DETERIORATION OF WATER QUALITY DUE TO
IMMERSION OF GANESH IDOLS IN THE
RIVER TAPTI AT SURAT (INDIA)

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ABSTRACT

The most vital resource for life on the planet earth is water. There cannot be life without fresh water, which is only 2.7% of total water on the earth. This 2.7% is not handy to us as it is distributed as Biological water, Glaciers, Atmospheric water, Surface water and Ground water.

Most of the freshwater resources are deteriorated in water quality and portability of freshwater which is very scanty. In our country Idol worship is very common. Idol are made of so many materials like, wood, stone, bamboo, jute, grass, clay and plaster of paris (POP). To make these idols decorative and attractive they are painted with bright synthetic color or lead oxide (Sindoor-orange in color) mixed with oils which contain large amount of heavy metals. Wood, stone, grass, jute, flowers, germinated seeds, leaves etc. cause short term deterioration of water quality due to their decay. On the other hand paints with plenty of heavy metals cause health hazards in the long run.

With intention to study deterioration of water quality of River Tapti at Surat which is major source of water supply to Surat city. The study of alkalinity, dissolved oxygen (DO), total dissolved solid (TDS), conductivity, total hardness, salinity, temperature, pH, COD, BOD, and colour were under taken. Results obtained are very interesting, particularly there is detection of high amount of lead (Pb), Arsenic (As), Zink (Zn) and Mercury (Hg) which causes long run effect on human health. Other parameters are indicative of non portability of water.

Key Words: Idol immersion, Heavy metals, Water, Quality, Deterioration, Fresh water

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INTRODUCTION

Water is life – a concept coined in the ancient Indian civilization. Indian Vedic scriptures have described in detail the origin of water, its importance, quality and conservation. The medicinal aspect of water has been discussed in "Rig-Veda" and "Atharva Veda".

Water supports life on earth and around which the entire fabric of life is woven. The requirement of water is in all lives, i.e. from micro-organisms to man, is a serious problem today because all water resources have been reached to a point of crisis due to unplanned urbanization and industrialization. Water is elixir of life. The life on the earth would be impossible without water. It is gift to man by nature. It is essence for all living organisms. It is the main component of protoplasm of cell. It is used in biological activities in organisms. Water meant for human consumption should not be only "safe" but also "wholesome". Safe water is one that cannot harm to consumer even when ingested for prolonged period of time.

Survival and quality of human life largely depends on adequate availability of clean and wholesome water basically for drinking and secondarily for other purposes. With 1.2 billion people without access to drinking water and 2.4 billion lacking basic sanitation, the symptoms of emerging global water crisis are obvious. Further, it is projected that the population under water stress will rise from 450 million at present to 2.7 billion by 2025 and Indian subcontinent is already being classified as the ‘Water Stressed’ meaning water needs exceed its availability.

Earth’s water in the ocean is comprised of 97 per cent, which is blocked as ice. The largest volumes of freshwater are stored underground as groundwater, accounting for about 0.6 per cent of the total. Only a tiny fraction (0.01 per cent) is present as fresh surface water in lakes, streams and rivers. But it is this proportion, which is so important for many of our terrestrial ecosystems, including humans. The quality of this fresh water is vitally important. We depend on surface and groundwater sources for our drinking water. We also need water to generate energy, to grow crops, to harvest fish, to run machinery, to carry wastes, to enhance the landscape and for a great deal more. Many human activities and their by-products have the potential to pollute water. Large and small industrial enterprises, the water industry, the urban infrastructure, agriculture, horticulture, transport, discharges from abandoned mines, and deliberate or accidental pollution incidents all affect water quality.

The natural resource, water, is of vital importance for human and animal life, maintaining economical balance and achieving economic development. The scarcity and diversity of water resource in different regions and its equitable and sustainable use has become a matter of vital importance.

All great civilizations have flourished along the rivers. The Egyptian civilization along the Nile, the Babylonian near Euphrates and the Tigris, and the Indian civilization along the rivers, Sindhu and Sarasvati. In all these cases, water became the life-line of the people; but nowhere do we find the
apotheosis, the deification of water as is found in the Indian Tradition.

The physical form of water in various reservoirs like the ponds, lakes, streams, rivers and oceans was first venerated, and then the guardian principle got personified and then deified by Indians. Rivers yielding sweet, milk-like water were considered to be life-bestowing mothers. Because of their constant flow, they were regarded as purifiers. All dirt, dust and impurity are supposed to be washed away by the flowing waters. Hence the apotheosis! On account of this purifying nature, water became an inevitable part of the ‘Samskara’ in Indian culture. Samskara is refining, polishing, cultivating a thing/person and making it perfect.

