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# Assessment of Physicochemical Parameters in Bhavali and Darna Reservoirs, Igatpuri, Maharashtra: Implications for Aquatic Ecosystems and Human Health

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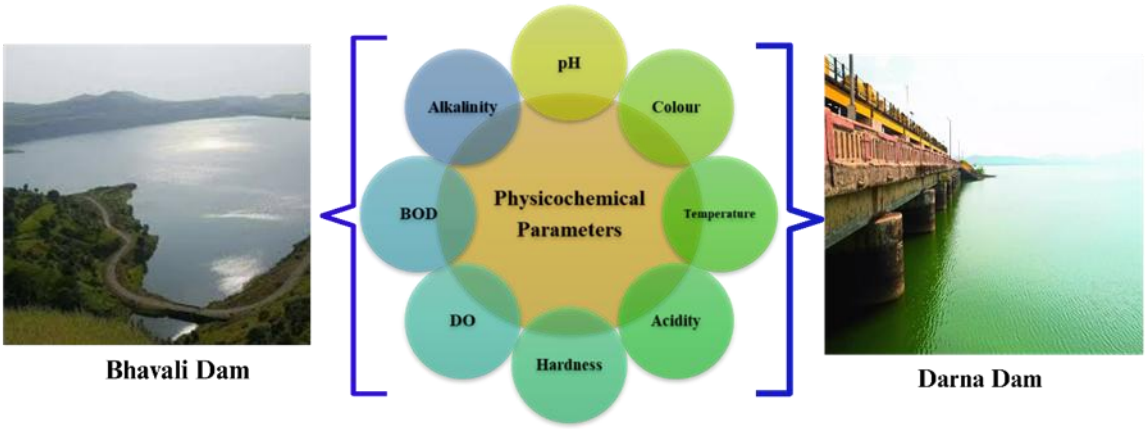
## ABSTRACT

The physicochemical properties of the Bhavali and Darna water reservoirs at Igatpuri, District-Nashik (Maharashtra) are being studied. Water from these dams is supplied for agricultural and drinking purposes to nearby villages. Multiple stations (I to VI) within each reservoir are monitored for water quality parameters, including temperature, pH, dissolved oxygen (DO), Biochemical oxygen demand (BOD), electrical conductivity, total dissolved solids (TDS), turbidity, and nutrient levels. Water temperature in both reservoirs ranges from 23.20 °C to 31.57 °C and closely correlates with air temperature changes, while pH values remain slightly alkaline range (7.35 - 9.76). In both reservoirs, DO levels are adequate for aquatic life (4.2 – 7.5 mg/L). Turbidity is generally low, reflecting clear water conditions. Some variations are seen in electrical conductivity and TDS levels, suggest fluctuations in dissolved solids content. The BOD values remain very low, indicating minimal organic pollution. Oxidation-reduction potential (ORP) and its fluctuations are significant across all stations in both reservoirs, indicating changes in redox conditions. The water quality in the Bhavali and Darna reservoirs looks appropriate for most uses, but we found good water quality in the Bhavali Dam compared to the Darna Dam. Still, continuous monitoring (especially ORP and pH) is suggested to maintain long-term ecosystem health and protect water quality for human consumption and other uses.

***Keywords:*** Reservoir water quality; physicochemical parameters; Bhavali reservoir; Darna reservoir

## GRAPHICAL ABSTRACT:




**Physicochemical parameters Bhavali and Darna dam**

## INTRODUCTION

Assessing physicochemical parameters in water bodies, including the Bhavali and Darna water reservoirs in Igatpuri, Maharashtra, requires more research; it is an essential step toward understanding their aquatic ecosystems and protecting human health [1], [2]. Water quality is an important aspect of environmental health and has a direct bearing on human survival and the viability of ecosystems. The physicochemical parameters of water, including pH, electrical conductivity, total hardness, turbidity, biological oxygen demand (BOD), chemical oxygen demand (COD), dissolved oxygen (DO), and nutrient amounts, are some of the most critical indicators of water quality and are widely used to evaluate the integrity of aquatic ecosystems [3], [4], [5]. Recent studies have highlighted the significant influence of these parameters on marine organisms, particularly phytoplankton communities, which are notably sensitive to changes in water chemistry [5]. For instance, in the Eko-Nde reservoir in Nigeria, temperature, pH, and total hardness were considered important factors controlling phytoplankton community structure. This indicates reservoir pollution and associated health risks for humans and aquatic species [4]. Likewise, the Dejla Dewda reservoir in India demonstrated seasonal variations in physicochemical properties, essential for maintaining fish diversity and the overall health of marine systems [3].

**(a)** **(b)**

**Figure: a) Bhavali dam, b) Darna dam**

Heavy metals and other pollutants in Maharashtra cause significant health hazards through contamination of water sources. Empirical studies show that this region is one of the most significant contributors to hazardous waste generation, including heavy metal pollutants, which can cause health problems such as gastrointestinal disorders when these contaminants seep into the drinking water sources. Moreover, the water quality in reservoirs often mirrors the nature of the surrounding landscape and human activities [6], [7]. For instance, agricultural runoff and other activities have degraded the water quality of the Azibo Reservoir, which further necessitates an integrated management strategy to reduce sources of pollution. Although much has been done to research water quality, there still exists a lack of knowledge of the specific impact of these physicochemical parameters on local ecosystems and human health, especially for the Bhavali and Darna dam reservoirs [8], [9], [10]. Although numerous studies have been conducted on the reservoirs of Maharashtra, further research is needed to assess the unique environmental and anthropogenic factors affecting these water bodies. This research gap provides the importance of continuous monitoring and evaluation of water quality parameters to safeguard the health and sustainability of aquatic ecosystems and protect human well-being. Addressing this issue will require a holistic approach that takes into account natural and human-induced changes in water quality and the socio-economic implications of these water bodies for nearby communities [4], [5], [10]. The physicochemical parameters play a significant role in the health of aquatic life and water safety for human consumption. The study of different parameters in reservoirs provides important information on water quality. For example, Eutrophication is caused by higher nutrient levels, excessive algal growth, and lower water oxygen levels. This phenomenon substantially threatens aquatic ecosystems, disrupting the organization of organisms and potentially leading to fish kills and other ecological disturbances [3], [11].

