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ASSESSMENT OF WATER QUALITY INDEX OF WATER BODIES BEFORE, DURING, AND AFTER IDOL IMMERSION IN TAMIL NADU, INDIA

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ABSTRACT

Ganesh Chaturthi, known as Vinayagar Chaturthi in Tamil Nadu, is a prominent Hindu festival observed across India, typically during the months of August and September. Traditionally, clay idols of Lord Ganesha are installed in homes and public spaces for worship and subsequently immersed in nearby water bodies. However, in recent years, many idols have been crafted using non-biodegradable materials like plaster of Paris and thermocol, and adorned with synthetic paints. The immersion of such idols has led to contamination of water bodies, adversely affecting aquatic ecosystems. To mitigate this environmental impact, the Central Pollution Control Board (CPCB) has issued comprehensive guidelines for the manufacture and immersion of idols and mandated State Pollution Control Boards to monitor water quality before, during, and after immersion events. District Administrations designate specific water bodies for this purpose. In Tamil Nadu, the State Pollution Control Board undertakes water quality monitoring and publishing the reports. Water Quality Index (WQI), a dimensionless scale ranging from 0 to 100, is used to assess water quality by consolidating various parameters. These values are interpreted using classification categories such as excellent, good, fair, poor, and highly polluted, based on Indian Standard IS 10500:2012, CPCB norms, and international benchmarks like those of the World Health Organization and the European Commission. This study evaluates the water quality of the water bodies by means of WQI in nine selected districts of Tamil Nadu, wherein idols were immersed during the 2024 Vinayagar Chaturthi festival. The results indicate that idol immersion activities have led to noticeable degradation of water quality, with most sites falling under the *Fair*/*Poor* category. The findings underscore the need for greater public awareness on the use of eco-friendly materials and strict adherence to CPCB guidelines and the Solid Waste Management Rules, 2016, for idol immersion and disposal of decorative waste materials.

KEY WORDS: Idol Immersion, CPCB guidelines, Water Sampling, Water Quality Index

INTRODUCTION

Ganesh Chaturthi is a significant Hindu festival celebrated across India, typically during the months of August and September. As part of the tradition, idols of Lord Ganesha are installed in homes and public spaces for worship and are later taken in procession for immersion in nearby water bodies (Gharat and Shaikh, 2021). In Tamil Nadu, this festival is celebrated as Vinayagar Chaturthi. Traditionally, these idols were crafted from natural materials like clay, decorated with natural flowers, and painted using natural dyes. However, in recent years, the practice has shifted towards using non-biodegradable materials such as plaster of Paris, thermocol, and synthetic paints (Bengani *et al.*, 2020; Bhattacharya and Ghosh, 2014). The immersion of such idols has been found to pollute water bodies

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and adversely affect aquatic ecosystems. Additionally, pooja materials such as flowers and decorative items are often discarded into water bodies, contributing to solid waste pollution (Bhagat and Singh, 2014).

To address these environmental concerns, the Central Pollution Control Board (CPCB) issued revised guidelines in May 2020 for environmentally safe idol immersion practices (CPCB, 2020). As per these guidelines, idols must be made from natural, biodegradable, and eco-friendly substances such as traditional clay or mud, and should not contain toxic or non-organic materials. The use of plaster of paris, thermocol, plastic, and synthetic or enamel paints is strictly prohibited. Instead, decorations should be limited to natural resins, non-toxic water-based biodegradable dyes, dried flowers, straw, and other eco-friendly materials.

The CPCB has also directed local bodies to establish artificial immersion ponds, where water can be treated and safely discharged after the immersion process. In cases where immersion takes place in natural water bodies like rivers, lakes, canals, or seas, the CPCB guidelines must be strictly enforced. Furthermore, the CPCB has directed State Pollution Control Boards (SPCBs) to conduct water quality monitoring before, during, and after the idol immersion period. This involves analyzing samples for a range of physico-chemical parameters, including pH, dissolved oxygen (DO), color, total suspended solids (TSS), biological oxygen demand (BOD), chemical oxygen demand (COD), turbidity, conductivity, total dissolved solids (TDS), chloride, hardness, and heavy metals such as chromium, lead, zinc, copper, cadmium, antimony, barium, mercury, and manganese (Odisha SPCB, 2022, Yigam and Bharti, 2025).

In Tamil Nadu, designated water bodies for idol immersion are notified by the respective District Administrations. The Tamil Nadu Pollution Control Board (TNPCB) undertakes water quality monitoring in accordance with CPCB guidelines in all the water bodies covering all the districts. In this paper, the quality of water bodies before, during and after immersion of idols during the 2024 Vinayagar Chaturthi festival for selective nine districts is presented. Water Quality Index (WQI) is calculated and compared with standard classification categories based on BIS 10500:2012 drinking water standards, CPCB norms, and international benchmarks from the World Health Organization (WHO) and the European Commission (EU).

MATERIALS AND METHODS

Study Area

In Tamil Nadu, Vinayagar Chaturthi 2024 was celebrated on 7th September 2024. Tamil Nadu State consists of 38 Revenue Districts. The District Administrations have notified the water bodies for immersion of idols. The TNPCB monitored the water quality in all these water bodies pre, during and post immersion of the idols (TNPCB 2024 a, b). Post immersion samples were collected after seven days of immersion. Samples were collected at least 100 m away from immersion point. In case of flowing water bodies, it is 100 metre at the downstream side so as avoid turbulence. The samples were analysed for the parameters,namely: dissolved oxygen, pH, biochemical oxygen demand, cadmium, copper, total chromium, manganese, lead, zinc and iron. The monitoring data is uploaded in the Board website. For this study, ninedistricts (i.e) Coimbatore, Cuddalore, Dindigul, Erode, Madurai, Salem, Trichy, Tirunelveli, and Vellore were selected. Figure 1 shows the location of districts selected for this study. Using the monitoring data, Water Quality Index was calculated.

Fig. 1. Tamil Nadu State Map Showing Districts Selected for Study

Water Quality Index

The Water Quality Index is a dimensionless number that translates the water quality parameters into a single number for easy understanding and it can be compared with water quality classification which is based on BIS drinking water standards and CPCB criteria for surface water bodies for designated best use (Abbasi and Abbasi., 2014; Uddin *et al*., 2021). WQI varies 0 to 100. It is classified into five classes: namely, *Heavily Polluted* (0 - 25), *Poor* (>25 - 50), *Fair* (>50 - 75), *Good* (>75 - 95), and *Excellent* (>95 - 100). WQI range and the corresponding water quality status is given Table 1 (Singh *et al*., 2015; Singh *et al*., 2019).

WQI is arrived based on aggregation of functions that allow for the analysis of large, temporally, and spatially varying water quality datasets to produce a single value,that indicates the quality of the water body. WQI is very useful to the water supply authorities for decision making purposes. The calculation of WQI involve four steps (i.e) parameter selection, sub-index computation by converting the parameter concentration in to a single value based on the concentration range, assigning weight age factor for the parameter, aggregation of sub-index of all the parameters and convert into a single value (Nag and Pande, 2015). There are uncertainties in each stage of index computation.

