

A Study on GIS based Pollution level monitoring in Water tanks of Coimbatore

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Abstract:

The Noyyal River System consists of several interconnected water bodies which receive water from the River Noyyal. This River system was severely damaged during the last century. A Non- Governmental Organization (NGO) called Siruthuli was founded by the people of Coimbatore to address the issue of acute water shortage by restoring the Noyyal River System. By the end of 2004, seven major tanks around Coimbatore were desilted and bunds were built. Subsequently, all the canals were desilted and cleaned up. But Medical waste and Sewage continue to be dumped in to the water bodies and hence the pollution level increased. This study aims in determining the water quality of three tanks in the Noyyal River System namely Krishnampathy, Valankulam and Periyakulam using Geographical Information Systems (GIS). The chemicals in the water bodies are increasing now a days, so it is necessary to find out whether the water is fit for human consumption. If the water is found to be unfit for human consumption, the possible causes will be analysed and possible solutions would also be proposed.

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The major causes for the degradation of the River Noyyal are Degradation of the catchment, Siltation in the water bodies, Encroachment, Change of land use pattern, Dumping of solid wastes, Discharge of untreated municipal sewage, Discharge of untreated industrial wastewater, Presence of aquatic weeds, Water stagnation, Poor maintenance, Lack of awareness. There are over 870 dyeing units located in Noyyal river basin particularly in Tirupur, Palladam and Avinashi blocks that are primarily responsible for pollution in the Noyyal river basin. The dam was constructed for irrigation purpose and only meager quantity of water was released to irrigate approximately 20,000 acres of land in Erode and Karur district. According to industrial experts, 8.7 crore litres of treated effluents flow from the dyeing units daily. These effluents contain Total Dissolved Solids (TDS) higher than 2,100mg/litre-the level set by the Tamil Nadu Pollution Control Board. It is highly contaminated; moreover poisonous gases emanating from it results in the infection of lungs. The bleaching liquids used by the textile industries in Tirupur find their way to Noyyal as effluent discharge. A study found that the dumping of dye factory effluent with sludge increases the soil pH, organic carbon, phosphorous, potassium, calcium and sodium, consequently reduces the water holding capacity of soil. Unplanned land use and encroachments have reduced the utility of the interconnected tanks around Coimbatore. Wastewater and biomedical waste from hospitals are also dumped in these lakes.

To tackle the water shortage affecting Coimbatore, the corporate of Coimbatore joined together to form an NGO called Siruthuli. The objective of the organization was to improve groundwater levels and to restore the Noyyal river system. By the end of 2004, 7 lakes in Coimbatore were desilted and bunds were constructed around the lakes. Siruthuli undertook the massive project of removing the water hyacinth. The water hyacinth removed from Valankulam, Selvachintamani, Periyakulam and Krishnampathy tanks were processed as manure using EM Technology. The manure which is obtained after processed using EM Technology was proved as a best bio-manure for crops.

Study Area:

Coimbatore city also known as Kovai is located on the banks of river Noyyal is chosen as our study area. Coimbatore is one of the major textile and industrial hub of Tamil Nadu. Fig: 2 shows the study area map showing the tanks and rivers at Coimbatore. Using GIS software the Valankulam tank, Coimbatore tank and Krishnampathy tank were mapped in the aerial map of Coimbatore and collected the latitude and longitude details of the desired area, Catchment area, Full tank level, Water spread area and Encroachment details. Water Samples from these tanks were also collected for analysis.

(i) Valankulam

Valankulam tank is situated in Coimbatore with a latitude of $10^{\circ} 58' 48''$ and longitude of $76^{\circ} 55' 44''$. It has a registered ayacut of 42 acres with the catchment area of 6.272 sq.km of free and 12.162 sq.km of combined area. The full tank level is 14.75m. The Noyyal river water is diverted at the point of Coimbatore anaicut. The water then passes through the Coimbatore big tank. Water reaches Valankulam when the Coimbatore big tank overflows

(ii) Coimbatore tank(Periyakulam)

Coimbatore tank is situated in Coimbatore with latitude of $10^{\circ} 58' 48''$ and longitude of $76^{\circ} 55' 14''$. The capacity of the tank is 69.65MCft with the water spread area of 319.27acres. It is having a registered ayacut of 1436 acres with the free catchment area of 10.752 sq.km and 51.712 sq.km of combined area. The full tank level is 19.1m. The Noyyal river water is diverted at the point of Coimbatore anaicut to the Coimbatore big tank.

