Gurukul International Multidisciplinary Research Journal (GIMRJ)*with* International Impact Factor 8.357
Peer Reviewed Journal
https://doi.org/10.69758/GIMRJ/2504I5VXIIIP0007
e-ISSN No. 2394-8426
Monthly Issue
APR-2025
Issue–IV, Volume–XIII

EFFECT OF URBANIZATION ON POTHARA DAM IN WARDHA DISTRICT, MAHARASHTRA

[1] Ankita A. Thakare, [2] Nayana S. Shirbhate
1.Research Scholar, Vidya Vikas Arts, Commerce & Science College, Samudrapur District- Wardha 442305, India
2. Associate Professor and Head Department of Botany, Vidya Vikas Arts, Commerce & Science College, Samudrapur District- Wardha 442305, India

ABSTRACT:Urbanization is a rapidly growing global phenomenon with significant socio-economic and environmental implications. This process fosters economic growth, infrastructure development, and improved access to healthcare and education. Water bodies, such as reservoirs like the Pothara Dam in Maharashtra's Wardha District, are significantly impacted by urbanization. With an emphasis on water quality, sedimentation, and ecological health, this study investigates how the Pothara Dam Water is affected by the fast urbanization of the area. Higher levels of pollution from industrial discharge, untreated sewage, and agricultural runoff have resulted from increased urban activity in the dam's catchment region. Sedimentation rates have also grown due to soil erosion from construction and deforestation, diminishing the dam's storage capacity and affecting water supply. These release of sewage and industrial trash has had a severe negative impact on rivers like, Pothara river, At various sampling sites of Pothara Dam, water quality parameters like pH, dissolved oxygen (DO), electrical conductivity (EC), TDS, temperature, sodium (Na), calcium (Ca), magnesium (Mg), potassium (K), carbonate, bicarbonate, chloride, sulphate, sodium adsorption ratio (SAR), and residual sodium carbonate (RSC) were analyzed to track changes in the basin's water quality.The findings highlight the urgent need for sustainable urban planning, effective waste management, and conservation strategies to mitigate the adverse effects of urbanization on the Pothara Dam. This research underscores the importance of balancing urban development with environmental preservation to ensure the long-term sustainability of vital water resources.

Keyword :Urbanization, Pothara Dam, Water Quality, Sedimentation, Ecosystem Health, Sustainable Planning,Pollution.

INTRODUCTION

The process of urbanization is the expansion of cities as a result of economic growth and industrialization, which also causes changes in human behaviour, labour division, and specialization that are unique to urban areas. With a population growth rate of roughly 17 million per year, there are an astounding 45,000 births every day and 31 births every minute. India would have 1620 million people by 2050 if the current trend continues. Uncontrolled urbanization in India has resulted in rapid environmental deterioration that is producing a number of issues, including housing shortages, declining water quality, excessive air pollution, noise, dust, and heat, as well as issues with solid waste and hazardous waste disposal (Uttara *et al.,* 2012).The haphazard and uncontrolled growth of cities due to rapid urbanization makes it one of the most pressing and dynamic concerns of our day. The meagre public amenities are practically collapsing due to the strain of an ever-increasing population Future needs must be taken into account while balancing the land's current requirements with the facilities that are already available. A trend known as urbanization is causing an irreversible decline in surface water bodies, forests, and fertile agricultural land (Mundhe*et al.,*2014).

India's rapid urbanization during the past few decades can be attributed to both fast economic and demographic growth. Urbanization's conversion of natural landscapes into impermeable urban terrain alters the surrounding climate, weather, and water quality (Mukate*et al.,* 2018). To provide a good image of the underlying water conditions in a freshwater ecosystem, the physico-chemical profile and biological analysis of the flora and fauna are required. Water pollution has increased recently as a result of human and industrial activity. The biota of the ecosystems rapidly changes as a result of the increased pollutant load, which impacts the water quality and, in turn, the biodiversity of the region. Designing a suitable framework to protect our natural resources is therefore necessary for sustainable environmental management. Due to human negligence, water bodies all around the world are now medium to severely contaminated, and studies are required to ignore the changes (Naoghade *et al.,*2023).

