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STUDY ON KOKKALA CANAL WATER IN KOLE LANDS NEAR THRISSUR CORPORATION AND ITS EFFECTS ON PADDY FIELDS

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Abstract:

The Thrissur kole wet land is a unique natural wet land system lying in Thrissur district. It is used for paddy cultivation and it covers more than 10,000 Ha. In fact kole in Malayalam means bumper yield, bumper prize, Jackpot etc. As the wet land all over the world are depleted and affected by development, the importance of natural wet land in water shed system becomes increasingly apparent effort to restore and maintain wet land have been crucial to water quality in many areas. This kole land provides natural fresh water resources for groundwater recharge, provide a sink for the large surface runoff from eastern height land in every monsoon and keep Thrissur city free from flood. The act as natural draining system through a network of canals and ponds and finally to the Arabian sea through back waters. But for the past decades the kole land which lies adjacent to Thrissur city re facing severe pressure due to urbanisation. The entire storm water drainage network of Thrissur city carries the urban waste with its flow and passes through the Kole lands. The municipal waste water it's made up of domestic waste water, Industrial waste water, Storm water, Groundwater seepage. Due to this Kole land adjacent to Thrissur city becomes highly polluted and is severe in a stream named Kokkala stream leading to Kole lands from the thrissur railway station. So in this project it has been studied the pollution level of the Kokkala stream and its effect on Kole lands. The collected water sample had been tested for different physical, chemical and biological parameters during the pre monsoon and post monsoon. From this result It is found that all the parameters tested in rainy season are well within the irrigation standard. But from the result of summer samples it is found that the parameters like Turbidity, BOD, suspended matters, oil and grease and COD are high and above the irrigation standard.

Key Words: Canal Water, Sampling Site, Parameters & Irrigation Standard

1. Introduction:

The Thrissur city doesn't have a systematic and planned a drainage facility to dispose waste water and excess rain water. Most of the drainage canals are connected to the irrigation canals which flow to kole wet land area. The drinking water sources of the city and surrounding area are largely depending on the kole wetland due to the ground water recharge properties of the same.

2. Study Area:

Thrissur is located at the central region of kerala and geographically situated between north latitude 9º52¹& 10º 10¹ and east longitude 76º14¹ & 76º21¹ with a total area of 101.42 sq.km. Thrissur corporation is subdivided into 52 wards. Thrissur city alone accounts for 38% of the urban population in the district. The average population density in the city is 6466person / sq.km in 1991, but it reduced to 3131person /sq.km in 2001 consequent to the merger of some Panchayats in 2001. Population growth is indicated in table given below. the city is expected to grow at the same rate as shown in the table over the next 3 decades.

Table 1: Population Growth of Thrissur

Year	1971	1981	1991	2000	2001
Population	76,248	77,923	81,798	317,526	315,957
Area in Sq.km	12.65	12.65	12.65	101.42	101.42
Density, Persons/sq.km	6027	6159	6466	3131	

Geologically Thrissur is mostly composed of Archean gneiss and crystallized data with central bed of laterite and narrow coastal belt of resend sediment. The major soil type are laterite The District has a tropical humid climate with an oppressive hot season and plentiful and fairly assured seasonal rainfall. The hot season from March to May is followed by the southwest monsoon from June to September. After that northeast monsoon picks up upto November. the average annual rainfall is 3158mm. the maximum daily temperature is 31ºc 68.6% of the city land is under residential use. Commercial area is comparatively less and comprises of small establishment. Industry sector occupy 5.73% of the developed area of the city. Public and semi-public use occupy 10.24%. Table is given below.

Table 2: Land Use Pattern

Type of land use	% of total area
Residential	68.60
Public and semi public	10.24
Commercial	2.28
Industrial major	5.73
Parks & open spaces	4.17
Transportation	9.00
Total	100

The main impact of urbanisation process has been expansion and constant change of urban land use.

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3. Preliminary Assessment of Storm Water / Waste Water:

The central point of Thrissur city is 'Thekkinkaadu ground' in a circular shape which is surrounded by roads. There are several links to the circle from all round through which the natural flow drains to the wetland in outskirts of the town. These wetlands are having several natural canals and ponds which enable the flood water to drain into the kole lands and ultimately to Arabian sea. These natural system has been completely spoiled due to the rapid development of the city without proper planning and maintenance which has converted the wetlands into lands for other uses. There are 3 main canals which receives the entire urban water and delivers to kole lands. During rainy season road side drains carries flood water to the canals. When there is no rain the drains become carriers of waste water. The 3 main canals which receive the total urban waste are Kokkala stream, Kunduvara stream and Panjikal stream.

