Chemical Concepts

International Journal of Chemical Concepts
ISSN:2395-4256 www.chemconsai.com
Vol.04, No.02, pp 97-104, 2018

The Quality of Physical and Chemical the Waters of the Arbes Ambon

Muhammad rijal*[1], Moh. Amin[2], Fathur Rochman[2], Endang Suarsini[2], Nur Alim N[1]

[1]*Institute Of Islamic Ambon, Dr. Tarmizi taher Street, 97128, Maluku, Indonesia
[2]Malang State University, Semarang 5 Street, 65145, East Java, Indonesia

Abstract : Water is a basic requirement for all this earth organisms, especially for clean water. There are many things that can affect the quality of the water so it doesn't deserve to be consumed, such as polluted by domestic waste, agriculture, and industry. The Arbes is a source of raw drinking water community of Ambon Indonesian that physically and chemically has showed a decrease in quality which is characterized by an increase in temperature, pH, BOD and COD
keywords*:* Arbes, chemical, quality of water, physical

1. Introduction

Water is basic needs for the life of all organisms on earth, for most of the body of a living organism are arranged by water. Structure of the cells of a living organism compiled about 75 % 85 % of them by water and the rest is a component of organic compounds like a carbohydrate, proteins, and fats. There is no a life lasted well if not supported by water availability in sufficient quantity, such as the cell cannot do at its metabolic activity, if there is no water may this water serve as catalyst who participated in reaction important in metabolism in a cell. One source of fresh water in the face of this is a river that is a large tract of formed naturally that serves as the flow of water from the crest or slope of a mountain and ended at the sea. Ambon is one of the province who lies to east Indonesia, which many had a river and one of the very important role for the society is Arbes. Arbes is a river with length of about 10 km that unfolds ranging from the mountains Kehena came to Galala. Wide river on the upstream about 2,5 m with the depth of the average 5 m, the body sections river with wide average 1.75 m with the depth of the average 0,85 m, at the downstream having wide average 1.5 m with the depth of an average of 0.7 m. Arbes be used as a source of raw drinking water nearly half of the residents Ambon by means of install the pipe PDAM of the part of the upstream then sent to the homes of people, even many people who live around the flow of river to direct the use it as drinking water [1].

Other than as a source of raw drinking water directly by the PDAM, the Arbes also exploited as tourist attractions, washing, irrigation, and industrial scale farming households to large scale. Utilization of the Arbes as tourist places, washing, bathing, and agriculture is more dominant on the upper reaches, whereas in the body section of the river (middle) is more dominant used to wash, bathe, and domestic household waste disposal. The lower reaches of the river are used for industrial waste disposal activities, household and large scale industries. Utilization of the Arbes uncontrolled pose a major problem for the environment and human beings who have to look for the way out, either through extension with the use of biological agents.

Problems arise as a result of the activity of the Community industry, agriculture, and uncontrolled influx resulted in the waste of heavy metals, detergents, and fecal coliform into the river, and if the river water used by the community for the purposes of bathing and drinking, then it will have an impact on health issues, even to the point of death [2]. Impurities detergentsand fecal coliform allegedly more found on the upper and river center, this is due to the activity of washing and the dominant society urines on the upper reaches and

along streams. Detergents are commonly used by the public in the form of solids that contain surfactants and could result in lower water quality. The use of a large amount of detergents can increase the levels of temperature and pH of water. While the organic waste such as feces can increase levels of COD and BOD of water so as to lower the quality water [3].

2. Method

This research is descriptive research method of sequential design models or combinations of explanatory research that combines the quantitative and qualitative approaches in a sequence, where in the first stage of the research is done using quantitative methods and on the second stage is done by qualitative methods. Quantitative methods for obtaining quantitative data that are measurable and qualitative methods serves to prove, deepen, expresses the quantitative data have been obtained previously [4].The object in this study are: (1) physical-chemical water quality river Arbes Ambon which include: temperature, pH, BOD, COD, and (2) people who lived around the river flow Arbes with techniques of sampling is done using a purposive sampling technique. With sampling purposive sampling was done with the purpose and particular consideration where samples are discrete, the nature and specific characteristics [5]. The population was settled and the people who live in the catchment watershed Arbes so far 2 km which counted starting from the upper reaches. The determination of the location of the sample are people who live and reside in watershed catchment is estimated to affect the quality of the river water Arbes directly. Determination of the number of samples is carried out by methods of snowball sampling the number of samples needed to thrive at the time of data capture in the field and the amount deemed sufficient after samples give an answer with the same characteristics. The respondent society is the head of the family or housewives who live in the catchment and Arbes has stayed watershed for at least 5 years.

