land, upland and settlements as well as an increase in industry will have an impact on the hydrological conditions in a watershed (DAS) (Idrus, 2014). Various human activities in an effort to meet the needs of life originating from industrial, household and agricultural activities will produce waste that has a negative impact on river water quality. Various industrial wastes that are discharged into rivers without prior treatment are one of the main causes of water pollution (Desai and Vanitaben, 2014). The causes of water pollution include industrialization, plastics, pesticides, fertilizers, sewage, population growth, urbanization, eutrophication, mining, agro-chemical waste, thermal pollution, oil spills, sediment disturbance, acid rain pollution, radioactive waste, climate change and others. others (Kilic, 2021).

LITERATURE REVIEW

Water Quality Index

The water quality index is obtained from the analysis of river water quality data that is monitored from 10 rivers that are under the authority of the province in each region. Monitoring of the 10 rivers was carried out in two stages, namely in the rainy season and in the dry season by dividing 50 monitoring points. The determination of monitoring points is based on the characteristics of each area of the Yogyakarta Special Blood Environment and Forestry Service, 2020).

The water quality standard is a tool to measure the limits or levels of living things contained in water, energy, substances or components that exist or which should have elements of pollution that are tolerated in the water. Quality classification is set into four types, namely:

a. Type I: water whose function can be used by humans as drinking water for consumption.
b. Type II: water whose use is for water recreation facilities, freshwater fish cultivation, animal husbandry, irrigating agriculture, and intended for similar activities.
c. Type III: water that is used as water intended for freshwater fish cultivation, animal husbandry, water for irrigating plants, and intended for similar activities.
d. Type IV: the use of this water is to drain water on plants and other things in similar activities.

According to Governor Regulation Number 20 of 2018, there are 3 parameters used to analyze river water quality, namely:

1. 6 physical parameters (temperature, odor, turbidity, color, TDS, TSS)
2. 28 chemical parameters (DO, BOD, COD, TSS, TDS, PO4, etc.)
3. 2 microbiological parameters: Fesal Coli and Total Califon

Water Pollution

According to government regulation No. 82 of 2001, Water pollution occurs due to the presence of living things, substances, energy, and or other elements that enter the water, this occurs by human actions, it causes water quality to decrease to a certain level which causes water to not function as water in general. Water pollution is where water contains several substances in such a way that the water cannot be consumed (Fow, 2016). Water pollution is substances that are mixed with water, changes the

physical, chemical and biological properties of water, damages the natural structure and causes changes that endanger the health of humans and living things (Kilic, 2021)

Water pollution has many negative effects on entire ecosystems, especially on humans and sea creatures. The results of a study conducted by Telussa et al., (2019) found that water pollution causes the death of aquatic biota. Ummi & Akhliyah (2016) found that the impact of water pollution is the contamination of agricultural land, clean water sources, and decreased river quality. Environmental pollution affects environmental functions both biotic and social (Puspitasari, 2009)

RESEARCH METHOD

The research method used is a descriptive qualitative approach, the selection of this method aims to analyze the situation descriptively about the water quality index in Special Region of Yogyakarta. The data used is secondary data obtained from the report of the Ministry of Environment and Forestry of the Republic of Indonesia in 2020 and the report from the Ministry of Environment and Forestry in the Special Region of Yogyakarta in 2020.

RESULTS

The water quality standard follows the criteria set out in the Regulation of the Governor of the Special Region of Yogyakarta Number 20 of 2008, 2008 regarding the water quality standard in the Province of the Special Region of Yogyakarta. Standard water is a measure of the level of living things, substances, energy, or components that contain elements of pollution that are acceptable in the water.

Classification of water quality in the class of microbiological parameters according to the Regulation of the Governor of the Special Region of Yogyakarta No. 20 of 2008 as follows:

a. Parameters of Total Coliform (Amount/100ml)
   Type I = 1000; Type II=5,000; Type III = 10,000; Type IV=10,000
b. Colifor fecal parameters (amount/ 100ml)
   Type I= 100; Type II=1,000; Type III=2,000; Type IV=20,000
   The following is a table of DIY microbiological parameter values in 2019

Table 1. DIY Microbiological Parameter Values in 2019

River	*Total Coliform*	*Fecal Colifor*	Total Coliform Class	Fecal Colifor Class
Winongo	7.225	45.438	Class II	Class II
Code	41.798	2.013.604	Class III	Class IV
Gajahwong	26.348.950	26.763.875	Class IV	Class IV
Tambakbayan	11.200	14.975	Class III	Class II
Kuning	30.950	30.950	Class III	Class II
Konteng	905.750	905.750	Class IV	Class IV
Bedog	10.266	50.360	Class s III	Class III
Belik	31.405.667	31.642.333	Class IV	Class IV
Bulus	70.000	210.000	Class III	Class IV
Oyo	2.665	2.783	Class I	Class II

Source: Ministry of Environment and Forestry DIY, 2020

Pollution Index

Pollution Index (IP) is a water quality analysis method to evaluate water pollution. The Pollution Index method is the result of the relative calculation between observations and quality standards (Marganingrum et al., 2013). Water quality assessment categories based on the Pollution Index value (Decree of the State Minister of the Environment, 2003):

Meets Quality Standards : Pollution Index 1
Lightly polluted : 1 Pollution Index 5
Moderately polluted : 5 < Pollution Index 10
Heavy Polluted : Pollution Index > 10
The following is the Pollution Index value of 10 rivers in DIY Province in 2019

Table 2. Pollution Index Value of 10 Rivers in DIY Province in 2019

River	Wacth Point	Pollution Index	Category
Winongo	8	5,319	Medium Polluted
Code	8	6,801	Medium Polluted
Gajahwong	4	5,515	Medium Polluted
Tambakbayan	4	5,254	Medium Polluted
Kuning	4	7,496	Medium Polluted
Konteng	5	11,416	Heavily Polluted
Bedog	5	5,765	Medium Polluted
Belik	3	10,960	Heavily Polluted
Bulus	2	6,465	Medium Polluted
Oyo	4	4,660	Lightly Polluted

Source: Ministry of Environment and Forestry DIY, 2020

DIY Water Quality Index

Water quality data is data from direct measurements that represent the upstream, middle and downstream areas of the 15 priority watersheds in each province. Data is obtained from each monitoring point 2-4 times representing the conditions of the rainy season and dry season (Ministry of Environment and Forestry, 2019).