Table 3: Waste Generating Sources

Sources	Category	Total No. of Units
Households(resident population-324,839 persons)	HIG, MIG and LIG	70,730
Hotels & Restaurants	Large Medium Small	34 108 390
Commercial Establishments	Large Medium Small	90 210 10,680
Markets	Large (stall-337, vendors-62) Medium(stall-140,vendors-22) Small (stall-75, vendors-10)	2 3 6
Offices & Institutions	Large Medium & Small	124 2100
Hospitals (No. of beds)	-	5,361 beds
Marriage/ community halls	-	45
Roads and streets in km	Dense Inner City Area Medium Density Area Low Density Area	372 200 180
Slaughter House	-	1
Construction / Demolition	-	LS

Thrissur kole land is a unique wetland lying in Thrissur district, it gives 40% of Kerala's rice requirements and act as a natural drainage system for Thrissur city. The kole wetland is one of the largest highly productive and threatened wetland in Kerala. The kole wetland lies between 10º20¹ & 10º40¹ N latitude and 75º58¹ & 76º11¹ E longitude. The kole wetlands cover an area of about 13672 Ha spread over Thrissur and Malappuram District. The area extend from Chalakkudy river in the southto Bharathapuzha in north. They are low lying tract located 0.5m to 1m below MSL and remain submerged for about 6months in a year. Enriched by the silt brought by the rivers, they are very fertile for rice cultivation. The submerged wetland are dewatered into the canal system from November onwards for making the field reasy for cultivation. The cultivation period is from November to May.

4. Contamination on Kole Land:

Kole lands are natural wetlands and wetlands world wide described both as the 'kidney of the landscape' and 'biological supermarket'. This is because of the functions they performed in the hydrological and chemical cycle and because of the extensive food webs and rich biodiversity that they support. The kole lands which adjacent to the thrissur city are facing severe pressure due to urbanisation. The entire storm water drainage network of the city carries the urban waste along with its flow and passes through the kole land. The municipal waste water is made up of domestic waste water, industrial waste water, storm water and ground water seepage. In general urban waste include market waste, hotel waste, hospital waste, wash off from roads etc.. plastic waste and hospital waste include syringes, bottles etc. whch are floating in the entire reach of streams leading to kole land. All of these wastes are entering the kole land without treatment

5. Problem Due to Contamination:

The entry of waste contaminates both soil and water. The farmers of the kole land near the city abandoned cultivation due to pollution. Water weeds and hyacinths are decaying again effect the quality of water. Aquatic life including fish also gets reduced. The farm labourers are suffering skin problem like itching blistering etc. and there are allergic problems, wheel diseases. Jaundice, dysentery. The waste from corporation's area is being directly discharged into the main canals in the kole lands. The quantum of pollution costed by the discharge of untreated waste into the wetland system is alarming. These threads will finally costs ecological imbalance leading to deleterious effect on living resources, hazards to human health, hindrance to aquatic activities, impairment of water quality and reduction of aminities. Often fish deaths were reported in these canals. The water bodies suffocate with the excessive load of decomposable and non-decomposable

6. Materials and Methods:

Location: The Kokkala canal has three branches. The first one starts from Poothole Road Junction and flowing along back side of railway station and second one starting near SakthanThampuran Nagar. The third one starting from the existing road drains and

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joining to 2nd branch. These three joined together near railway station premises and finally discharged to Chettupuzha Canal. The total length of Kokkla Canal is 2000mts. Map of the same is shown below.

Collection of Canal Water Sample: Based on the site inspection it has been decided to take samples in post monsoon (rainy season) period and pre monsoon period. The Dist. Collector accorded sanction for study as he is the authority of kole wet lands

Collection of Canal Water Samples in Post Monsoon (Rainy) Season: During rainy season two samples of waste water were collected near Thrissur Railway station premises and Sakthan Tampuran Nagar in July 2016 as they are the sources of Kokkala Canal.

Collection of Canal Water Samples in Pre Monsoon Period: Six samples were collected which were at the starting point of the Kokkala canal, at the entrance point of a big drain to Kokkala Canal, 1km from the starting Kokkala Canal, next 1.5km that is at the bridge location and at 500mt from this bridge.