Due to growing urbanization, industry, population growth, raising living of standards, and a wide range of human endeavours, water resources are currently being overused. Even for everyday life, good quality water is sufficient, but it is becoming contaminated by industrial discharges from things like paper, textiles, rayon, fertilizers, pesticides, detergents, synthetic pharmaceuticals, antibiotics, oil refineries, and photo films (Gandhare *et al.,*2021).The physical, chemical, and biological properties of water are referred to as its quality. A sufficient quantity of water resources of the right quality serves as a requirement for both environmental and commercial growth. This is crucial for the needs of biotic species as well as for human, agricultural, and industrial needs. However, a number of factors, including industrial operations, agricultural pesticides, urbanization, and natural processes like soil erosion, have an impact on the quality of water. As a result, water quality becomes a major problem on a global scale(Patil*et al.,*2019).

The main causes of water pollution are population explosion, industrialization, urbanization, discharge of untreated water into natural sources and development thrust of human. Discharge of water without treatment is the major cause of river water pollution in developing countries like India. Most of the surface water is heavily polluted due to disposal of sewage and industrial waste into water bodies, excess fertilizers, pesticides, surface run-off, decomposed plant and animal matter, radioactive materials, atmospheric gases, recreational activities, etc. The polluted water is dangerous to aquatic flora and fauna(Patil*et al.,*2020).

URBANIZATION:

Ecosystem Health and Sustainable Planning

Unplanned growth brought on by rapid urbanization frequently encroaches on floodplains and riverbanks. This may lead to the loss of the natural buffers that shield rivers in Wardha District from erosion and pollution. Inadequate urban waste disposal systems can result in the discharge of untreated sewage and solid garbage into rivers, lowering the quality of the water. When natural landscapes (forests, wetlands, and agricultural fields) are turned into urban areas, the land's capacity to absorb rainwater is diminished, which increases surface runoff and pollutes waterways. Construction and deforestation are common aspects of urbanization, and they both contribute to increased soil erosion. Higher sediment loads in rivers which has an impact on aquatic habitats and water quality. Excessive sedimentation can modify the river's course, depth, and flow patterns, leading to issues including siltation and diminished water storage capacity.

Fish and other aquatic animals depend on their habitats, which can be destroyed by sedimentation suffocating riverbeds. The diversity of plants and animals in and around rivers can be diminished by urbanization, which can also split habitats. It's possible for species that depend on natural riverbanks and clean water to become extinct. Chemicals, heavy metals, and micro plastics are among the pollutants that urban runoff brings into rivers, endangering aquatic life and upsetting food networks.The "heat island"

Gurukul International Multidisciplinary Research Journal (GIMRJ)*with*
International Impact Factor 8.357
Peer Reviewed Journal
https://doi.org/10.69758/GIMRJ/2504I5VXIIIP0007
e-ISSN No. 2394-8426
Monthly Issue APR-2025
Issue–IV, Volume–XIII

effect, which is frequently observed in urban areas, can cause river water temperatures to rise, impacting species that are sensitive to temperature fluctuations.

STUDY AREA

The Pothara Dam is located in the Wardha District of Maharashtra, India. While the exact longitude and latitude coordinates for the dam are not widely published in general sources, it is situated near Hinganghat, approximately 30 km from Wardha city.

Latitude: 20.55° N (approximate)**Longitude**: 78.83° E (approximate)