In addition, seasonal variations in water quality parameters are critical for aquatic life and human health. The BOD and overall health of reservoirs can change drastically with changes in temperature, turbidity, and nutrient concentrations, which are affected by seasonal cycles. During the monsoon season, increased runoff can elevate pollutant and nutrient amounts, thereby increase pollution levels and compromise water quality for human use [4]. Contaminated water poses a serious health hazard, mainly due to nitrates and heavy metals, particularly in the affected regions. Regular monitoring of the water quality parameters is crucial for safe drinking water

supply and safeguarding public health. Continuous monitoring is recommended and mandatory for safeguarding drinking water and public health. Finally, measuring physicochemical parameters in Bhavali and Darna water Reservoirs is essential for assessing its implications for aquatic ecosystems and human health [12], [13]. Researchers should closely monitor these parameters for effective management strategies to control pollution and ensure safe drinking water for the local population. An integrated approach is crucial for maintaining ecological balance and safeguarding human health in the region [14], [15]. The water quality of reservoirs is often subjected to complex interactions of natural and anthropogenic factors. For example, the small dam reservoir study of an agricultural catchment showed how reservoirs could improve water quality by removing contaminants but, at the same time, suffer from eutrophication due to high levels of phosphates and other pollutants, including COD, Cr, BOD, and nitrites. As with run-of-the-river reservoirs, the density flow regime determines the mixing of inflows to distribute nutrients and organics, leading to associated areas of algal bloom and hypoxia [16], [17]. Sedimentation and nutrient dynamics, especially phosphorus, are fundamental in agricultural watersheds, as seen in the Krishnagiri reservoir, where high organic amounts and sediment nutrients exacerbate eutrophication. Borehole water studies show that pH, DO, and COD usually exceed safe levels, indicating health risks. Correlating water quality parameters with meteorological factors, such as wind speed and rainfall, suspended solids, and TDS, further complicates the dynamics of reservoirs [18], [19]. Developing water quality indices like the CWQI simplifies water quality assessment by aggregating several physicochemical parameters. In studies of dam reservoirs, the resuspension of sediments can remobilize trace metals and increase the risk to water quality. Moreover, the corrosivity of water can affect the serviceability of reservoir infrastructure and the sustainability of hydropower. These studies highlight the complexity of controlling water quality in reservoirs and the need for a multilayered approach that responds to natural and human processes [12], [13].

Past research has proven that water quality must be assessed in reservoirs and other water-holding bodies. Studies have been done on the various effects of physicochemical factors on the aquatic environment and humans. For example, pH variability and its relation to the solubility and toxicity of heavy metals have caused harm to marine life. At greater values of BOD and COD, organic water contamination means more DO is involved [14], [15], [16]. The study provides a systematic approach involving the collection of water samples from various locations within the Bhavali and Darna dam reservoirs. Adhering to proper sampling procedures is essential for ensuring the validity and reliability of the process [4]. The collected samples are analyzed in the laboratory, considering their physicochemical parameters to compare them against standard water quality indices that depict the reservoir's current status. It has been concluded that states such as Maharashtra add up to significant amounts of hazardous wastes, for instance, heavy metal wastes contributing to gastrointestinal-related diseases and others in sources used for drinking purposes [1], [17]. This research gap underlines the continuous monitoring and evaluation of water quality parameters for health, sustainable aquatic ecosystems, and human welfare. A comprehensive fill of this gap with natural and anthropogenic water quality changes and water's socio-economic importance to adjacent communities, needs to be accomplished. This study shall contribute critical information on the water quality of the Bhavali and Darna reservoirs [9], [10]. The physicochemical parameters must be understood to understand the status of these reservoirs and possible threats to aquatic ecosystems and human health. Hence, analyzing the physicochemical

properties of the Bhavali and Darna reservoirs and comparing them with each other is necessary for the future sustainability of these invaluable water resources [3], [13], [15], [18], [20].

## MATERIALS & METHODS

### 1. General Geography and Climatology:

Igatpuri's Bhavali and Darna Dam are in the Nashik district of Maharashtra, India. The latitudes and longitudes are 19.6350 °N, 73.5805 °E and 19.8063 °N, 73.7485 °E, respectively. The general climate of the Nashik district is dry and hot, except during the monsoon period. While there are four distinct seasons in Western India, the year in this region is typically divided into three: Summer (March-May), which is dry, hot, and very hot with high temperatures; Monsoon (June-September), characterized by good rainfall to break the heat; and Winter (October-February), featuring cool (mild) temperatures with occasional cool spells. This climate extensively impacts the region's natural resources and agricultural practices [21], [22].

### 2. Study Areas

Five stations chosen from the Bhavali and Darna dam reservoirs were the only ones included in the study. Work began in June 2023 and was finished in December 2023. The dam's main water supply comes from the rivers and streams it feeds. Situated in a gorge, the Dam is a remarkable engineering achievement. It has a gated spillway and an earthen dam construction for regulated water release. The Bhavali dam is quite large, measuring over 1550 meters in length and rising to roughly 33.97 meters, while the Darna dam measures about 1634 meters in length and rising to roughly 28 meters. Additionally, dams are crucial for sustaining agricultural operations and supplying irrigation to a large region [6], [8], [23].

### 3. Sampling Stations

| Stations | Bhavali | Darna |
|---|---|---|
| Stations 1 | Lat-19.628364 Long 73.597285 | Lat 19.806501 Long 73.750855 |
| Stations 2 | Lat 19.629502 Long 73.594939 | Lat 19.787214 Long 73.75318 |
| Stations 3 | Lat 19.640341 Long 73.595151 | Lat 19.779045 Long 73.74986 |
| Stations 4 | Lat 19.643994 Long 73.591015 | Lat 19.770747 Long 73.74539 |
| Stations 5 | Lat 19.636535 Long 73.580521 | Lat 19.789994 Long 73.735546 |
| Stations 6 | - | Lat 19.788354 Long 73.717191 |

### 4. Field Work

Between June and December of 2023, water samples were taken from five to six stations of the Bhavali and Darna dams, respectively. Water samples were taken from every station in the research areas using 4-litre acid-washed plastic cans. Separate samples were gathered in 250 mL glass bottles to assess DO and BOD. A mercury centigrade thermometer measured the water temperature at regular intervals, 4 to 6 cm below the water's surface layer. The INOX 7 instrument is used to measure physicochemical parameters such as pH, TDS, EC, ORP, SG, salinity, and temperature of water samples from both dams.

## RESULT

The study's findings show that the Bhavali and Darna dam reservoirs have generally satisfactory water quality, with most parameters falling within ranges suitable for aquatic life and human usage. Sufficient light penetration for photosynthesis is ensured by low turbidity, while adequate DO levels promote aquatic biodiversity. The slightly alkaline pH in both reservoirs is ideal for most aquatic life. However, more research is necessary to fully comprehend the consequences of the observed variations in some indicators, including ORP, for the aquatic ecosystem's health. The outcomes of every physicochemical parameter measured at five stations for the Bhavali and six stations for the Darna dams are listed below.