Nature's rhythm, seasonal changes and the cycle of life and death have found religious and spiritual re-enforcement through a number of traditional Indian festivals. Based on the theme of resurgence and rejuvenation, many of them involve immersion of idols into water bodies as a symbol of returning the elements, which give life, back to the earth for a new cycle to begin.

In India religious activities have deep relationship with water bodies. In the recent years, the practice of immersion has become a growing cause for concern on account of its adverse environmental impacts, particularly on the water bodies. Idol worship is common in India. Idols are usually made up of wood, bamboo, strew, jute ropes, flowers, leaves and germinated seeds\(^2\) causes short term deterioration of water quality on their decay, but now a days the festivals of Ganesh Chaturthi and Durga Puja witness a massive community involvement. To match the contemporary ethos, new materials like Plaster of Paris (POP), paints containing hazardous dyes and chemicals are being used for 'modernizing' the representation of these idols without much thought being given to the issue of toxicity and its impact on the environment.

Toxic exposure of the larger community through deadly chemicals and heavy metals used for making the idols is now being placed under the scanner of authorities and civil society groups with greater focus than ever. In terms of health impacts, paints are a greater source of hazard and most of those used for decorating idols are chemical-based. They contain heavy metals like mercury, cadmium and lead, which are neurotoxin and nephrotoxin. These metals are bio-accumulative, implying that once they enter marine life forms like fish; they pass-up the food chain and end up in the food that we eat. Incidentally, the brighter the colour, the greater is its toxicity. Red, blue, orange and green colors are known to have higher content of mercury, zinc oxide, chromium and lead. Even a single drop of mercury on a person’s skin can be fatal. One drop in a 20-acre lake can make the fish poisonous to the birds, animals, and people that eat them. The higher amount of lead (Pb) in the harbour waters of Vizag cause marked decrease in biochemical constituents like carbohydrates, proteins and lipids of mullet *Liza parsia* which indicates negative impact on the nutritive value of the same.\(^3\)Mahajan AY and Zambare SP\(^4\) have studied the effect of acute and chronic doses of copper sulphate and mercuric chloride on oxygen consumptions
of the fresh water bivalve *Corbicula striatella* and the results shows reduction in the uptake of oxygen.

The growing size of idols and the desire for making them more and more colorful has forced idol-makers to shift from clay to Plaster of Paris (POP) as the base material. Immersion of hundreds and thousands of idols made of this material is wreaking havoc on these water bodies. When an idol made of Plaster of Paris (POP) is immersed in the water, it changes form to gypsum, thus adding a large amount of material to the water that breaks down very slowly, while adding to the hardness of water, both of which deteriorate the life carrying capacity and quality of the water. Plaster of Paris cause harmful impact on idol makers through inhalation, ingestion and through direct contact with eyes and skin. That can cause irritation in eyes, skin, and mucous membrane and affect the respiratory system.

River Tapti is the main source of water for drinking purpose and for other sectors of Surat city. In Surat Ganpati festival is one of the prominent festivals celebrated by all communities irrespective of cast creed and religion. The immersion of idol lord Ganesh during Ganesh Utsav is the major source of contamination and sedimentation to the river. The materials used to make these idols cause deterioration of water quality.1000 of idols of various sizes are immersed into Tapti River as a part of final ritual of Ganesh Utsav.

The over all impact has resulted in deterioration of water quality, accumulation of toxic chemical and sediments, shrinkage of river area and above all a loss of aesthetic value. The research has been carried out to study extent pollution in the River Tapti. For those two sites namely Navdi Ovara and Ramnath Ghela were selected. Both are easily approachable and major sites for idol immersion. According to officials of civic body like Surat Municipal Corporation (SMC), nearly 20000 to 25000 idols of various sizes are immersed in the river.

**MATERIAL AND METHODS**

A number of religious activities take place every year, which affect the water quality of Tapti River. The festival of Ganesh idol immersion is observed once in a year when the large numbers of idols are immersed into the river.

Sampling was done from two sites of river namely Navdi Ovara and Ramnath Ghela. The water samples were collected from the site of idol immersion at different intervals i.e. pre-immersion, during-immersion and post-immersion. Pre-immersion samples were collected a day before the immersion activities. During immersion samples were collected during the immersion activities and post-immersion samples were collected a day after the immersion activities. The samples were subjected to physico-chemical analysis following the procedures prescribed by standard methods of APHA. Heavy metals like lead (Pb), Arsenic (As), Zink (Zn), Mercury (Hg), Copper (Cu), Chromium (Cr) were also detected.
RESULTS AND DISCUSSION
Observations are based on the samplings done at two sites of the river namely Navdi Ovara and Ramnath Ghela. Table 1. shows the results of physico-chemical analysis.

