



Current Status of World's Third Largest Meteoritic Crater - Lonar Lake, India

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ABSTRACT

Lonar Lake, the world's third largest meteorite crater, is located in the Buldhana district of Maharashtra, India. It is the only saline water body of its kind in the world. The lake is nestled within a circular depression, surrounded by steep escarpments formed by an ejecta blanket. One of its most distinctive features is that it has an inlet but no outlet, which has led to its unusual and climate-driven isolation. Before 1985, the lake would dry up completely each summer, leaving behind a crust of salt along its shores. Local residents of Lonar town would collect this salt for making papads and washing clothes. During a study conducted between 1999 and 2004, the lake's water level rose by about six feet. Since then, the water level has continued to climb steadily. Today (2026), the situation has become alarming—the water level has risen by more than 20 feet compared to earlier records. This significant increase has drastically altered the lake's physico-chemical conditions, which in turn is affecting the biodiversity of the lake and its surrounding area.

Keywords: Current status, Meteoritic crater – Lonar Lake, Physico-chemical parameters

INTRODUCTION

Lonar Lake, situated in Buldhana district, Maharashtra, is the world's third largest meteorite crater and the largest basaltic impact crater on Earth (Fredriksson and others, 1973). Located at 19°58'N and 76°31'E, it is the only natural saltwater lake of its kind formed within a basaltic impact structure. The crater was formed approximately 50,000 to 57,000 years ago when a meteorite struck the Deccan basalt plateau (Maloof and others, 2010). What makes Lonar truly unique is that it brings together nearly six different types of ecosystems in one place. The saline water supports a distinctive community of haloalkaliphilic microbial flora and fauna (Dabhade, 2015). On February 15, 2002, the Maharashtra government declared it an 'A' grade tourist destination. Later, Lonar Lake was also recognized as a Ramsar site of India (Ramsar Convention, 2020). Before 1985, the lake used to dry up every summer, leading to salt accumulation along its shoreline. Local residents collected this salt for domestic purposes like preparing papads and washing clothes. Historically, the salt was even used in glass and soap manufacturing. According to records in the *Akbarnama* and *Ain-i-Akbari*, the saline water was also believed to help treat skin diseases (Godbole

and others, 2021). The lake water is naturally highly saline and alkaline, with pH values ranging between 10.50 and 11.00 (Mishra and others, 2019). Other physico-chemical parameters are equally unusual

Current Status of Lonar Lake

Lonar Crater Lake has an inlet but no natural outlet. Until 1985, the lake dried up every summer, resulting in salt deposits on its shores. However, after that period, the water level began to rise. According to earlier research, the water level increased by about six feet between 1999 and 2004 (Deshpande, 2004). Since then, the rise has continued. As of 2026, the water level is now more than 20 feet higher than previously recorded. This continuous rise is deeply concerning. Recent studies suggest that changes in land use patterns, increased freshwater inflow from surrounding catchments, and possibly climate-induced changes in rainfall intensity may be contributing to this phenomenon (Chandrasekharam and others, 2021; Wani and others, 2022).

The rising water level has brought about major changes in the lake's physico-chemical properties. Salinity and alkalinity have decreased significantly, along with other parameters (Kodarkar and others, 1998). The very uniqueness of Lonar Lake is being disturbed. The rising water is also having a negative impact on the microbial flora and fauna, including endemic haloalkaliphilic species (Upadhyay and others, 2020). Recent biodiversity assessments indicate a decline in the abundance of specialized microbes that thrive under extreme saline-alkaline conditions (Deshmukh and Ranade, 2023).

Around the lake, there are about 16 ancient temples built between the 12th and 18th centuries (Joshi and Pappu, 2015). Most are in poor condition, but a few are still well-preserved and regularly visited by pilgrims. The most famous among them are Dhar Teerth, Ramgaya Temple, and Kamaljamata Devi Temple. Every year during the Navratri festival, a *yatra* (religious fair) is held, attracting more than 150,000 devotees (Deshpande, 2004). Unfortunately, due to the dramatically increased water level, the well-known Kamaljamata Devi Temple has become fully submerged. Pilgrims can no longer reach it—only the top of the temple is visible from the viewpoint above. Similar submersion has been reported for at least three other smaller shrines along the eastern shoreline (Patil and Kulkarni, 2022).

MATERIALS AND METHODS

The methods used in this study follow standard procedures outlined in APHA (1998) and Kodarkar (1998). To understand the overall limnological picture of Lonar Lake, various physico-chemical parameters were analyzed. Water samples for physico-chemical analysis were collected early in the morning. Parameters such as color, odor, taste, temperature, pH, and hardness were measured on site during the visit on February 1, 2026, using a portable water analysis kit as described by Kodarkar (1998). Samples for other parameters were collected in acid-washed one-liter glass bottles from the desired depth. A separate half-liter glass reagent bottle was used for dissolved oxygen samples. All procedures were carried out in triplicate to ensure reproducibility.

