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Physicochemical Water Quality Monitoring at Arjun Sagar Reservoir in Nashik District

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ABSTRACT

Arjun Sagar is a freshwater impoundment on the Punad River in Nashik district, Maharashtra. This review examined the documentary record for the reservoir and developed a protocol for characterising its physicochemical water quality across seasons. A targeted search covered project records, public monitoring catalogues, regional studies and standard analytical methods. The national dam register and the earlier research proposal gave reference coordinates approximately 7.6 km apart. The reviewed sources did not yield a verifiable series of water-quality measurements from the reservoir. Regional studies nevertheless identified conditions worth testing locally, including sediment pulses during rainfall, changes in mineralisation during drawdown, and oxygen depletion that surface sampling alone may miss. The proposed design specified 24 monthly rounds at three fixed stations representing inflow, vegetated littoral and exposed littoral settings. It paired field measurements of temperature, pH, specific conductance and dissolved oxygen with laboratory determinations of solids, alkalinity, hardness, chloride, nutrients and biochemical oxygen demand. It included microbial indicators and selected ions for use-specific screening. The framework defined sample traceability, quality controls and separate criteria for interpreting raw and treated water. It provides a basis for establishing a local baseline and testing whether changes track catchment inputs or in-reservoir processes.

Keywords Arjun Sagar reservoir, Punad River, physicochemical analysis, monsoon, dissolved oxygen, water quality monitoring

INTRODUCTION

The Central Water Commission identifies Arjun Sagar as the Arjunsagar (Punand) project at Suple, on the Punad River in the Tapi basin. The Kalwan local administration locates the dam near Jaydar and Suple in Nashik district. An earlier aquatic-fauna proposal identified Arjun Sagar as one of two perennial study waters and described a programme of monthly surface-water sampling. This article treats Arjun Sagar as a single reservoir and focuses on the chemistry and sampling design needed to interpret water quality at this site. [1–3] An inflow sample after heavy rain may capture suspended material and a short-lived nutrient pulse. A sheltered margin may reflect local metabolism and sediment interaction. Drawdown can change the depth and habitat of an accessible station. These differences matter when interpreting exposure for aquatic fauna or characterising raw water at an intake. This review examined the provenance of the Arjun Sagar

site records, evaluated which observations from Maharashtra waters could inform local hypotheses, and developed a monitoring design for ecological, source-water and irrigation assessment.

LITERATURE REVIEW

Reservoir zonation and hydrological variability

Impoundments receive water, sediment and solutes from their catchments and modify these inputs through settling, biological uptake and water release. Reservoir limnology distinguishes a river-influenced inflow zone, a transition zone and a lake-like zone where basin shape and residence time permit. The locations of these zones shift as discharge and water level change. In shallow reservoir arms, wind exposure and distance from shore can also shape local gradients. Fixed coordinates, depth and stage help interpret differences among stations. [4,5] Rainfall can increase turbidity and suspended solids while lowering the concentration of conservative dissolved ions through dilution. Runoff can also mobilise soluble salts or transport nutrient-rich material. Conductance, chloride and suspended solids therefore answer different questions. Concordant changes in conductance and chloride can support a dilution or concentration interpretation, whereas rising turbidity with stable chloride can point to particle delivery. Flow or water-level information helps to distinguish rain-related inputs from local resuspension during drawdown. Estimating catchment loads also requires discharge data. [4,5]

Dissolved oxygen, temperature and the carbon system

Dissolved oxygen reflects solubility, air–water exchange, photosynthesis, respiration and the mixing of water layers. Oxygen solubility declines as water warms. Recording oxygen as both concentration and percentage saturation, with a contemporaneous temperature and pressure correction, helps separate this physical effect from under-saturation associated with oxygen demand or limited reaeration. Photosynthesis can raise surface oxygen and pH during daylight. Sediment oxygen demand and microbial decomposition can reduce oxygen at depth when surface exchange is restricted. Reviews of tropical impoundments show that stratification warrants direct examination where a deep basin is present. [5,6] Water pH describes hydrogen-ion activity at the time of measurement. Alkalinity reflects a sample's capacity to neutralise added acid and is usually controlled by the carbonate system in freshwaters. Hardness reflects mainly calcium and magnesium. Reporting alkalinity and hardness on the same calcium carbonate scale aids comparison, but the two measurements retain distinct chemical meanings. Joint observations of pH, alkalinity, conductance and chloride are more informative than a general description of water as alkaline or mineralised. [5]