**Table 1 :** Physico-chemical results of surface water samples of Tapti River, Surat

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Parameters</th>
<th>Unit</th>
<th>Pre-immersion</th>
<th>During-immersion</th>
<th>Post-immersion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>13/09/08</td>
<td>(Navdi Ovara)</td>
<td>(Ramnath Ghela)</td>
</tr>
<tr>
<td>1</td>
<td>pH</td>
<td></td>
<td>8.5</td>
<td>7.5</td>
<td>7</td>
</tr>
<tr>
<td>2</td>
<td>Temperature</td>
<td>°C</td>
<td>28.5</td>
<td>29.5</td>
<td>30</td>
</tr>
<tr>
<td>3</td>
<td>Total hardness</td>
<td>mg/l</td>
<td>188</td>
<td>172</td>
<td>440</td>
</tr>
<tr>
<td>4</td>
<td>Conductivity</td>
<td>µmho/cm</td>
<td>514</td>
<td>406</td>
<td>1739</td>
</tr>
<tr>
<td>5</td>
<td>Alkalinity</td>
<td>mg/l</td>
<td>8</td>
<td>164</td>
<td>320</td>
</tr>
<tr>
<td>6</td>
<td>DO</td>
<td>mg/l</td>
<td>4.5</td>
<td>3</td>
<td>3.5</td>
</tr>
<tr>
<td>7</td>
<td>BOD</td>
<td>mg/l</td>
<td>600</td>
<td>46.66</td>
<td>350</td>
</tr>
<tr>
<td>8</td>
<td>COD</td>
<td>mg/l</td>
<td>2165.12</td>
<td>172.22</td>
<td>1325.37</td>
</tr>
<tr>
<td>9</td>
<td>TDS</td>
<td>mg/l</td>
<td>360</td>
<td>280</td>
<td>1200</td>
</tr>
<tr>
<td>10</td>
<td>Lead as (Pb)</td>
<td>mg/l</td>
<td>0.153</td>
<td>0.384</td>
<td>0.538</td>
</tr>
<tr>
<td>11</td>
<td>Arsenic as (As)</td>
<td>mg/l</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>12</td>
<td>Zinc as (Zn)</td>
<td>mg/l</td>
<td>0.043</td>
<td>0.726</td>
<td>1.35</td>
</tr>
<tr>
<td>13</td>
<td>Mercury (Hg)</td>
<td>mg/l</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>14</td>
<td>Chromium (Cr)</td>
<td>mg/l</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>15</td>
<td>Copper as (Cu)</td>
<td>mg/l</td>
<td>ND</td>
<td>1.730</td>
<td>1.66</td>
</tr>
</tbody>
</table>

* ND- Not Detected

**pH:** The pH value of water samples of both the sites were within the standard limits. Observed pH values ranged from 7.5 to 8 at both the sites. During the immersion activities it turned slightly acidic due to the presence of harmful substances dissolved in the water.
Temperature: Water temperature showed variation at different sites. Results indicate that the temperature rise during immersion activities. Minimum temperature recorded was 28.5°C where as maximum temperature was 30°C.

Total Hardness: Hardness, which is very useful parameter to determine usefulness of water in different sectors, was, noticed comparatively higher during immersion activities at both the sites. It was found in the range of 188 mg/l in pre-, while 172-440 mg/l and 144-180 mg/l during and post immersion activities respectively for both the sites.

Conductivity: Conductivity is the measure of capacity of a substance or solution to conduct electric current. There was wide variation of conductivity at different sites of Tapti River. The maximum value was recorded as 1739 μmho/cm and the minimum value was found to be 406 μmho/cm. Water having conductivity more than 20μmho/cm is not suitable for irrigation. So the results indicate the river water is highly polluted.

Alkalinity: The total alkalinity indicates that there are fluctuations among both the sites, ranging from 8 mg/l to 320 mg/l. It was higher during the immersion activities.

Dissolved Oxygen: Dissolved Oxygen in water is of great importance to all aquatic organisms and is considered to be the factor that reflects the biological activity taking place in a water body and determines the biological changes.

