Water quality monitoring at Kaeng Don Klang, Kalasin Province, to ensure good water quality for the community

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Abstract

This study analyzed the water quality in the Kaeng Don Klang area and assessed its suitability for community use. Water samples were collected from five different locations: the upstream, midstream, downstream, and the mixed area between the midstream and downstream. Physical and chemical parameters of the water were measured, including temperature, dissolved oxygen (DO), electrical conductivity (EC), pH, and salinity. The water temperature ranged from 24.1–28.9 degree, with the highest temperature at the upstream and the lowest in the upstream-midstream mixture. Dissolved oxygen (DO) ranged from 4.69–7.71 *mg/L*, with the highest value at the downstream and the lowest in the midstream-downstream mixture. The electrical conductivity of the water ranged from 153–345 μ*S/cm*, with the highest value in the midstream-downstream mixture and the lowest in the midstream. The pH of the water ranged from 6.06–6.17, which is in the slightly acidic range, with the highest pH in the downstream and the lowest in the upstream. While salinity ranged from 101–345 ppm, with the highest salinity in the midstream and midstream mixing areas and the lowest in the downstream area. The overall water quality assessment revealed that the water quality in the Kaeng Don Klang area was mostly within acceptable limits for community use, especially in the upstream and midstream mixing areas where the water quality was similar to the natural environment. This project is therefore useful in providing basic information about water quality and can be used as a guideline for maintaining and conserving community water resources to ensure good and sustainable quality in the future.

Introduction

Water is a vital natural resource essential for the survival of humans, animals, and plants, and a fundamental factor in various community activities. Poor water quality can negatively impact public health, ecosystems, and the overall quality of life in the community (Department of Pollution Control, 2020). Therefore, monitoring and surveillance of water quality is crucial to ensure safe and sustainable use of water resources (Department of Water Resources, 2021)

Kaeng Don Klang is a large natural water source vital to the community for agriculture, fishing, and daily life. It provides a year-round water source, and the release of fish and freshwater aquatic animals promotes livelihoods and generates income for the community. Furthermore, natural water sources play a vital role in the local ecosystem and biodiversity (Department of Fisheries, 2019). In addition, the Kaeng Don Klang area has been developed into a public park and a venue for important community activities, as well as a place for exercise, relaxation, and natural tourism, aligning with the approach of sustainable water resource utilization for the benefit of the community (Department of Environmental Quality Promotion, 2022).

Kaeng Don Klang plays a key role as a water reservoir and primary water source for the community, necessary for consumption and daily activities. However, continuous human activities and water resource utilization can affect water quality. (World Health Organization, 2017) The researchers therefore questioned the quality of water flowing from Kaeng Don Klang into the community, wondering if it met standards and was suitable for use. This study focused on raising awareness of the importance of water resources and monitoring water quality's impact on health, the environment, and the long-term sustainability of the community. This will serve as a guideline for conserving and utilizing water resources appropriately and sustainably in the future. (Department of Water Resources, 2021)

Objective

1.To assess the water quality in Kaeng Don Klang to determine its suitability as a community water source.

2.To examine the impact of various activities, such as those affecting living organisms or communities, on the water source.

3.To compare water quality between the up stream, midstream, and down stream sections of the river

Expected Benefits

1. The water quality from Kaeng Don Klang that flowing into the community is suitability for domestic, consumption, and agricultural use.

Research methodology

This study on water quality assessment at Kaeng Don Klang, Kalasin Province, aimed to promote good water quality for the local community. The water quality analysis was conducted using collected water samples. The experimental procedures were divided into five sections as follows:

Part 1: Study the water temperature variation in Kaeng Don Klang

1. Collecting water samples from the five sampling points, upstream, upstream–midstream, midstream, midstream–downstream, and downstream, were used for analysis.

2. Use water thermometer to measure the temperature of each water sample.

3 Recorded the measured water temperature values from each sampling point.

4.Compared the result to identify differences in water temperature among the sampling points.