Nutrients, water clarity and biological response

Dissolved inorganic nitrogen and reactive phosphorus can respond rapidly to rainfall, uptake and sediment exchange. A low concentration on one visit can coincide with strong biological uptake or a missed pulse. Whole-water total phosphorus and filtered soluble reactive phosphorus represent different fractions and require separate aliquots and labels. Chlorophyll a measures algal pigment concentration. Secchi depth responds to algae, suspended sediment, and coloured dissolved matter, so a decline in transparency after a storm can have several explanations. Where trophic indices are used, the relationships among chlorophyll *a*, total phosphorus and clarity should be examined for disagreement before assigning a trophic category. [5,7] Visible surface accumulations, a persistent colour change or an unusual oxygen pattern may justify targeted algal identification and, where warranted, toxin testing. Establishing a cyanobacterial hazard requires evidence beyond pigment concentration. [5,8]

MATERIALS & METHODS

Evidence selection and site verification

A targeted narrative search was conducted in November 2026. Search terms combined Arjun Sagar, Arjunsagar, Punad, Punand, Suple and Kalwan with water quality, physicochemical, dissolved oxygen, reservoir, sampling and monitoring. Sources included the national dam register, the district administration, the earlier research proposal, the National Water Data Portal and the Maharashtra Pollution Control Board station directory. Regional studies were retained when the publication identified the water body, study period, and measured variables. Methods and use criteria were taken from standard-setting or technical agencies where available. [1–3,9–11] Site records were checked for the reservoir name, river, basin, locality and point description before any chemistry could be attributed to Arjun Sagar. A local observation was eligible if it had a documented source, a named station, a sampling date or period, and parameter units. Publications on other water bodies provided regional context. The proposal informed the prospective design. Differences in analytical methods and coverage precluded pooling regional estimates. The project coordinate in the Central Water Commission register was converted from degrees, minutes and seconds to decimal degrees. The proposal coordinate was retained as reported. The two positions were plotted on the same geographic grid and their separation was calculated using the haversine great-circle distance with a mean Earth radius of 6,371 km. The calculation treats both pairs as geographic latitude and longitude. Figure 1 shows the recorded points, and Table 3 describes their provenance. [1–3]

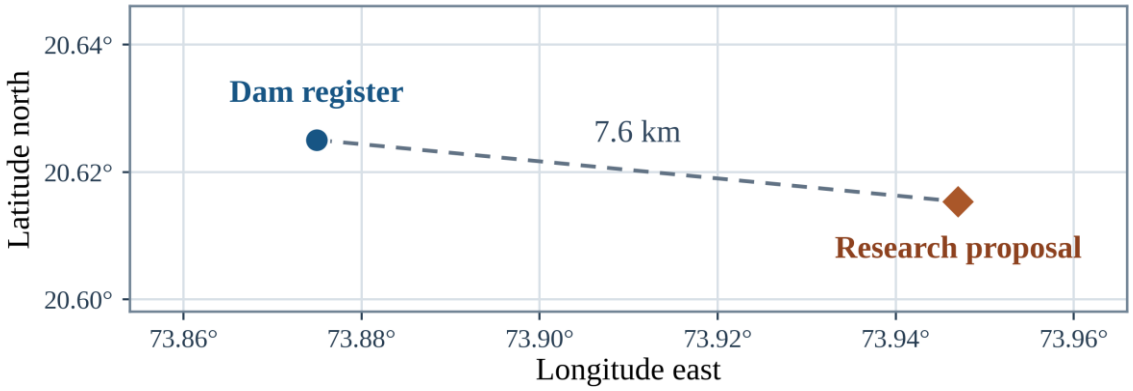

Figure 1. Documentary location references for Arjun Sagar in Kalwan, Nashik district. The line represents the approximate separation of the two recorded coordinates. The points denote references in the dam register and research proposal. Field stations require separate GPS records. [1,3]

Proposed monitoring scope

The following protocol adapts the earlier proposal's monthly schedule and morning sampling window to a single-reservoir investigation. It separates the routine surface series from event sampling and vertical profiles. The principal variables for seasonal comparison are specific conductance, turbidity, dissolved oxygen and dissolved nutrient forms. Other measurements provide chemical context or support an identified water use. Selecting final stations, bottle volumes, and method reporting limits is a task for the reconnaissance and laboratory planning stages. [3]