The ten rivers that represent all rivers in the province of the DIY are the Oyo River, Kining River, Tambakbayan River, Gajahwong River, Belik River, Code River, Winongo River, Bedog River, Koteng River, and Bulus River. Categorization of good and bad water quality can be seen in the following table:

Table 2. Predicate of DIY River and Water Quality Index Value in 2019

Predicate	**Score**	**River**
Very Good	IKA>70	-
Good	60< IKA≤70	-
Pretty Good	50< IKA≤60	-
Not Good	40< IKA≤50	Winongo, Code, Tambakbayan, Bedog, dan Oyo
Very Not Good	30< IKA≤40	Gajawong, Kuning, Konteng, Bulus dan Belik
Alert	≤30	-

Source: Ministry of Environment and Forestry DIY, 2020

DISCUSSION

Based on table 1 on the assessment of microbiological parameters in ten rivers in DIY Province in 2019 it can be explained as follows:
- Winongo River in the Total Coliform class and Fecal Colifor class into class II, which means the Winongo river can be used as a means of entertainment, fish cultivation, animal husbandry, for irrigating rice fields and similar activities.
- The Code River in the Total Coliform class is classified as class III, which means that the Code River can only be used for freshwater fish farming, animal husbandry, and water to irrigate crops, while in the Fecal Coliform Class, the Code River is classified as class IV where it is only intended to irrigate plants and the like.
- Gajahwong River in the Total Coliform class and Fecal Colifor class into class IV, which means that the Gajahwong river can only be used for plant irrigation activities
- The Tambakbayan River in the Total Coliform class is included in class III, which means that the Tambakbayan can only be used for freshwater fish cultivation, animal husbandry, water for irrigating plants, while in the Fecal Colifor class the Tambakbayan river is included in class II, meaning this river only intended for entertainment, fish farming, animal husbandry, rice field irrigation and similar activities.
- The Yellow River in the Total Coliform class is included in class III, meaning that this river is intended for freshwater fish cultivation, animal husbandry, water for irrigating plants, while in the Fecal Coliform class this river is included in class II, meaning that this river can be used as a means of entertainment, fish cultivation, animal husbandry, for irrigating rice fields and similar activities.
- Contents River in the Total Coliform class and the Fecal Colifor class into class IV, meaning that this river can only be used to irrigate crops.
- The Bedog River is in the Total Coliform class and the Fecal Colifor class is included in class III, meaning that this river is intended for freshwater fish cultivation, animal husbandry, water for irrigating crops
- Belik River in the Total Coliform class and Fecal Colifor class into class IV, meaning that this river can only be used for plant waters.
- Bulus River in the Total Coliform class and Fecal Colifor class into class IV, meaning that this river can only be used for plant waters.
- The Oyo River in the Total Coliform class belongs to class I, where the water in the river can be consumed by humans and other living things, while in the Fecal Colifor class the Oyo river is classified into class II, meaning that the Oyo river can be used as a means of entertainment, cultivation fish, livestock, as irrigating rice fields and similar activities.

Based on the Pollution index value, it shows that the only river that is categorized as lightly polluted is the Oyo River. Rivers that fall into the moderately polluted category are the Winongo River, Code River, Gajahwong River, Tambakbayan River, Yellow River, Contentg River, and Bulus River. Rivers that fall into the rice polluted category are the Kateng and Belik rivers. The DIY Water Quality Index in 2019 shows that rivers that have a poor Water Quality Index are the Winongo, Code, Tambakbayan, Bedog, and Oyo rivers. Rivers that have a very poor Water Quality Index are the Gajawong, Kuning, Contentg, Bulus and Belik rivers.

The results of research conducted by (Mubarok & Supryayogi, 2019) who conducted research related to the study of pollution characteristics of the upper Belik River found that the status of water pollution levels in terms of pH, TSS, TDS, BOD, Detergent, Nitrate, and Phosphate parameters, namely experiencing pollution heavy. The results of research that conducted research related to the water quality of the Belik River (Ramadan & Widyastuti, 2019).

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CONCLUSION

Finally, the results of the 2019 DIY Water Quality Index data, the 2019 DIY Water Quality Index shows that rivers that have a poor Water Quality Index are the Winongo, Code, Tambakbayan, Bedog, and Oyo rivers. Rivers that have a very poor Water Quality Index are the Gajawong, Kuning, Contentg, Bulus and Belik rivers.

Suggestion

Researchers suggest the government to conduct socialization to the people who are on the banks of the river in order to maintain the cleanliness of the river. The government is expected to be active in this outreach because public awareness of the importance of maintaining water quality is still very low, as seen from the water quality index in DIY which is in the very poor category.

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DECLARATION OF CONFLICTING INTERESTS

The author declares that there is no conflict of interest, financially or non-financially related to this research.

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