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A REVIEW ON PHYSICO-CHEMICAL ANALYSIS OF KATANGI RESERVOIR: EVALUATING WATER QUALITY FOR SUSTAINABLE MANAGEMENT.

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Abstract:- Water is the most important compound that has a significant impact on life. Water quality is degrading or deteriorating due to substantial and diversified pollution of aquatic life and the environment caused by uncontrollably growing urbanization and industrial wastewater discharge. The Katangi Dam Reservoir is an earthfill dam in the Gondia district of Maharashtra, India, close to Goregaon on the Katanginalla River. The Katangi Reservoir is an essential water source in the region, sustaining fisheries and agriculture while also giving the nearby town access to potable water for surrounding communities. The Katangi Dam Reservoir is a vital water resource for agricultural, domestic, and ecological purposes. Anthropogenic activities that impact this reservoir's water quality include farming, urbanization, and industrial growth. Its water quality must be evaluated for sustainable management because of growing environmental stresses like climate change and agricultural runoff. The physico-chemical perusal of the Katangi Dam reservoir on the Katanginalla River near Goregaon, Gondia district, is the main topic of this review. It mainly focuses on some important factors such as temperature, turbidity, pH, dissolved oxygen (DO), total dissolved solids (TDS), and electrical conductivity (EC). These metrics are essential for assessing the water body's health as well as the safety of using it for agricultural purposes and human consumption. The water quality characteristics required to evaluate the water's suitability for different purposes and the possible threats to aquatic life and human consumption can be found through a physico-chemical analysis. The investigation emphasizes how human activity affects water quality and how seasonal fluctuations occur. The findings demonstrate that although the reservoir can still be used for a variety of purposes, several characteristics exhibit seasonal stress, which calls for improved management techniques. To maintain long-term ecological health and water quality, real-time monitoring and pollution source control are recommended components of sustainable management.

Index term: **Water Quality, Physico-chemical analysis, Katangi Reservoir, Sustainable Management, Water Body, pH, Water Conservation.**

Aim:-

This review aims to assess the physico-chemical properties of the Katangi Reservoir and evaluate the water quality for sustainable management purposes.

Objectives:-

1. To analyze the physico-chemical parameters of water in the Katangi Reservoir.

2. To evaluate the implications of water quality on aquatic life and human usage.

3. To suggest sustainable management practices for maintaining and improving water quality.

Introduction:

A vital freshwater resource, Katangi Reservoir located on the Katanginalla River near Goregaon, Gondia district, is necessary for many human endeavors, including local fishing, agriculture, and drinking water production. To preserve the reservoir's health and guarantee that it continues to fulfill its ecological and socioeconomic roles, water quality monitoring is essential **[1].**To assess the health and quality of the water, this review focuses on physico-chemical perusal of important water quality metrics such as pH, dissolved oxygen (DO), total dissolved solids (TDS), turbidity, and electrical conductivity levels.

The responsible use and preservation of natural resources in a way that satisfies current demands without jeopardizing the ability of future generations to satisfy their own is known as sustainable management. To determine the state of the water in Katangi Reservoir, give a foundation for identifying trends, and offer the data necessary to establish cause-and-effect correlations, monitoring is a part of the water quality assessment process **[2].** Sustainable management, when it comes to water quality, makes sure that water resources are safeguarded, preserved, and effectively used to preserve ecosystem health and supply clean water for human consumption. This strategy focuses on striking a balance between social, economic, and environmental aspects to promote long-term sustainability management. The process of evaluating the physico-chemical perusal of water about its natural quality, human impacts, and intended uses especially those that could have an impact on human health or the health of the aquatic system as a whole is known as water quality assessment **[3].**

While Katangi Reservoir's water quality is typically appropriate for residential and agricultural use, certain parameters, such as DO, turbidity, and TDS, require closer examination, according to the physico-chemical analysis. Water quality is particularly impacted during the monsoon season, mostly as a result of increased turbidity brought on by agricultural runoff. Summertime low DO levels raise the possibility of oxygen depletion in the Katangi reservoir, endangering aquatic life **[4].**The physico-chemical analysis also emphasizes the possibility of long-term problems, including salinization and eutrophication, particularly if pollution and agricultural runoff persist. Preventive steps like regulating nutrient inflows and putting in place real-time monitoring systems are necessary for the effective sustainable management of water quality.