Station selection and seasonal coverage

Reconnaissance should identify a safely accessible point influenced by the Punad inflow, a vegetated margin and an exposed margin. The proposed codes in Table 1 define the target settings. The site register should record the confirmed coordinates, GPS datum, estimated positional

uncertainty, shore photograph and a fixed landmark for relocation. Each station should have a written relocation rule for periods when the shore recedes. If a station becomes dry or unsafe, the event should be recorded as missed with the reason. A move that changes the sampled habitat should have a documented new position and a traceable identifier. [3,12]

Table 1. Proposed routine sampling stations at Arjun Sagar reservoir

Code	Target setting	Purpose and field observations
ARJ-H1	Punad inflow influence	Track inflow chemistry and suspended particles. Record visible inflow, water level and the position of the mixing zone.
ARJ-H2	Vegetated littoral margin	Characterise nearshore water in contact with rooted or submerged vegetation. Record cover, depth and sediment disturbance.
ARJ-H3	Exposed littoral margin	Provide an open-shore comparison with the vegetated station. Record wind exposure, wave resuspension and water depth.

One routine visit per station per month for 24 months would yield 72 planned station-months. The reporting seasons are pre-monsoon (March to May), monsoon (June to September), and post-monsoon and winter (October to February). This allocation yields 18, 24 and 30 planned station-months, respectively, under complete coverage. The actual calendar date and year remain available to check whether rainfall onset and withdrawal in each cycle match the working season labels. Months missed during high flow or unsafe access should remain visible in the coverage table. [3] Visit the three stations on the same morning where possible, between 08:00 and 10:00 local time. Within the window, alternate the station order when access permits and record the actual time at each visit. This reduces systematic coupling between station identity and morning changes in pH or oxygen. Collect one primary bottle set per station visit. Collect an additional field duplicate at approximately 10% of station visits, distributed across stations and seasons. A full 72-event programme would target at least eight duplicate events if the minimum is set at 10%. Duplicate aliquots from a single bottle evaluate laboratory precision separately. Routine samples should be taken about 0.15 m below the surface. At an accessible deeper location, selected temperature and dissolved-oxygen profiles can test whether the surface value represents the water column. Profiles should start near the surface and continue at recorded depth intervals, with closer spacing across a high temperature or oxygen gradient. Flag samples taken during a rainfall pulse or at a deeper diagnostic station by event type, and interpret them separately from the fixed monthly series. This distinction keeps opportunistic observations available without altering the coverage or weighting of the routine programme. [3,6,12] A station visit should record stage or relative water level, recent rainfall from an identified source, wind, visible discharge or runoff, bank activity and the location of any nearshore bloom or sediment plume. These observations allow comparison of changes in turbidity or chemistry with hydrological conditions. With one fixed site per setting, station contrasts apply to the three sampled locations. Estimation of habitat-wide effects would require replicated stations within each habitat.

Water collection and sample handling

Field measurements should precede bottle collection in water undisturbed by wading or retrieval equipment. Record temperature, pH, conductance, and dissolved-oxygen readings after sensor stabilisation, along with the measurement depth and calibration identifier. Secchi depth can be measured from a shaded side where water depth permits. A reading limited by the bottom should carry that qualifier. Prepare separate raw-water bottles for unfiltered chemistry, dissolved nutrients, biochemical oxygen

demand (BOD_5), and microbiology. Determine the necessary volume with the laboratory before fieldwork, allowing for repeat tests, filtration and quality controls. The 250 mL bottle described in the original proposal is one container within this set. [3,12,13] For the dissolved nutrient fraction, filter a separate aliquot promptly through the pore size specified by the method, commonly 0.45 µm. Retain an unfiltered aliquot where a whole-water phosphorus measurement is planned. Collect oxygen-demand samples without avoidable aeration and protect cooled samples from light. Use sterile bottles for bacterial indicators. Each method should have a written bottle, preservative, storage and holding-time requirement agreed with the receiving laboratory. For pH and dissolved oxygen, on-site values are the primary observations. Record the collection time, receipt time, cooler condition and any deviations so that a result can be traced to its handling history. [12,13]