Singh *et al*. (2015) National Institute of Hydrology, Roorkee have developed a cumulative water quality index model for surface water and groundwater under the Indian context. The said model is used for this study.WQI assessment is presented below:

Parameter Selection

Based on the literature review and the monitoring data available for the nine districts, the following parameters are selected for WQI computation namely: dissolved oxygen (DO), pH, Bio-chemical oxygen demand (BOD), cadmium, copper, total chromium, manganese, lead, zinc and iron (Maiti *et al*, 2021; Singh *et al.*, 2019).

Normalization (Sub-index Calculation)

Each selected parameter is converted into a dimensionless sub-index (*Yi*) using equations. This step transforms the measured concentration of each parameter into a scale 0 to 100. It is arrived at by linear interpretation of index value for the corresponding class. Sub-Index function for the parameters corresponding to the class is given in Table 2 (Singh *et al*., 2019).

E.g. Let BOD concentration be measured as *X* mg/L. Consider it falls in the range value of 2-3 mg/l which corresponds to the quality class of *Good* with sub-index (Y_{BOD}) value falls in the range of >75 – 95.

$$Y_{BOD} = \left\{\frac{(95-75)}{(2-3)} \times X\right\} + \left\{95 - \left[2 \times \frac{(95-75)}{(2-3)}\right]\right\} = -20X + 135 \quad \ldots.(1)$$

Weight Assignment

A weight (w_i) is assigned to each parameter based on its relative importance to overall water quality and potential health/environmental impact. The weights reflect expert judgment or regulatory guidance and ensure that more critical parameters influence the WQI more significantly. Weight factor of each parameter is given in Table 2 (Singh *et al*, 2015, 2019).

Aggregation

The WQI is computed as a weighted average of the sub-indices using the formula. This aggregation yields a single numerical value that represents the overall water quality, typically categorized into qualitative classes such as excellent, good, fair, poor, highly polluted.

$$WQI = \left(\frac{\sum_{i=1}^{n} w_i Y_i}{\sum_{i=1}^{n} w_i}\right) \quad \ldots\ldots(2)$$

where,
w_i= weight of the i^{th} water quality parameter
Y_i = sub-index value of the i^{th} parameter
n = number of parameters

Computation of WQI using Python Program

Computation of WQI involves handling of large set

Table 1. WQI and Corresponding Class and Status of Water Quality

WQI	Class	Status of Surface Water
0 - 25	Heavily polluted	Unsuitable for all purposes
>25 - 50	Poor	Special treatment
>50 - 75	Fair	Needs treatment (filtration and disinfection)
>75 - 95	Good	Acceptable
>95 - 100	Excellent	Pristine quality

Source: Singh *et al* 2019

Table 2. Development of Sub-Index Function for Water Quality Parameters

S. No.	Parameter	Range of Parameter (X_i)	Index Score and class	Sub-Index Function (Y_i)	Weight Factor
1	Dissolved Oxygen (mg/L)	10 - 8	100 - >95 (Excellent)	Y = 2.5 xX + 75	0.12
		8 - 6	95 - >75 (Good)	Y = 10 xX + 15	
		6 - 4	75 - >50 (Fair)	Y = 12.5 xX	
		4 – 2	50 - >25 (Poor)	Y = 12.5 x X	
		2 - 0	25 - 0 (Heavily Polluted)	Y = 12.5 x X	
2	pH	7.0	100 - >95 (Excellent)	Y = 100	0.018
		6.8 – 7.0 and7.0 – 8.0	95 - >75 (Good)	Y = 75	
		6.5 – 6.8 and8.0 – 8.5	75 - >50 (Fair)	Y = 50	
		5.5 – 6.5 and8.5 – 9.5	50 - >25 (Poor)	Y = 25	
		<5.5 and >9.5	25 - 0 (Heavily Polluted)	Y = 0	
3	Bio-chemical Oxygen Demand (mg/L)	0 - 2	100 - >95 (Excellent)	Y = -2.5 x X + 100	0.09
		2 - 3	95 - >75 (Good)	Y = -20 x X + 135	
		3 - 5	75 - >50 (Fair)	Y = -12.5 x X + 112.5	
		5 - 7	50 - >25 (Poor)	Y = 12.5 x X + 112.5	
		> 7	25 - 0 (Heavily Polluted)	Y = -3.5714 x X + 50	
4	Cadmium	0 - 0.001	100 - >95 (Excellent)	Y = -5000 x X + 100	0.062
		0.001 - 0.002	95 - >75 (Good)	Y = -20,000 x X + 115	
		0.002 - 0.003	75 - >50 (Fair)	Y = -25,000 x X + 125	
		0.003 – 0.01	50 - >25 (Poor)	Y = - 3571.43 x X + 60.71	
		> 0.01	25 - 0 (Heavily Polluted)	Y = -2500 x X +50	
5	Copper	0 – 0.05	100 - >95 (Excellent)	Y = -100 x X + 100	0.013
		0.05 – 1	95 - >75 (Good)	Y = -21.05 x X + 96.05	
		1 – 1.5	75 - >50 (Fair)	Y=-50 x X + 125	
	.	1.5 – 3	50 - >25 (Poor)	Y = -16.67 x X + 75	
		>3	25 - 0 (Heavily Polluted)	Y = -8.33 x X + 50	
6	Total Chromium	0 – 0.005	100 - >95 (Excellent)	Y = -1000 x X + 100	0.102
		0.005 – 0.01	95 - >75 (Good)	Y = -4000 x X + 115	
		0.01 – 0.05	75 - >50 (Fair)	Y= -625 x X + 81.25	
		0.05 – 0.5	50 - >25 (Poor)	Y = -55.56 x X + 52.78	
		> 0.5	25 - 0 (Heavily Polluted)	Y = -50 x X + 50	
7	Manganese	0 – 0.05	100 - >95 (Excellent)	Y= -100 x X + 100	0.035
		0.05 – 0.1	95 - >75 (Good)	Y = -400 x X + 115	
		0.1 – 0.3	75 - >50 (Fair)	Y= -125 x X + 87.5	
		0.3 – 2	50 - >25 (Poor)	Y = -14.71 x X + 54.41	
		> 2	25 - 0 (Heavily Polluted)	Y= -12.5 x X + 50	
8	Lead	0 – 0.002	100 - >95 (Excellent)	Y = -2500 x X + 100	0.072
		0.002 – 0.005	95 - >75 (Good)	Y= -6666.67 x X + 108.33	
		0.005 – 0.01	75 - >50 (Fair)	Y= -5000 x X + 100	
		0.01 – 0.1	50 - >25 (Poor)	Y = -277.78 x X + 52.78	
		>0.1	25 - 0 (Heavily Polluted)	Y = -250 x X + 50	
9	Zinc	0 – 5	100 - >95 (Excellent)	Y = -X + 100	0.016
		5 – 10	95 - >75 (Good)	Y = -4 x X + 115	
		10 - 15	75 - >50 (Fair)	Y = -5 x X + 125	
		15 – 20	50 - >25 (Poor)	Y = -5 x X + 125	
		>20	25 - 0 (Heavily Polluted)	Y= -1.25 x X + 50	
10	Total Iron	0 – 0.05	100 - >95 (Excellent)	Y = -100 x X + 100	0.031
		0.05 – 0.10	95 - >75 (Good)	Y = -400 x X + 115	
		0.10 – 0.30	75 - >50 (Fair)	Y = -125 x X + 87.5	
		0.30 – 1.0	50 - >25 (Poor)	Y= -35.71 x X + 60.71	
		>1.0	25 - 0 (Heavily Polluted)	Y = -25 x X + 50	

Source: Singh *et al* 2019

of data, for that purpose Python program is used. WQI computation sequence in Python program is given in Figure 2. Input data pertaining to water bodies of nine districts were given as input file. Python program computed WQI and given the output file with classification. An example of WQI calculation for river water sample collected before immersion at BK Amman Temple Thekkampatty in Coimbatore district is given in Table 3. WQI computed by the Python program for all the sampling stations pre (before), during and post (after) immersion of idols is given in Table 4 to 8.

