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Water Quality Assessment for Coastal Tourism Suitability in Kampung Mandar, Banyuwangi Regency

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ABSTRACT

Kampung Mandar is a village in Banyuwangi Regency that was labeled the most slum-like village in 2017. This designation was largely due to a smelly and polluted river, which significantly affected water quality. The purpose of this study was to analyze the water quality based on physical and chemical parameters. *In situ* measurements included salinity, pH, and temperature, while *ex situ* measurements included nitrite, nitrate, and orthophosphate levels. The youth of Kampung Mandar, in collaboration with the local government (Supertim), initiated efforts to clean the polluted river and transform the village's image from slum to clean. In recognition of these efforts, the Banyuwangi government supported the community by organizing a fish market festival in 2018 and 2019. Today, the cleanliness and beauty of Kampung Mandar have made it an attractive destination for culinary, cultural, and mangrove tourism. Salinity, pH, and temperature at three sampling points generally met river or marine water quality standards. However, nitrite, nitrate, and orthophosphate concentrations were often above acceptable limits. This is likely due to the river's proximity to densely populated areas, where improper household waste disposal contributes to pollution. Despite this, positive behavioral changes among residents have had a favorable impact on the river, which is no longer dirty or smelly—improving the aesthetic and environmental value of Kampung Mandar as a tourist destination. High water quality greatly enhances the tourist experience and supports the sustainability of tourism. Waters that are clear, ecologically balanced, and free of pollutants offer visual appeal and ensure the safety and comfort of visitors during recreational activities.

INTRODUCTION

Marine tourism activities are very beneficial in improving the economy of communities around coastal areas **(Lestari *et al.*, 2021)**. Aesthetic value in a water area refers to the beauty perceived by humans when they are in or near a body of water. This aesthetic value is influenced by the water quality status as well as environmental attributes or supporting elements in the surrounding area. These attributes are often affected by effluents, such as waste entering the water, which can alter its quality—particularly through the introduction of organic matter. High levels of organic content can have both positive and negative impacts. On the positive side, it can enrich the water with nutrients, a condition known as eutrophication. However, excessive organic matter can also lead to negative effects, such as reduced water productivity and diminished aesthetic value **(Sunaris & Tallar, 2019)**.

Various activities along the coast and the paradigm of some coastal communities who consider the sea a garbage dump, significantly impact the carrying capacity and environmental sustainability of marine waters and coastal areas. This has led to environmental degradation in these regions and their surrounding ecosystems **(Haerudin & Putra, 2019)**.

A major issue often faced by water bodies such as rivers is the decline in water quality. This can be caused by pollutants from domestic and non-domestic waste, garbage disposal, and intense community activities near the river, such as tourism **(Anwar *et al.*, 2022)**. Besides waste, other water quality parameters—such as oil and odor—contribute to making beaches unattractive. These factors directly affect aesthetic value. Declining water quality can also lead to the presence of coliform bacteria, which poses a health risk to tourists **(Lestari *et al.*, 2021)**.

Understanding and managing water quality is crucial to maintaining optimal conditions for aquatic organisms and the environment **(Purwanti *et al.*, 2024a)**.

In 2017, Kampung Mandar was designated by the Banyuwangi Government as the densest village in Banyuwangi. It was also known as a dumping site—due to a lack of waste collection personnel, garbage carried downstream, and low public awareness of waste impacts—and a community perceived as hard, rude, and unwelcoming to outsiders. Concerned about the negative image, the youth of Kampung Mandar took the initiative to clean an 800-meter stretch of the river estuary using simple tools. Their efforts to shift waste disposal from the riverbanks to proper collection points made the area cleaner, more beautiful, and healthier.

These cleanup efforts received support from various government agencies, including the Culture and Tourism Office, Public Works Office, Fisheries Office, Cooperative Office, Environment Office, and others—referred to as the "supertim," indicating collaborative, synergistic action. As a result, Kampung Mandar has become a tourist destination.

Conserving riparian habitats is essential for supporting water quality and maintaining ecosystem integrity **(Henri *et al.*, 2020**). Nutrient management and ecosystem restoration are critical to improving river water quality **(Islamy *et al.*, 2024)**. A healthy river ecosystem also supports biodiversity conservation **(Islamy *et al.*, 2025a)**. However, environmental degradation from chemical pollutants and physical changes makes river ecosystems increasingly vulnerable to deterioration and biodiversity loss **(Islamy *et al.*, 2025b)**. Poor water quality—marked by low dissolved oxygen and high ammonia, nitrate, and nitrite levels—increases fish vulnerability to disease **(Kilawati *et al.*, 2025)**.

Kampung Mandar's coastal tourism includes cultural, culinary, and mangrove tourism. These activities depend on the Kalilo River, which flows into the Bali Strait. If water quality standards are not met, significant problems may arise. Therefore, this study aimed to analyze water quality based on physical and chemical parameters.

MATERIALS AND METHODS

This research was conducted from October 2024 to January 2025 in the Kampung Mandar river area and the Bali Strait sea. The location was selected using a purposive sampling technique, based on the consideration that water flows from the Kalilo River through Kampung Mandar—a coastal tourism area—before discharging into the Bali Strait.

Sampling locations (Fig. 1) were designated as follows:

- Sample Point I is near the mangrove tourism area.
- Sample Point II is at the river's endpoint, close to the breakwater.
- Sample Point III is located offshore in the Bali Strait, where cultural tourism activities, such as the ritual "Slametan Laut," take place.

Sample Point I was strategically selected within the river flow near the mangrove region to assess the impact of mangrove ecosystems on water quality. Mangroves play a vital role in filtering pollutants, stabilizing sediments, and regulating chemical and physical characteristics of water—such as salinity, pH, and concentrations of nitrate and nitrite.