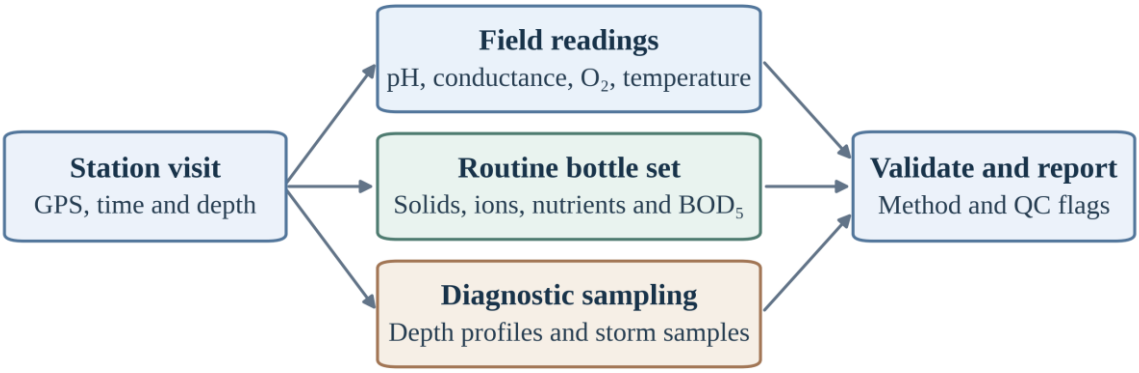

Figure 2. Proposed field-to-report workflow. The routine surface sample set, depth profiles and rainfall-event samples retain distinct identifiers. The quality review links each reported value to its collection and analytical record.

An event identifier should link the date, station, sample depth, and visit type. A separate sample identifier should distinguish the primary bottle set, field duplicate and any filtered aliquot. The instrument file and chain-of-custody record should carry the same event identifier. If a sample is split between laboratories, retain a shared parent identifier and independent laboratory sample numbers. Log container or holding-time deviations before releasing analytical results so validation can assess the affected parameters individually. For the first month, a pilot round should check access time, sensor response, bottle volumes and transport to the laboratory. Pilot results are comparable with the routine series only if the final protocol, station, and time window match. Any revised station should have a new dated entry in the site register. Recording these changes helps identify method-related shifts.

Physicochemical and supporting determinations

Table 2 specifies the routine panel and extensions. The laboratory method sheet should record the method variant, working range, reporting limit and sample handling for each analyte. Preserve the measured form and units alongside any converted value. [12,13]

Table 2. Proposed analytical panel and reporting basis [12,13]

Determination	Method or measurement	Reporting basis and interpretation
Temperature and pH	Thermistor and calibrated electrode at sampling depth	°C and pH units. Record temperature with pH.
Specific conductance	Calibrated conductivity cell, normalised to 25 °C	µS/cm at 25 °C. Indicator of dissolved ionic content.

Dissolved oxygen	Optical or membrane probe with pressure correction	mg/L O_2 and percentage saturation. Record depth and time.
Turbidity and clarity	Nephelometry and Secchi disc where depth allows	NTU for conventional nephelometry and metres for Secchi depth.
Suspended and dissolved solids	Separate gravimetric determinations on retained solids and filtered residue	mg/L for total suspended solids (TSS) and total dissolved solids (TDS).
Total alkalinity and hardness	Acid titration to the specified endpoint and separate EDTA titration	mg/L as $CaCO_3$. Distinct measures of buffering and hardness.
Chloride	Argentometric titration or validated ion chromatography	mg/L as Cl^-. Record dilution and interferences.
BOD_5	Five-day dark incubation at 20 °C with method controls	mg/L O_2. Report the dilution and seeding procedure where applicable.
Dissolved inorganic nutrients	Validated nitrate, ammonia and reactive phosphate methods on appropriate filtered aliquots	mg/L as N for nitrate-N and ammonia-N, and as P for soluble reactive phosphorus.
Total phosphorus and chlorophyll *a*	Digestion of unfiltered water for phosphorus and validated pigment extraction on a separate filtered sample	mg/L as P and µg/L chlorophyll *a*. Use to investigate trophic response.
Microbial indicators	Validated multiple-tube or enzyme-substrate method for total coliforms and *E. coli*	MPN/100 mL. Keep organism, method and sample location explicit.
Irrigation extension	Sodium, calcium and magnesium by validated instrumental or titrimetric methods, plus boron where relevant	mg/L for ions and boron. Convert major ions to meq/L for sodium adsorption ratio.