Part 2: Study the Dissolved oxygen (DO) levels of water in Kaeng Don Klang

1. Collecting water samples from the five sampling points, upstream, upstream–midstream, midstream, midstream–downstream, and downstream, were used for analysis.

2. Measure dissolved oxygen levels using a dissolved oxygen (DO) meter.

3. Record the dissolved oxygen (DO) values from each sampling point.

4. Analyze and compare the data to evaluate water quality.

Part 3: Study the electrical conductivity (Ec) of water in Kaeng Don Klang

1. Collecting water samples from the five sampling points, upstream, upstream–midstream, midstream, midstream–downstream, and downstream, were used for analysis.

2. Measure electrical conductivity (EC) by using an electrical conductivity (EC) meter.

3. Record the electrical conductivity (EC) values from each sampling point

4. Compare the results to assess the concentration of dissolved substances in the water.

Part 4: Study the salinity of water in Kaeng Don Klang

1. Collecting water samples from the five sampling points, upstream, upstream–midstream, midstream, midstream–downstream, and downstream, were used for analysis.

2. Measure salinity using a salinity meter.

3. Record the salinity values from each sampling point.

4. Compare and summarize the data to assess water quality in each area.

Part 5: Study the pH levels of water in Kaeng Don Klang

1. Collecting water samples from the five sampling points, upstream, upstream–midstream, midstream, midstream–downstream, and downstream, were used for analysis.

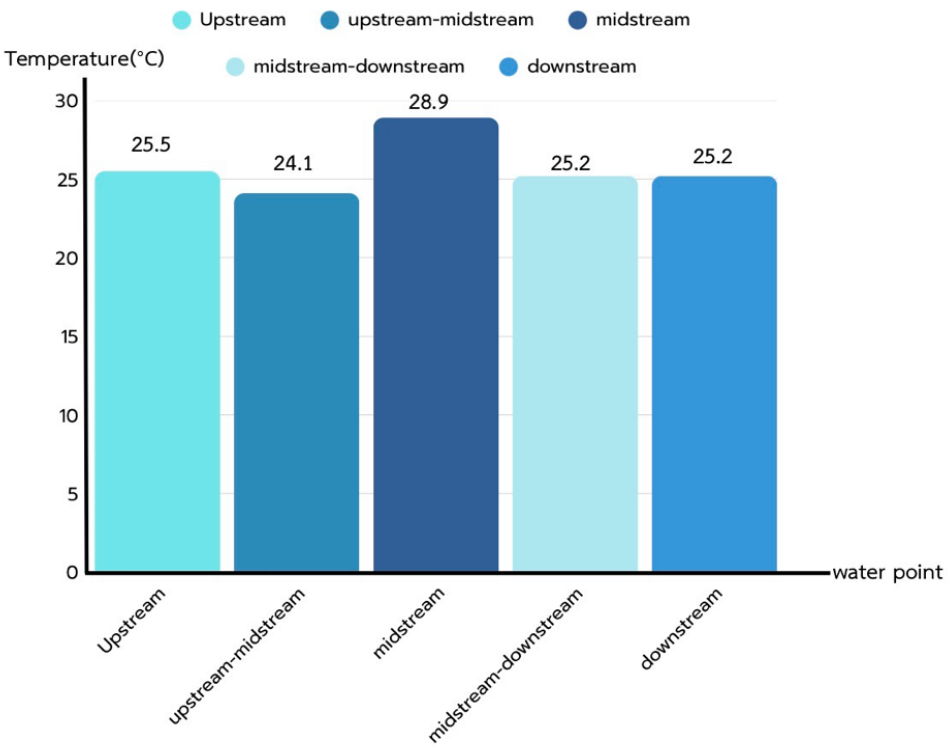
2. Measure pH values using a pH meter.