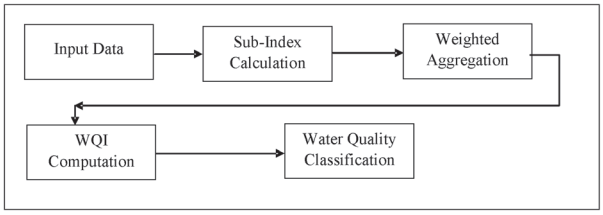

Fig. 2. Schematic Flow of WQI Computation Using Python Program

RESULTS AND DISCUSSION

Water Quality Index was assessed and plotted district-wise (Figures 3 to 11). Based on the WQI charts, the following observations are made:

Coimbatore District

Out of the 22 sampling sites, 17 were located in rivers and five in lakes. Among the river sites, except Vellakinar and Noyyal Ravuthur Privu, all locations fell under *Good* category before, during, and after idol immersion. Although a decline in WQI was noted during the immersion period, the values improved afterward, maintaining the *Good* status. However, Vellakinar and Noyyal Ravuthur Privu remained in *Fair* category throughout the monitoring period, with a further decline noted in post-immersion. Among the five lake sites, three remained in the *Fair* category across all phases, while Nagarajapuram lake and Kuniyamuthur lake dropped from *Good* to *Fair* following immersion activities.

Cuddalore District

Five locations were monitored - two in rivers and three in lakes. At Bhuvanagiri road bridge, river water quality stayed in *Fair* category throughout. In contrast, Kumaraodappudu Vaikkal experienced a sharp decline from *Good* to *Heavily Polluted* category due to elevated concentrations of cadmium and lead. Among the lakes, two remained in *Fair* category before, during, and after immersion. Veeranallur Lake, however, deteriorated from *Good* to *Heavily Polluted* due to heavy metal contamination.

Dindigul District

Water quality was monitored at 17 locations: Five in rivers, nine in ponds, two in surface water bodies, and one in dam. Of the rivers, three consistently stayed in *Fair* category with minor decline post-immersion. The other two remained in *Poor* category throughout, indicating pre-existing pollution. Five ponds retained their *Fair* category, while three declined from *Fair* to *Poor* after immersion. Dindigul Kottaikulam Pond deteriorated further to *Heavily*

Table 3. Water Quality Index Calculation for Sample Collected Before Immersion at BK Amman Temple Thekkampatty Coimbatore District

Sl No.	Parameter	Parameter (X_i) Concentration	Sub-Index function (Y_i)	Sub-Index (Y_i) Value	Weight Factor w_i	wiY_i
1	Dissolved Oxygen (DO), mg/l	7.8	$Y = 10 \times X + 15$	93.00	0.12	11.16
2	pH	6.98	$Y = 75$	75.00	0.018	1.35
3	Bio-chemical Oxygen (BOD), mg/l	2	$Y = -2.5 \times X + 100$	95.00	0.09	8.55
4	Cadmium, mg/l	0.0004	$Y = -5000 \times X + 100$	98.00	0.062	6.08
5	Copper, mg/l	0.0008	$Y = -100 \times X + 100$	99.92	0.013	1.30
6	Total Chromium, mg/L	0.025	$Y = -625 \times X + 81.25$	65.63	0.102	6.69
7	Manganese, mg/l	0.005	$Y = -100 \times X + 100$	99.50	0.035	3.48
8	Lead, mg/l	0.0075	$Y = -5000 \times X + 100$	62.50	0.072	4.50
9	Zinc, mg/l	0.0008	$Y = -X + 100$	100.00	0.016	1.60
10	Total Iron, mg/l	0.025	$Y = -100 \times X + 100$	97.50	0.031	3.02

WQI = (47.73)/(0.559) = 85.39Classification : Good "w_i=0.559 " $wiYi$ = 47.73

Polluted category, likely due to high levels of BOD, cadmium, and lead. The dam and surface water samples consistently stayed in *Fair* category.

Erode District

Four water bodies were sampled - three in rivers and one in canal. One river maintained the *Good* category throughout, while the other two fell from *Good* to *Fair* after immersion. The canal also remained in *Good* category during all sampling phases.

Table 4. WQI of the Water Bodies Before, During and After the Idol Immersion pertaining to Coimbatore, Cuddalore, and Dindigul Districts

District	Sampling location	Type of Water Body	WQI Before	WQI During	WQI After
Coimbatore	BK Amman Temple Thekkampatty	River	85.39	77.39	81.22
	Subramaniyar Kovil Mettupalayam	River	85.87	75.49	84.49
	Elagampalayam	River	85.61	76.43	79.17
	Sirumugai Pazhathottam	River	79.73	82.82	80.89
	Vellakinar	River	71.20	61.47	56.38
	Nadumalai River	River	84.78	82.84	80.42
	Mayiladhuthurai River	River	85.37	82.68	79.52
	Kaliyappagoundenpudur	River	84.83	77.73	80.79
	Anaimalai Upparu	River	84.61	80.21	77.39
	Ambarampalayam	River	81.93	77.66	77.72
	PAP Canal Kedimedu	River	83.81	82.04	80.82
	Singanallur	Lake	62.72	52.93	55.57
	Muthannan Lake	Lake	67.03	61.43	62.03
	Nagarajapuram Lake	Lake	79.83	72.75	73.49
	Sadivayal	River	81.89	78.34	75.57
	Thondamuttur Chithirai Chawadi	River	80.27	72.94	75.15
	Kuniyamuthur Lake	Lake	76.63	62.19	69.42
	Kuruchi Lake	River	68.97	60.13	63.43
	Walayar Dam	River	83.56	78.52	80.84
	PAP Sulthanpettai	River	81.88	79.13	79.01
	Noyyal Ravuthur Privu	River	71.39	64.41	69.18
	Achankulam Lake Neelambur	Lake	72.99	62.35	61.87
Cuddalore	Bhuvanagiri Road Bridge	River	68.42	65.91	55.56
	Ma.Kudikadu Lake	Lake	72.46	69.83	54.80
	Thandavankuppam Lake	Lake	72.61	74.54	63.83
	Veeranallur Lake	Lake	78.06	73.92	4.00
	Kumaraodappudu Vaikkal	River	77.84	77.25	4.91
Dindigul	Palani Shanmuganathi	River	63.38	62.85	59.07
	Oddanchatram Thalalkuthu Falls	Pond	63.14	59.90	57.87
	Thadicombu Kudaganaru River	River	42.08	40.41	36.04
	Vedasandur Kudaganaru River	River	41.78	42.65	38.94
	Vadamadurai Nariparai	Surface Water	63.31	56.44	58.06
	Shanarpatty Mathanakulam	Pond	61.21	61.17	56.94
	Natham Ammankulam	Pond	65.90	62.90	41.81
	Pattivereanpatty Marudhanathi Dam	Dam	67.15	62.28	59.52
	Kannapatty River - Batalagundu	River	64.13	59.17	56.50
	Eriodu - Karumparai - Nanthvankulam	Pond	49.89	44.13	41.99
	Gujiliamparai R.Kombai Bangalamedu Kulam	Pond	67.06	64.99	59.64
	Nilakottai Anaipatty Vaigai River	River	70.48	65.10	60.15
	Chinnalapatti Thommankulam	Pond	65.51	61.33	55.73
	Kannivadi Machakulam	Pond	64.48	60.70	57.68
	Reddiyarchatram - Mangaraikulam	Pond	53.62	52.06	47.34
	Kodaikanal Dhobikanal	Surface Water	67.77	63.42	58.82
	Dindigul Kottaikulam	Pond	39.25	64.82	5.10