(iii) Krishnampathy tank

Krishnampathy tank is situated in the village Telugupalayam. The capacity of the tank is 7.67 MCft. This registered ayacut is 568.79 acres with a water-spread area of 178 acres. The total capacity is 86 acres. The catchment area is 16 sq.km. The Noyyal river water is diverted at Chitrachavadi anaicut. The water then passes through the Pudhukulam tank. After overflow, water reaches Konarampathy tank, Narasimpathy tank, then water is reached to Krishnampathy tank.

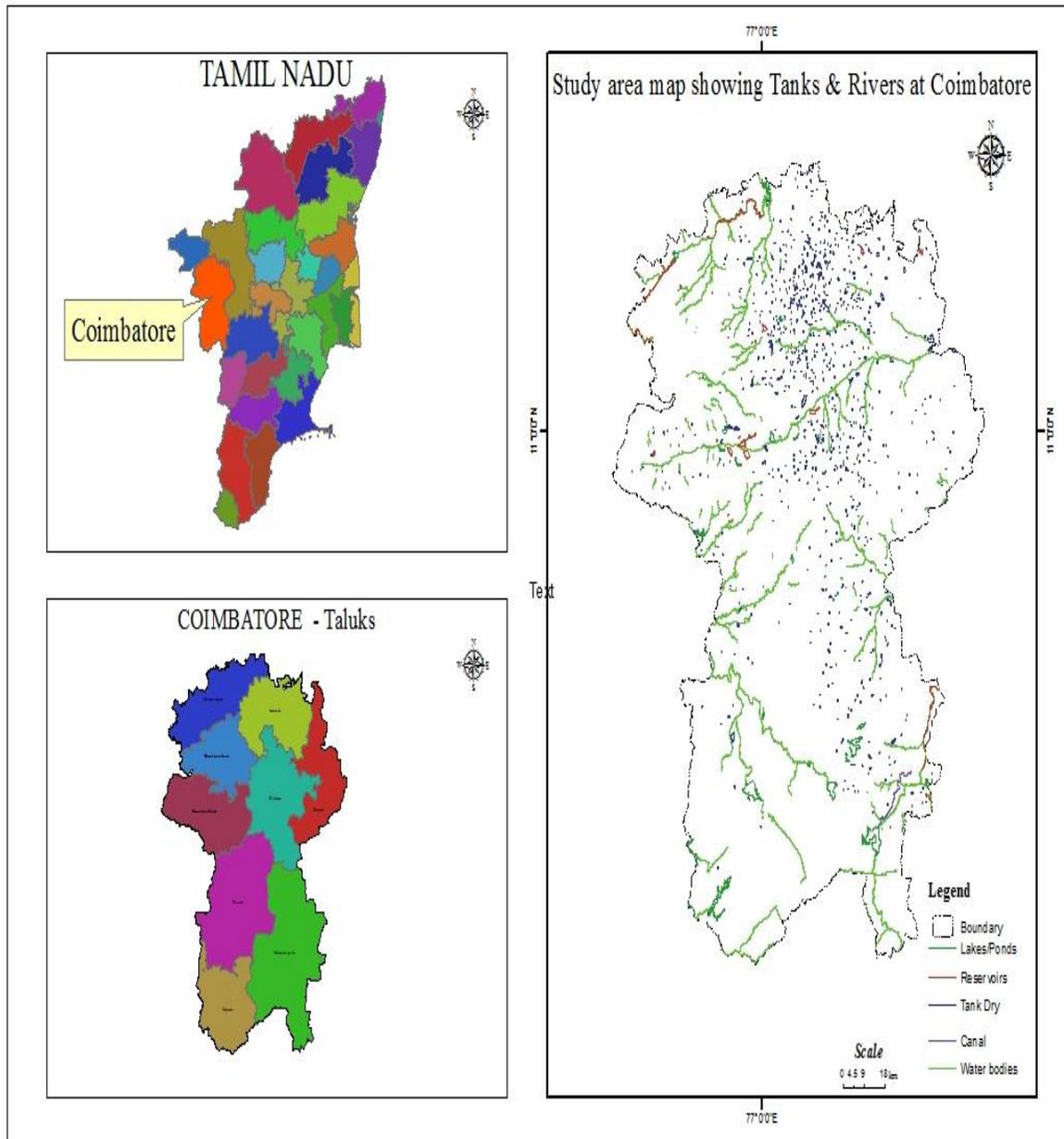


Fig:1

Fig: 2 –Study Area map showing the tanks and rivers at Coimbatore

Methodology:

Various steps involved in the Georeferencing process are described here. Add the layers which are residing in map co-ordinates and then add the raster data set on which we want to georeference. Then click Toolbars->Georeferencing in the customize menu for viewing the Georeferencing tool bar. Click layer drop down arrow from Georeferencing tool bar and then click on the layer we want to georeference. From the Georeferencing drop down menu click Fit To Display for displaying the raster dataset in the

same area as the target layers. For adding control points, click on the Add Control Points tool. Click a known location on the raster dataset, and click a known location on the vector layer in map coordinates to add a link. We have to add enough links for the type of transformation we apply. For evaluating the transformation, click on the View Link Table button. It is possible to examine the residual error for each link. We can add links until we get satisfied with the registration. There is also privilege for deleting unwanted link from the Link Table dialog box. Finally, Clicking on the Update Georeferencing from the Georeferencing drop down menu will save the transformation information where as clicking on the Rectify will result in the creation of new file with Georeferencing information.