3. Record the pH values from each sampling point.

4. Analyze the results to evaluate water quality suitability.

Research findings

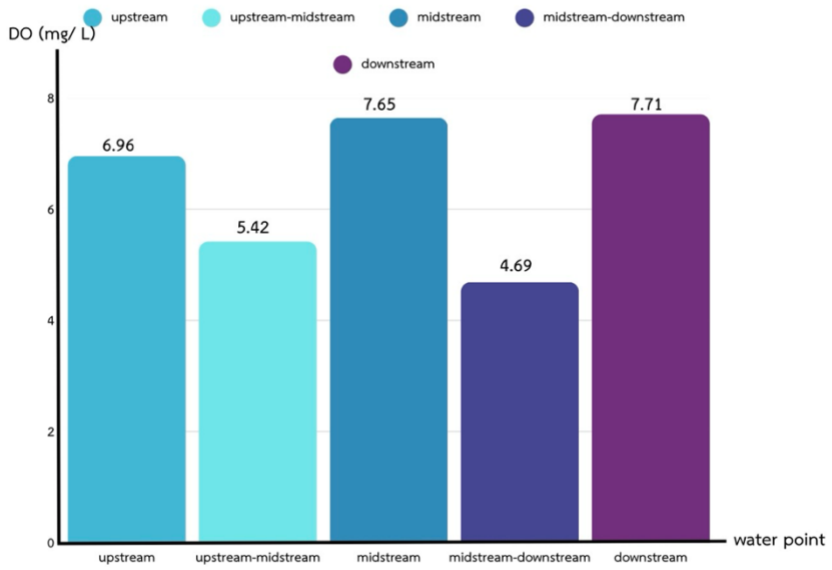
Part 1: Study the water temperature variation in Kaeng Don Klang



The graph shows the water temperatures at various points in the water source, measured using temperature-sensing equipment. The warmest point is in the middle of the waterway, at 28.9 °c, while the coldest point is at the upstream-midstream, at 24.1 °c. The water temperature ranges from 24.1–28.9 °c. The upstream area has lower temperatures due to shade, while the middle and downstream sections receive more sunlight, causing temperatures to rise, which may affect aquatic life.

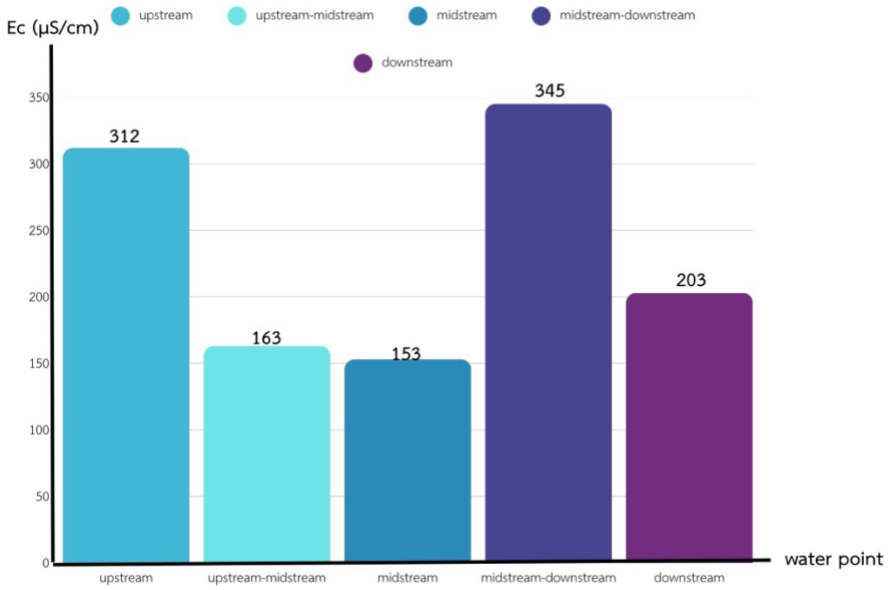
Part 2: Study the Dissolved oxygen (DO) levels of water in Kaeng Don Klang

Dissolved oxygen levels in water are a crucial factor for aquatic life and indicate the quality of a water source. The ideal dissolved oxygen level for life is at least 5-6 mg/L. However, levels below 3 mg/L are harmful to aquatic organisms.