7. Result:

Physico-Chemical Properties Tested for Post Monsoon Samples:

Table 4: Result of Post Monsoon Samples

Parameters	Location		Irrigation Stds
	Sample No 1	Sample No 2	
Sulphate (mg/1)	30	30	250
Sulphide (mg/1)	4.6	0.6	10
Iron (mg/1)	2.42	3.72	5.0
Chloride (mg/1)	39.98	45.98	350
Dissolved oxygen (mg/1)	7.3	5.3	8.0
COD (ppm)	52	53	250
BOD_5 (ppm)	3.6	3.95	30
Total solids (mg/1)	144	316	2100
Turbidity (NTU)	7.8	5.8	15
Conductivity (µs/cm)	246	274	2250
pH	5.67	5.62	6 - 8.5

Physico-Chemical Properties Tested for Pre Monsoon Sample:

Table 5: Result of Pre Monsoon Sample

Quantity Characteristics	Location						Irrigation Standard
	Sample No 1	Sample No 2	Sample No 3	Sample No 4	Sample No 5	Sample No 6	
pH	6.5	6.6	6.6	6.7	6.7	68	6- 8.5
Turbidity (NTU)	61.4	53.9	31.3	28.1	78.5	0.68	15
BOD (after incubation for 5 days) mg/l	198.5	319.4	89.5	268.8	99.4	9.8	30
Suspended matter(mg/l)	892.0	2078.0	1576.0	1518.0	846.0	80.0	200
Oil and grease(mg/l)	90.0	114.0	73.2	58.4	66.4	9.6	10
COD(mg/l)	1346	3269l	1346.2	1730.8	1538	46.1	250
Chloride (as Cl-)mg/l	74.4	114.14	148.8	138.9	99.2	178.6	350
Total dissolved solids(mg/l)	308.0	662.0	414.0	364.0	438.0	358.0	2100
Sulphates(mg/l)	6.0	8.0	6.0	4.0	6.0	2.0	250
Nitrate	Nil	Nil	Nil	Nil	Nil	Nil	-
Conductivity (/µs)	910.5	837.1	672.5	744.9	905.8	709.4	2250

8. Conclusion and Discussion:

From the result of post monsoon samples we can see that no treatment is required during the rainy season. Floating materials & obstructions are to be removed and the quality of water become worst when the flow is reduced and the obstructions are growing bigger in size. But from the result of pre monsoon sample we can see that from the 5 consecutives samples values of turbidity, BOD, suspended matter, oil and grease and COD are high and above the irrigation standard. So treatment is required to reduce the above parameters to a level of irrigation standard. For the 6th sample all the parameters are well within the irrigation standard. So water is suitable for irrigation purpose from the point of 6th sample onwards

Turbidity: Turbidity is the measure of relative clarity of a liquid. It is an optical characteristic of water and is an expression of the amount of light that is scattered by material in the water when a light is shined through the water sample. Turbidity makes water cloudy or opaque. Turbidity can provide food and shelter for pathogens. If not removed, turbidity can promote regrowth of pathogens in the distribution system, leading to waterborne disease outbreaks. The particles of turbidity provide "shelter" for microbes by reducing their exposure to attack by disinfectants.

BOD: Bio Chemical Demand (BOD) is the amount of dissolved oxygen needed by aerobic biological organism in a body of water to break down organic material present in a given water sample at certain temperature over a specified time period.

Oxygen consumed in the decomposition process robs other aquatic organisms of the oxygen they need to live. Organisms that are more tolerant of lower dissolved oxygen levels may replace a diversity of natural water systems contain bacteria, which need

oxygen (aerobic) to survive. Most of them feed on dead algae and other dead organisms and are part of the decomposition cycle. Physical characteristics of water stream will be altered. Reduction in the growth of aquatic life and alteration in food and migration. It results in hampered swimming problem and finally leads to death.

Suspended Matter: Suspended solids are particles that are larger than 2 microns found in the water column. Suspended particles can come from soil erosion, runoff, discharges, stirred bottom sediments or algal blooms Excessive suspended sediment can impair water quality for aquatic and human life, impede navigation and increase flooding risks. In terms of water quality, high levels of total suspended solids will increase water temperatures and decrease dissolved oxygen (DO) levels.

Oil and Grease: Often grease and oil that pollutes the water sources will also contain metal contaminates. it can adversely affect fish and aquatic plants in irrigation water.

COD: Chemical Oxygen Demand is a measure of chemical oxidants required to break down organics in water. High level of COD in water often correlate with threats to human health including toxic algae bloom bacteria's from organic wastes and sea food contamination. High COD levels decrease the oxygen level available for aquatic life. Low dissolved oxygen , or hypoxia causes reduced cell functioning, distrupts circulatory fluid balance in aquatic species and can result in death of individual organisms as well as large dead zones, hypoxic water can also release pollutants stored in sediment.

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