Figure no. 1

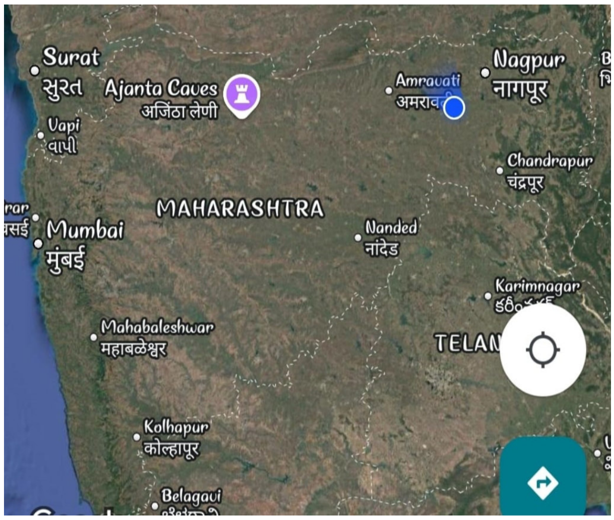


Figure no.2

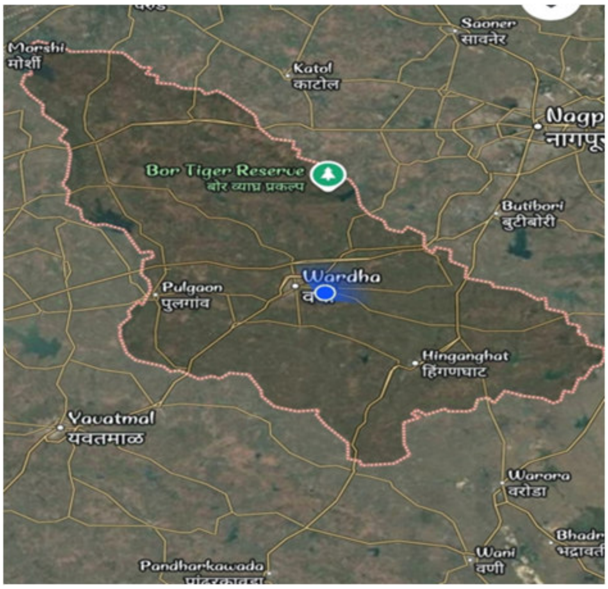


Figure no.3

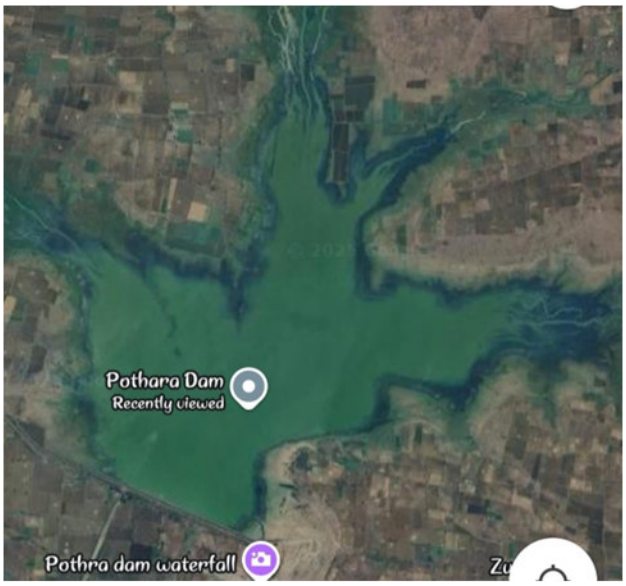


Figure no. 4

MATERIAL AND METHODOLOGY:

Gurukul International Multidisciplinary Research Journal (GIMRJ)*with*
International Impact Factor 8.357
Peer Reviewed Journal
https://doi.org/10.69758/GIMRJ/2504I5VXIIIP0007

e-ISSN No. 2394-8426
Monthly Issue
APR-2025
Issue–IV, Volume–XIII

Water samples were collected from Pothara dam of Wardha district in a glass bottles, in afternoon hours between 12 am to 3 pm on January month of 2024.A thermometer and a pH meter were used to record the pH and temperature of the water sample at the time ofsample collection.Other variables like Dissolved Oxygen (DO), Electrical Conductivity (EC), TDS, Temperature, Sodium (Na), Calcium (Ca), Magnesium (Mg), Potassium (K), Carbonate, Bicarbonate, Chloride, Sulphate, Sodium Adsorption Ratio (SAR), and Residual Sodium Carbonate (RSC), were estimated in the lab using conventional techniques as advised by APHAMethods.