The Water Quality Index (WQI), which is derived from aggregate data on water quality parameters, may be applied. For sustainable management, the water quality index (WQI) can also be employed. Human health and illness states are thought to be strongly influenced by the quality of the water. Several techniques for analyzing physico-chemical data on water quality differ based on the informative objectives, sample types, and sampling area size. Using the appropriate indices is one of the best ways to disseminate information about trends in water quality **[5].**The general public and decision-makers may be informed about the condition of the ecosystem through the use of indices in monitoring programs to evaluate ecosystem health.

Methods:-

The study employs a thorough methodology, examining existing secondary data on Katangi Reservoir's water quality for sustainable management and gathering primary data by recurrent testing. The review insights on the following key physico-chemical parameters for analysis.

1. **pH:-**Measures the acidity or alkalinity of water, by indicating its chemical environment.

2. **Dissolved Oxygen (DO):–**A measure of the quality of the water and a necessity for aquatic life.

3. **Turbidity:–**Represents water purity, and is influenced by organic matter and suspended silt particles **[6].**

4. **Temperature:-**Influences chemical solubility in water and biological activity.

5. **Electrical Conductivity (EC):–**This represents the ionic concentration, which can affect water usability for drinking and agriculture.

6. **Total Dissolved Solids (TDS):–**Indicates the amount of dissolved substances in water that affect its taste suitability for consumption.

Data Collection Method:-

To better understand seasonal fluctuations, water samples were taken at different times of the year from different sites inside the Katangi Reservoir sustainable management **[7].**Standard laboratory methods were used to analyze the physico-chemical parameters, and the data were compared to drinking water quality criteria for sustainable management from the Bureau of Indian Standards (BIS) and the World Health Organization (WHO).

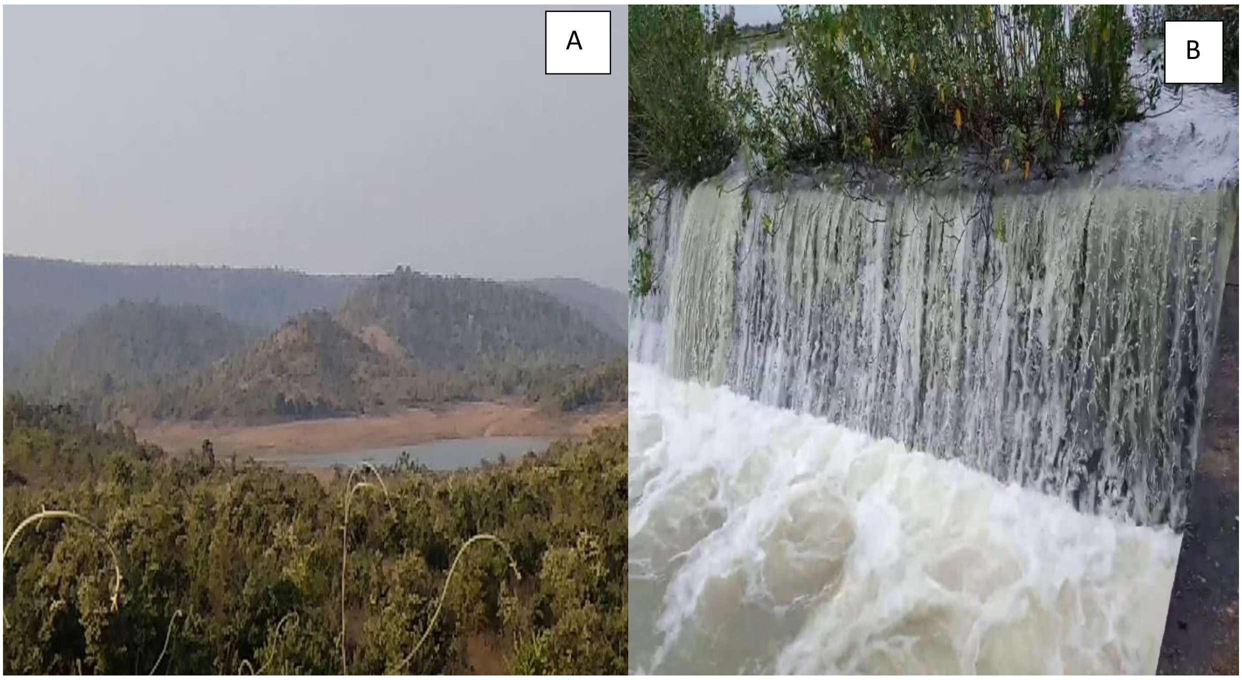

Fig 1:- Katangi Reservoir 2 different views

Results:-

The findings show different levels of water quality, which have an immediate impact on how sustainably the reservoir's management is carried out as well as how suitable it is for applications such as aquatic life, agriculture, and drinking water.