The research plant was implemented for 2 weeks which preceded by the observation location research and continued with the research field to capture data on the physical and chemical quality of water of the river due to impurities. In addition carried out a survey to the community who lived around the river and authorities related to the activity that caused the decreasing river water quality and strategy of processing. Tools used in this research are: sampling bottle water, burette acid/base, erlenmeyer, measuring cup, beaker, thermometer, digital pH, BOD/COD meter device, raffia rope, roll, and altimeter. The materials used are: phenoptalein, HCl, NaOH, aquadest sterile,and instrument in the form of the now about the community activities that cause declining water quality river Arbes. Field observations carried out to observe and analyze the condition of the area of research covers the activities of the community in utilizing the river for washing, bathing, and drinking. Sampling for the measurement of the quality of the river water which covers the physical and chemical conditions. every river water sampling point sampling done in grab samples (instantaneous shooting) and taken sample of the duplicate field (field duplicate sample) as independent sample 2 samples. According to Hadi, for a total sample of 5-10 sample then one (1) duplicate samples must be taken. Sample of the duplicate field is used for checking the overall good precision in-process sampling and analysis in the laboratory [6]. Next the water samples were taken to the laboratory for analysis.

In-depth interviews conducted to relevant agencies to obtain information on the problems of water pollution control policy and The Arbes as well as information obtained from other primary or secondary data. Information on the problems and policy control is used as the basis for the preparation of criteria and alternative strategies for controlling water pollution. Do a test sample water (pH and temperature), whereas for the COD and BOD measurement is performed in the laboratory. Data collection techniques include: (1) water quality data the Arbes retrieved from field testing and laboratory results, and (2) community activity data that affects the quality of the river water Arbes obtained through questionnaires and interviews. Data analysis is the examination or search for meaning from data obtained to find answers to the problem of research. Data analysis tailored to the research objectives to be achieved. Data analysis conducted included analysis of water quality of rivers Arbes and activity analysis of society.

3. Results

3.1. That causes pollution of the activity

Data about the activity of the society which led to water pollution in the river Arbes Ambon obtained through now are charging results by respondent, namely 10 people 5 respondents who settled around the upper

reaches of the river and 5 respondents who lived around the body (middle) River. General activity of the society is conducted by washing, bathing, agriculture, waste of plastic trash, feces or glass in to river, and drains the stool in to river through the pipeline. For more details can be seen in table 1

Table 1. That causes pollution of the activity

No	Questions indicator	Frequence		Percentage (100%)	
		Yes	No	Yes	No
1	Use for bathing.	10	0	100	0
2	Use to wash clothes.	10	0	100	0
3	Dispose of bottles, cans, glass into the river.	6	4	60	40
4	Shitting into a river.	4	6	40	60
5	Tillage around the river.	5	5	50	50
6	Place of rekresiasi.	10	0	100	0
7	Have the septic tanks.	6	4	60	40
8	Dispose of used oil	3	7	30	70

Table 1 indicates that there are many community activities which is the cause of the contamination of river water Arbes. Most of the activities carried out by the community who contributed most of the pollution is washing, bathing, recreation, and the stool that comes directly or flowing from the homes of residents who don't have septic tanks. Washing and bathing activities provides a very large influx of impurities detergents that can increase the temperature and pH of water, while the leisure activities and the exile of the stool gives you a chance of inclusion of organic materials into the river which led to the increasing levels of COD and BOD. Physical-chemical factors are indicators of a very simple and powerful to determine the quality of a contaminated water [7].