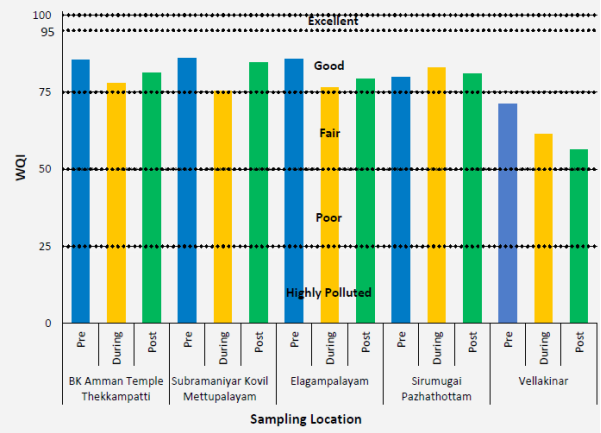

Fig. 3a. WQI of Sampling Locations 1 to 5 in Coimbatore District

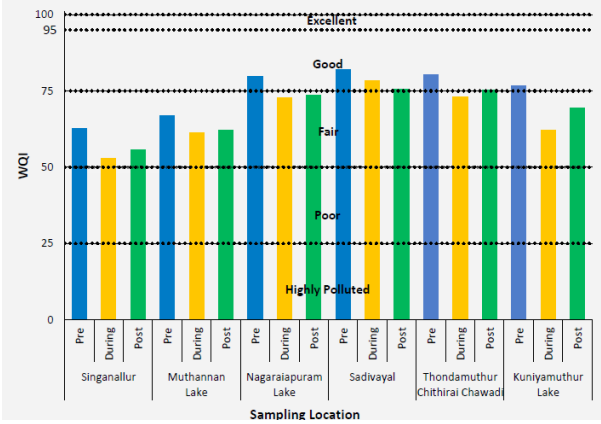

Fig. 3c. WQI of Sampling Locations 12 to 17 in Coimbatore District

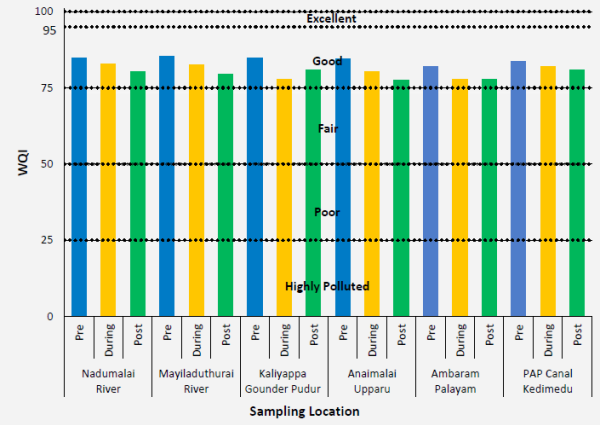

Fig. 3b. WQI of Sampling Locations 6 to 11 in Coimbatore District

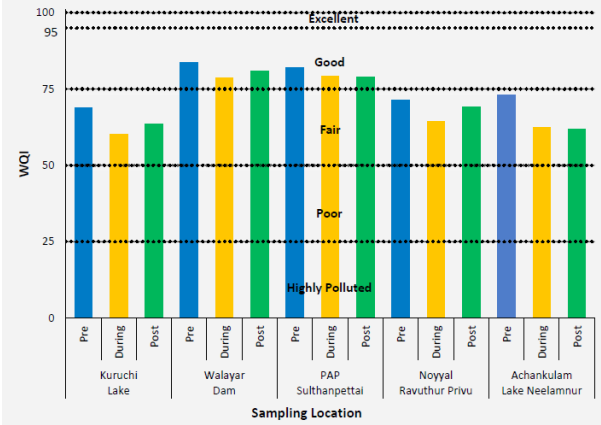

Fig. 3d. WQI of Sampling Locations 18 to 22 in Coimbatore District

Table 5. WQI of the Water Bodies Before, During and After the Idol Immersion Pertaining to Erode, and Madurai Districts

District	Sampling location	Type of Water Body	WQI		
			Before	During	After
Erode	River Bhavani Sathyamangalam	River	79.32	74.11	78.96
	Thadapalli Canal Gobichettipalayam	Canal	79.66	71.95	78.10
	River Cauvery Kooduthuri	River	75.42	71.21	74.83
	River Cauvery Pallipalayam	River	75.15	72.28	72.03
Madurai	Othakadai Thriumohur Kanmoi	Pond	68.24	33.44	48.06
	Kottampatti Kovil Teppakulam	Artificial Pond	65.09	37.04	54.70
	Mankatti Teppakulam	Artificial Pond	45.36	39.99	50.07
	Kumaran Kanmoi Vadipatti	Pond	63.43	49.15	40.06
	Vadipatti Ayyanar Kovil Oorani Ayyankottai	Pond	63.82	40.33	58.09
	Ayanpapakudi Kanmoi Avaniyapuram	Pond	64.10	65.16	55.10
	Sevathikulam Kanmoi Thirupparankundram	Pond	65.29	47.34	42.51
	Kundaru Sengulam Kanmoi Thirumangalam	Pond	60.81	43.79	57.37
	Matharai Kanmoi Usilampatti	Pond	58.84	48.55	52.00
	Subramaniasamy Kovil Kulam Peraiyur	Artificial Pond	65.37	40.83	43.23
	Vaigai Thaikkalpalam	River	47.36	33.32	45.74

Madurai District

Sampling was carried out at 11 locations: one in river, seven in ponds, and three in artificial ponds. The river water was in *Poor* category in all periods. Of the ponds, four remained in *Fair* category, and three declined to *Poor* post-immersion. Among the artificial ponds, two stayed in *Fair* category, while one dropped to *Poor* after immersion.

Salem District

Totally 37 water bodies were monitored(i.e) 16 in rivers, 10 in lakes, nine in dams, and two in canals. All locations consistently remained in *Fair* category before, during, and after idol immersion.