Sample Point II, situated near the breakwater, was chosen to examine how coastal structures influence the physicochemical properties of river water. Breakwaters can alter current patterns, sedimentation, and the distribution of water quality parameters like salinity, temperature, pH, nitrate, and nitrite at the river mouth. This location was also selected due to the breakwater's role in transporting organic and inorganic substances from upstream and its effect on freshwater and seawater mixing. The surrounding area is prone to contaminant accumulation from human activities such as residential waste disposal, fisheries, and port operations.

Sample Point III, located in marine waters near the river discharge, was selected to investigate the interaction between freshwater and seawater and its impact on water quality. This zone represents a unique transitional environment, marked by significant variation in salinity, temperature, pH, nitrate, and nitrite levels due to the convergence of the two water masses. The site is particularly vulnerable to anthropogenic influences stemming from terrestrial activities, including domestic, agricultural, and industrial waste carried by river currents, which in turn affect the marine ecosystem.

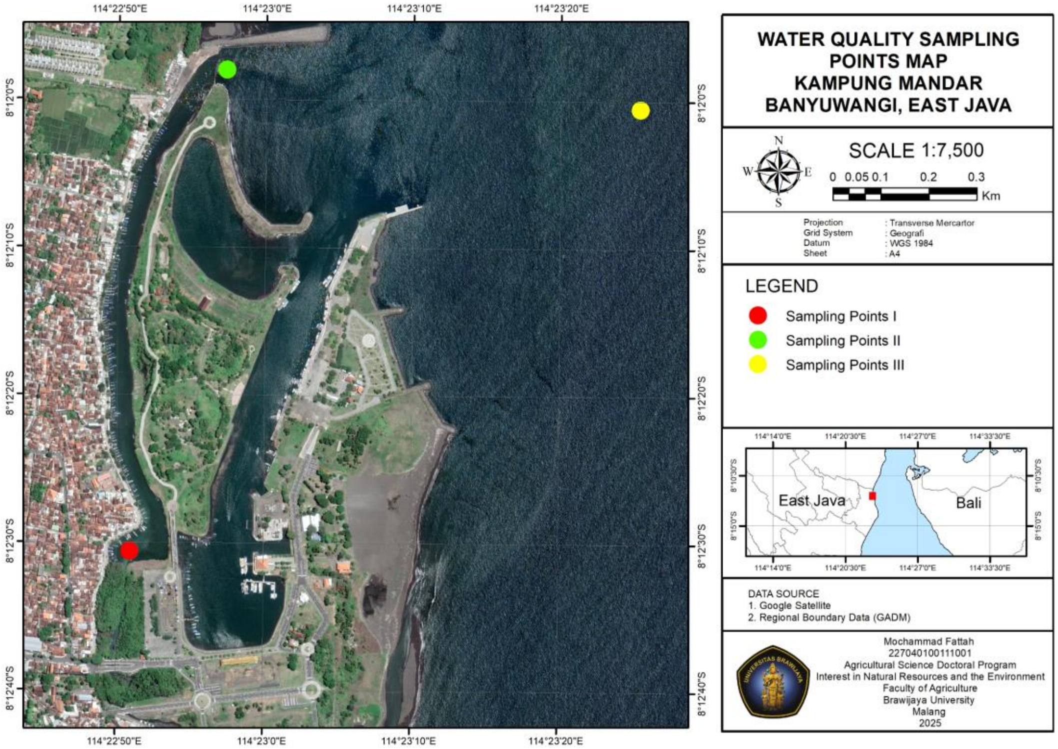

Fig. 1. Water quality sampling points

The main equipment used in this research included a visible spectrophotometer, pH meter, hand refractometer, thermometer, sample bottles, and other standard glassware. The materials required were river and seawater samples, along with chemical reagents for testing nitrate, nitrite, and orthophosphate concentrations.

Water samples were collected directly from river and marine sites using 500mL sample bottles. Samples were preserved according to the parameters to be analyzed. *In situ* observations included measurements of temperature, salinity, and pH. *Ex situ* analyzes involved nitrate, nitrite, and orthophosphate testing using spectrophotometric methods in accordance with the Indonesian National Standard (SNI) for water quality testing **(Irawati *et al.*, 2021)**.

Water quality testing was conducted both *in situ* (at the sampling site) and *ex situ* (at the Water Quality Laboratory of Untag Banyuwangi). The assessment adhered to the water quality standards defined in Government Regulation Number 22 of 2021 regarding Guidelines for Environmental Protection and Management **(Government of Indonesia, 2021)**.

In nitrate testing, nitrate compounds in the sample are reduced to nitrite using a cadmium (Cd) column coated with copper (Cu). The total nitrite is formed then reacts with sulfanilamide in an acidic medium to produce a diazonium compound. This compound subsequently couples with N-(1-naphthyl)-ethylenediamine dihydrochloride (NED) to form a pink azo dye. The intensity of the resulting color is directly proportional to the total nitrite concentration, and its absorbance is measured spectrophotometrically at 543 nm **(BSN, 2011)**.

Under acidic conditions (pH 2.0–2.5), nitrite reacts with sulfanilamide (SA) and NED dihydrochloride to form a purplish-red azo compound. The color intensity is measured spectrophotometrically at a maximum absorbance of 543 nm **(BSN, 2004)**.

For orthophosphate analysis, under acidic conditions, orthophosphate reacts with ammonium molybdate and potassium antimonyl tartrate to form phosphomolybdic acid. This is subsequently reduced by ascorbic acid, producing molybdenum blue complexes. The absorbance of these complexes is measured spectrophotometrically at 880nm **(BSN, 2021)**.