Dissolved oxygen (DO) levels in the water were found to be highest at the upstream area, ranging from 4.69–7.71 mg/L. This indicates relatively good water quality suitable for aquatic life. DO levels decreased in the midstream and downstream areas, with the lowest levels found at the downstream. This may be due to the accumulation of organic matter, community activities, or slower water flow leading to increased oxygen consumption during the decomposition of organic matter. The graph shows the DO values at different points in the water source, measured using appropriate equipment. The highest DO level was at the downstream area (7.71 mg/L), while the lowest was in the midstream-downstream area (4.69 mg/L).

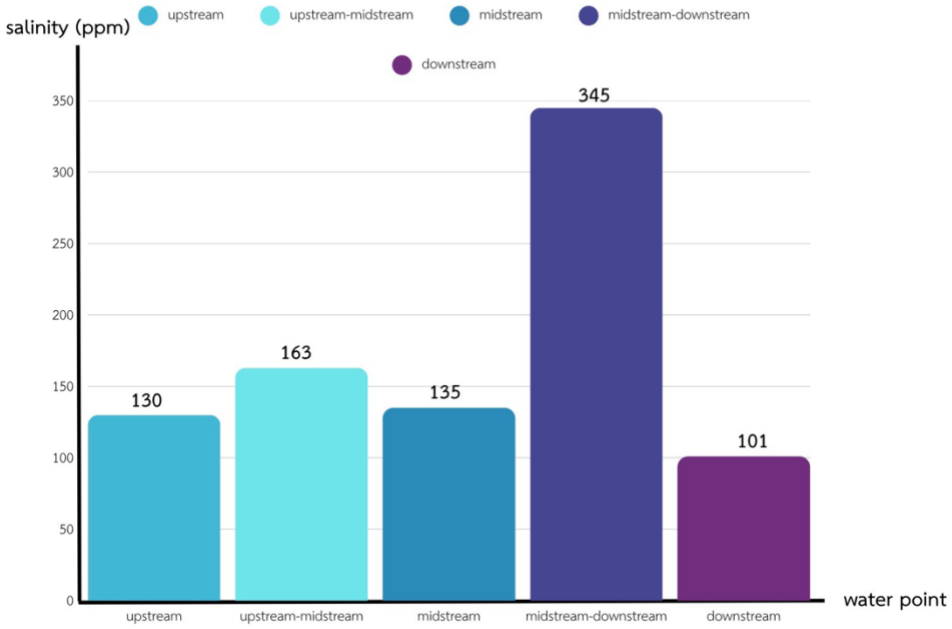
Part 3: Study the electrical conductivity (Ec) of water in Kaeng Don Klang



Electrical conductivity was measured, with values ranging from 153–345 microsiemens per centimeter. The graph shows the electrical conductivity of water at different points using a conductivity measuring device. The point with the highest electrical conductivity is in the midstream-downstream area at 345 µS/cm, and the point with the lowest electrical conductivity is in the middle of the stream at 153 µS/cm.