Trichy District

In Trichy district, water samples were collected from a total of 28 locations, comprising 20 in river sites, four in ponds, and four in canals. Among the river locations, four maintained in *Fair* category before, during, and after idol immersion activities. Ten river sites experienced a temporary decline in water quality, falling from *Fair* category before immersion to *Poor* category during immersion, but subsequently recovered to *Fair* category after the event. In two river locations, the quality dropped

Table 6. WQI of the Water Bodies Before, During and After the Idol Immersion Pertaining to Salem District

District	Sampling location	Type of Water Body	WQI		
			Before	During	After
Salem	Kalvadankam	River	73.56	67.15	67.03
	Kuppanur	River	72.19	64.69	66.07
	Poolampatti Santhaipettai	River	73.44	68.36	66.35
	Koodakal	River	72.62	72.88	73.35
	Pillukurichi	River	73.43	73.11	73.40
	Oonamparai	Canal	66.68	66.31	66.56
	Ellamadai	Canal	73.45	73.15	71.89
	Sendrayaperumal Kovil	River	71.83	70.35	71.62
	Kaveripallam Padithurai	River	72.89	66.67	71.82
	Thippampatti	River	73.33	46.99	57.41
	Koonandiyur	River	70.82	64.83	69.95
	Danishpettai	Lake	73.18	72.84	72.16
	Muttal	Lake	71.65	70.23	70.92
	Jangamasamudhram	Lake	71.91	67.24	68.89
	Sentharapatti	Lake	72.64	50.72	56.95
	Maniyarkundam	Lake	70.89	63.67	62.75
	Mookaneri	Lake	70.41	66.25	69.86
	Ammapet Kumaragiri	Lake	73.16	69.77	72.03
	Seelanaikenpatti	Lake	70.67	71.81	70.39
	Anaimadivu Vazhappady Tk	Lake	69.71	68.19	64.83
	Mohanur near Shivan Temple	River	74.16	60.84	69.20
	Nagamalai Dam	Dam	67.51	60.98	65.72
	Cauvery Hogenakkal	River	70.82	69.81	69.55
	Kesargulli Dam	Dam	66.82	62.72	67.01
	Chinnar Dam	Dam	69.01	68.62	69.18
	Kolasanshalli	Lake	71.64	70.66	72.16
	Thumalanhalli	Dam	67.68	63.91	65.39
	Thenpennai	River	67.80	63.64	64.17
	K.Ichampadi Dam	Dam	65.70	65.98	66.18
	Varattaru Dam	Dam	68.77	67.39	72.90
	Vaniyur Dam	Dam	72.09	67.33	72.30
	Thoppaiyaru Dam	Dam	67.66	63.07	62.50
	Nagavathi Dam	Dam	69.27	65.63	64.31
	Kumarapalayam Bridge	River	70.91	54.71	66.58
	Pallipalayam Bridge	River	70.94	51.48	62.46
	Erayamangalam	River	70.99	64.36	68.19
	Paramathi Velur	River	71.76	71.65	71.24

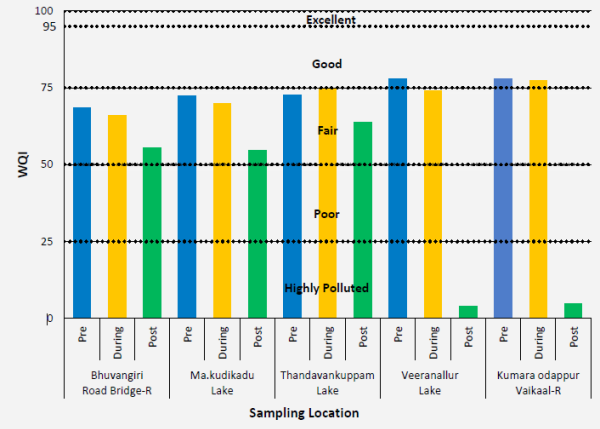

Fig. 4. WQI of Sampling Locations 1 to 5 in Cuddalore District

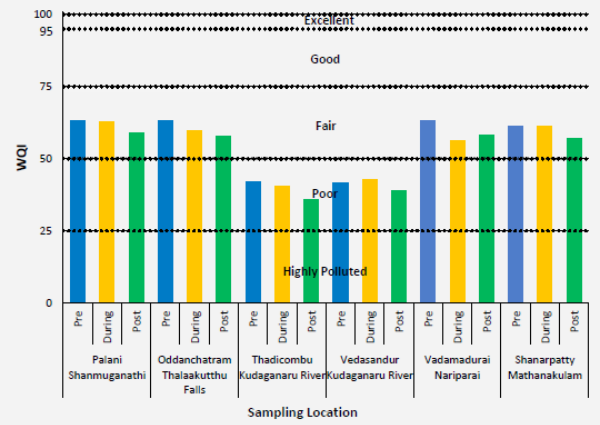

Fig. 5a. WQI of Sampling Locations 1 to 6 in Dindigul District

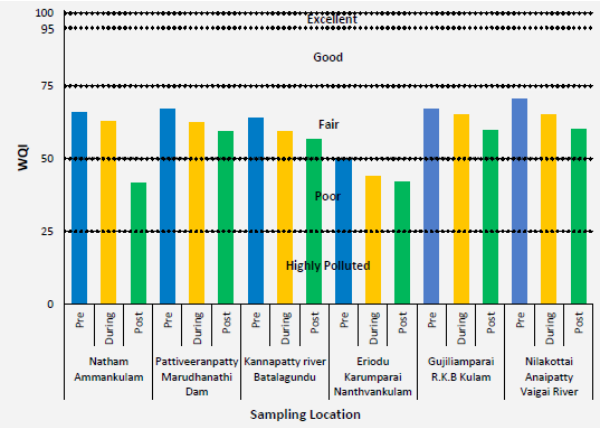

Fig. 5b. WQI of Sampling Locations 7 to 12 in Dindigul District

from *Fair* before immersion to *Poor* after immersion, indicating a lasting impact. Notably, at one site (i.e) Thiruverumbur Vengoor (Cauvery River) - the water quality declined from *Good* before immersion to *Poor*