From Table 1 a significant observation comes out in respect of Dissolved Oxygen (DO) of the water samples of Tapti River. The values ranged from 3 to 4.5 mg/l, which were below standard limits (ISI-6 mg/l, 1991)\(^8\)

Bio-Chemical Oxygen Demand: Biochemical Oxygen Demand (BOD) was noticed comparatively higher in pre-immersion activities than it was in during and post immersion activities. It was found 600 mg/l in pre-immersion activities and 46, 66 -350 mg/l and 65-12 mg/l in during and post-immersion activities at Navdi Ovara and Rammath Ghela respectively. This is because the organic discharge into the water had not dissolved when sampling was done. But still these values are higher than the maximum permissible limits of WHO.\(^9\) The higher values of BOD means presence of more biodegradable organic material.\(^10\)

BOD more than 6 mg/l indicates that the river water is highly polluted. The higher values of BOD has direct correlation with increase in nutrient level of the river water due to immersion activities (McCoy and Olson, 1986).\(^11\)

Chemical Oxygen demand: COD was noticed comparatively higher in during and post immersion periods at both the sites. It was found 360 mg/l in pre-immersion activities and 280-1200 mg/l and 240-390 mg/l in during and post immersion activities respectively. Which shows that water is became highly polluted because of the immersion activities. The maximum permissible limit for drinking water is 150 mg/l.\(^8\)

Heavy Metals: The water samples were also analyzed for the heavy metals and results are stinking. Heavy metal Lead (Pb) found higher than its maximum permissible
limit of WHO (0.10 mg/l). The concentration of metal in pre-immersion activities was 0.153 mg/l where as it ranged from 0.384- 0.538 mg/l and 0.307-0.153 mg/l in during and post-immersion activities at Navdi Ovara and Rammath Ghela respectively. Higher concentration of lead can cause problems in the synthesis of hemoglobin, affects kidney, reproductive system and can damage to the nervous system. 

Zinc (Zn) was also detected in all the samples but it was within the permissible limit. It ranged from 0.043 to 1.35 mg/l.

Copper (Cu) was found higher than its permissible limit. It was not at all detected in pre-immersion activities but it was present in during and post-immersion activities. Copper (Cu) ranged from 0.077 to 1.730 mg/l at both the sites and it is higher than the maximum permissible limit.

In all the samples Arsenic (As), Mercury (Hg) and chromium (Cr) were not at all detected.

Presence of Lead (Pb), Zinc (Zn) and copper (Cu) indicate that the river water became highly polluted because of the immersion activities.

**CONCLUSION**

The present study on assessment of idol immersion on physico-chemical characteristics of River Tapti revealed that idol immersion activity has negative impact on water quality of the river. The total hardness was also reported higher in during-idol immersion. The values of DO are lower than its standard limits which indicates harmful impact of immersion activities. BOD, COD have shown an increase during and after immersion of idols as same reported. The input of biodegradable and non-biodegradable substances deteriorates the lake water quality and enhances silt load in the river. The floating material released through idol in the river, after decomposition result in eutrophication of the lake.

The present study on Impact of idol immersion on water quality of two sites of Tapti River namely Rammath Ghela and Navdi Ovara revealed that idol immersion activities have negative effect on water quality of river.

**RECOMMENDATIONS**

A number of organisations, civil society bodies and state authorities have started addressing the issue of pollution and environmental hazard that is caused by the current immersion practice.

The Central Pollution Control Board (CPCB), for instance, has made some general recommendations and these have been further elucidated on by various state pollution control boards.

- Specific areas should marked for immersion and related activities to prevent indiscriminate disposal and facilitate retrieval of reusable materials.
- Temporary confined pond near river locations should be identified for immersion of idols and other materials to prevent pollution of main river stream.
- The closed pond water may be disposed appropriately.
- The offerings like flowers and leaves may be collected in separate containers.
or in pits for composting.

- After immersion, the recyclable articles like Jari, Clothes, plastics, aluminium foil, wood and bamboo may be taken out from the water bodies.
- The civic authorities may engage agencies/persons for doing the job.
- Environment friendly practices such as use of biodegradable dyes and paints should be encouraged.

**Safer alternative:**

- Use permanent idols made of brass or stone
- Do a symbolic immersion
- Reuse the same idol again the next year
- Use a small unpainted idol made of unbaked clay if you immerse the idol
- Immerse the idol in a tub or a water tank
- Collect the flowers and nirmalya and compost them
- Avoid the use of thermocol and plastic in decorations.

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G. SEED

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Environmental awareness programs, huge plantation and its conservation in India and abroad has also been organizing by the G.SEED. In this way, it has adopted the colonies and institutions for practical implementation of its objectives to conserve and protect the environment. Society is planning to start awards to distinguished persons / Institutions / Societies / Industries, working in the field for environment in its real term. Society is also successfully holding International Congress of Environmental Research (ICER) which gives fellow membership (FICER), Life membership (AICER), and annual membership to its subscribers throughout the world. More many privileges are associated with these memberships. Please feel free to visit Membership Opportunities of www.jerad.org for more details. Society is always looking towards innovative programs.

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