**Physicochemical parameters of Bhavali dam at Station-I to V**

The following are the results of all the physicochemical parameters of the Bhavali and Darna dams at five to six stations.

**Table 1: Physicochemical parameters of Bhavali dam at Station-I**

| Parameters | June 2023 | July 2023 | August 2023 | September 2023 | October 2023 | November 2023 | December 2023 |
|---|---|---|---|---|---|---|---|
| **Air Temperature ($^0$C)** | 28.67 | 27.00 | 24.53 | 27.20 | 26.70 | 29.40 | 27.20 |
| **Water Temperature ($^0$C)** | 27.30 | 25.23 | 23.20 | 27.23 | 25.87 | 25.23 | 23.60 |
| **Turbidity (NTU)** | 1 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| **pH** | 7.82 | 7.50 | 7.86 | 8.37 | 8.55 | 8.23 | 8.24 |
| **Electrical conductivity (mS/cm)** | 100 | 68 | 61 | 66 | 65 | 63 | 63 |
| **TDS (mg/L)** | 65 | 33 | 30 | 33 | 32 | 32 | 31 |
| **Salt (mg/L)** | 65 | 33 | 30 | 33 | 32 | 32 | 31 |
| **Salt %** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **S.G.** | 1.002 | 1.001 | 1.001 | 1.002 | 1.001 | 1.001 | 1.001 |
| **ORP (mV)** | 283 | 296 | 193 | 146 | -5 | -9 | 42 |
| **DO (mg/L)** | 4.2 | 5.8 | 5.3 | 4.4 | 5.1 | 5.3 | 5.5 |
| **BOD (mg/L)** | 1.8 | 1.8 | 0.2 | 0.2 | 0.2 | 1.4 | 1.3 |
| **Total hardness (mg/L)** | 26 | 20 | 28 | 24 | 20 | 20 | 20 |
| **Fluoride (mg/L)** | 0 | 0.1 | 0.05 | 0.03 | 0.02 | 0.02 | 0.02 |
| **Total Nitrogen as Nitrate (mg/L)** | 1 | 1 | 1 | 2 | 2 | 1 | 1 |
| **Iron (mg/L)** | 0 | 0.1 | 0.05 | 0.03 | 0.02 | 0.03 | 0.03 |
| **Chloride as Cl (mg/L)** | 6 | 5 | 6 | 6 | 5 | 6 | 6 |
| **Alkalinity (mg/L)** | 19 | 14 | 20 | 18 | 16 | 16 | 16 |
| **Sulphate (mg/L)** | 5 | 4 | 2 | 2 | 2 | 2 | 2 |

As shown in Table 1 at Station-I of Bhavali dam, the water quality parameters were analysed over time, with data collected on various physicochemical parameters such as temperature, pH, DO, BOD, TDS, EC, nutrients, etc. The results indicate that the overall water quality is generally reasonable. The water temperature closely followed the air temperature, showing fluctuations between 23.20 °C and 27.30 °C. The water remained clear with low turbidity levels throughout the sampling period. The pH values were slightly alkaline, ranging from 7.50 to 8.55. EC and TDS levels showed some variability, indicating changes in the dissolved solids content [17], [20]. DO levels were generally good, ranging from 4.2 to 5.8 mg/L, essential for aquatic life. The low BOD values suggest low levels of organic pollution. Other parameters, such as fluoride, nitrate, and iron, were within acceptable limits. However, some parameters exhibited significant fluctuations. The ORP showed a wide range, indicating changes in the redox conditions within the water body. While the pH remained slightly alkaline, consistent monitoring is necessary to ensure it stays within acceptable limits for aquatic life. Overall, the water quality at Station-I of Bhavali Dam appears suitable for most uses.

**Table 2: Physicochemical parameters of Bhavali dam at station-II**

| Parameters | June 2023 | July 2023 | August 2023 | September 2023 | October 2023 | November 2023 | December 2023 |
|---|---|---|---|---|---|---|---|
| **Air Temperature ($^0$C)** | 28.27 | 24.70 | 23.70 | 26.57 | 26.30 | 29.47 | 28.40 |
| **Water Temperature ($^0$C)** | 26.83 | 25.23 | 23.43 | 27.10 | 25.83 | 26.40 | 23.70 |
| **Turbidity (NTU)** | 1 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| **pH** | 7.35 | 7.51 | 7.85 | 8.46 | 8.61 | 8.27 | 8.24 |
| **Electrical conductivity (mS/cm)** | 80 | 67 | 60 | 65 | 62 | 64 | 62 |
| **TDS (mg/L)** | 40 | 33 | 30 | 32 | 32 | 32 | 31 |
| **Salt (mg/L)** | 40 | 33 | 30 | 32 | 32 | 32 | 31 |
| **Salt %** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **S.G.** | 1.002 | 1.001 | 1.001 | 1.002 | 1.001 | 1.001 | 1.001 |
| **ORP (mV)** | 281 | 294 | 236 | 172 | 18 | -13 | 43 |
| **DO (mg/L)** | 4.3 | 6.1 | 5.3 | 4.6 | 5.3 | 5.3 | 5.7 |
| **BOD (mg/L)** | 1.6 | 1.4 | 0.4 | 0.2 | 0.2 | 1 | 1 |
| **Total hardness (mg/L)** | 26 | 20 | 28 | 24 | 20 | 20 | 20 |
| **Fluoride (mg/L)** | 0 | 0.1 | 0.05 | 0.03 | 0.02 | 0.02 | 0.02 |
| **Total Nitrogen as Nitrate (mg/L)** | 1 | 1 | 1 | 2 | 2 | 1 | 1 |
| **Iron (mg/L)** | 0 | 0.1 | 0.05 | 0.03 | 0.02 | 0.03 | 0.03 |
| **Chloride as Cl (mg/L)** | 6 | 5 | 6 | 6 | 5 | 6 | 6 |
| **Alkalinity (mg/L)** | 19 | 14 | 20 | 18 | 16 | 16 | 16 |
| **Sulphate (mg/L)** | 5 | 4 | 2 | 2 | 2 | 2 | 2 |

Table 2 (Station-II) shows that the water temperature ranged from 23.43 °C to 27.10 °C following the air temperature fluctuations. Turbidity remained low throughout the sampling period, except for a slight increase on one month. The pH values were slightly alkaline, ranging from 7.35 to 8.61. EC and TDS levels exhibited some variability, indicating changes in the dissolved solids content. DO levels were consistently good, ranging from 4.3 to 6.1 mg/L, essential for aquatic life. The BOD values were generally low, suggesting low levels of organic pollution. Other parameters, such as fluoride, nitrate, and iron, were within acceptable limits. However, some parameters exhibited fluctuations. The ORP showed a wide range, indicating changes in the redox conditions within the water body. While the pH remained slightly alkaline, consistent monitoring is necessary to ensure it stays within acceptable limits for aquatic life. Overall, the water quality at Station-II of Bhavali Dam appears suitable for most uses.