3.2. Temperature

Results of measurements of the temperature of the river water Arbes from point 1 to point 10 shows that the water temperature ranges between 30-35^{0}C. The highest temperature reached 33^{0}C in point 6-7 and the lowest temperature is 30^{0}C in point 1-5. The temperature conditions were still in the raw water quality thresholds according to Government Regulation No. 82 of 2001, where raw water quality class II requires that the temperature of the river water has a different deviation 3^{0}C natural temperature conditions of the surrounding environment. An average air temperature of DAS Arbes range between 29-30^{0}C. Data about the temperature of the river water Arbes from point 1-10 can be seen in table 2

Table 2. The water temperature measurements Arbes river

Sampling point	Temperature ^{0}C	Government Regulation No. 82 of 2001 (Class-)				Information Meet the class -
		I	II	III	IV	
1	30	3	3	3	5	Class I
2	30					Class I
3	30					Class I
4	30					Class I
5	30					Class I
6	33					Class I
7	33					Class I
8	33					Class I
9	33					Class I
10	33					Class I
Average	31,5					Class I

High low temperature of the river water is influenced by the temperature of the surrounding air. In addition, the intensity of sun exposure that goes into a body of water as well as the density of the vegetation around the river water would also affect the temperature of the river water. The intensity of the Sun is affected by cloud cover, season, and time of day. The more the intensity of sunlight on a body of water then it will make the temperature of the river water is getting high [8]. Similarly, the more and the more dense the vegetation around the banks of water then it will make the air temperature around a lower temperature of the river water is also getting lower. On point 3, 6 and 7 water temperature caused by the intensity of the sunlight coming into the body of water is quite high due to the location of the sample measurement is an open area exposed to sunlight directly. Temperature measurement of begins to point 1 to point 7 is done during the day at 10.55 – 13.15 WIB. At the time of measurement temperature, the weather is very hot and bright sky without a cloud so that the intensity of the Sun's entry into a body of water is quite high.

An increase in temperature will cause an increase in the speed of metabolism and respiration of organisms water resulting in increased consumption of oxygen. Rising temperatures have also led to an increase in organic matter decomposition by microbes so that levels of BOD in water will also increase. The range of optimum temperature for the growth of phytoplankton in waters ranging from 20 ^{0}C – 30 ^{0}C [9]. This suggests that the river water temperature conditions can interfere with the growth of the Arbes phytoplankton because the optimum temperature for growth was exceeded

3.3. pH

Results of measurements of the pH of the water stream water pH indicates the Arbes from point 1 to point 5 are at normal conditions has a pH of 7, while on the point of 6-10 are also still in normal conditions with a pH value is 8,5. The degree of acidity on point 1-5 (upstream) and point 6-10 (middle) were still in the raw threshold quality of river water class I to class IV. Data about the pH of water the river can be seen in table 3

Table 3. The water pH measurements Arbes river

Sampling point	pH	Government Regulation No. 82 of 2001 (Class-)				Information Meet the class -
		I	II	III	IV	
1	7	6-9	6-9	6-9	<5->9	Class I
2	7					Class I
3	7					Class I
4	7					Class I
5	7					Class I
6	8,5					Class I
7	8,5					Class I
8	8,5					Class I
9	8,5					Class I
10	8,5					Class I
Average	7,75					Class I

The degree of acidity (pH) water showed the presence of hydrogen ions in the water. This is due to the hydrogen ions are acidic. Most of the aquatic biota are sensitive to changes in pH [10]. The opinion refers to the pH of the water stream Arbes can still support life organisms indicate that the water so can live well

3.4. BOD

Based on the results of the measurement of BOD Arbes river water from point 1 to point 10 shows the value of BOD ranging between 3-10.5 mg/L. concentrations of BOD in points 5-7 has exceeded the threshold value of river water quality class II, whereas in point 8-10 has exceeded the threshold value of river water quality class III. Data about the value of BOD Arbes river water can be seen in table 4