PHOTOS OF POTHARA DAM RIVER WARDHA DISRTRICT MAHARASHTRA

Figure no.5

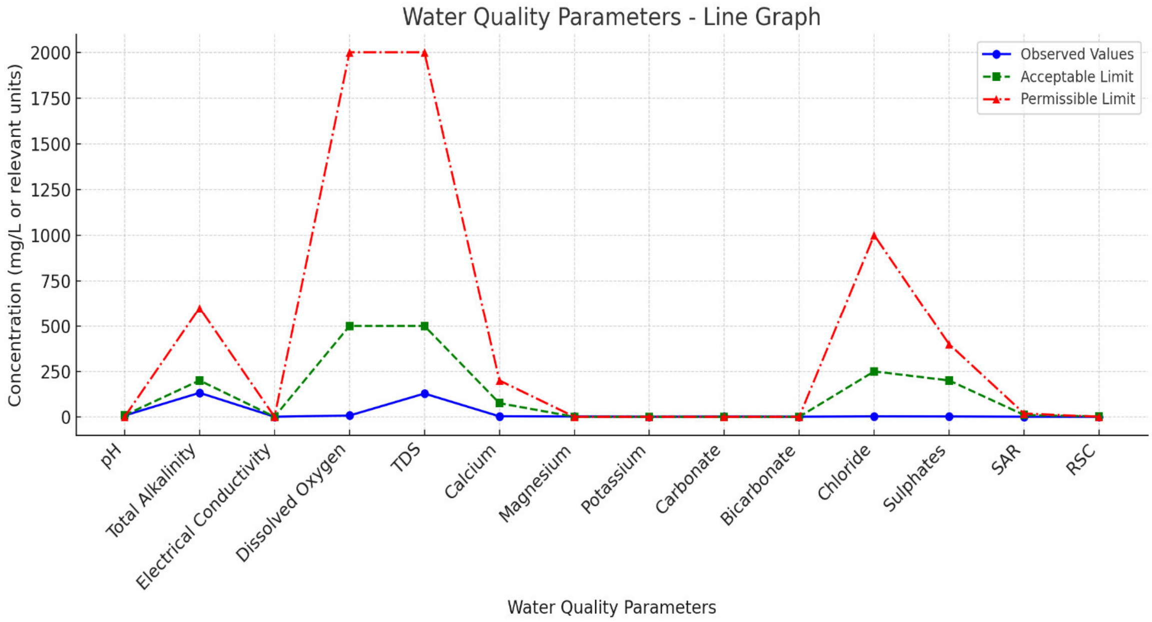
Figure no. 6

Figure no.7

Figure no.8

Parameters	Content	Acceptable Limit (BIS Standard)	Permissible Limit (in absence of alternate source)
pH	7.01	6.5–8.5	No relaxation
TotalAlkalinity(mg/L)	132	200	600
ElectricalConductivity(µS/cm)	0.31	-	-
Dissolved oxygen (mg/L)	6.8	500	2000
Total Dissolved Solids (TDS) (mg/L)	128	500	2000
Calcium(mg/L)	2.50	75	200
Magnesium (mg/L)	1.50	30	100
Potassium (mg/L)	0.39	-	-
Carbonate (mg/L)	1.00	-	-
Bicarbonate (mg/L)	0.50	-	-
Chloride (mg/L)	2.00	250	1000
Sulphates(mg/L)	1.56	200	400
Sodium Adsorption Ratio (SAR) (mg/L)	0.48	10	17.99
Residual Sodium Carbonate (RSC) (mg/L)	0.00	1.25	0.00

Reading of water quality parameters at Pothara dam Wardha



Graphically Representation of Water Testing Analysis with BIS Limits.

