# TREATMENT OF WASTE WATER DISCHARGE INTO ALIYARRIVER, ANAMALAI TOWN PANCHAYAT

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## Abstract:

Urban waste water management is a global concern. Rapid urbanization and indiscriminate use of natural resources have placed the environment under increasing stress due to human activities and population growth, and different measures are being implemented to prevent further deterioration. It is evident that, if huge volume of untreated waste water is recycled then it would reduce water scarcity and also avoids pollution in the receiving water bodies. The waste water must be considered as a resource and it must be effectively used for the betterment of eco system. In this work pollution of the Aliyar River passing through Anaimalai Town panchayat area is studied. Aliyar river emerges in the eastern slopes of Anaimalai hills of the Western Ghats in Coimbatore district at an altitude of 2250 m .The untreated wastewater from Anaimalai town panchayat is being let out to the river Aliyar, Uppar and PWD Channel. For analyzing the quality of the river, samples were collected at eight places and from the test results it was observed that the parameters such as Alkalinity, Hardness, TDS, Fluorides and Ammonia are more than the permissible limits. The values are of alkalinity are (480, 780, 580, 620, 600, 560), Hardness are (650, 440, 380, 440, 400, 520), TDS (1836, 1848, 1344, 1464, 1608), fluorides (1.5) and ammonia (greater than 5) which are greater than their allowable limits of 200, 200, 500, 1 and 0.5 respectively. So water treatment is essential and Activated Sludge Process (ASP) which is suspended bacteria consuming Bio degradable organic substance from waste water for three places and Decentralized Waste water Treatment (DEWATS) which is decentralized method anaerobic baffled reactor and Phytoremediation for Three places are proposed these methods of water treatment suggested must remove the excess chemicals in the water so that the water can be let into the river as harmless water and improves the environmental condition of the river and locality.

**Keywords**: ASP, DEWATS, Aliyar, Anaimalai, Water treatment, Samples, Chemical Parameters

## Introduction

Water covers 71% of the Earth's surface, mostly by seas and oceans. The versatility of water as a solvent is that it is essential for survival of living organisms. Life is believed to have originated in the aqueous solutions of the world's oceans, and living organisms depend on aqueous solutions, such as blood and digestive juices, for biological processes. Small portions of water occur as groundwater (1.7%), in the glaciers and the ice caps of Antarctica and Greenland (1.7%), and in the air as vapour, clouds which is formed of ice and liquid water suspended in air, and precipitation (0.001%). Water plays an important role in the world economy. Agriculture uses over 70% of the freshwater consumed by people. A significant source of food for many regions of the world is fishing in salt and fresh water bodies. Much of the longdistance trade of commodities such as oil, natural gas, and manufactured products is transported by ships through seas, rivers, lakes, and canals. Large quantities of water, ice, and steam are used for cooling and heating, in industry and homes. Water is an excellent solvent for a wide variety of substances both mineral and organic; as such it is widely used in industrial processes, and in cooking and washing. Water scarcity and water pollution are crucial issues in today's world. One of the ways to reduce the impact of water scarcity and pollution is to expand water usage and wastewater reuse. Concerns regarding proper water management techniques are raised by the world's increasing water scarcity and the rapid population growth in urban areas. Urban wastewater treatment has received less attention compared to water supply& treatment. Water scarcity coupled with the bursting seams of our cities and towns have taken a toll on our health and environment.

