REIMAGINING THE PURPOSE OF ENERGY EDUCATION BEYOND CONSERVATION

Editors

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ANALYSIS OF WATER QUALITY PARAMETERS AND MANAGEMENT STRATEGIES FOR POLLUTED NEYYAR CANAL, VENGANOOR

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Abstract

Water is the most important natural resource for shaping the land and regulating the climate. The quality of water is usually described according to its physical, chemical and biological characteristics. Canals are man-made water bodies that were once important for the transport of goods but nowadays are mainly used for recreation both on the water and along the towpath. Contaminated canal water will bring a lot of diseases. It will directly affect human beings by consuming water or it will indirectly affect the food chain. Canal water pollution causes ecological imbalance. It is utilized not only by humans but by animals, plants and other organisms too. If the canal water is polluted it will lead to a major problem. The motive of the study is to ascertain how to analyze and manage the polluted Canal of Neyyar which flows through Venganoor town by comparing other

two sources, which include the dam of Neyyar and Vellayani lake (taken as the control unit). The initial step of the work is to conduct a general survey. The survey questionnaire will be circulated to 20 households in Venganoor, just to get information regarding how people perceive canal pollution. The second phase includes an investigation of the three sites (canal of Neyyar, dam of Neyyar and Vellayani lake) and collecting water samples. Experimental procedures will be done in the Institutional laboratory. Parameters like Calcium hardness, total alkalinity, pH, fluoride, chloride, residual chloride, phosphate, iron, nitrite, ammonium, and microbial- E. coli will be performed in the laboratory, but certain steps for the estimation of some parameters like BOD, DO shall be performed at the site. Values will be noted. Water quality parameter values which will be obtained from the three different samples will be compared with one another, and the site which has the highest pollution content can be estimated. In the study, characterization of the physicochemical parameters of canal ofVenganoor, dam of Neyyar and Vellayani lake was carried, the water quality of the 3 sites is moderately good or safe to use for different activities. Most of the parameters in the water samples were found to be within the permissible limit. Awareness programs can be conducted for management purposes. It can be virtual or real also, creating and uploading videos, posters on social media, etc. Reducing canal water pollution is the last thing that we can contribute to our environment to protect it, and from this small step, we can climb the stairs, and conserve and protect the natural resources.

Keywords: *Water Quality, Management Strategies*

I. INTRODUCTION

Water is an essential natural resource of life. It plays an important role in ecological processes in various ecosystems.

Water consists of physical and chemical substances that help survive every living thing on the earth. The presence, distribution movement and composition of the earth's water are largely connected with the structure and nature of the geographical structures. Clean drinking water is essential for human health everywhere in the world. Being a global solvent, water is a major resource of infections.

According to the World Health Organization (WHO), 80% of diseases are caused by water. 3.1% of deaths take place due to contaminated and poorer water quality. Rapid urban development areas affect groundwater quality due to excessive use of resources and waste disposal execution. Therefore, there is always a need concerned about the safety and management of surface water and groundwater quality.

Freshwater availability is one of the major problems facing the world, and almost one-third of the world's drinking water needs come from surface sources such as rivers, Dams, lakes and others. These water sources serve as the best immersion for the disposal of domestic and industrial wastes. (International Journal of Applied Engineering Research ISSN 0973-4562 Volume 15 Number 10 (2020) pp 1070-1074).

Water is typically referred to as polluted when it is impacted by anthropogenic contaminants and either does not support a human use, such as drinking water or undergoes a marked shift in its ability to support its constituent biotic communities, such as fish. Natural phenomena such as volcanoes, algae blooms, storms and earthquakes also cause major changes in water quality and the ecological status of water.

Farmers put fertilizers and pesticides on their crops so that they grow better. But these fertilizers and pesticides can be washed through the soil by rain, to end up in rivers. If large amounts of

fertilizers or farm waste drain into a river the concentration of nitrate and phosphate in the water increases considerably. Chemical waste products from industrial processes are sometimes accidentally discharged into rivers.