RESULT AND DISCUSSION

Some physicochemical parameters, including Dissolved Oxygen (DO), Electrical Conductivity (EC), TDS, Temperature, Sodium (Na), Calcium (Ca), Magnesium (Mg), Potassium (K), Carbonate, Bicarbonate, Chloride, Sulphate, Sodium Adsorption Ratio (SAR), and Residual Sodium Carbonate (RSC), were measured in the lab using standard techniques as recommended by APHA Methods. The water sample was collected and analyzed using various methods.

Under IS 10500:2012, the Bureau of Indian Standards (BIS) has set drinking water quality standards. Although BIS's Electrical Conductivity (EC) does not officially define a standard for EC, it is frequently associated with TDS. High salinity may be indicated by EC values more than 1000 µS/cm. IS 10500:2012 makes no specific reference to potassium, carbonate, bicarbonate, SAR, or RSC. Nonetheless, they are frequently assessed in industrial applications or irrigation water. Although they are not included in the BIS drinking water criteria, SAR and RSC are essential for the quality of irrigation water.

- **pH :**Pothara dam in the Wardha district had pH values ranging from a minimum of 7.01 and maximum 8.68. It might due to anthropogenic activities, domestic waste, other effluents and urbanization.Sewage treatment works well, or the pH can stay neutral if the intake is properly diluted.
- **Total Alkalinity:**The primary causes of water's alkalinity are the ions OH, CO_3, and HCO_3. The ability of water to withstand a pH shift when acid is added is measured by its alkalinity. Total alkalinityrangesfrom132mg/ltowas recorded in Pothara dam and its permissible limit of BIS.
- **Electrical conductivity (EC) :**The ability of water to carry electric current is measured by its electrical conductivity (EC). It represents the entire amount of dissolved salts. The Electrical conductivity isvaries from 0.31µS/cm because of High pollution and presence of high amount of dissolved inorganic substances in ionized form.
- **Dissolved Oxygen (D.O.):**The D.O. concentration varies between 6.8 mg/l. The high value of D.O. form Pothara dam may be due to high temperature, wave action, organic matter and pollution load.
- **Total Dissolved Solid**:The Total Dissolved solids (TDS) of water bodies were range of 128mg/l. The desirable and maximum excessive level of TDS in drinking water prescribed by BIS is 500 mg /L and 1000 mg/L respectively. It appears that river water samples tested were not exceeding the desirable limit prescribed by BIS(Budhlaniand Musaddiq, 2014).
- **Calcium(mg/L)**: According to the Bureau of Indian Standards (BIS) rules for drinking water, which suggest an ideal level of 75 mg/L and a maximum permitted limit of 200 mg/L, a calcium content of 2.50 mg/L in water is typically regarded as low and might not exceed the requirements. Lack of calcium can increase the corrosiveness of water and perhaps cause lead or copper to leak out of pipes, contaminating the water.
- **Magnesium (mg/L) :**The Bureau of Indian Standards (BIS) recommends a drinking water magnesium concentration of 30 mg/L; the highest allowable limit is 100 mg/L. A concentration of 1.50 mg/L is regarded as low.Low magnesium (and calcium) water can become more corrosive and may cause contamination by leaking metals from pipes and plumbing systems.
- **Potassium (mg/L) :**Since potassium is usually not regarded as hazardous at normal concentrations found in water, the Bureau of Indian Standards (BIS) for drinking water (IS 10500:2012) does not set a specific limit for potassium in drinking water. Potassium levels in water of 0.39 mg/L (ppm) are extremely low and well within acceptable bounds. Since potassium is an essential nutrient, there would be no health risks from such a low concentration.
- **Carbonate (mg/L):**As per BIS (Bureau of Indian Standards) 10500:2012 for drinking water, there is no specific limit set for carbonate (CO_3^{2-}) in water. However, a carbonate value of 1.00 mg/L is quite low and generally does not pose any major concerns.Low carbonate levels indicate minimal alkalinity,

which suggests that the water's ability to neutralize acids is reduced. This could lead to pH instability and make the water more corrosive to pipelines and infrastructure.