Table 4. The water BOD measurements Arbes river

Sampling point	BOD (mg/L)	Government Regulation No. 82 of 2001 (Class-)				Information Meet the class -
		I	II	III	IV	
1	3	2	3	6	12	Class II
2	2					Class II
3	3					Class II
4	3					Class II
5	5					>Class II
6	4					> Class II
7	4					> Class II
8	7					> Class III
9	8					> Class III
10	10,5					> Class III
Rerata	4,95					> Class II

The value of BOD from upstream into the body (middle) River tend to be volatile. The lowest value for BOD there is on point 1 and the highest point is at 10. This condition is related to the activity of the society point 5-10 high which include bathing, washing and bowel movements especially in point 8-10. The society's activities led to increased organic matter in river water. Waters that have a value of BOD over 10 mg/L is considered to have been subjected to contamination. An increase in the value of BOD in river water from upstream into the body (middle) shows that the river has experienced the Arbes pollution especially in the central region. The level of pollution of the river water in the middle of the Arbes is high and includes a category of bad water. It refers to the opinion of Salmin, that a low level of contaminant waters and could be categorized as a good waters, the levels of oxygen biochemistry (BOD) ranged from 0-10 ppm [11]

3.5. COD

Results of measurements of parameters of river water COD Arbes in point 1 to point 7 shows the value of COD ranging between 5.75-58.97 mg/L. Concentrations of COD from the upstream to the downstream is likely to increase. The high concentration of COD are associated with the presence of organic matter in water. Data on COD values the Arbes river water can be seen in table 5

Table 5. The water COD measurements Arbes river

Sampling point	BOD (mg/L)	Government Regulation No. 82 of 2001 (Class-)				Information Meet the class -
		I	II	III	IV	
1	7,80	10	25	50	100	Class I
2	5,75					Class I
3	6,58					Class I
4	5,55					Class I
5	10,24					Class II
6	17,89					Class II
7	25,70					Class III
8	32,18					Class III
9	58,90					Class IV
10	58,97					Class IV
Rerata	22,956					> Class II

On point 5 concentrations of COD has increased when compared to the points 1-4. This relates to the activity of the community that use river water for bathing, Arbes wash and defecation. The society's activities led to increased organic matter in river water. The highest COD concentration occurs at the point of 10 that

reaches 58,97 mg/L. Concentrations of COD at this point has surpassed the raw river water quality Classes II and III. This is due to the activity of the community in disposing of domestic waste into the river containing organic ingredients. According to Effendi, the presence of organic material in the water can be derived from nature or the activity of households and industry [9]. The value of COD in the waters of the uncontaminated is usually less than 20 mg/L, and the waters that have highly undesirable COD for fishing and agricultural activities [12]. Based on concentrations of COD in river water at the sampling point 7-10 is > 20 mg/L indicating that the Arbes has experienced the pollution.

4. Discussion

Based on the testing the quality of physical and chemical Arbes, water of a river then known that the waters which have been used as a source of raw drinking water pollution has shown a symptom caused by the activity of people living near the river. The activity of causing the contamination of the water of the washing, includes: a bath, disposing of sewage domestic in to river, agriculture, and other. To overcome the spread of the impact of pollution Arbes, water of a river then efforts to combat, needs to be done either directly or indirectly. Prevention directly is to provide guidance to the public about the importance of maintaining cleanliness of a river, and indirectly is through cited environmental education as material learning (integrated in environmental knowledge) with the hope that the students have been taught can be applied in the community.

The results of the observation show that the frequency of the activity of washing local residents river Arbes of upstream until the middle of very large which is about 50 people / day with a donation pollution for detergents 150 cm^3/day. You can imagine within brackets time one week will be produced pollution for detergents as many as 1050 cm^3 and everything disposed kesungai without through processing. The result of preliminary observations also show that almost all people who live around the river Arbes not having septic tank, people just make pipe as a sewer feces and ended up at the river. Can't be denied that nature having the ability to recover the condition ' s own by using an organism to be around, but the extent to which nature can do it if human activities resulting in the damage are increasing and uncontrolled. As with any heavy metal waste, detergents are also very dangerous because it can reduce the quality water loss, and will have an impact on the health and balance of an ecosystem. The mass death of fish in the case of the ciliwung river caused by increasing the pH of the stream and the dissolved oxygen levels decline caused by detergents waste. In addition, the cases of the skin disease that strikes people who lived around the ciliwung river due to increasing levels of posfat and sulphur river water by waste detergents and still many other cases caused by detergents waste. Waste detergents that is too large will result in CO_2 water levels will rise and if that happens, then it will result in the occurrence of toxicity on aquatic organisms including humans who use the water as a source of raw drinking water [13].