Examples of such pollutants include cyanide, zinc, lead, copper, cadmium and mercury. These substances may enter the water in such high concentrations that fish and other animals are killed immediately. Sometimes the pollutants enter a food chain and accumulate until they reach toxic levels, eventually killing birds, fish and mammals. Factories use water from rivers to power machinery or to cool down machinery. Dirty water containing chemicals is put back in the river. Water used for cooling Traces of fertilizers and pesticides is wasted in the nearest water bodies at the onset of the monsoons or whenever there are heavy showers (MeenaRaghibetal, 2016).

Monitoring the water is an essential step to understanding the trends and patterns of pollutants and their effect on living aquatic systems. The quality of natural water bodies impacts those using or living within those waterbodies (Singh et al, 2010).

II. MATERIALS AND METHODS

Along with water quality analysis, a survey was also carried out among the people residing in the nearby areas to understand the pollution levels of the canal.The motive of the study is to ascertain how to analyse and manage the polluted Canal of Neyyar which flows through Venganoor town by comparing other two sources, which include the dam of Neyyar and Vellayanilake.

The initial step of the work is to conduct a general survey. The survey questionnaire will be circulated to 20 households of Venganoor, just to get information regarding how people perceive canal pollution, their awareness, etc.

The survey questions include:

1. Full Name
2. Place of residence
3. What is your age?
4. Phone number
5. E-Mail ID
6. Sex
7. Occupation
8. Do you use canal water?
9. For what purposes do you use canal water?
10. Do you think the Neyyar canal in Venganoor is polluted
11. Do you think not only humans but other organisms are also suffering from canal pollution?
12. What do you do with the garbage from your house?
13. What do you think is the major contributing pollutant which is causing, canal pollution in your area?
14. What do you think is the major contributor to canal pollution in your area?
15. How do you rate the issue of canal pollution in your area
16. Have you ever faced a water shortage due to polluted water?
17. If you saw pieces of trash by the canal or in the canal what would you do?
18. Who do you believe is responsible for maintaining the canal?
19. Is there any industry, in your place of residence and what type?
20. Do you know whether the industries threw the [illegible] and other waste into the canal directly /indirectly?

21. How regularly is garbage thrown into the canal?
22. Are you aware of canal water pollution and its consequences?
23. What are some of the consequences that you think people contributing to water pollution should face?
24. How does the polluted canal affect you?
25. What are some of how you and your household can be more informed about canal pollution?
26. How often are you affected by canal pollution?
27. Do you ever did any activities related to canal water pollution?
28. Are you willing to help to avoid canal pollution?
29. What are the things that you wanted to contribute to avoid or minimize canal pollution?
30. Suggestions for improvement of water quality in a canal.

The second phase includes an investigation of the three sites (canal of Neyyar, dam of Neyyar and Vellayani Lake) and the collected water samples. Experimental procedures will be done in the Institutional laboratory. Parameters like Calcium hardness, total alkalinity, pH, fluoride, chloride, residual chloride, phosphate, iron, nitrite, ammonium, and microbial- E. coli will be performed in the laboratory, but certain steps for the estimation of some parameters like BOD, DO shall be performed at the site. Values will be noted. Water quality parameter values which will be obtained from the three different samples will be compared with one another, and the site which has the highest pollution content will be estimated.

The water quality analysis was carried out following standard protocols as follows,

Sl. No.	Parameter	Method
1	Dissolved Oxygen	Basic chemical analysis method (titration method)
2	Biological Oxygen Demand	Winkler method (titrimetric)
3	Microbial testing	Paper strip
4	Calcium hardness	Titration with EDTA
5	Alkalinity	Titration with sulphuric acid
6	PH	Ph paper
7	Flouride	Ion selective electrode method
8	Chloride	Titration with silver nitrate
9	Residual chlorine	Digital colorimeter, pool test kit
10	Phosphate	Spectrophotometric abs. UV
11	Iron	The high iron content method
12	Nitrite	Colorimetry
13	Ammonium	Colorimetry

Table 1: Various parameters used for the analysis and the method used.

For management purposes, the canal can be cleaned by seeking aid from the Government, people who are involved in 'Thozhilurappu', volunteers of different NGOs', and the concerned interested people living in the particular area. Awareness programs will be conducted on real and virtual platforms.