Time passes, and the distance between desirable and achievable, between laws and reality, continues to enlarge.
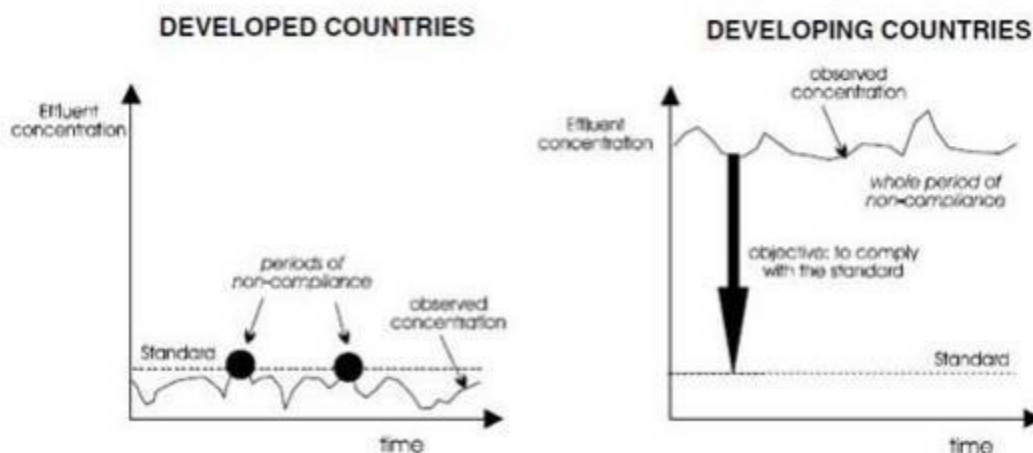
## Fig 1.1 Discharge Standards-Developed & Developing Countries

Fig 1.1 presents a comparison between the current status of developed and developing countries in terms of the actual effluent concentrations of a particular pollutant and its associated discharge standard. In most of the developed countries, compliance occurs for most of the time, and the main concern relates to occasional Episodes of non-compliance, at which most of the current effort is concentrated. However, in most developing nations the concentrations of pollutants discharged into the water bodies are still very high, and the efforts are directed towards reducing the distance to the discharge standards and eventually achieving compliance.Unfortunately, over the years, the river water quality has been deteriorated at a rapid pace. In this study PAP basin in Tamil Nadu is considered. One common problem in the state of Tamil Nadu is that most of the rivers get polluted by human intervention by way of discharging domestic sewage into the rivers / lakes / ponds and dumping of solid waste in water bodies. In addition, rapid growth of industries has also played a major role in polluting water bodies by the way of disposing the industrial effluents into the water bodies. In the context of trends in urban development, wastewater treatment deserves greater emphasis. Currently, there is a growing awareness of the impact of sewage contamination on rivers and lakes. N. K. Singh et. al (2019) explains that Wastewater discharge with high biological oxygen demand (BOD) and high nutrient levels (e.g., nitrate, phosphate) affects water quality and is a major reason for degradation of water bodies, including rivers. Green plant-based technologies such as phyto remediation, the development of constructed wetlands, and algal pond systems may perform key roles in treating wastewater by removing nutrients and toxic metals before their discharge into rivers.Accordingly, wastewater treatment is now receiving greater attention from the World

Bank and government regulatory bodies. The current urban wastewater management system is a linear treatment system that is based on disposal. The traditional system needs to be transformed into a sustainable, closed-loop urban wastewater management system that is based on the conservation of water and nutrient resources. A huge loss of life-supporting resources is the result of failed organic wastewater recovery.

## OBJECTIVES:

The main objectives of this study are

> ➢ To increase the quality of discharged water to the acceptable level of water to be discharged into water bodies or for agricultural land by removing pollutants, toxicants, neutralising coarse particles, and killing microorganisms.
> ➢ To avoid the bio-magnification of harmful compounds in the food chain and to reduce BOD, COD, eutrophication, and other factors that affect receiving water bodies.
> ➢ To purify the Discharged water according to international standards so that it can be used in irrigation.
> ➢ To improve the environmental situation in areas around Aliyar river.
> ➢ To protect surface and groundwater resources.
> ➢ To remove enough solid wastes from (organic and inorganic) the wastewater.
> ➢ To Discharge treated water without harm to public health, or when re-used again.
> ➢ Before the construction of a treatment plant it must be taken into consideration that the treatment plants must be located at sufficient distance from the city and within the network service required.
> ➢ To create buffer zones in the site and residential areas acting as buffer green spaces.