RESULTS AND DISCUSSION

Coastal tourism in Kampung Mandar Banyuwangi Regency

The youth of Kampung Mandar, through the Tourism Awareness Group (Pokdarwis) led by Hilmansyah Anwar, won first place in the Sustainability CID Awards 2022 in the *CSV Social Programme* category, organized by PT PLN (Persero). With funding from the CSR *Bina Lingkungan* programme of PLN Banyuwangi, Pokdarwis constructed a 5×2 meter fibre catamaran boat. The boat consists of two hulls (left and right), a net in the middle for capturing garbage as it passes through, and a propulsion engine, with a total cost of IDR 19,000,000.

Pokdarwis and Poklahsar (Processing and Marketing Group) take turns operating the garbage boat. The waste collected is sorted for further processing by residents and the Environmental Agency (DLH). Maintaining environmental cleanliness has positively influenced the sustainability of culinary businesses along the Plengsengan River.

During the peak event of the *National Ocean Love Month Movement* in November 2023, the garbage boat received an award from the Ministry of Maritime Affairs and Fisheries. In December 2023, the *Kampung Mandar Fish Market* programme helped PLN Banyuwangi achieve Gold in the Indonesia Sustainable Development Goals Award (ISDA). PLN also provided support infrastructure and facilities for the fish market to stimulate community economic growth. This initiative aimed to empower the community by encouraging the development of independent micro, small, and medium enterprises (MSMEs), not only in culinary sectors but also in tourism-related businesses such as souvenirs and children's games that embrace the *electrifying lifestyle* concept.

PLN's CSR programme for environmental development also contributes to the improvement of economic welfare and social and environmental education. The Department of Culture and Tourism (Disbudpar), along with sub-district and village governments and Pokdarwis, provides education and training for residents, including public speaking and tourism charm training to prepare them for receiving visitors. The

Environmental Agency supports these efforts through the *Banyuwangi Green Programme*, including TPS3R optimization (Waste Sorting, Collection, and Processing), enhancement of waste banks, and the *Banyuwangi Watershed Care School* (Sekardadu).

The cleanliness of the Kampung Mandar River was previously acknowledged by the Banyuwangi Regency Government through the *Fish Market Festival* held in 2018 and 2019 in Kampung Mandar. This event offered tourists a range of processed fish dishes representing diverse ethnic cuisines.

In 2023, the Ministry of Maritime Affairs and Fisheries supported mangrove conservation efforts in Kampung Mandar by constructing a 100-meter tracking path and forming the Pokmaswas (Community Monitoring Group) "Kampung Mandar Youth." This initiative aims to improve community income through sustainable tourism.

Furthermore, in November 2023, the government—through the National Renewal Forum (FPK) under the auspices of the National Unity and Politics Agency (Bakesbangpol)—organized traditional activities in Kampung Mandar, including the *Slametan Laut* ritual.

The continuous development of Kampung Mandar has led to the flourishing of tourism activities managed by various ethnic groups, including culinary, cultural, and mangrove tourism. Consequently, the condition of Kampung Mandar's water quality plays a crucial role in influencing tourist satisfaction, especially in line with the principles of *Sapta Pesona* (safe, orderly, clean, cool, beautiful, friendly, and memorable), as promoted by tourism managers.

River water quality parameters in Kampung Mandar, Banyuwangi Regency

Water quality is a highly sensitive issue, as it is closely linked to various societal concerns—ranging from community water use for daily activities to the health of aquatic ecosystems and the organisms that inhabit them. Water quality, which encompasses both physical and chemical properties, plays a vital role in ecological stability. These physico-chemical characteristics of water are subject to continuous change, influenced by multiple factors. Therefore, temporal and spatial monitoring of these parameters must be consistently conducted. Water quality assessments provide essential information to the public, indicating whether water is safe for consumption or suitable for various community uses **(Irawati *et al.*, 2021)**.

High water quality is especially critical for the development of coastal tourism, as it directly affects the attractiveness and sustainability of gastronomic, cultural, and mangrove tourism in Kampung Mandar. Clean and unpolluted water enhances aesthetic appeal and supports various tourism activities. Culinary tourists, for example, feel more comfortable and are likely to extend their stay when coastal areas feature clean river water. In addition, high-quality river water fosters the growth of lush mangrove forests, which serve not only as tourism attractions but also as natural barriers against erosion and as breeding grounds for marine life.

Cultural tourism activities, such as the *Slametan Laut* ceremony, can proceed smoothly in clean water conditions, free from unpleasant odours or visible pollution, allowing fishing boats to navigate the area comfortably during ritual offerings.

Water sampling was conducted four times: on 16 October 2024, 23 November 2024, 20 December 2024, and 18 January 2025, between 15:00 and 16:00 WIB (during high tide), at three different sampling points (Fig. 1). Kampung Mandar is located at the river estuary, making it vulnerable to waste carried from upstream areas. However, general observations revealed that the amount of waste near the estuary was relatively minimal, consisting mostly of plastic and organic materials. As a result, the river did not exhibit a foul odor or a brownish colour (Fig. 2).

At sample point III, located in the sea near the mouth of the Kampung Mandar River, no rubbish or odor was detected. According to **Natasha and Adharini (2024)**, signs of river pollution typically include turbid, brownish water and an unpleasant smell—both of which were absent in this observation.

Fig. 2. River color (Sample point I: 23 November 2024)

1. Salinity

The salinity of coastal waters is directly influenced by population activities and the presence of nearby rivers. Salinity levels in these areas tend to be slightly lower than those of waters directly connected to the open sea. This reduction is primarily due to anthropogenic influences originating from land, which enter and mix with coastal waters, thereby altering their salinity **(Daulat *et al.*, 2014)**.

