

POLLUTION LEVEL AND CONTROL MEASURE OF RIVER WATER (TAGWAI RIVER IN MINNA AS A CASE STUDY)

Saidu. M., Civil Engineering Department Federal University Of Technology Minna,

Abstract

Most water supply systems dependent on good and less polluted sources. Level of pollution in Tagwai River was examined since it is the source of water supply to Minna. It is always assumed that problems may exist with a lot of agricultural and residential activities. Samples were collected from strategic points, selected namely upstream, middle stream and downstream were analyzed. Both the physical, chemical and biological analysis for different parameters show that values obtained were found to be within World Health Organisation standard which shows that the river is not too polluted except at the downstream where some parameters such as carbon, nitrate and COD were found to exceed the W.H.O. standard which indicate some pollution.

Keywords: water supply, pollution, W.H.O, River source

Introduction

The level at which our water is being polluted has become a night mare. Although we as humans recognize this fact, we disregard it by polluting our river, lakes and oceans, we are slowly destroying one of the greatest gift of nature. Good sanitization is a characteristic of healthy environment. It is therefore clear that the manner in which our river is being polluted is one of the most significant factors in the ambient health of an area. Water with a mixture of sewage from both domestic and industrial waste is a threat to marine life, to the people using it for domestic purpose (such as bathing, washing, and drinking).

The paper is aimed at determining the pollution level and control measure of Tagwai river water and is to determine the causes of river pollution, its characteristic, classification of river pollution and to recommend ways of limiting the effect. A river is polluted when its composition is altered and is unsuitable for all or any of the purpose in when it is in its natural state (Goel 2001). Most freshwater pollution is caused by the addition of organic material which is mainly sewage but can be food waste or farm effluent; these pollutants contain nutrients such as nitrate and phosphate. In excess levels, nutrients over stimulate the growth of aquatic plants and algae. Excessive growth of these types of organism consequently clogs our water ways, use up dissolved oxygen as they decompose, and block light to deeper water.

The sources of water pollution are categorized as being a point source or non-point sources (diffuse source). Point source of pollution occur when the polluting substance is discharge directly into the water way. A pipe spewing toxic chemicals directly into a river is an example. Pollution from non-point source (diffuse source) originates either from the atmosphere or land, (Richend 1992). Point sources of pollution include; Petroleum, Heat, Radio-active substances while some non-point sources of pollution are; Land, Atmosphere, Sediments.

Description of study Area

Tagwai River is located on 6° 39'E and 9° 34'N, the river takes its source form the confluence of river Tagwai and Jidho South West of Minna. The landscape of Tagwai area is made up of flat lying to undulating terrains. The geology of the area is made up of pre combination basement complex with varieties of igneous and metamorphic rocks. The surface soil profile in the area is dominated by sandy clays; light brown aeolic and gravel-like in some plates except along the river banks and flood plains which have alluvial

deposits because of the fertility of the soil around the area. The rainfalls ranges from 1300mm to 3200mm between march to may when the peak rainfall is recorded with respect to temperature variations, November to March which ranges from 37°C to 40°C in march. Relative humidity of 70% -75% occurs between July and august which the lowest value of 16%-20% occurs between December and February.

Methodology

Field Survey

Field trip to the study area was undertaken, then three sampling point were selected. During the surveys, the sources of pollution were determined. The sample point 1 was collected at the upstream, the point 2 was marked just at the intake point of the Chanchaga water treatment plant and point 3 was at the downstream of the intake point.

Questionnaires

A questionnaire was structured to assess the environment condition of the study area by the people living along the river bank.

Laboratory Analysis

Water quality of the river was determined; water samples were collected from the marked points. The samples were taken to the laboratory for chemical, physical and biological quality analyses using standard methods (APHA/AWWA, 1996). Parameter examined for river water quality included:

- (a) pH,
- (b) Colour,
- (c) Temperature,
- (d) Conductivity,
- (e) Turbidity,
- (f) Total dissolved solids.
- (g) Chloride,
- (h) Nitrates,
- (i) Total hardness,
- (j) Soleplate,
- (k) Calcium,
- (l) Biological oxygen demand.
- (m) Chemical oxygen demand.

Results and Discussion

Table 1 shows the laboratory analysis results, it shows that colour values are all higher then WHO standard of 15hazen. The increase in colour may be as a result of certain types of dissolved and colloidal organic matter. Temperatures were almost having the same range and the values are within the specified limited set by W.H.O standard of 20°C "33°C. It has no effect on man and aquatic organisms. The pH values confirm within the W.H.O standard of 6.5 - 9.0, the conductivity ranges are within the W.H.O standard of 5 NTU, while the turbidity of the river water shows that all the samples are above the standard value of 5NTU, which may likely block the light where by preventing photosynthesis process to take place.