**Table 3: Physicochemical parameters of Bhavali dam at station-III**

| Parameters | June 2023 | July 2023 | August 2023 | September 2023 | October 2023 | November 2023 | December 2023 |
|---|---|---|---|---|---|---|---|
| **Air Temperature ($^0$C)** | 28.37 | 26.00 | 23.60 | 26.30 | 26.00 | 29.90 | 28.40 |
| **Water Temperature ($^0$C)** | 27.50 | 26.33 | 23.37 | 26.90 | 26.13 | 25.57 | 24.60 |
| **Turbidity (NTU)** | 1 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| **pH** | 7.80 | 7.90 | 7.91 | 8.47 | 8.88 | 8.21 | 8.3 |
| **Electrical conductivity (mS/cm)** | 73 | 67 | 60 | 66 | 64 | 62 | 63 |
| **TDS (mg/L)** | 47 | 34 | 30 | 32 | 32 | 31 | 31 |
| **Salt (mg/L)** | 47 | 34 | 30 | 32 | 32 | 31 | 31 |
| **Salt %** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **S.G.** | 1.002 | 1.002 | 1.001 | 1.002 | 1.001 | 1.001 | 1.001 |
| **ORP (mV)** | 271 | 277 | 252 | 192 | 38 | -18 | 48 |
| **DO (mg/L)** | 4.6 | 6.4 | 5.6 | 4.6 | 5 | 4.4 | 5.6 |
| **BOD (mg/L)** | 1.5 | 1.5 | 1.2 | 0.7 | 0.6 | 0.7 | 0.5 |
| **Total hardness (mg/L)** | 19 | 21 | 28 | 24 | 20 | 20 | 20 |
| **Fluoride (mg/L)** | 0 | 0.2 | 0.05 | 0.03 | 0.02 | 0..2 | 0.02 |
| **Total Nitrogen as Nitrate (mg/L)** | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| **Iron (mg/L)** | 0 | 0.3 | 0.05 | 0.02 | 0.02 | 0.02 | 0.03 |
| **Chloride as Cl (mg/L)** | 4 | 5 | 6 | 5 | 4 | 6 | 6 |
| **Alkalinity (mg/L)** | 14 | 15 | 16 | 19 | 17 | 16 | 16 |
| **Sulphate (mg/L)** | 4 | 4 | 2 | 2 | 2 | 2 | 2 |

Table 3 (Station-III) shows that the water temperature ranged from 23.37 °C to 27.50 °C following the air temperature fluctuations. Turbidity remained low throughout the sampling period, except for a slight increase on one month. The pH values were slightly alkaline, ranging from 7.80 to 8.88. EC and TDS levels exhibited some variability, indicating changes in the dissolved solids content. The DO levels necessary for aquatic life were continuously good and ranged from 4.4 to 6.4 mg/L. Low levels of organic contamination were indicated by the BOD values, which were generally low. Iron, nitrate, fluoride, and other criteria were all within permissible bounds. Nonetheless, there were variations in a few requirements. [1], [17], [20]. The wide range of the ORP indicated changes in the redox conditions inside the water body. Even though the pH stayed somewhat alkaline, regular monitoring is required to ensure it stays within ranges suitable for aquatic life. Overall, Station-III of Bhavali Dam's water quality seems appropriate for most applications.

**Table 4: Physicochemical parameters of Bhavali dam at station-IV**

| Parameters | June 2023 | July 2023 | August 2023 | September 2023 | October 2023 | November 2023 | December 2023 |
|---|---|---|---|---|---|---|---|
| **Air Temperature ($^0$C)** | 27.07 | 25.00 | 24.00 | 25.20 | 25.50 | 31.10 | 27.10 |
| **Water Temperature ($^0$C)** | 26.37 | 27.17 | 23.63 | 26.90 | 25.93 | 25.93 | 25.10 |
| **Turbidity (NTU)** | 1 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| **pH** | 7.81 | 7.77 | 7.85 | 8.47 | 8.76 | 8.30 | 8.24 |
| **Electrical conductivity(mS/cm)** | 77 | 68 | 59 | 65 | 61 | 64 | 62 |
| **TDS (mg/L)** | 50 | 34 | 29 | 32 | 31 | 32 | 31 |
| **Salt (mg/L)** | 50 | 34 | 29 | 32 | 31 | 32 | 31 |
| **Salt %** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **S.G.** | 1.002 | 1.002 | 1.001 | 1.002 | 1.001 | 1.002 | 1.001 |
| **ORP (mV)** | 272 | 282 | 263 | 195 | 43 | -26 | 62 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **DO (mg/L)** | 4.5 | 5.8 | 5.5 | 4.8 | 5.1 | 5.2 | 5.8 |
| **BOD (mg/L)** | 1.4 | 1.2 | 1.5 | 0.7 | 0.6 | 1.5 | 1.2 |
| **Total hardness(mg/L)** | 20 | 21 | 28 | 24 | 20 | 20 | 20 |
| **Fluoride (mg/L)** | 0 | 0.1 | 0.05 | 0.03 | 0.02 | 0.02 | 0.02 |
| **Total Nitrogen as Nitrate (mg/L)** | 1 | 1 | 1 | 2 | 2 | 1 | 1 |
| **Iron(mg/L)** | 0 | 0.2 | 0.05 | 0.02 | 0.02 | 0.02 | 0.02 |
| **Chloride as Cl (mg/L)** | 5 | 5 | 6 | 5 | 4 | 6 | 6 |
| **Alkalinity (mg/L)** | 15 | 15 | 20 | 19 | 17 | 16 | 16 |
| **Sulphate (mg/L)** | 4 | 4 | 2 | 2 | 2 | 2 | 2 |

Table 4 (Station IV) shows that the water temperature ranged from 23.63 °C to 27.17 °C, following the air temperature fluctuations. Turbidity remained low throughout the sampling period, except for a slight increase on one month. The pH values were slightly alkaline, ranging from 7.77 to 8.76. DO levels were consistently good, ranging from 4.5 to 5.8 mg/L, essential for aquatic life. The BOD values were generally low, suggesting low levels of organic pollution. Some other parameters, such as fluoride, nitrate, and iron, were within acceptable limits. However, some parameters exhibited fluctuations. The ORP showed a low range, indicating changes in the redox conditions. [2], [11]. Therefore, the water quality at Station-IV of Bhavali Dam appears suitable for most uses.