## POLLUTION IN ALIYAR RIVER

In Aliyar river the pollution is caused by mainly the domestic waste water discharge by the Anaimalai town panchayat and some of the reasons for pollution are consideration of used water is wastewater. In addition to coming from sinks, showers, and toilets, it also comes

from commercial, industrial, and agricultural activity. Storm water runoff, which occurs when rainstorm rushes chemicals, oil, grease, and other contaminants from impermeable surfaces into our waterways, is another example of the phrase. More than 80% of the wastewater produced worldwide is released back into the environment without being cleaned up or recycled. Our nation's aging and easily overwhelmed sewage treatment systems also release more than 850 billion gallons of untreated wastewater each year. General types of water pollutants include pathogenic organisms, oxygen demanding wastes, plant nutrients, synthetic organic chemicals, inorganic chemicals, micro plastics, sediments, radioactive substances, oil, and heat. Sewage is the primary source of the first three types. Farms and industrial facilities are also sources of some of them. Sediment from eroded topsoil is considered a pollutant because it can damage aquatic ecosystems, and heat (particularly from power-plant cooling water) is considered a pollutant is given by fig 2.1, because of the adverse effect it has on dissolved oxygen levels and aquatic life in rivers and lakes.



**Fig 2.1 Pollution in Aliyar River**
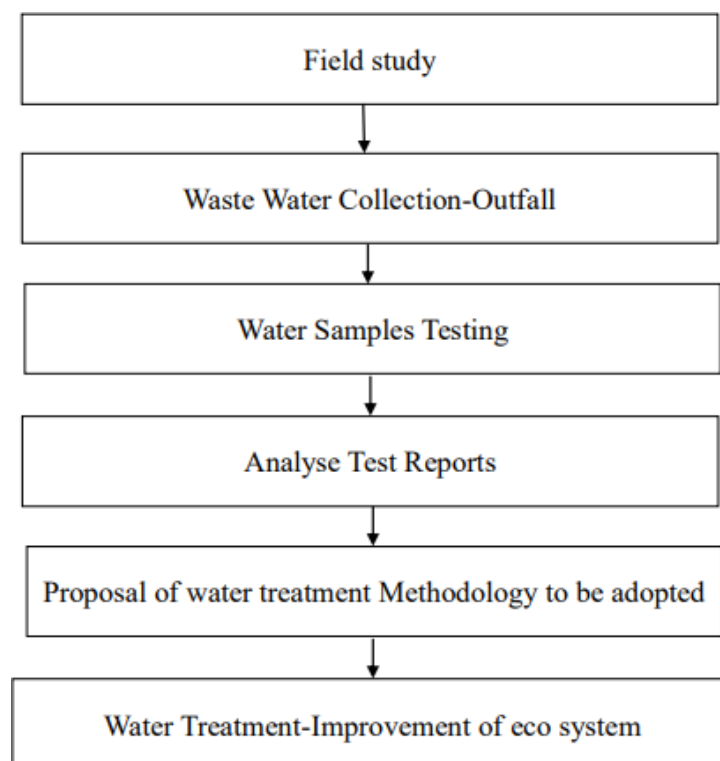
There are three categories of sewage or wastewater:

Home and apartment waste water is referred to as domestic sewage.

Used water from manufacturing or chemical processes is referred to as industrial sewage.

Storm sewage is precipitation runoff that is gathered in a network of pipelines or open channels.