Salinity values (Fig. 3) varied across the three sampling points:

- Sampling Point I: 8–15‰
- Sampling Point II: 16–34‰

- Sampling Point III: 32–38‰

The lower salinity values at Sampling Points I and II are attributed to the substantial volume of freshwater from river discharge, which is intensified by high rainfall during November and December. Additionally, these locations are affected by seawater intrusion into the river system.

In contrast, the higher salinity at Sampling Point III is due to its location in a marine area, where conditions are influenced by several factors including freshwater inflow, evaporation, rainfall, and ocean currents.

According to Government Regulation Number 22 of 2021, the salinity levels observed—especially at Point III—meet the quality standards for natural marine tourism.

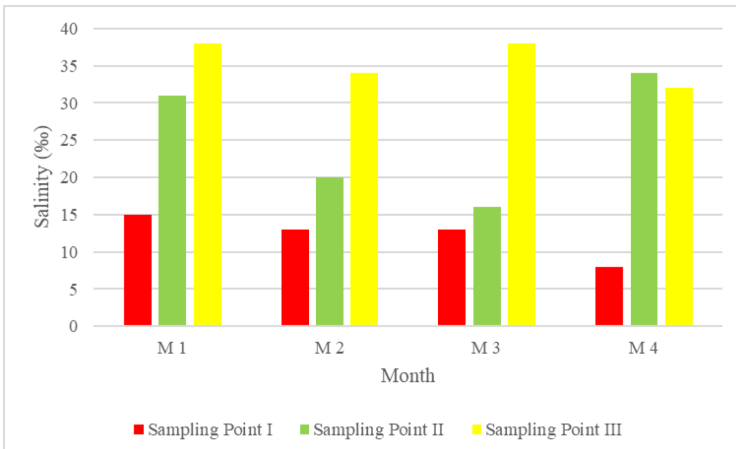

Fig. 3. Salinity values

2. Temperature

The interaction between temperature and nutrient availability may exacerbate the aquatic environment. Warmer temperatures can stimulate the growth of harmful algae, which not only produce toxins but also release additional odors when unpleasant **(Campbell & Hyslop, 2023)**. The high and low temperature of river water is influenced by the air temperature around Kampung Mandar, in general the coastal area of Kampung Mandar tends to be hot. If the condition of the river is bad, the high temperature results in the potential for unpleasant odors to appear, but in Kampung Mandar in general it does not produce unpleasant odors.

he temperature values (Fig. 4) observed at the sampling points were as follows:

- Sampling Point I: 29–32 °C

- Sampling Point II: 29–31 °C
- Sampling Point III: 29–30 °C

These temperature variations are relatively stable across locations, with slight differences likely due to varying exposure to sunlight, water depth, and the influence of riverine and marine water mixing. According to Government Regulation Number 22 of 2021, these temperature ranges are considered natural and within acceptable limits for marine tourism activities.

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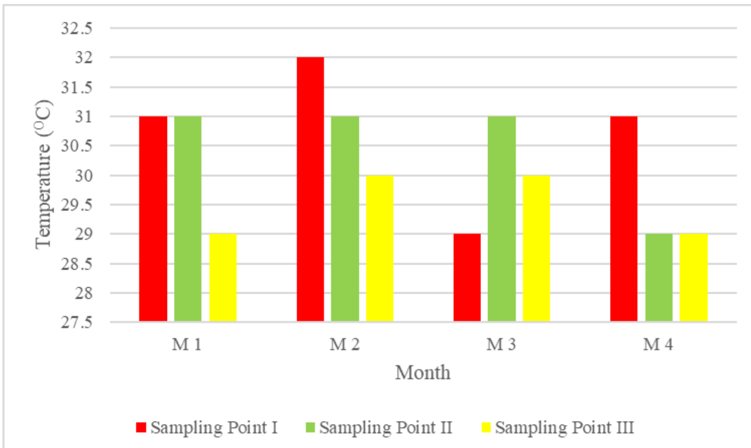

Fig. 4. Temperature value

3. pH

The pH parameter is a unit of hydrogen ion concentration in solution, usually used to express the degree of acidity or basicity of a solution. The pH value plays a crucial role in maintaining the health and balance of aquatic ecosystems. Variations in pH levels can be influenced by the presence of organic matter transported through river flow **(Daulat *et al.*, 2014)**. pH is also a key parameter in various water treatment and control processes, including taste and odor regulation **(Adams *et al.*, 2022)**. Changes in pH are often dependent on the types and quantities of pollutants entering the water. Water with pH levels higher than the normal range becomes unsuitable for acidophilic bacteria and other sensitive organisms. Alkaline discharges, typically from sources containing inorganic substances, contribute to increased water alkalinity. Conversely, water with an excessively low pH (acidic) can damage containers, pipelines, and even clothing during use **(Muzayana & Hariani, 2019)**.

The observed pH values (Fig. 5) at each sampling point were as follows:

- Sampling Point I: 5.0–7.5
- Sampling Point II: 6.0–7.3
- Sampling Point III: 5.9–7.2

Based on Government Regulation Number 22 of 2021, the acceptable pH range for river water is 6.0–9.0, and for marine tourism, 7.0–8.5. Overall, the pH at all three sample points generally falls within these acceptable ranges. However, a lower pH was recorded at Sampling Point I in December, indicating slightly acidic conditions. This anomaly is likely due to household or industrial waste carried downstream after early morning rainfall.