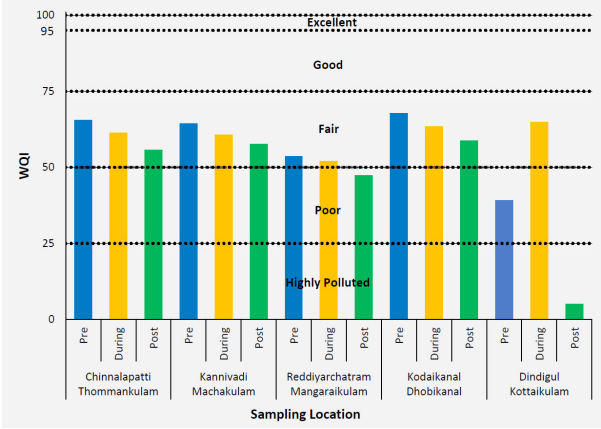

Fig. 5c. WQI of Sampling Locations 13 to 17 in Dindigul District

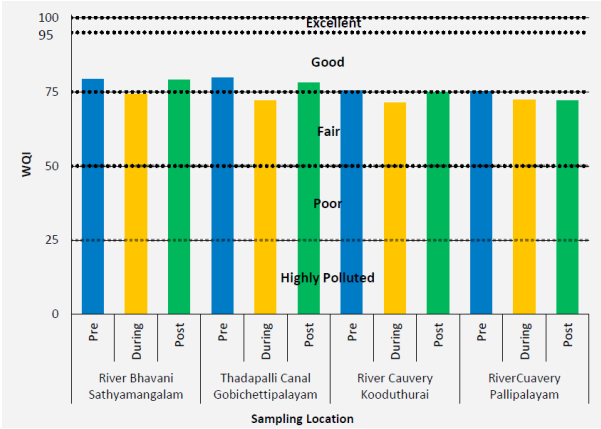

Fig. 6. WQI of Sampling Locations 1 to 4 in Erode District

during immersion and later improved to *Fair* category after immersion. Three river sites remained in *Poor* category throughout the monitoring period, suggesting that these water bodies were already under significant pollution stress even before the immersion activity. Regarding the canal water samples, one site at Uyyankondanvaikkal (Somarasampettai) showed a decline in quality from *Fair* to *Poor* after immersion, while the other three canal locations remained in *Poor* category before, during, and after the immersion period. For the pond samples, one location experienced a temporary drop in water quality from *Fair*to *Poor* during immersion but recovered to *Fair* afterward. The remaining three pond sites were classified as *Poor* throughout the entire sampling period.

Tirunelveli District

Three locations - two in natural ponds and one in artificial pond were monitored. All three remained

in *Fair* category throughout the monitoring period.

Vellore District

Six surface water bodies were monitored. Two sites consistently remained in *Fair* category. Two others dropped to *Poor* during immersion and later improved to *Fair*. One site declined to *Poor* after immersion without recovery, while the remaining site stayed in *Poor* category throughout the sampling period.

CONCLUSION

The present study offers a comprehensive

Table 7. WQI of the Water Bodies Before, During and After the Idol Immersion Pertaining to Trichy District

District	Sampling location	Type of Water Body	WQI		
			Before	During	After
Trichy	River Cuavery Iyyalamman Padithurai	River	61.16	43.07	58.51
	Pond Manikandam	Pond	53.34	46.96	51.38
	Uyyankondan Vaikkal Somarasampettai	Canal	51.23	42.65	46.99
	River Cauvery Jeeyapuram	River	57.39	47.82	58.51
	River Cauvery Pettavaithalai	River	53.54	45.98	50.28
	River Cauvery Thiruengoimalai	River	53.40	36.72	47.66
	River Cauvery Kattuputhur	River	56.37	53.04	54.71
	River Cauvery Musiri Parisalthurai	River	59.53	52.93	58.66
	River Cauvery Vathalai	River	65.47	53.23	62.80
	River Kollidam Thuraiyur	River	59.38	45.79	54.22
	Manapparai Pothamattupatti Mamundi River	River	57.57	47.00	55.26
	Vaiyampatti Ponnaniyar Dam	River	54.26	32.22	44.91
	Puthanatham Idaiyapatti Pond	Pond	45.62	28.19	36.47
	Thuvarankurichi Boothanayagi Amman Temple Pond	Pond	43.16	30.32	39.33
	Valanadau Village Pond	Pond	35.69	24.30	33.52
	Cauvery River at Chinthamani	River	53.27	43.03	51.79
	Thiruverumbur Sarkar Palayam Cuavery River	River	44.85	37.11	44.12
	Thiruverumbur Vengoor Cauvery River	River	81.87	41.06	50.62
	Lalgudi Senkaraiyur at Kollidam River	River	53.27	37.77	50.94
	Lalgudi Anbil at Kolllidam River	River	42.80	32.14	40.75
	Kallakudi Pullampadi Vaikkal	Canal	48.24	36.88	46.08
	KK Nagar Pungai Sangenthi-Pullambadi Vaikkal	Canal	49.53	40.41	47.80
	Lalgudi Iyyanvaikkal - Kolidam River	River	63.28	48.80	59.62
	Puliyancholai - Puliyancholai River	River	52.97	39.60	51.44
	Pullambadi Vaikkal Mannachanallur	Canal	48.39	30.97	46.82
	River Kollidam Nochiyam	River	47.41	30.30	45.70
	River Cauvery Srirangam Town	River	60.44	44.44	58.38
	KK Nallur Pungai Sangenthi Pond	River	60.44	50.64	56.53

Table 8. WQI of the Water Bodies Before, During and After the Idol Immersion Pertaining to Tirunelveli and Vellore Districts

District	Sampling location	Type of Water Body	WQI		
			Before	During	After
Tirunelveli	Karukurichi	Pond	70.77	60.75	67.53
	Vagaikulam	Pond	71.25	60.86	67.24
	Temporary Pond near Peratchiammon Kovil	Artificial Pond	67.90	58.42	63.81
Vellore	Esanodai Katpadi	Surface Water	63.15	49.67	56.92
	Sadhuperi Vellore	Surface Water	52.37	35.03	35.66
	Karugampathur Vellore	Surface Water	59.95	50.68	50.23
	Thellur Lake Anaicut	SurfaceWater	67.03	49.18	56.54
	Thangal Lake KV Kuppam	Surface Water	56.82	58.09	60.79
	Nellorepettai Gudiyatham	Surface Water	45.70	32.81	31.67

assessment of impact due to immersion of Vinayagar idols on the water quality of selected water bodies across nine districts in Tamil Nadu using the Water Quality Index as a key metric. The analysis, based on data monitored by the TNPCB, revealed distinct variations in water quality before, during, and after the immersion of idols. The parameters studied pH, DO, BOD, and heavy