## METHODOLOGY

The proposed system gives a step-by-step approach for reducing and eliminating the contamination of Aliyar river based on the waste water from domestic use. The steps in the proposed system is given by the following

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│              Field study                  │
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│      Waste Water Collection-Outfall       │
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│          Water Samples Testing            │
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│           Analyse Test Reports            │
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│ Proposal of water treatment Methodology to be adopted │
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│  Water Treatment-Improvement of eco system │
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## WATER SAMPLE COLLECTION-OUTFALLS

Eight Outfall location of wastewater discharge have been identified within the Town Panchayat limits and the details are furnished in the Table 3.2. The outfall location map is given in Figure 3.3. The waste water samples are collected from 8 outfall points and these points are selected based on the geological survey and at locations of waste water outfall

| Sl No | Location of Sewage Water Mixing Point | Covered Town Panchayats – HH / Population | | | Waste water generated in Lakhs Litres (80% Supply) |
|---|---|---|---|---|---|
| | | Anaimalai | | | |
| | | Covered Ward (Numbers) | House Hold (Numbers) | Population (Numbers) | |
| 1 | Indira Nagar | 5 | 613 | 1939 | 1.38 |
| 2 | Near Masaniamman Temple | 6 | 945 | 2835 | 2.02 |
| 3 | Vepparai Road | 6 | 1275 | 3825 | 2.72 |
| 4 | Kottur Road (Near TP Office) | 4,9,12,13 & 15 | 1725 | 5275 | 3.76 |
| 5 | Near Someshwar Temple | 3 | 644 | 2412 | 1.72 |
| 6 | Haj Layout | 2,18 | 625 | 1964 | 1.40 |

## Results And Discussion

### Water Samples Testing

Analyse the samples in National Accreditation Board for testing and calibration Laboratories (NABL) laboratory for its characteristics and composition and based on the test the water parameters are compared with the standard values.

| Quality | Indira Nagar | Near Masani Amman Temple | Vepparai Road | Kottur road(near Annaimalai TP office) | Standard Values (IS: 10500 − 2012) |
|---|---|---|---|---|---|
| Appearance | Colourless | Colourless | Colourless | Colourless | Colourless |
| Odour | Sulphide | Slightly Sulphide | Slightly Sulphide | None | Agreeable |
| Turbudity | No | No | No | No | 1 |
| pH | 7 | 7 | 8 | 8 | 6.5 to 8.5 |
| Alkalinity | 480 | 780 | 580 | 620 | 200 |
| Hardness | >600 | 440 | 380 | 440 | 200 |
| Chloride | 300 | 320 | 160 | 160 | 250 |
| TDS | 1836 | 1848 | 1344 | 1464 | 500 |
| Fluorides | 1.5 | 1.5 | 1.5 | 1.5 | 1 |
| Iron | 2 | 0 | 0 | 0 | 0.3 |
| Ammonia | >5 | >5 | 2 | 5 | 0.5 |
| Nitrite | 0.05 | 0.1 | 0.2 | 0.1 | 1 |
| Nitrate | 40 | 45 | 45 | 20 | 45 |
| Phosphate | 0.5 | 0.5 | 0.5 | 0 | 0.1 |
| Residual Chloride | 0.2 | 0.2 | 0.2 | 0.1 | 0.2 |

### PH

The pH of a solution is a crucial parameter since it shows its chemical makeup. The pH can regulate nutritional availability, biological processes, microbial activity, and chemical behaviour. The normal pH range of drinking water is 6 – 8.5.Given by Fig 3.12, the pH is mostly a result of natural geological conditions at the site and the type of minerals found in the local rock. The pH can also be affected by acid rain. Water with a pH value less than 7 is acidic and tends to be corrosive. When the PH of water becomes greater than 8.5, water taste can become more bitter. This elevated pH can also lead to calcium and magnesium carbonate building up in your pipes. While this higher pH doesn't pose any health risks, it can cause skin to become dry, itchy and irritation.
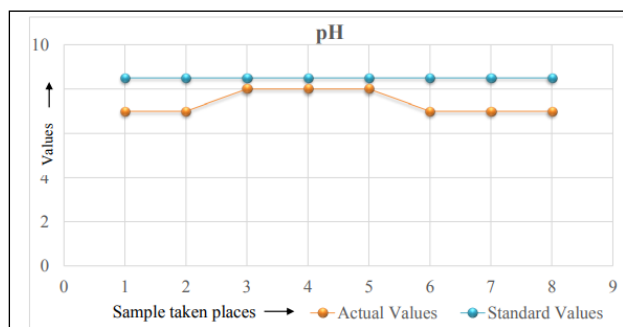
## Alkalinity