Another contributing factor is the proximity of Sampling Point I to a mangrove area. The decomposition of high amounts of organic matter in mangroves can release acidic byproducts, lowering the water's pH. During the rainy season, surface runoff and increased biological activity often cause acidic compounds, such as carbonic acid from fish metabolism, to accumulate and decrease pH levels. According to **Susana (2009)**, detergents—commonly used in household and industrial applications—also contribute to reduced pH levels in water.

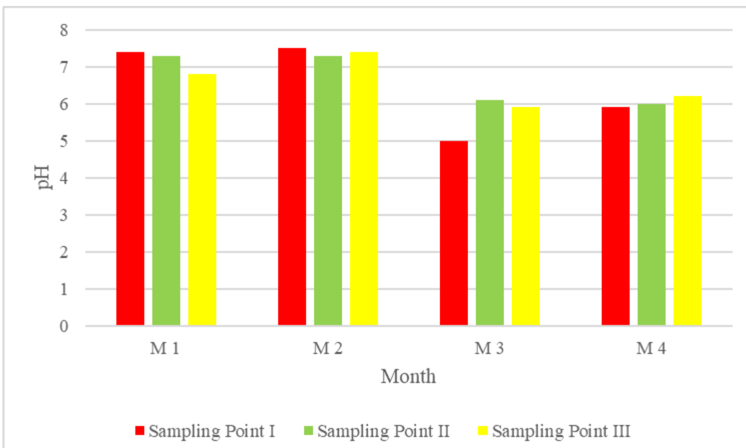

Fig. 5. pH value

4. Nitrite

Nitrite is an intermediate compound formed during both nitrification (the oxidation of ammonia to nitrate) and denitrification (the reduction of nitrate to nitrogen gas). Because of its transitional nature, nitrite is unstable in well-oxygenated environments. In natural waters, nitrite concentrations are typically low, averaging around 0.001mg/ L **(Purwanti *et al.*, 2024b)**. Elevated nitrite concentrations in rivers are often caused by intensive waste disposal activities, particularly from markets and slaughterhouses located near riverbanks **(Maulianawati *et al.*, 2018)**.

Nitrite represents a partially oxidized form of nitrogen. It is generally absent in fresh wastewater but may be present in older or stagnant sewage. As a transient compound in the nitrogen cycle, nitrite quickly converts either to ammonia or is further oxidized to nitrate. It may also originate from corrosive industrial materials, as it is commonly used in factory processes **(Ginting, 2007)**.

Nitrite concentrations (Fig. 6) measured at the sampling points were as follows:

- Sampling Point I: 0.21–0.33 mg/L
- Sampling Point II: 0.10–0.32 mg/L
- Sampling Point III: 0.07–0.16 mg/L

According to Government Regulation No. 22 of 2021, the acceptable nitrite concentration in river water is approximately 0.06mg/ L. The measured values at all three sampling points consistently exceeded this standard, indicating that the Kampung Mandar River is subject to pollution—likely originating from domestic, market, and industrial waste inputs.

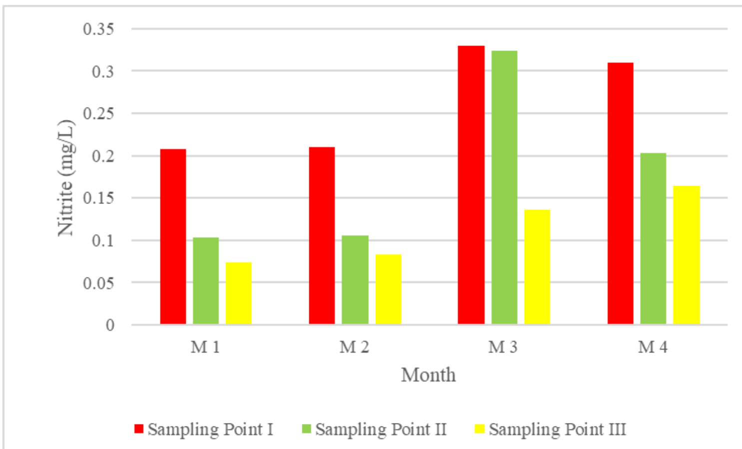

Fig. 6. Nitrite value

5. Nitrate

Low temperatures can increase dissolved oxygen (DO) levels in water, which in turn may result in lower nitrate concentrations. As water temperature decreases, the solubility of oxygen increases, thereby elevating dissolved oxygen levels, and vice versa **(Salsabilla *et al.*, 2023)**. One of the primary factors contributing to elevated nitrate levels in water is the discharge of household waste **(Tungka *et al.*, 2016)**. Nitrate is a water-soluble, stable form of nitrogen. Its presence in river systems is often preceded by the formation of ammonia, which may originate from natural sources or human activities. Excessive nitrate concentrations can lead to oxygen depletion, declining fish populations, unpleasant odours, and poor water quality **(Sanjaya *et al.*, 2023)**.

Nitrate concentrations (Fig. 7) at the three sampling points were as follows:

- Sampling Point I: 14.9–24.9 mg/L
- Sampling Point II: 9.9–34.9 mg/L
- Sampling Point III: 4.9–14.9 mg/L

According to Government Regulation No. 22 of 2021, the acceptable nitrate concentration in river water is around 10–20 mg/L. The data show that nitrate levels at Sampling Points I and II frequently exceed this standard, indicating that water quality in the Kampung Mandar River is impacted by domestic waste discharge and activities related to culinary tourism.

Additionally, **Arnanda (2023)** suggests that elevated nitrate levels may also result from the denitrification process**,** which is influenced by dissolved oxygen conditions. In low-oxygen surface waters downstream, nitrate undergoes a reduction sequence: first to nitrite, then to nitric oxide, and finally to nitrogen gas. This biochemical reaction underscores the dynamic relationship between oxygen availability and nitrogen transformation in aquatic systems.