In addition to the problem of waste detergents waste, feces is also needs to be a serious concern. The presence of fecal coliform on water caused by the activity of the society that throw feces directly in to river or derived from the well water catchmen water source originates from a river contaminated by feces. Water contaminated by fecal coliform can cause diarrheal disease, typhus, cholera and other diseases impacting upon death. Cases that occurred in the community in East Nusatenggara who consume water that is contaminated by fecal coliform alleged result in death due to acute diarrhea-stricken toddler. In addition the same case happened in Nias Islands that resulted in the deaths of hundreds of toddlers due to ingestion of drinking water contaminated milk as mixed E. *coli* [14].There are many business that can be done to preserve the environment, in this is water that is a source of life all orgnaisms. Start by means of putting waste in place, counseling, the application of sanctions, came to the use of a nature to remediation the waste which already exist in the water. According to zainuddin, that aquatic plants having the ability in general to neutralize certain components in the waters, and that is very useful in processing liquid waste [15]. Suriawiria, suggest that the arrangement of aquatic plants in a small land in the pool of processing can serve as a sieve life for liquid waste that is passed on land. It is indicated that the ability of aquatic plants for filtering materials that is soluble in liquid waste of potential to become part of an effort pureit liquid waste [14].The research by Diah Agustiningsih about the study of water quality of the river Kendal in an effort to control of water pollution river show that the activity of residential provide input the burden of pollution to rivers Kendal highest. Loads of pollution BOD settlement of 641,75 kg/day; agriculture 284,32 kg/day; and industry 8,23 kg/day. The activity of people who use the waters of the Kendal as a bath, washing and defecate provide input the burden of organic pollutants into the river Kendal. The activity of agriculture due to the use of fertilizers and pesticides that excessive as well as the

processing industries fish that has not been processing water the waste accurately also provide input burden contaminant into the river Kendal [15].

After going through the survey related to the activity of the society led to the pollution of the river water and reinforced with physical-chemical tests river water, then there are a lot of solutions offered to minimize the impact of the pollution. The solution offered is an effort to control pollution levels which are more severe. The efforts that have been undertaken are: (1) conveys to the community about the condition of the river water has been contaminated Arbes, (2) conduct outreach with community-based family who lived on nearby Arbes streams that have a habit of disposing of household wastes into the river, (3) conducting outreach to communities that do not have a septic tank septic tank of the importance as a reservoir of feces so that river water was not contaminated by the bacteria causes diarrhea and typhus, (4) conducting outreach to the community not to use heavy detergents with high levels of surfactant because it can lower the quality of the river water, (5) crafting learning modules about water contaminants and attempts to resolve it. Hopes of drafting this module is so that students have the knowledge about the importance of water and are able to spread their knowledge to the community.

5. Conclusion

The conclusion that can be drawn from the results of this study are: (1) the activity of the community living around the river flow which causes decreased quality Arbes water are: washing, bathing, waste palstic/glass/exhaust cans, the stools, the opening of the fields, the absence of a septic tank, the river was used as a place for recreation, and the disposal of used oil into the river, (2) The quality river water based on the physical -chemistry shows that the average temperature of the water of the river is 32^0C; the average pH of water is 7,75; average BOD is 4.95 ppm; average COD is 22,956 ppm; and (3) efforts are being made to address the impact of declining water quality river Arbes is to do family-based extension in hopes that the behavior of the associated community waste directly into the river can be minimised, so that the burden of pollution entering the river a little more.