Alkalinity can be defined as the ability of a water to neutralize acid or to absorb hydrogen ions. It is the sum of all acid neutralizing bases in the water. This ability to maintain the proper pH in the wastewater as it undergoes treatment is the reason why alkalinity is so important to the wastewater industry. pH can be adjusted by combining calcium carbonate (CaCO3) and other bicarbonates with hydrogen or hydroxyl ions. Water's ability to act as a buffer (also known as alkalinity) increases when carbonate minerals are present in the soil, maintaining the pH of the water  close to neutral even when acids or bases are introduced. Acid rain and other acid wastes will be absorbed by surface water with higher alkalinity levels, preventing pH shifts that are hazardous to aquatic life. Alkalinity is also in important considering the treatment of wastewater and drinking water because it influences cleaning processes such as anaerobic digestion.
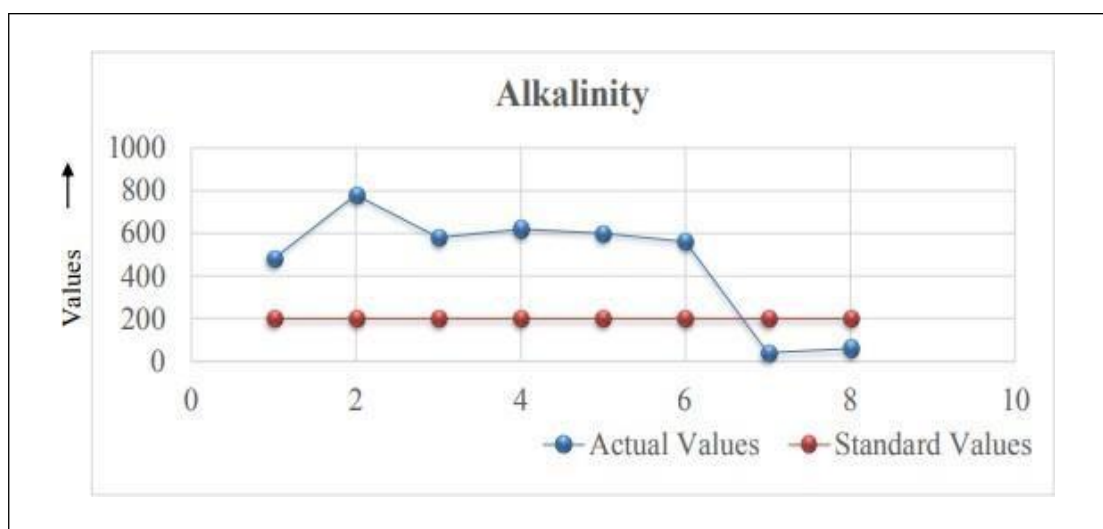


## Hardness

Water hardness is the amount of dissolved calcium and magnesium in the water. Hard water is high in dissolved minerals, largely calcium and magnesium.The health effects of hard water are mainly due to the effects of the salts dissolved in it, primarily calcium and magnesium. To a large extent, individuals are protected from excess intakes of calcium by a