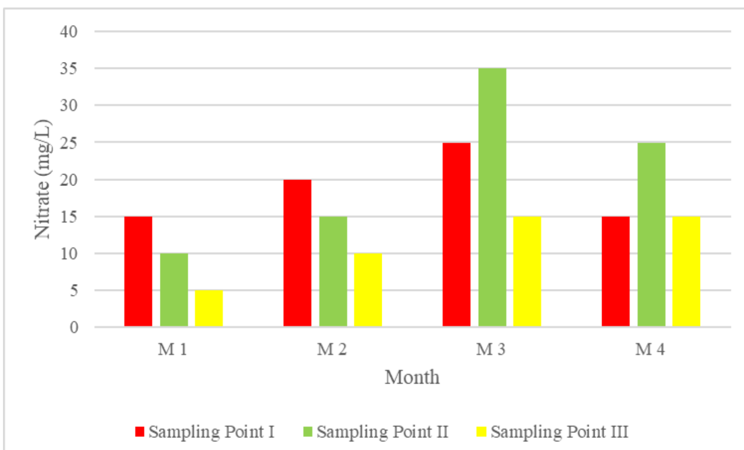

Fig. 7. Nitrate value

6. Orthophosphat

Industrial development and household activities along the river are believed to affect water quality through the discharge of nutrient-rich waste. High concentrations of these nutrients can lead to nutrient enrichment (eutrophication), which in turn may trigger phytoplankton blooms. Detergents, in particular, contribute to this process by increasing orthophosphate concentrations, as phosphate ions are a common component in many detergent formulations. The widespread use of phosphate-containing detergents plays a significant role in eutrophication and the resulting algal blooms **(Tungka *et al*.,** 2016**)**.

Orthophosphate concentrations (Fig. 8) at the sampling points were as follows:

- Sampling Point I: 0.0059–0.91 mg/L
- Sampling Point II: 0.0029–1.25 mg/L
- Sampling Point III: 0.00099–0.83 mg/L

The river in Kampung Mandar flows near densely populated residential areas, suggesting that household waste has a direct impact on orthophosphate concentrations. A significant increase in orthophosphate was recorded in December 2024, likely due to heavy rainfall in the morning that carried waste from upstream to the sea sampling point.

According to Government Regulation No. 22 of 2021, the acceptable orthophosphate concentration is approximately 0.015mg/ L for marine recreational waters and 0.2mg/ L for river water. Based on this standard, orthophosphate levels at the sampling points were generally within acceptable limits—except in December 2024, when a notable spike was observed.

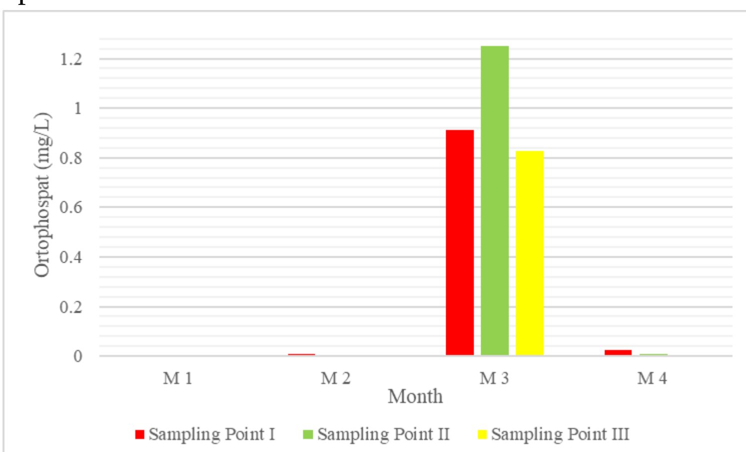

Fig. 8. Orthophosphate value

Potential sources of pollutants that can increase nitrite, nitrate, and phosphate concentrations include agricultural activities, mining operations, industrial processes, poultry processing facilities or slaughterhouses, residential areas, latrines, and commercial activities such as markets and small-scale industries (e.g., workshops). Other contributors include construction projects, river transportation, temporary waste disposal sites (TPS), sewer pipes, and street vendors operating near the river **(Sanjaya *et al.*, 2023)**. Additionally, fishing boat traffic near sampling locations can cause turbulence at the water surface, further influencing water quality **(Wicaksono *et al.*, 2024)**.

Domestic wastewater from densely populated settlements can also degrade streamflow quality due to the high organic content, which reduces dissolved oxygen levels as a result of biological and chemical degradation processes **(Sonia & Harisuseno, 2019)**. Fluctuations in salinity—caused by seawater intrusion or industrial discharges—

can destabilize river ecosystems and diminish the appeal of tourist destinations, especially when aquatic vegetation or fish mortality occurs.

Elevated water temperatures, resulting from climate change or thermal pollution, can lower dissolved oxygen levels, harming aquatic organisms and making the environment less conducive for tourism. Similarly, highly acidic or alkaline pH levels—often linked to industrial or mining waste—can reduce water clarity and pose health risks to individuals engaging in direct contact with river water.

Nitrite and nitrate concentrations, commonly increased by fertilizer runoff or domestic waste, can trigger eutrophication. This process results in algal blooms that reduce visibility, emit foul odors, and degrade the river's aesthetic value. Phosphate compounds, while essential for phytoplankton and aquatic plant growth, can also contribute to eutrophication when present in excess. This leads to diminished water clarity, limited sunlight penetration, and the growth of harmful algae, all of which pose risks to tourists.