pH Levels:-

During the monsoon season, the pH values in Katangi Reservoir varied between 7.7 and 8.4, indicating mildly acidic conditions. Although this variation falls within WHO drinking water regulations, the pH drop during the rainy season may have an impact on aquatic life **[8].**

$pH = -\log [H^{+}]$

Dissolved Oxygen (DO):-

The quantities of dissolved oxygen (DO) in Katangi Reservoir varied from 5.3 to 7.4 mg/L. Summertime values were lower, maybe as a result of increased temperatures and reduced water levels, which can lead to a decrease in oxygen solubility. Decreased DO levels raise the possibility of eutrophication, particularly in dry seasons.

$DO\ (mg/L) = \left(\frac{V1-V2}{V0}\right) \times 8 \times 1000$

Where,

V1 = Volume of sodium thiosulphate titrated for sample

V2 = Volume of sodium thiosulphate titrated for blank

V0 = Volume of a sample.

Turbidity:-

During the monsoon, turbidity levels in Katangi Reservoir significantly increased, reaching as high as 15 NTU (nephelometric turbidity units). The cause of the high turbidity during monsoon seasons is thought to be silt deposits and agricultural runoff. This might have an impact on drinking water purification as well as aquatic life.

$$\text{Turbidity NTU} = \frac{\text{Intensity of light scattered}}{\text{Intensity of incident light}} = \frac{S}{W}$$

Temperature:-

During the summer, the water temperature of Katangi Reservoir rose to a maximum of 32°C. Elevated temperatures have the potential to impact the reservoir's environment through their effects on chemical and biological interactions.

Total Dissolved Solids (TDS) and Electrical Conductivity (EC):-

The Katangi Reservoir's average TDS level was 4000 mg/L and 4000 mg/L, and its average EC was approximately 850 µS/cm. Both values are still below what is necessary for agriculture and human consumption. On the other hand, the tendency towards rising TDS indicates that continued observation is necessary to avoid salinization **[9].**

Total Dissolved Solids (TDS) calculation:

$$\text{TDS (mg/L)} = \frac{\text{Mass of residue after evaporation (mg)}}{\text{Volume of water sample (L)}} = \frac{M}{V}$$

Electrical Conductivity (EC) calculation:

$$EC = \frac{1}{R} \times \frac{L}{A}$$

Where,

EC – Electrical Conductivity

R – Electrical Resistivity

L – Distance between the electrodes

A – Cross-sectional area of the sample between the electrodes.

Conclusion:-

The Katangi Reservoir's physico-chemical perusal underlines the necessity of sustainable management techniques and offers important insights into the water quality of the reservoir as it stands right now. Encouraging sustainable water use, controlling agricultural runoff, and putting in place appropriate waste management procedures are all crucial for the long-term viability of the Katangi Reservoir. The examination of diverse physico-chemical parameters such as pH, turbidity, dissolved oxygen (DO), Total Dissolved Solids (TDS), and Electrical Conductivity (EC) indicates that although the reservoir can sustain aquatic life and supply water for human consumption, there are signs of growing concerns because of domestic waste, agricultural runoff, and possible industrial discharge in the surrounding areas. To maintain the water quality in the Katangi Reservoir, a long-term management plan that prioritizes routine monitoring, pollution control, and public education programs to lessen human impact must be implemented. Water quality for sustainable management can be preserved by creating buffer zones surrounding the reservoir, reducing the number of chemicals used in neighboring farms, and encouraging environmentally friendly behaviors. The ecosystem of the reservoir must be preserved, and water quality regulations must be upheld, using sustainable water management techniques. In conclusion, proactive and sustainable management initiatives are critical to halting deterioration even if the Katangi Reservoir still satisfies many of the requirements for water quality. These initiatives will guarantee that the reservoir continues to be a dependable supply of water for nearby populations and ecosystems in the future, in addition to preserving the ecological integrity of the reservoir. To guarantee that the reservoir survives in the face of escalating environmental difficulties, sustainable measures are essential.

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