**Table 5: Physicochemical parameters of Bhavali dam at Station-V**

| **Parameters** | **June 2023** | **July 2023** | **August 2023** | **September 2023** | **October 2023** | **November 2023** | **December 2023** |
|---|---|---|---|---|---|---|---|
| **Air Temperature ($^0$C)** | 27.17 | 27.00 | 24.77 | 24.70 | 25.10 | 30.30 | 27.40 |
| **Water Temperature ($^0$C)** | 26.50 | 26.43 | 23.97 | 26.20 | 25.60 | 26.17 | 24.20 |
| **Turbidity (NTU)** | 1 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| **pH** | 7.80 | 7.57 | 8.00 | 8.56 | 8.82 | 8.34 | 8.32 |
| **Electrical conductivity (mS/cm)** | 78 | 69 | 59 | 64 | 64 | 63 | 63 |
| **TDS (mg/L)** | 51 | 34 | 29 | 32 | 32 | 32 | 31 |
| **Salt (mg/L)** | 51 | 34 | 29 | 32 | 32 | 32 | 31 |
| **Salt %** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **S.G.** | 1.002 | 1.002 | 1.001 | 1.001 | 1.001 | 1.001 | 1.001 |
| **ORP (mV)** | 253 | 267 | 249 | 194 | 60 | -27 | 80 |
| **DO (mg/L)** | 4.6 | 6 | 5.7 | 4.4 | 5.1 | 6.2 | 5.8 |
| **BOD (mg/L)** | 1.6 | 2 | 1.2 | 0.1 | 0.2 | 1.8 | 1.5 |
| **Total hardness (mg/L)** | 20 | 20 | 28 | 26 | 20 | 20 | 20 |
| **Fluoride (mg/L)** | 0 | 0.2 | 0.05 | 0.03 | 0.02 | 0.02 | 0.02 |
| **Total Nitrogen as Nitrate (mg/L)** | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| **Iron (mg/L)** | 0 | 0.2 | 0.05 | 0.02 | 0.02 | 0.02 | 0.03 |
| **Chloride as Cl (mg/L)** | 5 | 5 | 6 | 5 | 4 | 6 | 6 |
| **Alkalinity (mg/L)** | 15 | 14 | 20 | 18 | 16 | 16 | 16 |
| **Sulphate (mg/L)** | 4 | 4 | 2 | 2 | 2 | 2 | 3 |

Table 5 (Station-V) shows that the water temperature ranged from 23.97 °C to 26.50 °C, following the air temp fluctuations. The pH values were slightly alkaline, ranging from 7.57 to 8.82. EC and TDS levels exhibited some variability, indicating

changes in the dissolved solids content. DO levels were consistently good, ranging from 4.4 to 6.2 mg/L, essential for aquatic life. The BOD values were generally low, suggesting low levels of organic pollution and other parameters within acceptable limits. However, some parameters exhibited fluctuations. The ORP showed a wide range, indicating changes in the redox conditions within the water body. Overall, the water quality at Station V of Bhavali Dam appears suitable for most uses. Over time, data was gathered on several water quality indicators, including temperature, pH, DO, and nutrients, at each of the five stations of Bhavali Dam. According to the findings, all stations have generally good water quality. Aquatic life could tolerate the water's temperature, pH, and DO levels. As a result, the water quality at each of the five Bhavali Dam stations seems appropriate for most applications.

## Physicochemical parameters of Darna dam at Station-I to VI

**Table 6: Physicochemical parameters of Darna dam at Station-I**

| Parameters | June 2023 | July 2023 | August 2023 | September 2023 | October 2023 | November 2023 | December 2023 |
|---|---|---|---|---|---|---|---|
| Air Temp. ($^0$C) | 27.50 | 24.23 | 24.70 | 26.00 | 34.00 | 32.73 | 28.30 |
| Water Temp. ($^0$C) | 28.00 | 25.17 | 24.57 | 27.37 | 28.47 | 26.73 | 26.83 |
| Turbidity (NTU) | 1 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| pH | 8.27 | 8.45 | 8.51 | 9.58 | 9.40 | 9.37 | 8.97 |
| Electrical conductivity (mS/cm) | 121 | 119 | 172 | 150 | 150 | 150 | 155 |
| TDS (mg/L) | 60 | 59 | 86 | 75 | 75 | 75 | 77 |
| Salt (mg/L) | 60 | 59 | 86 | 75 | 75 | 75 | 77 |
| Salt % | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S.G. | 1.002 | 1.001 | 1.001 | 1.002 | 1.002 | 1.002 | 1.002 |
| ORP (mV) | 233 | 226 | 208 | 133 | -30 | -10 | 89 |
| DO (mg/L) | 5.1 | 5.1 | 5.1 | 6.5 | 6.2 | 6.5 | 6.5 |
| BOD (mg/L) | 1.9 | 1.5 | 0.3 | 0.5 | 0.8 | 1.3 | 1.6 |
| Total hardness (mg/L) | 80 | 31 | 36 | 36 | 37 | 36 | 46 |
| Fluoride (mg/L) | 0.1 | 0.1 | 0.03 | 0.03 | 0.03 | 0.04 | 0.04 |
| Total Nitrogen as Nitrate (mg/L) | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Iron (mg/L) | 0.1 | 0.5 | 0.05 | 0.06 | 0.05 | 0.05 | 0.06 |
| Chloride as Cl (mg/L) | 11 | 7 | 10 | 9 | 9 | 11 | 8 |
| Alkalinity (mg/L) | 38 | 22 | 28 | 28 | 29 | 28 | 32 |
| Sulphate (mg/L) | 6 | 6 | 5 | 5 | 5 | 5 | 6 |

Table 6 (Station I) shows that the water quality characteristics at Station-I of Darna Dam were monitored over time, with data collected on various issues. The results indicate that the water quality is generally reasonable. The water temperature closely matched the air temperature, ranging from 24.57 °C to 28.47 °C. The water was clear and had no turbidity during the observation time. The pH readings were relatively alkaline and varied from 8.27 to 9.58. Variability in electrical conductivity and TDS levels ranged from 119 to 172 µS/cm and 59 to 86 mg/L, respectively, indicating variations in the dissolved solids concentration. The levels were usually good, with dissolved oxygen levels between 5.1 and 6.5 mg/L, critical for aquatic life. However, some parameters exhibited significant fluctuations. The ORP showed a wide range, indicating changes in the redox conditions within the water body. While the pH remained slightly alkaline, consistent monitoring is necessary to ensure it stays

within acceptable limits for aquatic life. Therefore, the water quality at Station-I of Darna Dam appears suitable for most uses.

