`

ASSESSMENT THE IMPACT OF RAJAKULAM WATER RESOURCE POND OF GROUND WATER QUALITY IN DINDIGUL

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ABSTRACT:

The Rajakulam water resource pond, situated in the Dindigul district, Tamil Nadu, receives water from diverse sources, including domestic, municipal, agricultural, industrial, and medicinal areas, making it a complex and vulnerable ecosystem. Alarmingly, the contaminated pond water has a profound impact on human health, affecting approximately 70-75% of the population, while also jeopardizing the entire environmental system. Recognizing the vital role of pond water in supporting all living organisms, this study undertakes a comprehensive analysis of water quality across various ponds in and around Rajakulam. By collecting and examining water samples from multiple sites, the research evaluates physico-chemical parameters, such as turbidity, pH, dissolved oxygen, and nutrient levels, against WHO standards. The findings reveal that nine of the ponds are severely polluted, rendering them unsuitable for direct domestic or drinking purposes. However, with appropriate treatment, these water bodies can be restored for domestic use, emphasizing the need for effective water management and remediation strategies to mitigate the far-reaching consequences of pollution on sustainable living and human vitality.

KEY WORDS:

Physico-chemical parameters, Standards, Pollution,Various pond water, Analysis

SCOPE

- To assess the physico and chemical characteristics.
- To investigate the hydrochemical properties.
- To suggest effective treatment solutions for contaminated water.

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INTRODUCTION:

The Rajakulam water resource pond, situated in the Dindigul district of Tamil Nadu, receives water from diverse sources, including domestic, municipal, agricultural, industrial, and medicinal areas, making it a complex and vulnerable ecosystem. Alarmingly, the contaminated pond water has a profound impact on human health, affecting approximately 70-75% of the population, while also jeopardizing the entire environmental system. Recognizing the vital role of pond water in supporting all living organisms, this study undertakes a comprehensive analysis of water quality across various ponds in and around Rajakulam. By collecting and examining water samples from multiple sites, the research evaluates physico-chemical parameters, such as turbidity, pH, dissolved oxygen, and nutrient levels, against WHO standards. The findings reveal that nine of the ponds are severely polluted, rendering them unsuitable for direct domestic or drinking purposes. However, with appropriate treatment, these water bodies can be restored for domestic use, emphasizing the need for effective water management and remediation strategies to mitigate the far-reaching consequences of pollution on Wellness and sustainability.

In the district of Dindigul, Tamil Nadu, with a population of 483,648, access to uncontaminated water for crop growth. The region's water sources include rainwater, groundwater, and surface water, with rainwater being the cleanest but requiring large storage reservoirs, which are costly to build and maintain. Groundwater sources, such as bore wells and wells, are also unevenly distributed, while surface water sources like tanks, dams, canals, and rivers are often polluted. Historically, Dindigul has relied on its iconic Rajakulam water resource pond, a stagnant water body susceptible to pollution, which has been a vital part of the region's heritage. However, the pond's water quality is compromised by various contaminants, affecting both human health and the local ecosystem. Freshwater bodies worldwide are facing pollution, decreasing their portability (Gupta S., 2008). Ponds like Rajakulam play a crucial ecological role, supporting wildlife habitats, rainwater harvesting, and groundwater recharge, but are vulnerable to pollution from Domicile waste, Domestic waste discharge, garbage disposal, Surfactants, Petroleum run off, Overfishing bycatch, farm chemical runoff (Bhuiyan, J.R., 2007). This study aims to investigate the water quality of diverse groundwater samples from Rajakulam, addressing the critical requirement for sustainable water resource management for the local population.

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GEOGRAPHICAL EXTENT:

The current research concentrates on the ponds in Dindigul.This study focuses on assessing the water quality of nine selected ponds in Dindigul, India, namely S1Kullnampatti, S2Balakrishnapuram, S3Rajakulam water resource Pond, S4Annanagar, S5Nanthavanampatti, S6Seelapadi, S7Padiyur,S8Odaipatti, andS9Siluvathur.

MATERIALS AND METHODS:

During the monsoon season in October 2022, Pond water specimens were gathered for analysis and labeled as 1 to 9 (Table 1) for comprehensive analysis. The results from each sample were benchmarked against the standard.

HYDROCHEMICAL PROPERTIES:

Physical and chemical analyses were conducted on water samples from each pond identified in Table 1, encompassing parameters such as pH, total solids, dissolved oxygen, phosphorous concentration, and others, with the findings summarized in table1.