Report gravimetric TDS as a direct measurement. If a meter estimates TDS from conductance, the record should state the conversion factor and the result should be identified as estimated TDS. Conductance and an estimate derived from it share the same information and should not be counted as separate evidence of seasonal change. For nutrients, 1 mg/L nitrate-N corresponds to about 4.43 mg/L nitrate as NO_3^-. The laboratory result and any converted value should be stored in separate fields to preserve the original reporting basis. [13]

Where fishery screening calls for free ammonia, measure pH and temperature alongside total ammonia nitrogen. Use pH and temperature to estimate the un-ionised fraction and express it as N for comparison with the fisheries criterion. [5,13]

Quality assurance and data traceability

Calibrate pH with certified buffers that bracket the expected sample range. Check the conductivity cell with an appropriate standard and record whether the meter applied temperature compensation. Verify dissolved-oxygen sensor performance and use the local barometric pressure when determining saturation. Retain the calibration time, instrument identifier, reference value and pre- or post-run check. A failed check should lead to assessment of the samples measured since the last acceptable verification. [12,13] Laboratory controls should include method blanks and a calibration verification appropriate to each analytical batch. Use an equipment blank where a reusable sampler or filtration assembly could contribute contamination. Analyse a laboratory duplicate to assess within-bottle precision and a suitable fortified or reference sample to check performance where the method requires one. A field duplicate includes collection and handling variability. For paired positive concentrations sufficiently above the reporting limit, relative percentage difference is the absolute difference divided by their mean and multiplied by 100. Close to the reporting limit, an absolute difference criterion is more informative. Acceptance limits should come from method performance and be documented before the data are interpreted. [12,13] The data register should distinguish a quantified result, a result below the reporting limit, a missed visit and a result rejected during quality review. Retain the reported limit for each censored result because it may change with

dilution or analytical batch. The analytical record should also include units, sample fraction, method, analyst or laboratory identifier and the validation decision. For each rejected or qualified result, document the reason and preserve the original reading in the audit trail. [13,14]

Statistical analysis of the proposed series

The primary reporting unit is the station-month. Begin with a matrix of planned and achieved visits, counts of usable measurements by parameter, and the frequency of censored results. Present monthly series and station-by-season medians, interquartile ranges and observed ranges. Report the corresponding sample counts. Where concentrations fall below varying limits, use a suitable censored-data method if the number of observations supports it. Where censoring is extensive, report detection frequencies and limits and restrict quantitative comparisons accordingly. Zero substitution can distort a trend or an apparent difference. [14] Compare stations on common sampling dates to reduce confounding by catchment-wide rainfall and reservoir operations. A seasonal contrast should use the repeated monthly sequence, with station and year represented as fixed terms if a model is justified. Examine residual dependence across months, report effect estimates with uncertainty, and keep formal inference modest where only two annual cycles are available. Priority contrasts should be specified in advance for turbidity, conductance and dissolved oxygen. Keep supplemental storm and depth records separate, and use the routine series to define the denominators of comparisons. If seasonal contrasts are materially changed by a single visit or an imbalanced set of sampling dates, report both results and their coverage. [14]

RESULTS OF THE REVIEW

Reservoir identity and provenance of site records

The dam-register entry and district description support the identification of Arjun Sagar with the Punad project near Suple in Kalwan, Nashik district. The historical register assigns project code MH09MH1820 and places the dam in the Tapi basin. It records irrigation as the listed purpose. The proposal describes a broader local role, including use as a drinking-water source. The intended treatment pathway or intake position would require confirmation from the responsible water-supply agency before a source-water assessment is made. [1–3]

Table 3. Documentary sources for locating and characterising Arjun Sagar

Record	Details relevant to the review	Appropriate use
CWC dam register [1]	Arjunsagar (Punand), Suple, Kalwan. Punad River, Tapi basin. Dam point 20.625000° N, 73.875000° E.	Official historical project identity and dam reference. Coordinates converted from degrees, minutes and seconds.
Historical engineering fields [1]	Completion year 2011. Height 33.28 m and length 676 m. Gross storage 39.75 million m³.	Context from the dated register entry. The storage value represents design documentation.
Kalwan local administration [2]	Arjun Sagar dam near Jaydar and Suple village.	Corroborates the local name and general setting.
Aquatic-fauna proposal [3]	Arjun Sagar point 20.6153124° N, 73.947022° E. Water collection planned at about 0.15 m depth in monthly morning rounds.	Proposal reference and sampling precedent. The coordinates lack station-level field verification.