III. RESULTS AND DISCUSSION

Results from the general survey, which is taken as the first phase are shown below, along with tables and graphs. People in the Venganoor town agreed not to dump waste in the canal and not to

put waste beside or in the canal even by carefree. Panchayat members also agreed to take action against the person who dumps waste in the canal. People who are there in Thozhilurappu agreed to clean the canal as soon as possible, because of the pandemic. The Survey results show a major pavement to see how people's attitudes towards pollution, waste dumping and control. Survey results are shown below represented either by a bar diagram or pie chart. Survey tables are also represented.

According to the results from the survey, females responded more than males. The major proportion of the people who responded to the survey is starting from the 20-30 age group.

Based on survey results, people do use canal water for many reasons. it depends upon people. 17.86% use canal water for various purposes, 19.64% never used canal water, 55.36% sometimes and 7.14% use canal water if it's necessary.

The major proportion of the People use canal water mainly for animal purposes-36.21%, for washing clothes 25.86%, for bathing and washing plates 10.34%, and only 5.17% used for direct drinking purposes. Some people chose another option as 12.07%, it can be for building/construction purposes, or industrial/ laboratories purposes.

75.93% believe that the Neyyar canal in Venganoor is polluted and no one has the opinion that, it is not polluted, already it makes sense, and some people have the opinion that sometimes 24.04%, find it as polluted.

From the survey, it is clear that not only humans but animals are also suffering from canal pollution, 94.34% opted for it. 1.89% opted for no option, and 3.77% opted for sometimes. From this is clear how different people's opinions, views, attitudes and mentalities toward pollution differ.

5.56% dump the waste into the canal but most of them used to incinerate it - 61.11%. 33.33% gives the waste to waste collectors and nobody chose the option to throw the waste on the road.

The main contributor which causes canal pollution is plastics, about 37.10% chose plastics as the main contributor. animal waste includes 15.32%, house garbage - 2.97%, vegetable garbage - 16.13%, and leather products - 10.48%.

81.48% have the belief that canal water pollution is serious it is causing major impacts. Some people opted for somewhat serious; on the other hand, 5.56% opted for no option. Their viewpoint is, that canal water pollution is not at all serious.

26.42% faced water shortages, and 67.92% sometimes faced water shortages due to polluted water. Only 5.66% chose that, they never faced water shortage due to polluted water.

People's attitude towards the waste when they see it in the beside the canal is: 72.22% pick and put it in the trash can and 22.22% don't like to pick it and 5.56% don't care/ they are not interested in picking the waste.

35.64% have the opinion that people are responsible for maintaining the canal. 24.75% have a strong belief that it's the resident's duty to maintain the canal. 14.85% chose Government and 12.87% opted for the option panchayat. 6.93% the belief that it's the pollution controller's duty and 3.94% opted for environmental volunteers it can including NGOs.

From the survey report, it is clear that industries are there in Venganoor town. 44.90% opted for small-scale industries are there. 2.04% chose large-scale industries are also present. 8.16% opted for both small and large-scale industries are present. 8.16% opted for there are no industries which are visible in the town.

majority of the people haven't noticed whether the industries are there / present in the Venganoor town.

13.47% opted that they haven't noticed, whether the industries are throwing waste into the canal or not. 12.24% chose that is they handle seen that the industries are dumping waste into the canal, and 14.28% have the belief that no industries are dumping waste into the canal.

On behalf of the survey, 53.57% of people made it clear that the garbage's thrown/dumped into the canal daily, 30.36% have the view that weekly the waste has been dumped in the canal, 10.7% chose monthly and 5.36% opted annually.

From this, it is giving an appropriate vision that wastes are being dumped, and people are aware of that, but not willing to do anything.

On basis of whether the people are aware of canal water pollution; 86.79% are aware of canal water pollution but 12.22% know a little about canal pollution, which means they don't know that much, maybe they also don't know what the consequences in which they have to face afterwards and 1.89% know nothing about canal water pollution and they are not aware of it.

The consequences that people opted for the people who contribute to canal pollution are as follows:47.62% of people chose for pay fine option, 44.44% opted for community service and 7.94% have the opinion that they must go to jail as a part of their punishment. These consequences are really necessary, it should be put as a rule, so that people won't even dump waste in the canal even as carefree.

A large proportion of people think that flooding, diseases, breeding mosquitoes, foul smell, etc. will be faced as the effects of canal pollution and also there will be a problem with the

consumption of water due to its pollution.