Improper management of these issues may cause a severe decline in water quality, reduce tourist interest, damage the destination's reputation, and ultimately jeopardize the sustainability of river-based tourism.

CONCLUSION

Since 2017, the government and community of Kampung Mandar have undertaken initiatives to improve river water quality following the Regent's Decree, which designated the area as a slum village. These community-driven efforts were recognized by the Banyuwangi Government through the organization of the *Fish Market Festival* in 2018 and 2019. Over the years, Kampung Mandar's coastal area has evolved into a vibrant destination for culinary, cultural, and mangrove tourism.

Based on in situ water quality measurements—including salinity, pH, and temperature—results indicate that these parameters fall within acceptable quality standards. However, ex situ analyses of nitrite, nitrate, and orthophosphate revealed nitrite and nitrate concentrations that tend to exceed regulatory thresholds. Despite this, the river's aesthetic condition remains favorable, with no unpleasant odors reported.

This study recommends the following actions to enhance water quality management:

- Install optimal garbage barriers to prevent waste accumulation before the mangrove area and restrict garbage entry through culverts connected to residential homes.
- Increase collaboration with NGOs to expand the frequency and scope of river cleanup activities.
- Implement modern waste management systems and support independent

household waste management through the Environmental Agency's assistance—such as the provision of waste collection barrels.

Enhancing community engagement in river water quality management is a strategic step toward ensuring the sustainability of coastal tourism. Local residents, who possess deep knowledge of the river's dynamics and directly benefit from tourism, should be actively involved in participatory monitoring programs, environmental education initiatives, and household-level waste management practices.

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REFERENCES

Adams, H.; Burlingame, G.; Ikehata, K.; Furatian, L. and Suffet, I. H. (2022). The Effect of pH on Taste and Odor Production and Control of Drinking Water. Aqua Water Infrastructure, Ecosystems and Society, 71(11), 1278–1290. https://doi.org/10.2166/aqua.2022.133.

Anwar, D. F.; Alawiyah, T. and Yulma. (2022). Determination of Water Quality Status of The Bidadari River in Juata Kerikil, Tarakan City. Jurnal Harpodon Borneo, 15(2), 124–132.

Arnanda, R. (2023). Analysis of Nitrate Levels in River Water Using a UV-Visible Specthrophotometer. Jurnal Kolaboratif Sains, 6(3), 181–184. https://doi.org/10.56338/jks.v6i3.3357.

BSN. (2004). Water and Waste – Part 9: Spectrophotometric Test Method for Nitrite (SNI 06-6989.9-2004). Badan Standarisasi Nasional. Jakarta

BSN. (2011). Water and Waste – Part 79: Test Method for Nitriate by UV-visible Spectrophotometry by Cadmium Reduction (SNI 6989.79:2011). Badan Standarisasi Nasional. Jakarta

BSN. (2021). Water and Waste – Part 31: Test Method for Orthophosphate and Total Phosphorus by Spectrophotometry Using Ascorbic Acid Reduction (SNI 6989.31:2021). Badan Standarisasi Nasional. Jakarta

Campbell, G. R. and Hyslop, E. J. (2023). Technical Reports: Methods—The Application of Temperature and Light Intensity as Intermittency Sensors in a Temporary Pond. Water Resources Research, 59(2), WR031574. https://doi.org/10.1029/2021WR031574.

Daulat, A.; Astrid Kusumaningtyas, M.; Anggoro Adi, R. and Setiyo Pranowo, W. (2014). Distribution of dissolved CO2 in the southern coastal waters of Natuna Islands. Depik, 3(2), 166–177. https://doi.org/10.13170/depik.3.2.1538.

Ginting, P. (2007). Sistem pengolahan lingkungan dan limbah industri (Environmental and industrial waste processing systems). Yrama Widya.

Government of Indonesia. (2021). Government Regulation Number 22 of 2021 concerning Guidelines for Environmental Protection and Management, Sekretariat Negara Republik Indonesia. http://www.jdih.setjen.kemendagri.go.id/

Haerudin, H. and Putra, A. M. (2019). Analysis of Sea Water Quality Standards for the Development of Marine Tourism in Labuhan Haji Beach Waters, East Lombok Regency. Geodika: Jurnal Kajian Ilmu Dan Pendidikan Geografi, 3(1), 13–18. https://doi.org/10.29408/geodika.v3i1.1473

Henri, H.; Hakim, L.; Rahardi, B. and Retnaningdyah, C. (2025). Influence of riparian habitat quality on spring ecosystem water quality in Nangka Island , Bangka Belitung Influence of riparian habitat quality on spring ecosystem water quality in Nangka Island , Bangka Belitung. IOP Conf. Series: Earth and Environmental Science (The 11th International Conference on Sustainable Agriculture and Environment), 012020. https://doi.org/10.1088/1755-1315/1490/1/012020

Irawati, H.; Firdaus, M.; Jojon, H.; Wijayanti, T. and Maulianawati, D. (2021). Water Quality Assessment of Kelurahan Pantai Amal Kecamatan Tarakan Timur Kota Tarakan. Jurnal Harpodon Borneo, 13(2), 61–69. https://doi.org/10.35334/harpodon.v13i2.1819

Islamy, R. A.; Alfian, R. A.; Valen, F. S.; Alfian, R. A. and Hasan, V. (2025a). First record of Xiphophorus helleri (Heckel, 1848) (Cyprinodontiformes: Poeciliidae) from the Bangka Island, Indonesia. Egyptian Journal of Aquatic Biology and Fisheries, 29(2), 1055–1065. https://doi.org/10.21608/ejabf.2025.418393