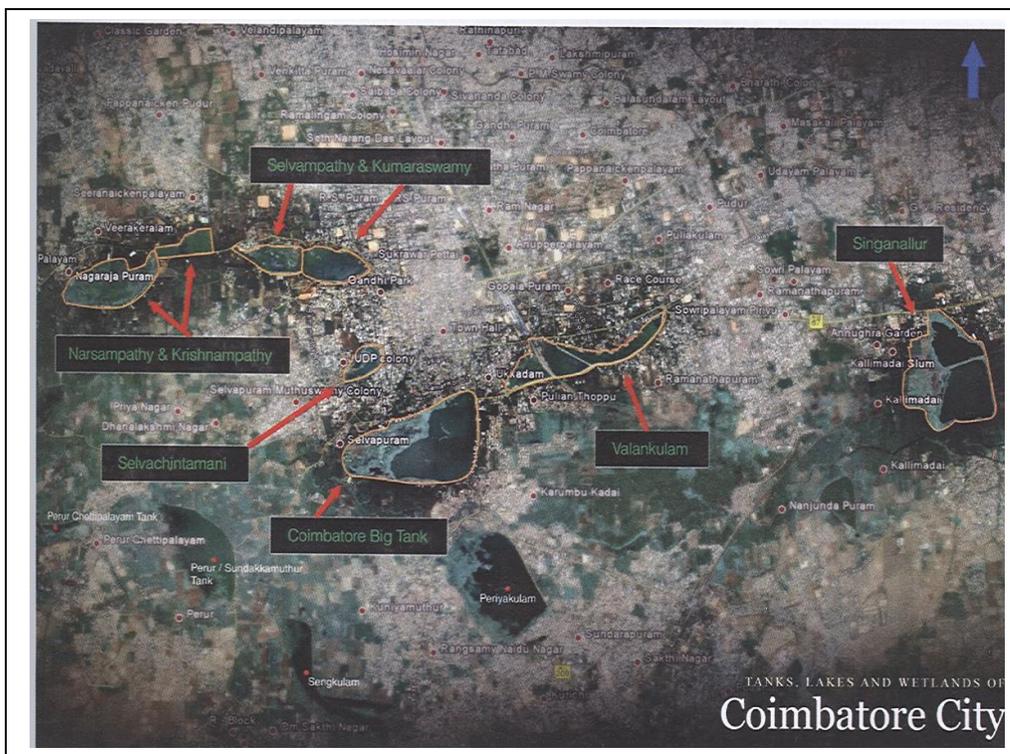


Fig: 3 –Water tanks in Coimbatore

The aerial map of Coimbatore was taken and the water tanks under consideration were marked using GIS software. The latitude and longitude details of the tanks were collected. Also the details about the catchment area, full level of tank, Water spread area, common pollutants and encroachment details were collected. The water samples from each tank were also collected for analysis.

Results and Discussions:

The Table: 1 Water Analysis Results is the table showing the analysis results of water samples collected from the tanks. Various Physical and Chemical parameters that were considered in water sampling are also listed in the table. GIS and remote sensing techniques were used to identify the locations of desired tanks and rivers in the study area. The encroachment details and details of catchment area were collected. The length and width of the tanks were measured and the total capacity of each tanks were also calculated.

Table 1
Water Analysis Results

Physical Examination	Krishnampathy(Pond)	Periyakulam(Pond)	Valankulam(main tank)
Appearance	Clear	Clear	Clear
Colour	Colourless	Colourless	Colourless
Odour	Objectionable	Objectionable	Objectionable
Turbidity NT Units	7	8	10
Electrical conductivity micro mho/cm	1385	1575	1090
Chemical Examination			
pH	7.29	7.26	7.3
Total Hardness as CaCO ₃	400	580	350
Calcium	106	154	94
Magnesium	32	47	28
Sodium	250	220	170
Potassium	27	23	18
Iron	0.2	0	0.3
Manganese	0	0	0
Free Ammonia	9	10	10
Nitrite	0.4	0.2	0.2
Nitrate	40	60	50
Chloride	390	420	280
Fluoride	0.4	0.4	0.4
Sulphate	180	140	150
Phosphate	6	7	5