Part 4: Study the salinity of water in Kaeng Don Klang

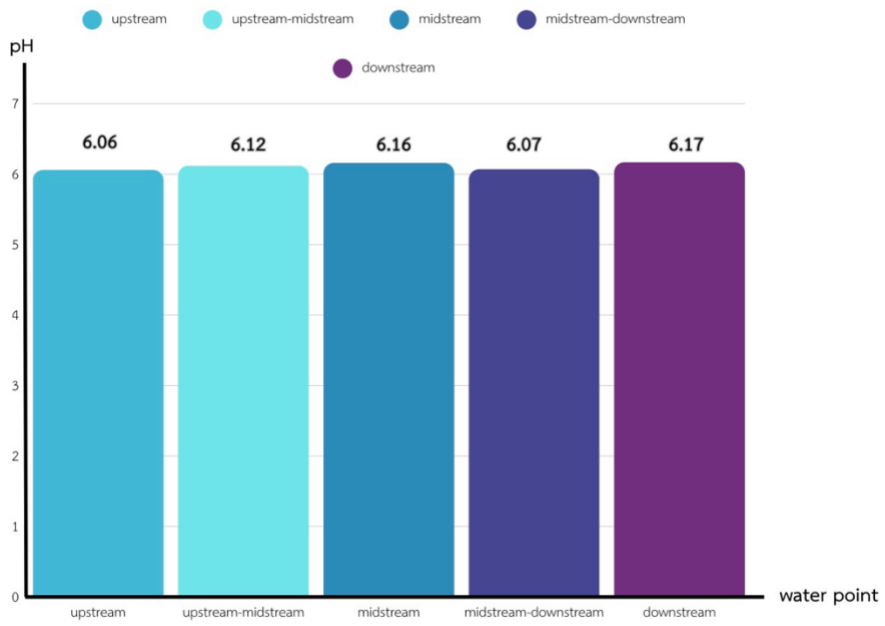
The ideal salinity of water sources depends on their use. Freshwater for consumption should have very low salinity (<0.5 ppt or <500-600 ppm), while water for agriculture should not exceed 1.5 ppt.



The graph shows the salinity of water sources at different locations, measured using salinity testing equipment. Salinity values were found to be higher in the midstream and downstream areas than at the upstream. The salinity ranged from 101–345 parts per million (ppm), with the highest salinity at 345 ppm in the midstream-downstream area and the lowest at 101 ppm in the downstream area.

Part 5: Study the pH levels of water in Kaeng Don Klang

The ideal pH level for drinking and domestic use, according to most standards, is between 6.5- 8.5, classified as neutral to slightly alkaline. This value meets the standard for safe drinking water, eliminating acidity, preventing pipe corrosion, and avoiding adverse effects on health or skin.



The graph showing pH values using a pH meter reveals that the acidity-alkalinity of the water at all points is in a similar range, between 6.06 and 6.17. This range is slightly acidic and within the standard range, indicating that the water is still in balance, neither too acidic nor too alkaline, and suitable for the survival of living organisms. The point with the highest pH is at the water outlet, at 6.17, while the point with the lowest pH is at the water source, at 6.06.

Summary of the operation

Water temperature ranged from 24.1 to 28.9 °C, with lower temperatures upstream due to shading and higher temperatures downstream from direct sunlight. Dissolved oxygen (DO) was highest upstream (4.69–7.71 mg/L) and decreased toward downstream areas, likely due to organic matter accumulation and slower water flow. Electrical conductivity (153–345 µS/cm) and salinity (101–345 ppm) were higher in midstream and downstream sections, indicating increased dissolved substances from surrounding activities, but remained within safe levels. pH values ranged from 6.06 to 6.17, showing slightly acidic conditions suitable for aquatic life

Discussion

The study of water quality in the Kaeng Don Klang area aimed to assess the suitability of water for community use. Water samples were collected from five points: upstream, midstream, downstream, and the mixing area between the midstream and downstream. Physical and chemical properties of the water, including temperature, dissolved oxygen (DO), electrical conductivity (EC), pH, and salinity, were measured. The results showed that water temperature ranged from 24.1–28.9 degrees Celsius; dissolved oxygen ranged from 4.69–7.71 milligrams per liter; electrical conductivity ranged from 153–345 microsiemens per centimeter; pH ranged from 6.06–6.17, classified as slightly acidic; and salinity ranged from 101–345 parts per million. Overall, the water quality in the Kaeng Don Klang area was deemed suitable for community use. The study found slight differences in water quality at each point, which may be due to environmental conditions, topography, and human activities in the vicinity. The upstream and mixing area had water quality close to natural conditions, resulting in suitable parameters. The midstream and downstream areas showed significant changes in electrical conductivity, dissolved oxygen, and salinity. This may reflect the accumulation of dissolved substances or the effects of water flow. However, the overall water quality values do not exceed the standards that affect community use.

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