Islamy, R. A.; Valen, F. S.; Ramahdanu, D. and Hasan, V. (2025b). Presence of Midas cichlid (Amphilophus citrinellus Günther, 1864) (Actinopterygii : Cichlidae) on Bangka Island, Indonesia: an invasive Non-Native species. Egyptian Journal of Aquatic Biology & Fisheries, 29(2), 1045–1054. https://doi.org/10.21608/ejabf.2025.418392

Islamy, R. A.; Hasan, V.; Kilawati, Y.; Maimunah, Y.; Mamat, N. B. and Kamarudin, A. S. (2024). Water Hyacinth (Pontederia crassipes) bloom in Bengawan Solo River, Indonesia: An Aquatic physicochemical and biology perspective. International Journal of Conservation Science, 15(4), 1885–1898. https://doi.org/10.36868/IJCS.2024.04.19

Kilawati, Y.; Fadjar, M.; Maimunah, Y.; Lestariadi, R. A.; Yufidasari, H. S.; Ma`Rifat, T. N.; Syaifullah; Salamah, L. N.; Amrillah, A. M.; Perdana, A. W.; Rangkuti, R. F. A. and Islamy, R. A. (2025). Innovations in Shrimp

Aquaculture: Optimizing seaweed biostimulants as an integrated approach to disease prevention. Egyptian Journal of Aquatic Biology and Fisheries, 29(2), 1221–1234. https://doi.org/10.21608/ejabf.2025.419362

Lestari, T.; Yasser, M.; Taru, P. and Simarangkir, O. R. (2021). Feasibility Study of Water Quality on Tourism in Monpera Balikpapan City East Kalimantan Provience. Jurnal Harpodon Borneo, 14(2), 53–68. https://doi.org/10.35334/harpodon.v14i2.1938

Maulianawati, D.; Herman, M. I.; Ismail, M.; Fiandaka, M. O. A.; Sadrianto, S., Tarfin, T. and Irawati, H. (2018). Assesment of the Surface Water Quality in Pamusian River of Tarakan City. Jurnal Harpodon Borneo, 11(2), 97–103.

Muzayana, F. U. and Hariani, S. (2019). Analysis of Color, Odor and pH of Water Around Final Disposal Site II Karya Jaya Musi 2 Palembang. ALKIMIA : Jurnal Ilmu Kimia Dan Terapan, 3(1), 16–19. https://doi.org/10.19109/alkimia.v3i1.3138

Natasha, R. A. and Adharini, R. I. (2024). Analysis of Sea Water Quality Standards for the Development of Marine Tourism in Labuhan Haji Beach Waters, East Lombok Regency. Jurnal Ilmu Lingkungan, 22(6), 1652–1662. https://doi.org/10.14710/jil.22.6.1652-1662

Purwanti, P.; Sofiati, D.; Anandya, A. and Fattah, M. (2024a). Sustainability of Fish Farming in Bucket (Budikdamber) of the Catfish (Clarias gariepinus) in Kediri, Indonesia. Egyptian Journal of Aquatic Biology and Fisheries, 28(5), 885–906. https://doi.org/10.21608/ejabf.2024.380439

Purwanti, P.; Sofiati, D.; Anandya, A.; Aisyah, D.; Fattah, M. and Nurnuha, L. (2024b). Profitability of Fish Culture Using Budikdamber System Under Water Quality Control in Kediri City , Indonesia. Tuijin Jishu/Journal of Propulsion Technology, 45(1), 3198–3208.

Salsabilla, D. F.; Setyo Sasongko, A. and Dwi Cahyadi, F. (2023). Analysis of Nitrate, Nitrite, and Ortophosphate Content in Merak Kecil Island Waters Dewi. Jurnal Laot Ilmu Kelautan, 5(2), 152–161. https://doi.org/10.35308/jlik.v5i2.8092

Sanjaya, C.; Pramaningsih, V.; Suhelmi, R. and Kurniawan, D. (2023). The Content of Nitrite, Nitrates and Phosphates of Karang Mumus River from Upstream to Downstream. EnviroScienteae, 19(2), 1–7.

Sonia, P. I. A. and Harisuseno, D. (2019). Domestic Wastewater Contribution to Water Quality of Brantas River at Dinoyo Urban Village, Malang City. J-Pal, 10(2), 2087–3522. https://doi.org/10.21776/ub.jpal.2019.010.02.02

Sunaris, M. L. and Tallar, R. Y. (2019). Study of Aesthetic Value and Water Quality in the Context of Sustainable Aquatic Ecotourism. Jurnal Teknik Sipil, 15(2), 114–121. https://doi.org/10.28932/jts.v15i2.1962

Susana, T. (2009). Acidity Level (pH) and Dissolved Oxygen as Indicators of Water Quality Around the Cisadane River Estuary. Indonesian Journal of Urban and

Environmental Technology, 5(2), 33–39. https://doi.org/10.25105/urbanenvirotech.v5i2.675

Tungka, A. W.; Haeruddin and Ain, C. (2016). Concentration of Nitrate and Orthophosphate at Banjir Kanal Barat Estuary and their Relationship with the Abundance of Harmful Algae Blooms. Indonesian Journal of Fisheries Science and Technology (IJFST), 12(1), 40–46.

Wicaksono, A.; Jayanthi, O. W.; Efendy, M.; Nuzula, N. I.; Kartika, A. G. D.; Rahmadani, P. A.; Putri, D. S.; Hariyanti, A. and Syaifullah, M. (2024). Distribution of Minerals and Pollution in Marine Waters as Utilization of Quality Raw Salt Water. JST (Jurnal Sains Dan Teknologi), 12(3), 593–602. https://doi.org/10.23887/jstundiksha.v12i3.43780