**Table 7: Physicochemical parameters of Darna dam at station II**

| Parameters | June 2023 | July 2023 | August 2023 | September 2023 | October 2023 | November 2023 | December 2023 |
|---|---|---|---|---|---|---|---|
| **Air Temp. ($^0$C)** | 27.43 | 25.13 | 24.80 | 26.00 | 29.10 | 31.10 | 29.00 |
| **Water Temp. ($^0$C)** | 27.90 | 25.10 | 24.87 | 27.00 | 28.60 | 27.50 | 26.10 |
| **Turbidity (NTU)** | 1 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| **pH** | 8.10 | 8.14 | 8.12 | 9.30 | 9.49 | 9.16 | 8.69 |
| **Electrical conductivity(mS/cm)** | 125 | 122 | 176 | 155 | 155 | 154 | 155 |
| **TDS (mg/L)** | 62 | 61 | 88 | 77 | 77 | 77 | 77 |
| **Salt (mg/L)** | 62 | 61 | 88 | 77 | 77 | 77 | 77 |
| **Salt %** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **S.G.** | 1.002 | 1.001 | 1.001 | 1.002 | 1.002 | 1.002 | 1.001 |
| **ORP (mV)** | 231 | 221 | 232 | 75 | 6 | -36 | 133 |
| **DO (mg/L)** | 5.3 | 5.1 | 5.4 | 6.5 | 6.5 | 6.7 | 5.8 |
| **BOD (mg/L)** | 2.5 | 1.7 | 1.9 | 0.6 | 0.5 | 3.3 | 1 |
| **Total hardness (mg/L)** | 74 | 34 | 44 | 42 | 39 | 34 | 44 |
| **Fluoride (mg/L)** | 0.1 | 0.2 | 0.04 | 0.04 | 0.05 | 0.04 | 0.04 |
| **Total Nitrogen as Nitrate (mg/L)** | 2 | 2 | 2 | 3 | 3 | 2 | 2 |
| **Iron (mg/L)** | 0.1 | 0.3 | 0.06 | 0.05 | 0.06 | 0.06 | 0.06 |
| **Chloride as Cl (mg/L)** | 9 | 8 | 10 | 10 | 11 | 10 | 10 |
| **Alkalinity (mg/L)** | 34 | 25 | 32 | 32 | 32 | 29 | 32 |
| **Sulphate (mg/L)** | 6 | 7 | 5 | 5 | 6 | 6 | 6 |

Data on temperature, pH, dissolved oxygen, and nutrients were gathered while the water quality parameters at Station II of Darna Dam were tracked over time (Table 7). According to the findings, the water quality is generally reasonable. The water temperature fluctuated between 24.87 °C and 28.60 °C, closely matching the air temperature. Throughout the monitoring period, the water clarity and low turbidity. The pH levels ranged from 8.10 to 9.49 and were quite alkaline. Variability in TDS and EC levels, ranging from 61 to 88 mg/L and 122 to 176 µS/cm, indicated variations in the dissolved solids content. The levels were generally good, with dissolved oxygen levels between 5.1 and 6.7 mg/L, critical for aquatic life. However, some parameters exhibited significant fluctuations. The ORP showed a wide range, indicating changes in the redox conditions within the water body [3], [4]. While the pH remained slightly alkaline, consistent monitoring is necessary to ensure it stays within acceptable limits for aquatic life. Overall, the water quality at Station II of Darna Dam appears suitable for most uses.

**Table 8: Physicochemical parameters of Darna dam at station-III**

| Parameters | June 2023 | July 2023 | August 2023 | September 2023 | October 2023 | November 2023 | December 2023 |
|---|---|---|---|---|---|---|---|
| **Air Temp. ($^0$C)** | 26.67 | 25.40 | 23.10 | 25.50 | 39.90 | 32.20 | 29.20 |
| **Water Temp. ($^0$C)** | 27.50 | 26.30 | 24.53 | 25.90 | 29.10 | 28.80 | 28.00 |
| **Turbidity (NTU)** | 1 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| **pH** | 8.25 | 8.57 | 7.92 | 9.26 | 9.42 | 9.17 | 8.76 |
| **Electrical conductivity (mS/cm)** | 134 | 122 | 220 | 155 | 157 | 152 | 152 |
| **TDS (mg/L)** | 64 | 68 | 110 | 77 | 78 | 76 | 77 |
| **Salt (mg/L)** | 64 | 68 | 110 | 77 | 78 | 76 | 77 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Salt %** | 0 | 0 | 0.01 | 0 | 0 | 0 | 0 |
| **S.G.** | 1.002 | 1.001 | 1.001 | 1.001 | 1.002 | 1.002 | 1.001 |
| **ORP (mV)** | 235 | 196 | 246 | 74 | 5 | 10 | 114 |
| **DO (mg/L)** | 5.3 | 6 | 4.6 | 5.1 | 5.1 | 5.2 | 5.8 |
| **BOD (mg/L)** | 2.9 | 2.6 | 0.1 | 1 | 1 | 1.3 | 1.2 |
| **Total hardness (mg/L)** | 78 | 34 | 44 | 42 | 45 | 46 | 44 |
| **Fluoride (mg/L)** | 0.1 | 0.2 | 0.04 | 0.04 | 0.05 | 0.04 | 0.04 |
| **Total Nitrogen as Nitrate (mg/L)** | 2 | 3 | 2 | 3 | 3 | 2 | 2 |
| **Iron (mg/L)** | 0.1 | 0.3 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 |
| **Chloride as Cl** | 10 | 10 | 10 | 11 | 11 | 16 | 8 |
| **Alkalinity (mg/L)** | 34 | 31 | 32 | 32 | 35 | 36 | 32 |
| **Sulphate (mg/L)** | 5 | 9 | 5 | 6 | 7 | 6 | 6 |

Data on temperature, pH, dissolved oxygen, and nutrients were gathered as part of a long-term monitoring of the water quality parameters at Station-III of Darna Dam (Table 8). The findings show that the water quality is generally acceptable. The water temperature fluctuated between 24.53 °C and 29.10 °C, closely matching the air temperature. Throughout the monitoring period, the water clarity and low turbidity. The pH ranged from 7.92 to 9.42 and was quite alkaline. TDS and EC levels varied from 64 to 110 mg/L and 122 to 220 µS/cm, respectively, indicating variations in the dissolved solids concentration. The amounts of dissolved oxygen, which are necessary for aquatic life, varied between 4.6 and 6.0 mg/L. The low BOD values suggest low quantities of organic contamination. Iron, nitrate, fluoride, and other criteria were all within permissible bounds. Nonetheless, there were notable variations in a few requirements. [5], [10]. The wide range of the ORP indicated changes in the redox conditions inside the water body. Even though the pH stayed somewhat alkaline, regular monitoring is required to ensure it stays within ranges suitable for aquatic life. Overall, the water quality at Darna Dam's Station-III seems appropriate for most purposes.