The register and proposal points were approximately 7.6 km apart. Their separation is large enough to affect assignment to a shoreline reach or inflow zone. The sources may refer to different project features or may reflect a coordinate error. The proposal also gives different structural dimensions and a different

completion year, and the storage unit in that document could not be reconciled with the register. The engineering values in Table 3 are therefore attributed to the historical register and have no role in the analysis of water chemistry. The station register should be tied to observed habitat features and verified against the project authority's site information. [1–3]

Availability of reservoir water measurements

The earlier project material described intended sampling. The public catalogue entries inspected in the National Water Data Portal describe state-wide surface-water resources. The Maharashtra Pollution Control Board entry for the Godavari upstream of Gangapur Dam refers to a separate monitoring location. No Arjun Sagar concentration series that satisfied the station, date and unit criteria was identified in the reviewed sources. Local concentrations, seasonal trends and attainment of water-use criteria require a verified reservoir series. [3,9–11]

Regional evidence and hypotheses for Arjun Sagar

Published Maharashtra studies show how season, catchment, and station type influence freshwater measurements. Table 4 summarises findings relevant to choosing variables and sampling windows. The studies use different time periods and water-body types. Their reported values are shown only for the stated sites. Regional information is most useful where a specific finding leads to a locally testable comparison. [15–18] The regional studies point to two processes that can occur during the same monsoon. Runoff can dilute dissolved salts while delivering particulate or nutrient-rich material. Tracking conductance, chloride, suspended solids and nutrients on the same visit would help distinguish these responses at Arjun Sagar. A matched comparison should start at the inflow and include both littoral stations. [15,18]

Table 4. Selected Maharashtra evidence relevant to the Arjun Sagar monitoring design

Study and setting	Observation reported for the study site	Question to test at Arjun Sagar
Rahane et al. [15] Girna, Ozarkhed, Chankapur and Gangapur reservoirs, Nashik.	Conductivity and chloride were lower in the monsoon than in summer across the four surface-water series. Dissolved oxygen was higher in winter than in summer.	Do conductance and chloride change together across low-water and high-flow periods at fixed stations?
Pagar and Gaikawad. [16] Girna River at three Kalwan locations.	Water temperature showed seasonal change and site differences. The study concerns a flowing river reach.	Does the timing of seasonal warming differ among the inflow and littoral stations of the impoundment?
Rathod et al. [17] Kadwai reservoir, Ratnagiri, Jun–Nov 2015.	Reported dissolved oxygen was 3.2–4.8 mg/L in the monsoon observations and 4.4–7.0 mg/L in the later observations.	Does oxygen vary with water temperature and hydrology at the surface, and is the pattern similar at depth?
Darvekar et al. [18] Koteshwar Lake, Ramtek, 2024.	Nutrients and oxygen demand rose in the monsoon. Chlorophyll a peaked in the post-monsoon period.	Are nutrient and particle peaks concurrent with rainfall, and does a chlorophyll response occur later?

A dry-season oxygen concentration minimum would be consistent with warming if percentage saturation changed little. A deficit at depth would justify testing for restricted exchange and oxygen consumption with profiles. A low oxygen reading after high runoff calls for checking turbidity, organic loading and probe performance. The Kadwai and Nashik studies show why the oxygen response should be tested at the relevant season and depth. [6,15,17,18]

DISCUSSION

Water-use criteria and interpretation

The Central Pollution Control Board (CPCB) classifies inland surface water by designated use (Table 5). A comparison should identify the intended use, station and analytical method and cover every applicable criterion. A Class D fisheries assessment requires pH and free ammonia alongside dissolved oxygen. [19]

Table 5. CPCB designated best-use screening criteria for inland surface water [19]

Class	Designated use	Criteria
A	Drinking-water source for disinfection only	pH 6.5–8.5. DO ≥6 mg/L. BOD_5 ≤2 mg/L. Total coliforms ≤50 MPN/100 mL.
B	Organised outdoor bathing	pH 6.5–8.5. DO ≥5 mg/L. BOD_5 ≤3 mg/L. Total coliforms ≤500 MPN/100 mL.
C	Source water for conventional treatment and disinfection	pH 6.0–9.0. DO ≥4 mg/L. BOD_5 ≤3 mg/L. Total coliforms ≤5,000 MPN/100 mL.
D	Propagation of wildlife and fisheries	pH 6.5–8.5. DO ≥4 mg/L. Free ammonia as N ≤1.2 mg/L.
E	Irrigation, industrial cooling or controlled waste disposal	pH 6.0–8.5. EC at 25 °C ≤2,250 µS/cm. Sodium adsorption ratio ≤26. Boron ≤2 mg/L.