From the survey it is clear that people wanted [illegible] awareness and information regarding canal pollution. [illegible] opted that they required information about canal pollution, [illegible] conducting awareness programs through social media. [illegible] opted for posters by looking at the posters people will make [illegible] make nit to dump waste. 9.02% opted for public role plays.

Due to the pollution people are facing a lot of problems [illegible] they are suffering from canal water pollution. 64.91% [illegible] suffering daily, 14.04% suffer weekly and monthly, and [illegible] 7.02% people are suffering annually. However, people [illegible] suffering a lot due to the polluted canal.

Most of the people didn't do any activities related to canal water pollution that is, 50.94%, even though it is getting serious people's willingness are so down, but they want it to be cleared [illegible] that they are looking for others to do it, 20.65% did some activities.

51.92% have shown their willingness to help to minimize the canal pollution, 46.15% have you opinion that they will think about it and 1.92% don't like to assist to diminish the pollution.

People would like to contribute to mitigating canal water pollution mainly showing through their actions/ activities (36.71%). 29.11% have shown their willingness and courage to spread/conduct awareness programs on actual/ real platforms and 17.72% through virtual platforms. 10.13% have the strong decision that they will file a case against the person who pollute the canal and 6.33% of people chose that, they will give the petition to higher authorities, to take specific actions.

Behalf of the survey gave an exact vision of the situation about the canal and its pollution. The majority of the people responded in a good way. They do feel bad because of the

pollution, but only a few people showed interest / wanted to make a step to do some activities to make good progress to diminish the canal water pollution. A major proportion of the people have the opinion of conducting awareness programs through real/virtual platforms, by posters, pamphlets etc., because there are people who don't even know or care about pollution and are dumping waste. Some people don't react anything regarding the canal problem, even if they saw things which are not supposed to do, or which cause impacts afterwards in future.

People do use canal water for various purposes, but those who don't use canal water are more willing to dump the waste, so the others are becoming so bewildered and the canal pollution is becoming more intimidating especially to the people who use the water and the people who live near to the canal.

From the survey results, it is clear that the canal pollution must be stopped and the Government should take certain steps to mitigate the canal pollution. The initial step for diminishing canal water pollution should be the people's attitude towards the pollution. People should unravel/unleash the mindset of others who will do it, without considering that it's their responsibility too.

"IT'S FUNDAMENTALLY MORONIC TO LET THE WATER GET DIRTY AND THEN CLEAN IT UP AS OPPOSED TO JUST KEEPING IT CLEAN".

Management strategies should be initiated on the part of people. Most of the people showed their willingness to do activities related to canal water pollution. Managing canal water pollution is the initial step to protecting our environment from various hazards. It can be a stepping stone to diminishing all other pollution. There are just a few ways that people can help to stop canal water pollution, the solutions are affordable and reachable, and they are essential for our future wellbeing.

The second phase includes the analysis of water quality parameters.

Sl. No:	Name of Water Quality Parameters	Results Obtained from the Experiment (Canal)
1	Dissolved oxygen	9.6 mg/L
2	Biological oxygen demand	3.2 mg/L
3	Microbial testing	presence
4	Calcium hardness	25 mg/L
5	Alkalinity	35 mg/L
6	pH	6.5 – 7.5
7	Fluoride	1.0 mg/L
8	chloride	70 mg/L
9	Residual chlorine	0-0.5 mg/L
10	phosphate	0.005-0.05 mg/L
11	Iron	1 mg/L
12	Nitrite	0.05-0.3 mg/L
13	Ammonium	0.00 mg/L

Table 2: Experimental results obtained from canal water

Sl. No.	Name of Water Quality Parameters	Results Obtained from the Experiment (Dam)
1	Dissolved Oxygen	6.8 mg/L
2	Biological Oxygen Demand	0.3 mg/L
3	Microbial Testing	Presence
4	Calcium Hardness	15 mg/L
5	Alkalinity	30 mg/L
6	pH	6.5 – 7.5
7	Fluoride	1.0 mg/L
8	Chloride	40 mg/L
9	Residual Chlorine	0-0.5 mg/L