- **Bicarbonate (mg/L):**There is no acceptable limit for bicarbonate in drinking water according to the BIS 10500:2012 standard. A bicarbonate level of 0.50 mg/L, on the other hand, is extremely low and indicates a weak buffering ability, leaving the water vulnerable to corrosiveness and pH swings.Low bicarbonate levels increase the acidity or alkalinity of water by making it more vulnerable to pH changes.
- **Chloride (mg/L):**The maximum amount of chloride that can be present in drinking water, as per BIS 10500:2012, is Limit Acceptable: 250 mg/L 1000 mg/L is the maximum permissible limit (if no other source is available). Two milligrams per litter of chloride is incredibly low and well within safe bounds.Very low chloride levels can be a sign of low total dissolved solids (TDS), which over time can make the water more aggressive and cause pipe corrosion.
- **Sulphates(mg/L):**The acceptable limits for sulphate in drinking water, as stated in BIS 10500:2012, are: Limit Permitted: 200 mg/L ,400 mg/L is the maximum allowable limit (lack of an alternate source).Sulphate levels of 1.56 mg/L are quite low and well within acceptable bounds.
- **Sodium Adsorption Ratio (SAR) (mg/L)**: The BIS standards (IS 10500:2012) for drinking and irrigation water state that a Sodium Adsorption Ratio (SAR) of 0.48 mg/L is well below the safe level.Significant increases in SAR may have an impact on soil permeability and lower crop output as a result of salt buildup.

CONCLUSION:

As a result, the present study shows that proper groundwater quality management and conservation are required for a healthy ecosystem and for selecting the right treatment to reduce pollution of water bodies in Wardha district, such as Pothara Dam water. Agriculture cannot develop sustainably unless natural resources, such as water, are managed. Water is now crucial for both the agricultural sector and the state's development, so it is crucial to maximize the improvement and efficient use of our water resources. Forty percent of the state's cultivated area is susceptible to drought, and the state of Maharashtra requires water management and conservation for a number of reasons, including fluctuating rainfall, a lack of rainy days, water pollution, population growth, anthropogenic activities, industrialization, urbanization, and agricultural modernization.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCE:

APHA (1985): Standard Methods for Examination of Water and Wastewater, 20th Edition, American Public Health Association, Washington D. C.

Bhosale, S. R. (2022)An analysis of urbanisation trends in Maharashtra: issues and perspectives.

Fule, U. W., &Nimgare, S. S.(2024)Study of changes in physico-chemical characteristics' of ashti lake, district Wardha, Maharashtra, India.

Gaikwad, G. S., Wankhade, A. V., &Maldhure, A. V. (2010). Hydrochemical characteristics of ground water (well and tube well) in the slum area of Bhoogaon, Wardha district, Maharashtra. *Jour. Chemical and Pharma. Res*, *2*(3), 499-503.

Gandhare, N. V., Jogi, P. S., Kongre, N. C., Meshram, V. P., & Tanna, J. (2015) Impacts of Textile Industry Effluents on Surface Water Quality: A Study on Hinganghat in Wardha District of Maharashtra.

Ganvir, P. S., & Guhey, R. (2020). Groundwater quality assessment with reference to some heavy metals toxicity and its probable remediation around Ballarpur area of Wardha valley coalfields, Maharashtra.

In *IOP Conference Series: Earth and Environmental Science* (Vol. 597, No. 1, p. 012001). IOP Publishing.

Ganvir, P. S., & Guhey, R. (2022). Hydro-geochemical elucidation and its implications in the Wardha valley coalfields of central India. In *IOP Conference Series: Earth and Environmental Science* (Vol. 1032, No. 1, p. 012015). IOP Publishing.

Kerketta, P., Baxla, S. L., Gora, R. H., & Kumari, S. (2013). Analysis of physico-chemical properties and heavy metals in drinking water from different sources in and around Ranchi, Jharkhand, India. *Veterinary world*, *6*(7).

Khan, R. M., Jadhav, M. J., & Ustad, I. R. (2012). Physicochemical analysis of Triveni lake water of Amravati district in (MS) India. *Bioscience discovery*, *3*(1), 64-66.