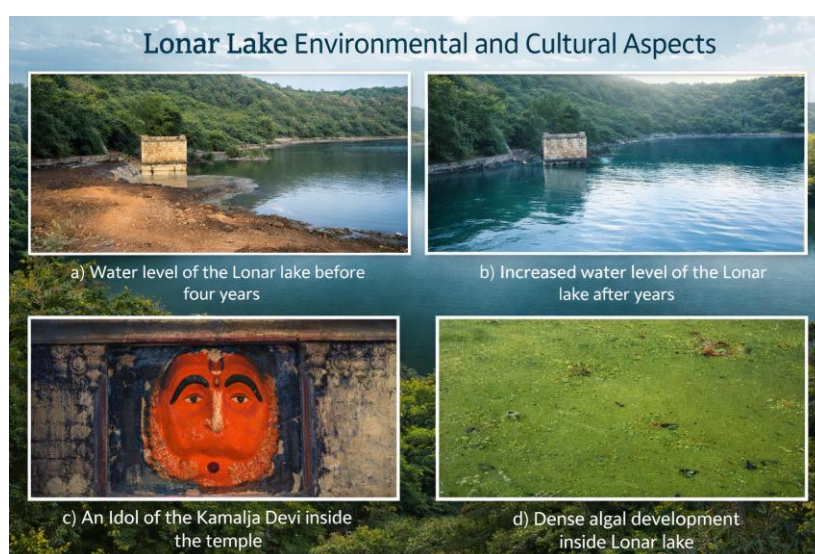


Fig.1: Previous status of Lonar Lake (2004)



Fig.2: Current status of Lonar Lake (2026)

RESULTS AND DISCUSSION

When compared with earlier findings from 2002 (Deshpande, 2004), the current results reveal substantial changes across almost all parameters, including pH, hardness, total alkalinity, and salinity. The observations clearly show a decline in pH from 10.15 to 8.50, indicating a shift from highly alkaline to near-neutral conditions. Hardness decreased from 120 mg/L to 95 mg/L, while total alkalinity (carbonate +

bicarbonate) dropped from 906 mg/L to 825 mg/L. The most dramatic change was observed in chlorides, which fell from 3084.15 mg/L to 2275 mg/L, and salinity, which declined from 5659.41 mg/L to 4106.40 mg/L (Table 1 and Table 2).

These changes are consistent with a dilution effect caused by continuous freshwater influx, a phenomenon also observed in other terminal lakes worldwide (Williams, 2019; Hammer, 2021).

Table 1: Physico-Chemical Parameters analysed during Feb. 2002 (Deshpande R.P.)

Sr. No.	Parameters	Readings
1.	Colour	Pale Green
2.	Odour	Not so offensive
3.	pH	10.15
4.	Temperature	25°C
5.	Hardness	120 mg/lit.
6.	Taste	Salty
7.	Dissolved oxygen	1.96 mg/lit.
8.	Dissolved CO ₂	Free CO ₂ absent
9.	Carbonate alkalinity	295 mg/lit.
10.	Bicarbonate alkalinity	611 mg/lit
11.	Chlorides	3084.15 mg/lit.
12.	Salinity	5659.41 mg/lit.
13.	Sodium (ppm)	5500 ppm
14.	Potassium (ppm)	09 ppm
15.	Iron (ppm)	0.38 ppm

Table 2: Physico-Chemical Parameters analysed during Feb. 2026 (Deshpande R.P.)

Sr. No.	Parameters	Readings
1.	Colour	Pale Green
2.	Odour	Not so offensive
3.	pH	08.50
4.	Temperature	24°C
5.	Hardness	95 mg/lit.
6.	Taste	Slightly salty
7.	Dissolved oxygen	1.65 mg/lit.
8.	Dissolved CO ₂	Free CO ₂ absent
9.	Carbonate alkalinity	255 mg/lit.
10.	Bicarbonate alkalinity	570 mg/lit
11.	Chlorides	2275 mg/lit.
12.	Salinity	4106.40 mg/lit.
13.	Sodium (ppm)	5090 ppm
14.	Potassium (ppm)	08 ppm
15.	Iron (ppm)	0.33 ppm

The decline in sodium from 5500 ppm to 5090 ppm and potassium from 9 ppm to 8 ppm further supports the dilution hypothesis. Dissolved oxygen also showed a slight decrease from 1.96 mg/L to 1.65 mg/L, which may be attributed to changes in microbial community structure and reduced photosynthetic activity due to altered water clarity (Upadhyay and others, 2020). The absence of free CO₂ in both datasets suggests that despite the pH decline, the system still remains saturated with respect to carbonate chemistry (Mishra and others, 2019).

CONCLUSION

Based on the recent visit and analysis of physico-chemical parameters, it is clear that Lonar Lake the world's third largest meteorite crater has experienced a dramatic rise in water level of over 20 feet compared to historical records (Deshpande, 2004). This continuous increase is alarming and has led to significant changes in both the physico-chemical and biological characteristics of the lake. The pH has dropped from highly alkaline (10.15) to near-neutral (8.50), while salinity has decreased by approximately 27% over the past two decades. These changes are rapidly transforming the unique haloalkaline ecosystem into a more dilute freshwater system, threatening endemic microbial and faunal communities (Upadhyay and others, 2020; Deshmukh

and Ranade, 2023). Additionally, several culturally significant temples along the shoreline, including the historic Kamaljamata Devi Temple, have become submerged, representing an irreversible loss of cultural heritage (Patil and Kulkarni, 2022). There is an urgent need to investigate the root causes behind this rising water level—including catchment hydrology, land use changes, and climate variability—and to take immediate steps to conserve this internationally recognized Ramsar site.

Conflict of interest

The authors declare no competing interests.

Data Availability Statement: Not applicable.

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