From the analysis result of water samples, we can infer the quality of water in the tanks. The Pollutants in the sample can be determined from the level of turbidity. Also it is shown that the presence of calcium is below the allowable range 200. The increased amount of free ammonia in the range of 9-10 is highly dangerous. There is no iron content in the water sample collected from Periyakulam tank. The presence of nitrite mentioned in the above table increases the toxicity of water and will affect the health. The presence of iron in the water sample collected from Valankulam tank is comparatively high.

Conclusion:

Identified the locations of Valankulam tank, Coimbatore tank, and Krishnampathy tank using GIS and Remote Sensing techniques. Physical and Chemical analysis of water samples was done and the results are provided in Table: 1. Water tanks must not be used as landfill areas. Before dumping in to the River system, effluents must be properly treated. Dumping of medical waste and sewage in to tanks must be stopped as soon as possible.

References:

1. W.B.Vasantha Kandasamy, Florentin Smarandache, S.R.Kannan, S.Ramathilagam, Methods in Environmental Biotechnology for Environmentalists
2. Francois Molle, Philippus Wester, River Basin Trajectories: Societies, Environments and Development
3. Dr. Sushmitha Baskar, Dr.R. Baskar
4. www.siruthuli.org
5. http://en.wikipedia.org/wiki/Noyyal_River
6. <http://siruthuli.com/river-noyyal-origin-and-its-tributaries/>

7. <http://siruthuli.com/?cat=8>
8. http://en.wikipedia.org/wiki/User:Nppradeep/Noyyal_River
9. http://resources.arcgis.com/en/help/main/10.1/index.html#/to_a_vector/009t000000mq000000/
10. <http://en.wikipedia.org/wiki/Coimbatore>
11. <http://www.articlesbase.com/environment-articles/noyyal-a-lost-river-environment-threat-4623873.html>
12. <http://en.wikipedia.org/wiki?curid=37738>