The total dissolved solid shows value which are within the W.H.O standard of 100mg/l, the chloride value form the analysis shows that there are all less then the 200mg/l value of W.H.O which indicate there is no effect on man and aquatic life. Nitrates at the upstream and middle stream are for less than the W.H.O standard but at the downstream, it indicates high value of 121.7mg/l nitrate, which is far greater than W.H.O of25mg/l. The increase is due to a lot of agricultural activities in the down stream. Total hardness at both the

upstream and middle stream have the same value of 35.03mg/l, except for the downstream that has a slight value of value of 22.02mg/l. Sulphate content at upstream and middle stream are 9.2 mg/l and 6mg/l which is less than W.H.O standard of 25mg/l, except the downstream that has higher value of 42mg/l.

Biological oxygen demand (B.O.D) value is 0.4 upstream, 1.7 midstream and 1.9 at down stream, there are all less than the W.H.O standard of 3.0. Chemical oxygen demand for upstream and middle stream are 11 mg/l and 10mg/l respectively which is less than the W.H.O standard of 20mg/l, while the down stream value 51 mg/l is greater than W.H.O standard, but if concentration of COD is greater than 200mg/l the river is said to be polluted. With this value it implies the water is safe

From the questionnaires analyzed, it shows from table 2 that about 80% of the people leaving along the river bank uses chemical fertilizer and the remaining people said they uses organic manure, majority of people do not disposed their waste into the river directly while only about 10% disposed directly into the river as shown in table 3. From table 4 the analysis is shows that 76% of the people wash along the river bank. The river served as sources of drinking water to the majority of the people which is about 94% and only 6% of the total respondent uses other as sources of drinking water as show in table 5. Table 6 show that

40% of the responded have had cholera within the past two year and 60% of the people had malaria and Typhoid fever. The general analysis shows that the rate of population is low.

Conclusion.

The essence of this study is to asses the physical, chemical and biological analysis of Tagwai river i.e. upstream/midstream of Tagwai village and the down stream (Chanchanga) in order to ascertain the quality water. Considering the result obtained from the section of the river, it can be concluded that the degree or level of pollution at river Tagwai is not generally alarming. Waste discharge to Tagwai river is more of domestic waste since there is no incident of industrial waster discharge into the river.

Therefore, the pollution present in Tagwai River is not at present hazardous and poisonous to the user sof the river and also to the aquatic organism.

Recommendation

- 1) The local authority should ensure those municipal waster are properly
- 2) disposed of as to prevent run off from drainage containing domestic waste,
- 3) Farmers need to be enlightened on ways of applying fertilizer to prevent serious run off into surface water.
- 4) Development of monitoring station, this is necessary so as to endure that no discharge of waste along the river course.
- 5) Communities along the river course should be educated on health implications of polluted water. Water for drinking and cooking should be boiled before being taking.
- 6) Fishermen should be enlightened on the dangers associated with fishing with chemicals.

References

- APHA/AWAA (1996), Standard methods for the examination water, and waster water. 14th Edition America Public Health Association, Washington, D.C.
- RICHARD L.R (1992); Pollution and fresh water fish, first Edition.

GOEL P.K. (2001); Water pollution: causes, effects and control. Published by New Age international Ltd.
WHO (1984) Water Quality Standard Manual.

Appendix

TABLE 1: Laboratory quality analysis results.

1.	Parameter	Unit	Upstream	Mid-stream	Down stream
1.	Colour	1 l; i; en	27	28	47
2.	Temperature	"C	26.6	20.5	26.4
3.	pH		7.1	7.5	7.5
4.	Conductivity	ppm	86	78	58
5.	Turbidity	NTU	55	91	45
6.	Total Dissolve Solid	mg/l	46	47	45
7.	Chloride	mg/l	46.98	46.99	52.9
8.	Nitrates	mg/l	0.1	0.1	27.5
9.	Total Hardness	mg/l	35.03	36	22.02
10.	Sulphate	mg/l	9.2	6	4.2
11.	Calcium	mg/l	12.03	10.03	8.02
12.	BOD		0.4	1.7	1.9
13.	COD		11	10	51

TABLE2: Type of fertilizer being use by the people.

Type of Fertilizer	Percentage (%)
Chemical	80
Organic	20

TABLE 3: Ways of disposal of household waste

Waste Disposal into the River	Percentage (%)
Yes	10
No	90

TABLE 4: Number of people who wash directly into the river.

Washing along the River Bank	Percentage (%)
Yes	76
No	24

TABLE 5: Source of Drinking Water

Source of Drinking Water	Percentage (%)
Bore Hole	6
Pipe Borne Water	
River Tagwai	94

TABLE 6: Number of respondent for the last year's epidemic in the area

Last Years epidemic	Percentage
Cholera	40
Typhoid	60

TABLE; 7 World Health Organization water Quality Standard

	Parameter	
1.	Colour	15 Hazem
2.	Temperature	20 ^o c-33 ^o c
3.	pH	6.5 -9.0
4.	Conductivity	5 ppm
5.	Turbidity	5NTU
6.	Total Dissolve Solid	100mg/l
7.	Chloride	200mg/l
8.	Nitrates	25mg/l
9.	Total Hardness	75mg/l
10.	Sulphate	25mg/l
11.	Calcium	1 .0mg/l
12.	BOD	3
13.	COD	20

Source: WHO Water Standard 1984.