The samples were evaluated for various physical and chemical parameters, including pH, dissolved oxygen (DO), phosphorus content, and others, using standard methods outlined by the American Public Health Association (1995). The analytical procedures involved pH measurement using a pH meter, turbidity assessment with a digital turbidity meter, and determination of total alkalinity, acidity, and hardness through titrimetry. Additionally, dissolved oxygen (DO) and chemical oxygen demand (COD) were measured using Winkler's method and the closed reflux method, respectively, while phosphorus and total nitrogen levels were determined using spectrophotometry and the other method, respectively. The results of this analysis are presented in Table 1, providing valuable insights into the water quality of these ponds and informing strategies for effective water management and conservation in the region.

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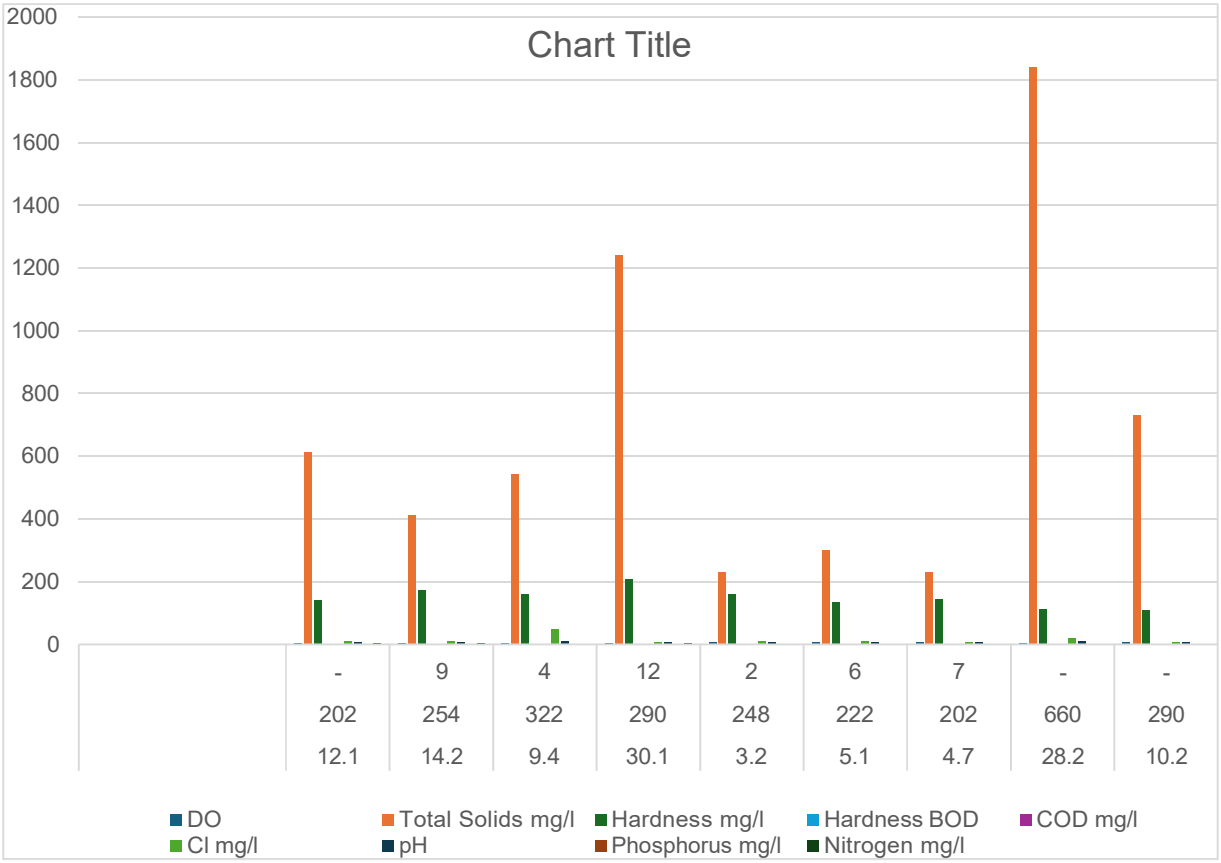
RESULTS AND DISCUSSION: Table -2: A water quality study was conducted in nine ponds surrounding Rajakulam water resource pond, Dindigul, analyziphysico chemical parameters.