tightly regulated intestinal absorption mechanism through the action of 25-dihydroxy-vitamin D, the hormonally active form of vitamin D. Although, calcium can interact with iron, zinc, magnesium, and phosphorus within the intestine, thereby reduces the absorption of these minerals. On the other hand, the major cause of hypomagnesaemia is renal insufficiency associated with a significantly decreased ability to excrete magnesium. Increased intake of magnesium salts may cause a change in bowel habits (diarrhea). High quantities of magnesium and sulphate (around 250 mg/l each) in drinking water can have a laxative effect. Laxative effects have also been associated with excess intake of magnesium taken in the form of supplements, but not with magnesium in the diet. Water treatment methods such as reverse osmosis, ion exchange or oxidizing filters can be used to reduce other types of water hardness. With the ion exchange process, water is pumped through a tank containing a resin that causes calcium and magnesium ions to be exchanged for sodium or potassium ions.
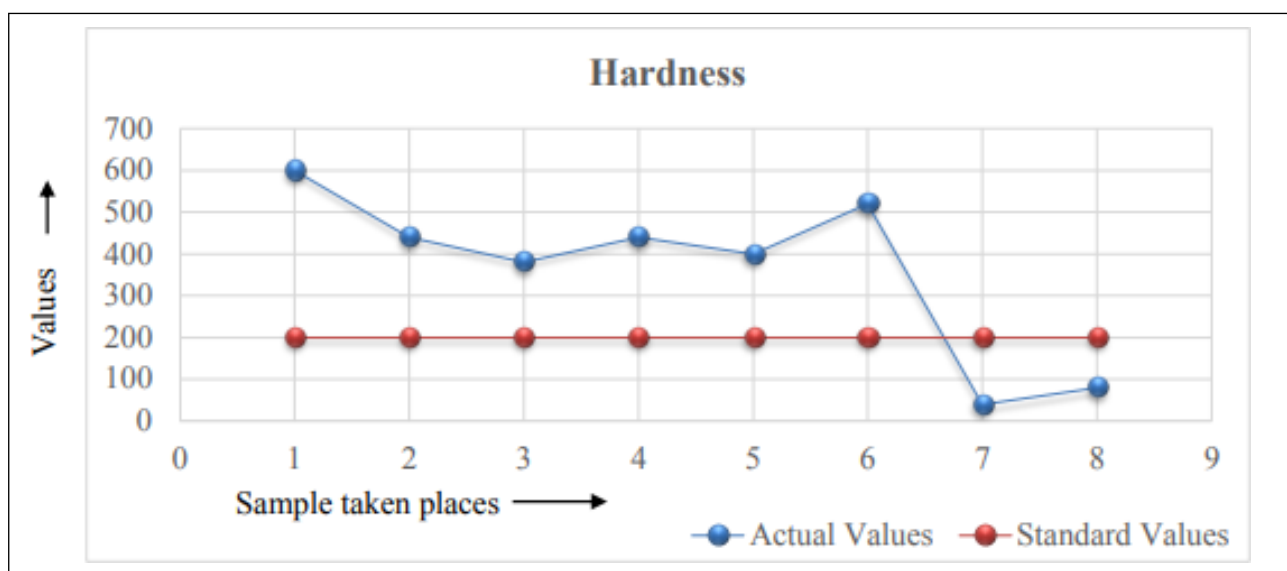


## Chloride

Chloride makes water more corrosive by enhancing its electrical conductivity. Chloride interacts with metal ions to create soluble salts in metal pipes (8), raising the concentration of metals in drinking water. One of the most significant electrolytes in blood is chloride. It maintains the proper balance of fluid in and around your cells. It also helps maintain proper blood volume, blood pressure, and pH of your body fluids. Although chlorides are safe at low concentrations, well water high in sodium chloride can harm plants if used for irrigation or gardening, and it imparts a disagreeable taste to drinking water. When consumed in excess, sodium chloride can exacerbate pre-existing heart conditions and contribute to high blood pressure at levels higher than this. Reverse osmosis, anion exchange, and distillation

treatment systems are the most often used water treatment methods for lowering the chloride concentration of drinking water.
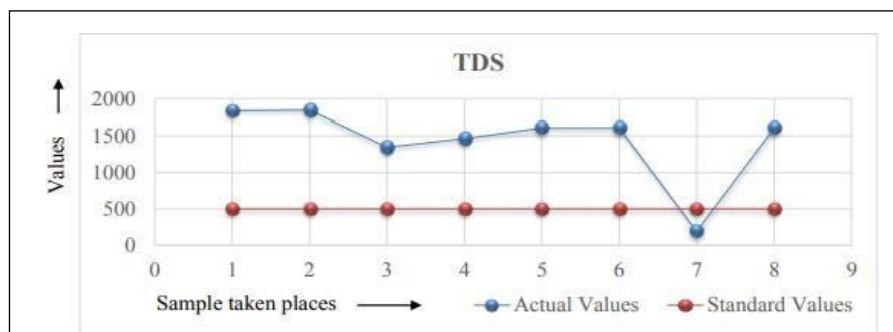