**Table 9: Physicochemical parameters of Darna dam at station-IV**

| **Parameters** | **June 2023** | **July 2023** | **August 2023** | **September 2023** | **October 2023** | **November 2023** | **December 2023** |
|---|---|---|---|---|---|---|---|
| **Air Temp. ($^0$C)** | 26.50 | 25.80 | 23.70 | 32.30 | 29.10 | 33.70 | 29.50 |
| **Water Temp. ($^0$C)** | 27.40 | 26.67 | 24.43 | 31.57 | 28.80 | 29.10 | 27.60 |
| **Turbidity (NTU)** | 1 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| **pH** | 8.30 | 7.97 | 8.09 | 9.40 | 9.43 | 9.13 | 8.86 |
| **Electrical conductivity (mS/cm)** | 135 | 279 | 157 | 131 | 144 | 149 | 154 |
| **TDS (mg/L)** | 68 | 139 | 78 | 82 | 72 | 74 | 78 |
| **Salt (mg/L)** | 68 | 140 | 78 | 82 | 72 | 74 | 78 |
| **Salt %** | 0 | 0.01 | 0 | 0 | 0 | 0 | 0 |
| **S.G.** | 1.002 | 1.001 | 1.001 | 1.003 | 1.002 | 1.002 | 1.002 |
| **ORP (mV)** | 236 | 198 | 242 | 136 | 13 | 53 | 118 |
| **DO (mg/L)** | 5 | 6 | 5.1 | 6.8 | 6 | 6.1 | 6.5 |
| **BOD (mg/L)** | 2.3 | 2.3 | 2.5 | 1.3 | 1.2 | 2 | 1 |
| **Total hardness (mg/L)** | 78 | 63 | 44 | 38 | 36 | 46 | 48 |
| **Fluoride (mg/L)** | 0.1 | 0.1 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 |
| **Total Nitrogen as Nitrate (mg/L)** | 2 | 4 | 2 | 2 | 2 | 2 | 2 |
| **Iron (mg/L)** | 0.1 | 0.2 | 0.06 | 0.05 | 0.05 | 0.05 | 0.06 |
| **Chloride as Cl (mg/L)** | 9 | 15 | 10 | 10 | 10 | 15 | 10 |
| **Alkalinity (mg/L)** | 36 | 46 | 36 | 30 | 28 | 34 | 36 |
| **Sulphate (mg/L)** | 6 | 13 | 6 | 6 | 5 | 6 | 6 |

Data on temperature, pH, DO, and nutrients, among other water quality indicators, were gathered at Station-IV of Darna Dam over an extended period (Table 9). According to the findings, the water quality is typically acceptable. The water temperature fluctuated between 24.43 °C and 31.57 °C, closely matching the air temperature. Throughout the sampling period, the water was clear with modest turbidity levels. The pH ranged from 7.97 to 9.43, which is mildly alkaline. The TDS levels and EC ranged from 68 to 139 mg/L and 131 to 279 µS/cm, suggesting variations in the dissolved solids concentration. The amounts of DO, which are necessary for aquatic life, varied between 5 and 6.8 mg/L. The low BOD values suggest low quantities of organic contamination. The wide range of the ORP indicated changes in the redox conditions inside the water body. Even though the pH stayed somewhat alkaline, regular monitoring is required to ensure it stays within ranges suitable for aquatic life. Overall, the water quality at Darna Dam's Station-IV seems appropriate for most purposes.

**Table 10: Physicochemical parameters of Darna dam at Station-V**

| Parameters | June 2023 | July 2023 | August 2023 | September 2023 | October 2023 | November 2023 | December 2023 |
|---|---|---|---|---|---|---|---|
| **Air Temp. ($^0$C)** | 26.80 | 26.13 | 24.80 | 27.00 | 31.50 | 30.10 | 28.90 |
| **Water Temp. ($^0$C)** | 27.60 | 26.80 | 25.00 | 27.10 | 29.37 | 27.10 | 27.03 |
| **Turbidity (NTU)** | 1 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| **pH** | 7.87 | 8.04 | 8.51 | 9.76 | 9.43 | 9.09 | 9.40 |
| **Electrical conductivity(mS/cm)** | 134 | 119 | 172 | 148 | 157 | 150 | 151 |
| **TDS (mg/L)** | 67 | 59 | 99 | 74 | 78 | 75 | 76 |
| **Salt (mg/L)** | 67 | 59 | 99 | 74 | 78 | 75 | 76 |
| **Salt %** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **S.G.** | 1.002 | 1.002 | 1.001 | 1.002 | 1.002 | 1.002 | 1.002 |
| **ORP (mV)** | 242 | 283 | 213 | 117 | 7 | -4 | 105 |
| **DO (mg/L)** | 5.2 | 5.1 | 5.8 | 7.5 | 7 | 5.2 | 5.8 |
| **BOD (mg/L)** | 3.2 | 1.8 | 1.9 | 1.2 | 1.3 | 1.5 | 0.9 |
| **Total hardness (mg/L)** | 74 | 43 | 50 | 36 | 36 | 44 | 44 |
| **Fluoride (mg/L)** | 0.1 | 0.2 | 0.06 | 0.05 | 0.05 | 0.04 | 0.04 |
| **Total Nitrogen as Nitrate (mg/L)** | 2 | 3 | 3 | 3 | 3 | 2 | 2 |
| **Iron (mg/L)** | 0.1 | 0.2 | 0.08 | 0.05 | 0.05 | 0.06 | 0.06 |
| **Chloride as Cl (mg/L)** | 10 | 10 | 10 | 8 | 8 | 14 | 8 |
| **Alkalinity (mg/L)** | 34 | 31 | 40 | 30 | 24 | 36 | 32 |
| **Sulphate (mg/L)** | 5 | 9 | 7 | 6 | 5 | 6 | 6 |

Darna Dam's Station-V water quality characteristics were monitored over time, with data obtained on temperature, pH, DO, and nutrients (Table 10). The results show that the overall water quality is satisfactory. The water temperature mirrored the air temperature, fluctuating between 25.0 °C and 29.37 °C. The water was clean with slight turbidity during the monitoring period. The pH levels were slightly alkaline, ranging from 7.87 to 9.76. EC and TDS levels varied, indicating changes in dissolved solids content (119–172 µS/cm and 59–99 mg/L, respectively). DO levels were typically acceptable, ranging from 5.1 to 7.5 mg/L, which is required for aquatic life. Low BOD values indicate low levels of organic contamination. The ORP varied widely, indicating changes in the redox conditions inside the water body. While the pH remains somewhat alkaline, regular monitoring is required to keep it within safe levels for aquatic life. Darna Dam's Station

V's water quality seems sufficient for most uses.