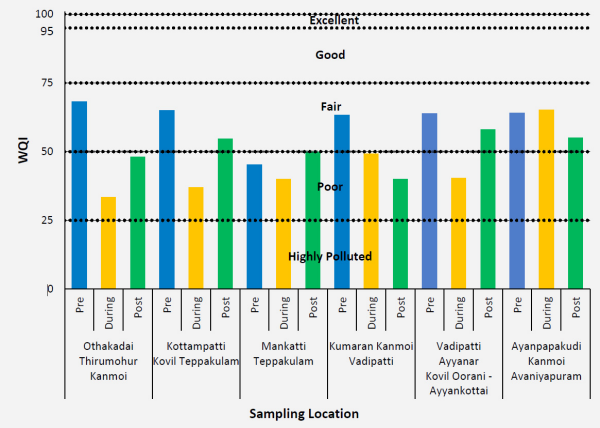

Fig. 7a. WQI of Sampling Locations 1 to 6 in Madurai District

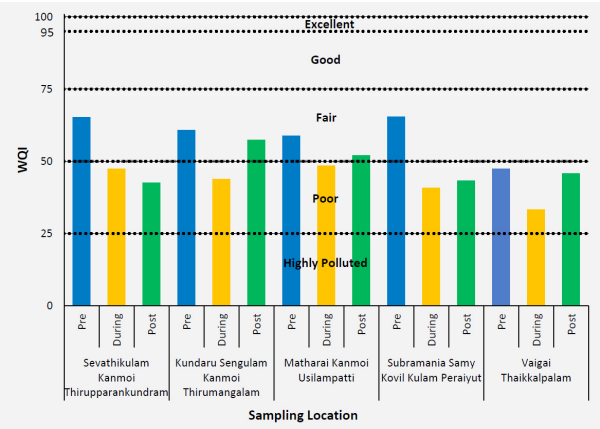

Fig. 7b. WQI of Sampling Locations 7 to 11 in Madurai District

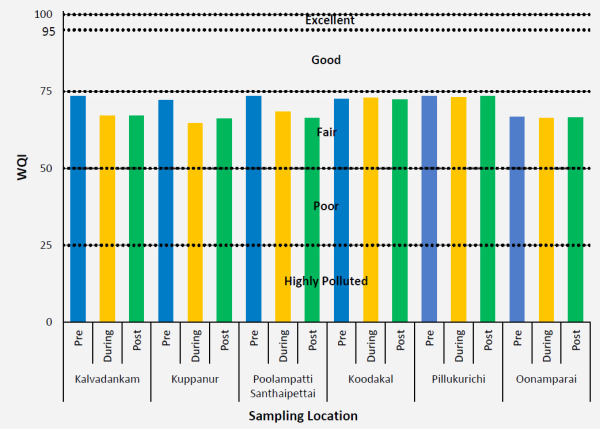

Fig. 8a. WQI of Sampling Locations 1 to 6 in Salem District

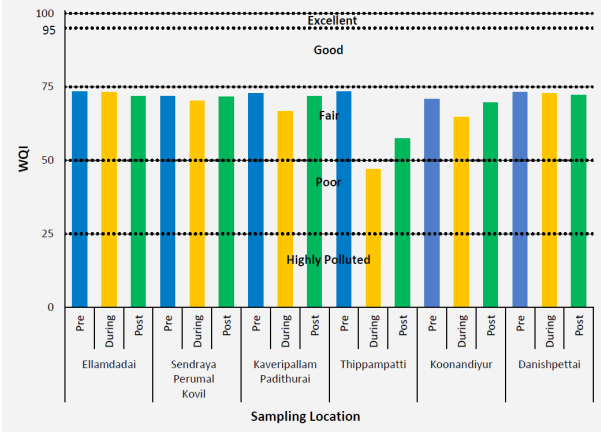

Fig. 8b. WQI of Sampling Locations 7 to 12 in Salem District

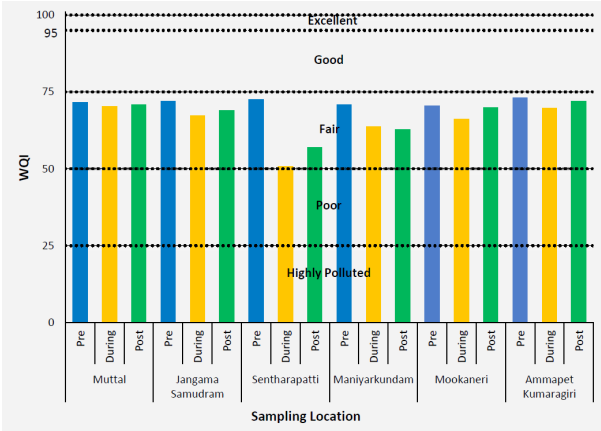

Fig. 8c. WQI of Sampling Locations 13 to 18 in Salem District

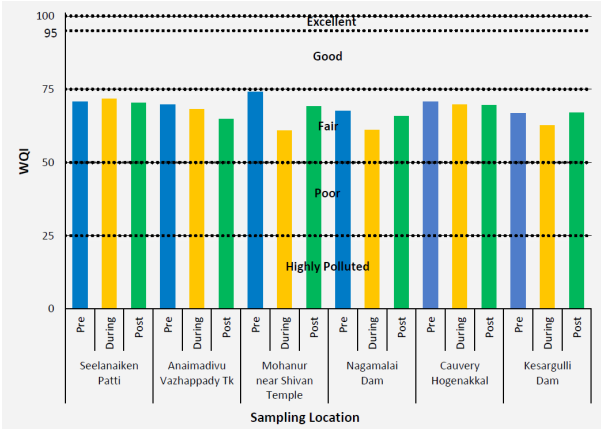

Fig. 8d. WQI of Sampling Locations 19 To 24 In Salem District

metals such as cadmium, copper, chromium, manganese, lead, zinc, and iron serve as critical indicators of both physicochemical stability and ecological health of the water bodies.

WQI computations showed a clear decline in water quality during the immersion period, with many water bodies shifting from *Good* or *Fair* categories to *Poor* or even *Heavily Polluted* classes. This deterioration is attributed primarily due to the introduction of insoluble materials and toxic