## Residual Chloride

Free chlorine, also known as chlorine residual, free chlorine residual, and residual chlorine, is a sign that there was initially enough chlorine added to the water to render the bacteria and some viruses that cause diarrheal disease inactive, and that the water was also protected from recontamination during storage. The presence of free chlorine in drinking water is correlated with the absence of most disease-causing organisms, and thus is a measure of the potability of water
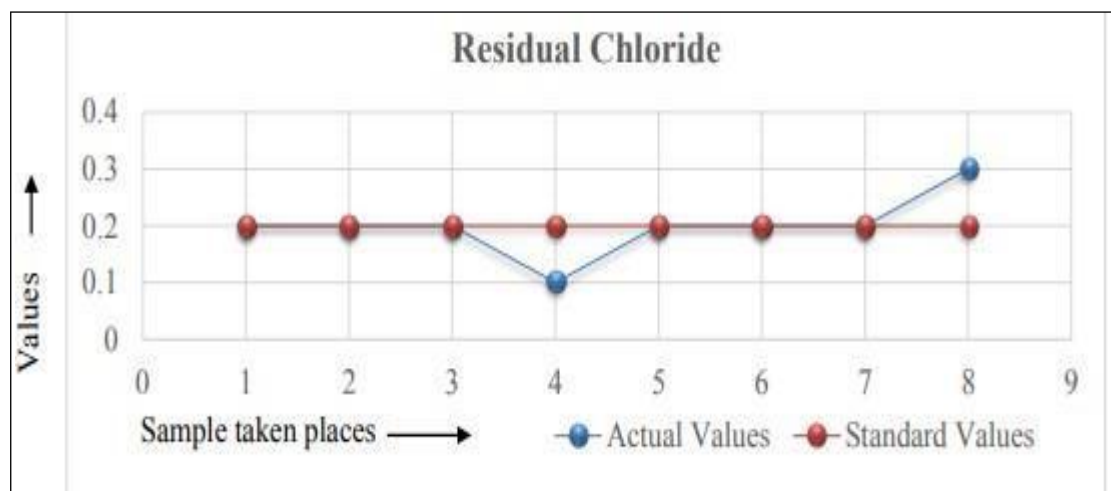


## CONCLUSION

The Parambikulam Aliyar Project (PAP) basin consists of eight water outfalls from Anamalai town which allows the flow of untreated waste water into river Aliyar, and due to the mixing of the waste water the river gets contaminated and the value of physical and chemical quantities such as alkalinity, Ammonia, Fluorides, TDS and hardness values rise beyond the permissible limits. So, based on the test results conducted and study, Activated Sludge process treatment method and DEWATS are suggested. These treatment method will improve

the water quality and also will maintain the values of parameters within the permissible limit. The treated water can be reused for agriculture purposes and let into Aliyar River. In developing countries like India, the problems associated with wastewater reuse arise from its lack of treatment. So, the challenge is to find such low-cost, low-tech, user friendly methods, which avoids threatening our substantial wastewater dependent livelihoods and on the other hand protect degradation of our valuable natural resources. Activated Sludge based treatment and DEWATS are suggested based on the excessive chemicals found on the test samples and the treatment is mainly focused on reducing Alkalinity, Hardness, TDS, Ammonia and Fluoride. DEWATS is suggested as a water treatment method where the discharged water flow is low. Discharge standards should be adapted periodically, eventually allowing targets for receiving water bodies to be achieved. These systems adopted will open doors for community participation and engagement that would eventually lead to sustainable model.

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