Makde, P. R., & Kale, M. C. (2023). Withdrawn: A Study on phytoplanktonic diversity of Pothara river, near Khambada, Maharashtra.

Manjare, B. S., & Singh, V. (2021). Sub-Watershed Prioritization for Soil and Water Conservation–A Case Study of Lower Wardha River, Maharashtra, India, Using GI Science. *Geographic Information Science for Land Resource Management*, 337-358.

Manjare, S. A., Vhanalakar, S. A., & Muley, D. V. (2010). Analysis of water quality using physicochemical parameters Tamdalge tank in Kolhapur district, Maharashtra. *International journal of advanced biotechnology and research*, *1*(2), 115-119.

Mukate, S., Panaskar, D., Wagh, V., Muley, A., Jangam, C., & Pawar, R. (2018). Impact of anthropogenic inputs on water quality in Chincholi industrial area of Solapur, Maharashtra, India. *Groundwater for Sustainable Development*, *7*, 359-371.

Mundhe, N. N., &Jaybhaye, R. G. (2014). Impact of urbanization on land use/land covers change using Geo-spatial techniques. *International journal of geomatics and geosciences*, *5*(1), 50-60.

Nagarnaik, P. B., & Patil, P. N. (2012). Analysis of ground water of rural areas of Wardha-city using physico-chemical and biological parameters. *International Journal of Engineering Research and Applications*, *2*(3), 803-807.

Nagarnaik, P. B., & Patil, P. N. (2012). Analysis of ground water of rural areas of Wardha-city using physico-chemical and biological parameters. *International Journal of Engineering Research and Applications*, *2*(3), 803-807.

Naoghade, R. B., Ramteke, J., & Alam, M. S. (2023). Assessment of Physico-Chemical Parameters of Erai River of Chandrapur District in Maharashtra State. *Assessment*, *10*(3).

Patil, M. A. A., More, A. B., & Kumbhar, M. S. S. (2019). WATER QUALITY OF RIVER BASIN CONTEXT IN MAHARASHTRA REGION. *parameters*, *6*(05).

Patil, P. N., Sawant, D. V., & Deshmukh, R. N. (2012). Physico-chemical parameters for testing of water–A review. *International journal of environmental sciences*, *3*(3), 1194-1207.

Patil, S. N., & Prasad, S. R. (2020). An impact of nationwide lockdown on physico-chemical parameters of bhogavati river water. *ES Energy & Environment*, *11*, 28-39.

Phansalkar, S., & Kher, V. (2006). A decade of Maharashtra groundwater legislation: Analysis of the implementation process. *Law Env't & Dev. J.*, *2*, 67.

Salunke, V. S., Pathare, A. R., &Kudnar, N. S. (2021). An Empirical Analysis of Emerging Trend and Pattern of Urbanization in Maharashtra State, India. *Urban India*, *41*(2), 170-190.

Sharman, N., &Walla, Y. K. (2017). Water quality investigation by physicochemical parameters of Satluj River (Himachal Pradesh, India). *Magnesium*, *390*(190), 1368.

Shende, A. D., & Sahoo, M. M. (2023). Groundwater Quality Analysis for Wardha, Maharashtra, India. *Jordan Journal of Civil Engineering*, *17*(4).

Shende, A. D., Sahoo, M. M., &Tekade, S. (2022, June). Water quality index assessment for drinking and irrigation purpose for Wardha district. In *IOP Conference Series: Earth and Environmental Science* (Vol. 1032, No. 1, p. 012012). IOP Publishing.

Simpi, B., Hiremath, S. M., Murthy, K. N. S., Chandrashekarappa, K. N., Patel, A. N., &Puttiah, E. T. (2011). Analysis of water quality using physico-chemical parameters Hosahalli Tank in Shimoga District, Karnataka, India. *Global Journal of Science Frontier Research*, *11*(3), 31-34.

Uttara, S., Bhuvandas, N., & Aggarwal, V. (2012). Impacts of urbanization on environment. *International Journal of Research in Engineering and Applied Sciences*, *2*(2), 1637-1645