6. Suggestion

Suggestions that can has been said are: (1) expected to do physical-chemical water testing of the others to ensure the level of pollution Arbes which includes: test sulfur levels, levels of nitrate, nitrite, levels of phosfat, the levels of oils and fats, as well as the alkalinity of water, (2) expected to do fecal testing water content of coliform in Arbes to see what extent the level of impurities in microbiology, (3) are expected to perform measurements of the levels of heavy metals as a result of impurities from waste plastic waste, cans, oil, or other domestic waste that might eventually lead to the inclusion of heavy metals into the river, and (4) are expected to conduct searches of biological agents to reduce the impact of pollution on river water Arbes, both of microbes, plants, and animals.

7. References

1. Tafangenyasha, C. and T. Dzinomwa. “Land-use Impacts on River Water Quality in Lowveld Sand River Systems in South-East Zimbabwe”. Land Use and Water Resources Research, Vol.5 (3.1-3.10), 2005.
2. Marfai, M. A., D. Mardiatno, S. R, giyarsih, suyono, Halengkara, Rahmawati, noor ainun, H. J. Pulungan, S. Jatiningtyas, Z. Man, saifudin, Pratiwi. “The potential and environmental problems in watersheds (DAS) and the coastal areas”. Geography Faculty, UGM Publishers, Yogyakarta, 2011.
3. Priyambada, I. B. Oktiawan, D. Suprapto, R, P. “Analysis of the influence of the difference of land use Functions Load Impurities BOD River (a case study of Central Java Serayu River)”. Journal Of Precipitation, Vol. 5. No. 2, pp 55-62, 2008.
4. Arikunto. “A Research Procedure approach to practice”. Publisher Rineka Copyright, Jakarta, 2006.
5. Hadi. “The sample management principles environment”. Gramedia, The Main library, Jakarta, 2007.
6. Hach, Clifford. C. R. L. Klein, and Jr. C. R. Gibbs. “Introduction to Biochemical Oxygen demand”. Technival Information Series, No. 7, Hach Company, USA123, 1997.

7. Meynendonckx, J., G. Heuvelmans, B. Muys, and J. Feyen. "Effects of Watershed and Riparian Zone Characteristics on Nutrient Concentrations in The River Scheldt Basin". Hydrol. Earth Syst. Sci, Vol. 10 pp, 913-922, 2006.
8. Effendi, Hefni. "Review of water quality (for the management of resources and the aquatic environment)". CANISIUS, Yogyakarta, 2003.
9. Casali, J. R. Gimenez, J. Diez, J. Álvarez-Mozos, J. D.V. de Lersundi, M. Goni, M.A. Campo, Y. Chahor, R. Gastesi, J. Lopez. "Sediment production and water quality of watersheds with contrasting land use in Navarre (Spain)". Agricultural Water Management, 97 pp, 1683–1694, 2010.
10. Salmin. "Dissolved oxygen (DO) and Biological Oxygen Demand (BOD) as one of the Indicators to determine the quality of the water". Oseana journal, Volume XXX, number 3, pp: 21-26, 2005.
11. Xia Yu. H. Lingguang. Xu Ligang. "Characteristics of Diffuse Source N Pollution in Lean River Catchment". Procedia Environmental Sciences, Vol. 10, pp 2437 – 2443, 2011.
12. Herlambang. "Water pollution and strategies for solution". Jai, Vol. 2 No. 1, pp 16-29, 2006.
13. Atmojo, T. Yuni. Bachtiar, T. Radjasa, Sabdono, A. "The content of Koprostanol and Coliform Bacteria in aquatic environment of the River, Estuary and coastal Flooding in the East of the Canal, on the Eastern Monsoon". Journal of marine science, vol. 9, No. I, pp : 54-60, 2003.
14. Zainudin, Z. Zulkifli, A. R., and J. Jaapar. "Agricultural Non-Point Source Pollution Modeling In sg. Bertam, Cameron Highlands Using Qual". The Malaysian Journal of Analytical Sciences, Vol 13. No 2, pp 170 – 184, 2009.
15. Diah Agustiningsih. "The study of water quality of rivers Blukar Kendal in an attempt to Control the pollution of the river water". Thesis, Diponegoro University, Semarang, 2012.

*****