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S.No	Name of Various pond	Turbidity NTU	Alkalinity mg/l	Acidity mg/l	DO	Total Solids mg/l	Hardness mg/l	BOD 4 days mg/l	COD mg/l	Cl mg/l	pH	Phosphorus mg/l	Nitrogen mg/l
1	Kullanampatti	12.1	202	-	4.6	613	142	0.20	0.32	11.7	7.9	2.2	4.30
2	Balakrishnapuram	14.2	254	9	3.1	413	174	0.51	0.6	9.7	7.3	2.4	5.0
3	Rajakulam water resource pond	9.4	322	4	4.6	542	161	0.6	1.23	49.7	9.3	0.6	1.26
4	Annanagar	30.1	290	12	3.0	1240	208	0.50	0.71	7.7	7.5	2.0	3.7
5	Nanthavanampatti	3.2	248	2	6.5	231	160	0.5	1.1	11.7	8.5	1.1	2.0
6	Seelapadi	5.1	222	6	7.1	302	136	0.7	1.1	9.7	8.4	0.6	1.6
7	Padiyur	4.7	202	7	6.5	231	146	0.1	0.14	5.8	7.6	0.21	0.41
8	Odaipatti	28.2	660	-	5.0	1842	113	0.84	1.26	19.7	9.1	0.5	1.27
9	siluvathur	10.2	290	-	7.1	733	110	1.03	1.53	7.7	7.8	1.1	1.7
WHO STANDARD		1-5	-	-	-	1000-5000	60-180	6	10	0.2-3.5	6.5-8.5	-	-

pH :

The water quality assessment of nine ponds in Dindigul, India, revealed varying levels of physical and chemical parameters. pH levels ranged from 7.5 to 9.3, with Rajakulam water resource Pond and Odaipatti exhibiting the highest values.

TUBIDITY:

Turbidity levels were elevated, ranging from 3.2 to 30.1, likely due to green moss and the influx of solids from Urban runoff, Sewerage, Graywater.

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ALKALINITY:

Alkalinity levels varied from 202 to 660 mg/l, with higher values potentially imparting a bitter taste to the water.

ACIDITY :

Acidity levels were mostly negligible, ranging from 4 to 14.

DISSOLVED OXYGEN CONTENT

Dissolved oxygen (DO) levels were concerning, ranging from 3.0 to 3.1 mg/l, indicating decomposition of organic matter and potential harm to aquatic life. . Total solids levels ranged from 230 to 1840 mg/l, likely due to decomposition of organic matter.

TOTAL HARDNESS LEVEL

Total hardness levels ranged from 110 to 174 mg/l, while chloride levels were relatively low, ranging from 7.7 to 49.7 mg/l.

CHEMICAL OXYGEN DEMAND

Chemical Oxygen Demand-(COD) levels indicated from 0.3 to 1.53 mg/l, indicating the oxygen demand for organic matter degradation.

BIOLOGICAL OXYGEN DEMAND

Biological Oxygen Demand-(BOD) levels indicated microbial activity and dead organic matter, with an inverse relationship observed between DO and BOD values.

PHOSPHROUS CONTENT

Phosphorus content ranged from 0.41 to 5.0 mg/l, essential for plant growth but potentially contributing to eutrophication at excess levels.

NITROGEN LEVEL

Total nitrogen levels indicated from 0.41 to 5.0 mg/l, varying in importance depending on the forms of nitrogen present.

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CHLORIDE LEVEL

Elevated chloride levels are often a sign of pollution stemming from high amounts of organic waste from animal sources. However, in this case, chloride concentrations were relatively low, ranging from 7.7 t0 49.7 mg/l.

CONCLUSIONS:

The rapid urbanization in the area has led to a significant increase in water quantity problems in ponds, resulting in compromised water quality. The turbidity levels in all nine ponds exceed the standard values by up to five times, indicating high levels of suspended particles. The chlorine content in all nine ponds surpasses the recommended levels, posing a risk to aquatic life. The pH levels in the ponds require neutralization due to higher than acceptable values. The study concluded that water quality issues, particularly turbidity, total solids, phosphorus, and total nitrogen, were prevalent due to contamination. Improvements can be made through prevention of sewage water entry and responsible disposal of pet waste. The absence of E. coli bacteria is advantageous for human and animal health. To address high TDS levels, the installation of domestic is recommended reverse osmosis or adsorption for residential areas surrounding Rajakulam water resource pond.

RECOMMENDATION

RO technology

Global access to Reverse Osmosis (RO) technology has been enhanced with the introduction of

the cutting-edge Mega Magnum RO Element, boasting an impressive 18” diameter and 60” length

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ADSORPTION

- Adsorption can remove a wide range of contaminants, heavy metals, heavy chlorine content.
- It is less expensive
- Easy to implement
- High efficiency.
- No chemical addition
- Long term reliability
- Compact design.
- Another recent development in adsorption methods is the use of adsorbents like aluminium-based, calcium-based, iron-based adsorbents.

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