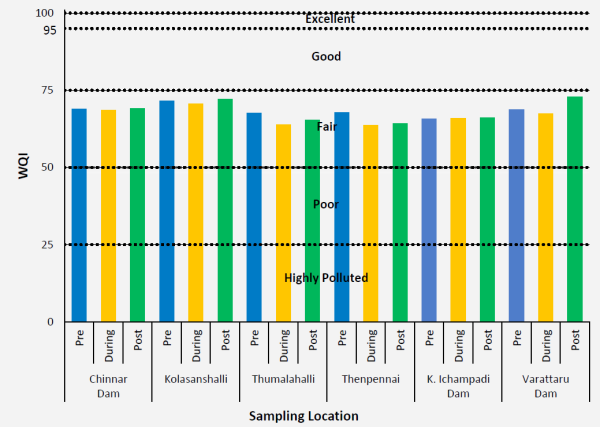

Fig. 8e. WQI of Sampling Locations 25 to 30 in Salem District

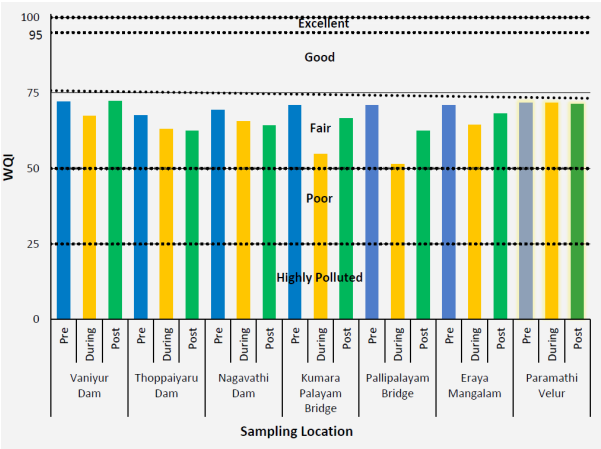

Fig. 8f. WQI of Sampling Locations 31 to 37 in Salem District

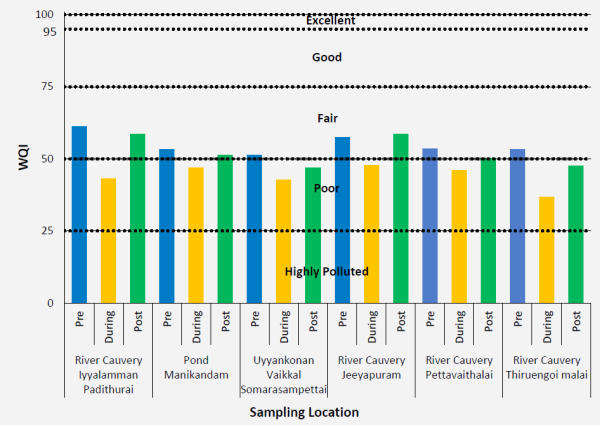

Fig. 9a. WQI of Sampling Locations 1 to 6 in Trichy District

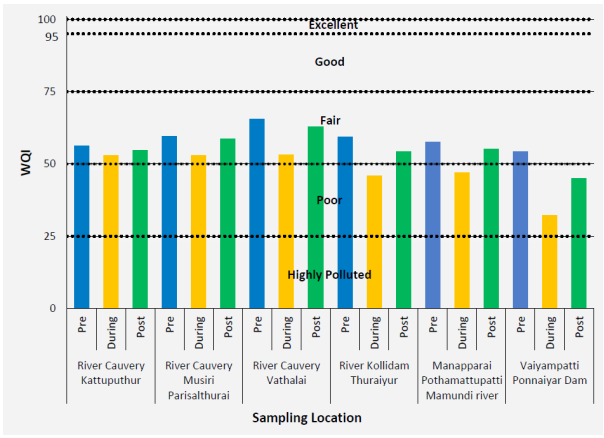

Fig. 9b. WQI of Sampling Locations 7 to 12 in Trichy District

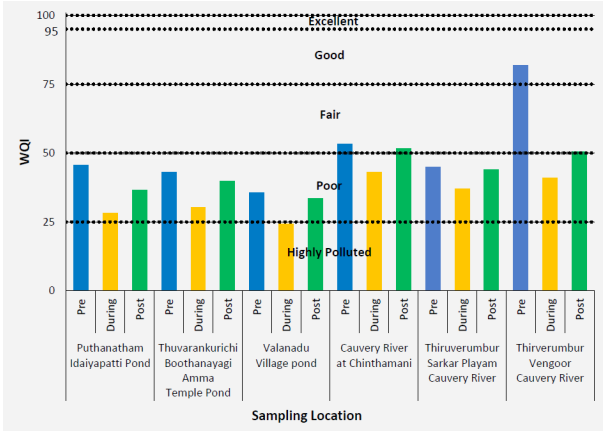

Fig. 9c. WQI of Sampling Locations 13 to 18 in Trichy District

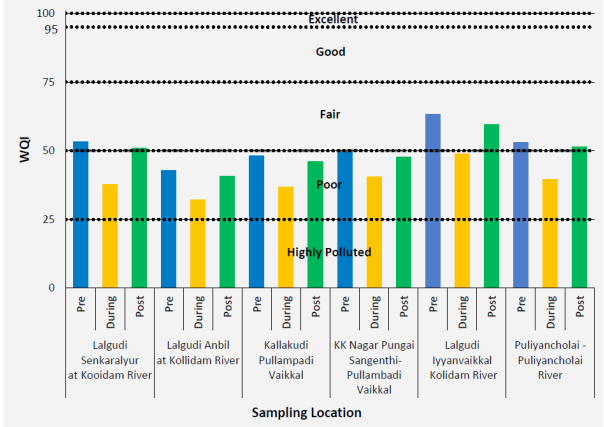

Fig. 9d. WQI of Sampling Locations 19 to 24 in Trichy District

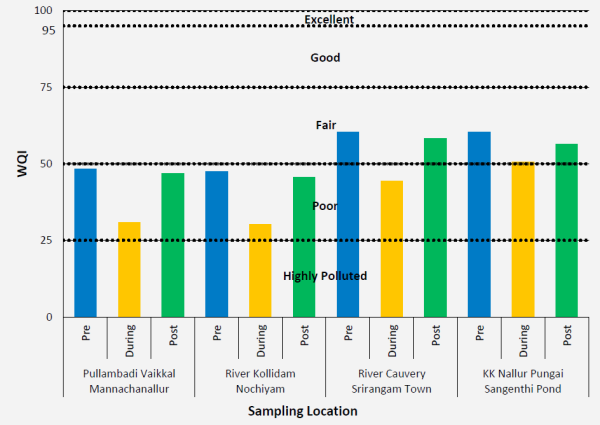

Fig. 9e. WQI of Sampling Locations 25 to 28 in Trichy District

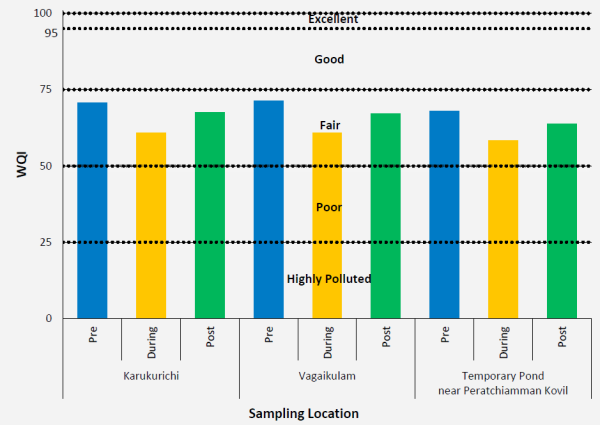

Fig. 10. WQI of Sampling Locations 1 to 3 in Tirunelvelli District

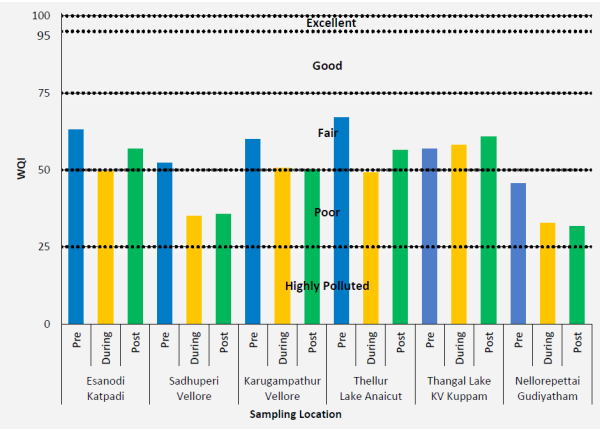

Fig. 11. WQI of Sampling Locations 1 to 6 in Vellore District

compounds originating from plaster of paris idols, synthetic paints, and decorative accessories. While some improvement was noted in post-immersion samples due to natural dilution and sedimentation processes, the overall water quality remained compromised in several locations, particularly in stagnant or slow-moving water bodies.

The study emphasizes the importance of implementing stricter controls and promoting environmentally responsible practices during religious festivities. The use of biodegradable materials for idol making, creation of artificial immersion tanks, awareness campaigns, and enforcement of CPCB guidelines can significantly mitigate the pollution load. Moreover, the WQI-based approach provides an efficient and scientifically sound tool for policymakers, local bodies, and environmental agencies to monitor and manage water quality in a holistic manner.

In conclusion, the findings underscore the urgent need for collaborative action involving government agencies, local communities, and religious organizations to ensure that cultural traditions are preserved without compromising environmental sustainability. Continuous monitoring, public participation, and eco-friendly innovations will be key for maintaining the integrity of surface water resources in Tamil Nadu as well as across India.

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