DO, dissolved oxygen. BOD_5, five-day biochemical oxygen demand measured at 20 °C. EC, electrical conductivity. MPN, most probable number.

Drinking-water assessment applies to water intended for consumption. In India, IS 10500 provides requirements for finished drinking water, including acceptable limits and, for selected constituents, permissible limits in the absence of an alternate source. Examples are turbidity of 1 NTU acceptable and 5 NTU permissible, total dissolved solids of 500 and 2,000 mg/L, and total hardness of 200 and 600 mg/L as $CaCO_3$. Nitrate as NO_3^- has a limit of 45 mg/L with no relaxation. A raw-reservoir survey can inform selection of tests at an intake or treatment works. Assessment of drinking water also requires microbiological verification and attention to the treatment and distribution system. [20,21] Irrigation interpretation depends on soil drainage, crop sensitivity and management as well as water composition. The sodium adsorption ratio is calculated by dividing sodium concentration by the square root of half the sum of calcium and magnesium concentrations, with all three ionic concentrations in meq/L. Assess the ratio jointly with conductivity when considering soil infiltration. The chloride and boron concentrations provide additional context for sensitive crops. A hardness result describes divalent ions collectively and needs a separate sodium measurement to inform sodicity. [19,22] If a summary index is used after a local baseline is established, its objectives, included parameters and missing-data rules should be declared in advance. Different sets of variables and limits can change an index even when the measured chemistry is identical. Parameter-level exceedances, sampling coverage and individual concentrations should remain visible beside any score. [14,23]

Linking findings to follow-up sampling

At Arjun Sagar, three observations would be especially useful when reviewing the first annual cycle. An inflow turbidity peak supported by suspended-solids measurements and a dated rainfall record would justify a short sequence of follow-up visits across the event. An isolated nearshore peak during low stage and strong wind would favour checking for resuspension at both littoral stations. If the event series shows sustained deterioration at an intake, an intake-specific sampling point and operating record would help distinguish changes in the water entering the treatment system from changes at the shoreline. [4,5,12] The oxygen investigation should prioritise paired temperature and oxygen readings at comparable times, with depth profiles where a deep station is safely accessible. A repeat visit outside the morning window can test whether an oxygen minimum recurs. BOD_5,

water level and clarity provide context for testing potential causes. Check calibration and recent weather when reviewing an isolated low reading. [6,12,13] Biological observations should be linked by station, date and depth to the water record. Where the association of chemistry with zooplankton or other fauna is evaluated, keep sampling effort and habitat changes visible in the analysis. Higher counts may reflect favourable conditions for particular taxa, concentration of organisms in a shrinking habitat or changes in detectability. A comparable plankton series, alongside nutrients and chlorophyll *a*, would help separate a nutrient response from shifts caused by mixing or water level. Interpret taxon-specific responses in the context of habitat structure and water-column conditions. [4,5,8,18]

Scope and limitations

This narrative review used a bounded search and did not estimate pooled effects across studies. The public records examined identified the project and provided regional context. Local measurements linked to a verified station, collection date and analytical method are required to assess reservoir condition. Three fixed stations would characterise the selected settings, while reservoir-wide means, whole-reservoir loads and rare-event frequencies would require designs with broader coverage or direct flow information. Calendar seasons also simplify changes in monsoon timing, so reporting both actual dates and stage is important when comparing years. [4,14]

CONCLUSION

The available documentary evidence places Arjun Sagar on the Punad River near Suple and identifies a 7.6 km discrepancy between the two recorded reference coordinates. A two-year programme at verified inflow and littoral stations would establish a local physicochemical baseline. Monthly measurements paired with stage and rainfall records; targeted oxygen profiles and traceable laboratory controls would allow the main seasonal hypotheses to be tested. Water-use interpretation should retain the applicable criteria and underlying measurements for each sampled location.

Declaration by Authors

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Data availability: Source documents are listed in the references.

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