10	Phosphate	0.005-0.05 mg/L
11	Iron	0.5 mg/L
12	Nitrite	0.05-0.3 mg/L
13	Ammonium	0.00 mg/L

Table 3: Experimental results obtained from dam water

S. No	Name of Water Quality Parameters	Results Obtained from the Experiment (Lake)
1	Dissolved oxygen	8 mg/L
2	Biological oxygen demand	0.8 mg/
3	Microbial testing	Slightly present
4	Calcium hardness	10 mg/L
5	Alkalinity	25 mg/L
6	pH	6.5 – 7.5
7	Fluoride	1.0 mg/L
8	Chloride	20 mg/L
9	Residual chlorine	0-0.5 mg/L
10	Phosphate	0.005-0.05 mg/L
11	Iron	0 mg/L
12	Nitrite	0.05-0.3 mg/L
13	Ammonium	0.00 mg/L

Table 4: Experimental results obtained from Vellayani Lake

The result obtained from the canal is 9.6mg/L, dam-6.8mg/L and lake- 8mg/L. From the results, it is clear that the canal has the maximum DO level and the least is in dam water.The result obtained from canal-3.2mg/L, dam-0.3mg/L, and lake-0.8 mg/L.Unpolluted water sources typically have a BOD below 1mg/L, moderately polluted water sources vary between 2-8mg/L. From the results, it is clear that the canal is moderately polluted.E. coli is the marker of choice several other markers are used in

environmental monitoring. The result obtained from all 3 cases is the presence of E. coli. Canal has the maximum alkalinity level of 35mg/L and the least is the lake which is 25mg/L, finally, the value obtained from the dam is 30mg/L. From the values, it is clear that the 3 sampling sites range between the average range of total alkalinity levels. Lower values of total alkalinity in 3 sites may contribute to algae growth and other aquatic life. The results obtained from 3 sampling sites ranges from 6-8, so it is clear that the pH of the water was almost uniform magnitude in all study samples, which was tolerant of the life system. Fluoride concentration from the 3 sites is taken as 1.0mg/L, where the average value is considered to be less than 1-1.5mg/From the analysis, it is found that the canal has the highest value and the lake has the least value, ranging from 20-70mg/L, in which the average range of chloride level should not exceed 250mg/L. Therefore, the values obtained from the study reveal normal

IV. CONCLUSION

Contamination of water sources causes major impacts on the environment, harmful to all living creatures. By analyzing the water quality parameters, the quality of canal water is less when compared to dams and lakes. The freshwater resource Vellayani comparatively has good quality. Maybe because of the preferences canal became polluted and less cared for. On the other hand, a dam is a reservoir and people do give preference when compared to a canal. In all three cases, they are not too bad or too good quality they do have limitations because of natural most probably due to anthropogenic activities.

In the study, characterization of the physicochemical parameters off canal of Venganoor, dam of Neyyar and Vellayani lake was carried. It can be concluded that the water quality of the 3 sites is safe or moderately good safe to use for different activities

Most of the water samples were found to be within the permissible limit.

Impacts of canal water pollution include the spreading of diseases, breeding of mosquitoes foul smell, unable to uptake water for consumption. From these, we can understand the harmful impacts which are even lethal to humans, and animals, and can even destroy the environment. So, it is clear that controlling water pollution and conserving water are necessary. Awareness programs should be conducted. It can be even conducted through virtual platforms. Distributing pamphlets creating and uploading videos, posters on social media, etc.

Reducing canal water pollution is the last thing that we can contribute to our environment to protect it, and from this small step, we can climb the stairs, and conserve and protect natural resources.

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This book constitutes the refereed proceedings of the First International Conference on Sustainable Energy Education, ICSEE 2021, held in Department of Education, University of Kerala, on 10-12, January, 2022 in the online mode. The conference discussed "WHAT" of energy education - should be. It then asks the contributors to bring forth their best ideas regarding "HOW" to implement the education process, and finally "WHY" we should be educating about energy. We hope that the interesting scholarly work and case studies that the contributors have brought us, will trigger an on-going dialog about how to frame energy education in the much bigger picture of energy cycles and their fundamental importance to powering our life, and its increasingly energy - hungry industrialized, urbanized and digitized infrastructure. The book serves as a reference resource on sustainable energy education for researchers and practitioners in academia and industry.

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