**Table 11: Physicochemical parameters of Darna dam at station-VI**

| Parameters | June 2023 | July 2023 | August 2023 | September 2023 | October 2023 | November 2023 | December 2023 |
|---|---|---|---|---|---|---|---|
| **Air Temp. ($^0$C)** | 26.97 | 25.37 | 26.30 | 28.80 | 21.77 | 32.30 | 29.80 |
| **Water Temp. ($^0$C)** | 27.60 | 25.80 | 25.63 | 28.10 | 29.20 | 27.90 | 28.33 |
| **Turbidity (NTU)** | 1 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| **pH** | 7.75 | 7.85 | 8.17 | 9.63 | 9.39 | 9.06 | 8.84 |
| **Electrical conductivity(mS/cm)** | 134 | 146 | 226 | 153 | 155 | 152 | 156 |
| **TDS (mg/L)** | 67 | 73 | 113 | 76 | 77 | 76 | 78 |
| **Salt (mg/L)** | 67 | 73 | 113 | 76 | 77 | 76 | 78 |
| **Salt %** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **S.G.** | 1.002 | 1.001 | 1.001 | 1.002 | 1.002 | 1.002 | 1.002 |
| **ORP (mV)** | 243 | 277 | 226 | 125 | -1 | 44 | 98 |
| **DO (mg/L)** | 5.3 | 5.7 | 5 | 6.9 | 6.9 | 5.2 | 6 |
| **BOD (mg/L)** | 3.3 | 2.5 | 2.3 | 1.1 | 1.3 | 1.5 | 1.8 |
| **Total hardness (mg/L)** | 74 | 34 | 56 | 56 | 36 | 46 | 46 |
| **Fluoride (mg/L)** | 0.1 | 0.2 | 0.06 | 0.05 | 0.05 | 0.04 | 0.04 |
| **Total Nitrogen as Nitrate (mg/L)** | 2 | 2 | 3 | 3 | 2 | 2 | 2 |
| **Iron (mg/L)** | 0.1 | 0.2 | 0.08 | 0.08 | 0.05 | 0.06 | 0.06 |
| **Chloride as Cl (mg/L)** | 10 | 8 | 10 | 9 | 9 | 16 | 10 |
| **Alkalinity (mg/L)** | 34 | 24 | 44 | 44 | 25 | 34 | 36 |
| **Sulphate (mg/L)** | 5 | 7 | 7 | 6 | 5 | 5 | 6 |

The findings show that the water quality is generally acceptable. With variations between 25.63 °C and 29.20 °C, the water temperature nearly mirrored the atmospheric temperature. Throughout the monitoring period, the water clarity and low turbidity. The pH values ranged from 7.75 to 9.63 and were quite alkaline. The dissolved solids content varied, as seen by the EC and TDS levels, which ranged from 134 to 226 µS/cm and 67 to 113 mg/L, respectively. DO levels were generally good, ranging from 5 to 6.9 mg/L, essential for aquatic life. The low BOD values suggest low levels of organic pollution. Nonetheless, there were notable variations in a few parameters. The wide range of the ORP indicated changes in the redox conditions inside the water body. Even though the pH has become somewhat alkaline, regular monitoring is required to ensure it is within ranges suitable for aquatic life. The water quality of Darna Dam's Station-VI is generally ideal for most applications. However, monitoring important metrics like pH and ORP is essential for figuring out long-term patterns and evaluating any effects on the aquatic environment. Water quality assessments were conducted at several locations in the Bhavali and Darna dam reservoirs in Igatpuri, Maharashtra. Temperature, pH, DO, and turbidity were within acceptable limits for most aquatic life, indicating good water quality in both reservoirs. The water temperature patterns in both reservoirs were similar, with values closely tracking changes in the air temperature. Both reservoirs had mildly alkaline pH values. The DO concentrations in both reservoirs ranged from 4.2 to 6.4 mg/L in Bhavali and 4.6 to 7.5 mg/L in Darna Dam, which were sufficient for aquatic life. Both had usually low turbidity, which suggests that the water was clear. Unlike Bhavali, Darna Dam showed more notable fluctuations in EC and TDS levels. Significant variations in ORP were observed at all sites in both reservoirs, which indicates changes in the redox conditions. Although the pH of both dams was slightly alkaline, it is essential to

monitor it regularly to ensure that it remains within safe limits for aquatic life. The water quality in the Darna and Bhavali reservoirs was generally good. It is observed that there are some variations in water quality physicochemical parameters between the Darna dam and the Bhavali dam. The ORP was significantly lower in October and November compared to other months during the study period. It was also observed that the Darna dam water had a higher EC, TDS, and salinity compared to the Bhavali dam. It further showed high levels of total hardness and total nitrogen, such as nitrate, iron, chloride, alkalinity, and sulphate, at the Darna dam compared with the Bhavali dam. The pH in both reservoirs is higher, especially during the months of September, October, and November, primarily because of more algal growth and increased photosynthesis within this period, as an increase in pH is well noted to take place when such photosynthesis occurs. However, monitoring important metrics such as pH and ORP is critical for determining long-term patterns and evaluating the effects on the aquatic environment [3], [5], [20].

## CONCLUSION

The evaluations of both the Bhavali and Darna dam reservoirs generally presented satisfactory water quality. The critical parameters, such as temperature, pH, turbidity, and DO, were within the safe limits for maximum aquatic life. Low BOD values suggested lower organic contamination levels. However, variations in the ORP parameter were found to exist at every station in the two reservoirs, which inferred some changes in the redox conditions of these water bodies. Although the pH is somewhat alkaline, it must be monitored regularly to ensure it is constant within allowable limits. Overall, the water quality in both Bhavali and Darna dam reservoirs appears suitable for most uses. However, the water quality in the Bhavali dam is superior to that of the Darna dam. Monitoring key parameters like ORP and pH is important to understand long-term trends and assess potential impacts on the aquatic ecosystem. The study shows variations in physicochemical parameters between Darna and Bhavali dams. Darna Dam shows higher levels of several parameters, including EC, TDS, salinity, Total Hardness, Total Nitrogen (Nitrate), Iron, Chloride, Alkalinity, and Sulphate. Conversely, ORP was significantly lower in October and November at both dams. Notably, both reservoirs showed higher pH during September, October, and November, likely attributed to increased algal growth and photosynthesis. Therefore, regular monitoring will facilitate the identification of water quality issues that emerge and lead to timely intervention that will protect the ecological integrity of these waters [15], [17], [22], [23].

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