

# Water Quality Investigation with GIS Map Illustration of Water Quality using IDW method in Huay Had Sai Waterfall and Nong Nam Khiao Reservoir, Chonburi

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Thanakron Preesong\*

Princess Chulabhorn Science High School Chonburi, Thailand

\*6606189@pccchon.ac.th

## Introduction

Currently, the world is experiencing a shortage of water quality and a scarcity of available water resources with the demand for water. It is a result of many factors, such as the rate of population growth in an increasing direction. Deforestation for housing and agricultural land (LESA, 2016) contributes significantly to this issue. Good quality water is encroached upon by wastewater from industry (National Disaster Warning Center [NHDC], 2021). etc.

Khao Kheow-Khao Chomphu Wildlife Sanctuary, located in the area of Ban Bueng, covers a total area of 35,746 acres. It stands as the sole remaining wildlife sanctuary in Chonburi province. The diversity of wildlife and the abundance of natural resources are high.

Huai Hat Sai Waterfall is one of the waterfalls in Khao Kheow-Khao Chomphu Wildlife Sanctuary. It is an upstream source of water that nourishes streams such as Nong Nam Khiao Reservoir and Nong Nam Khiao Canal, helping to provide moisture to nearby areas and helping alleviate flooding in another way. It is also a source of natural learning.

## Purpose

The purpose of this study was to compare the water quality between the upstream point of Huai Hat Sai Waterfall and the downstream point of Nong Nam Khiao Reservoir in Chonburi.

## Hypothesis

The water quality at the upstream source has been better than water quality at the downstream area.

## Research Methodology

1. The first step was to determine four water sampling points from both the Nong Nam Khiao Reservoir and Huai Hat Sai Waterfall.
2. The second step involved collecting water samples and conducting water quality tests. This step comprised two parts: Firstly, assessing the quality on-site using a Multiparameter water quality instrument, followed by sending samples to the laboratory for further testing.
3. The third step involved the collection of field or environmental data for the study.
4. Calculate water quality from data using CCME WQI calculation under the standards of the Ministry of Natural Resources and Environment, Thailand.

$$CCME\ WQI_w = 100 - \left( \frac{\sqrt{F_1^2 + F_2^2 + F_3^2}}{1.732} \right)$$

$F_1 =$  Scope,  $F_2 =$  Frequency,  $F_3 =$  Amplitude

5. The final step involved creating a water quality map using the Inverse Distance Weighting method in ArcGIS.

## Result and Analysis

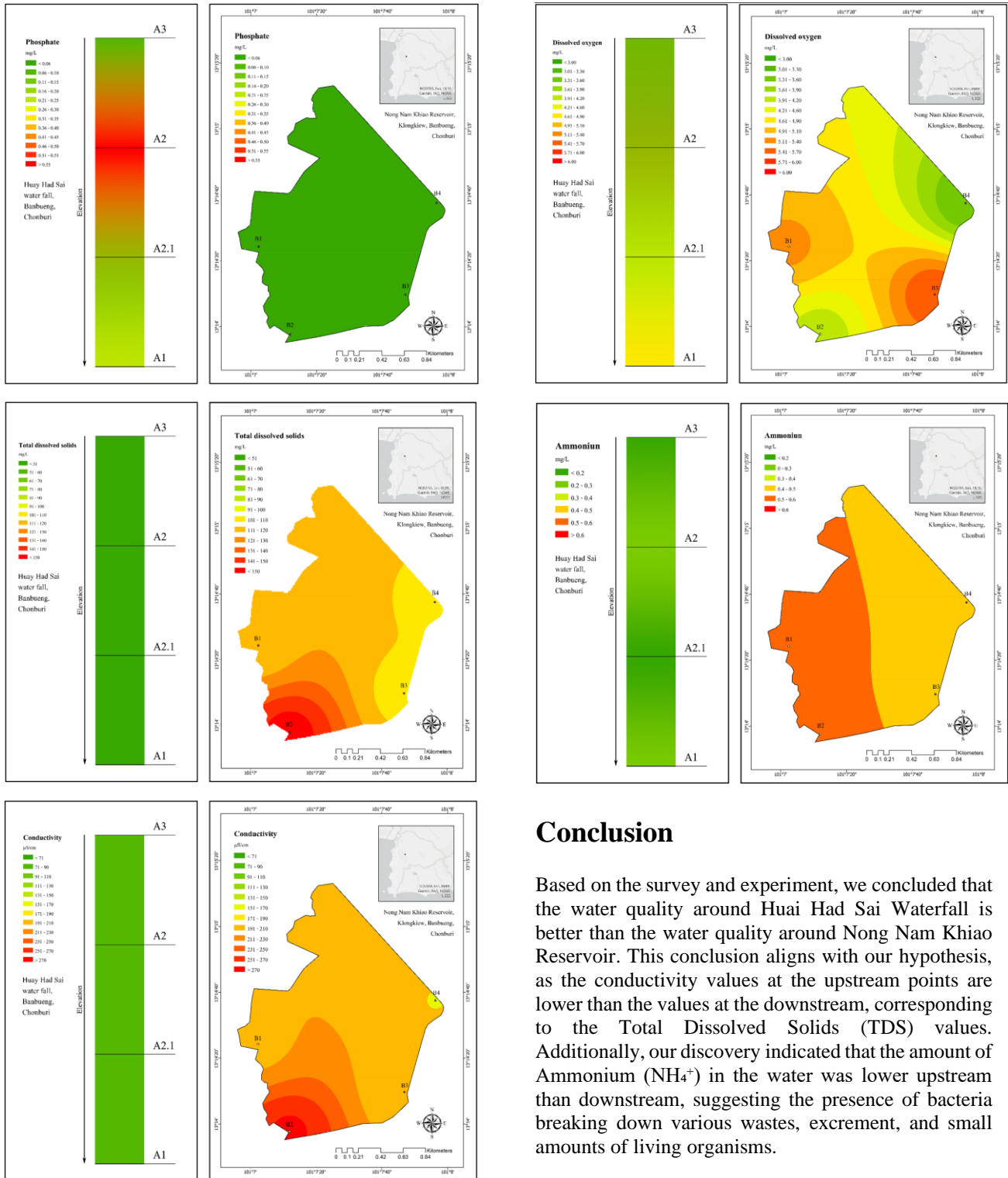
When we have water quality data, we present the data in a table and analyze it using the Inverse Distance Weighting method to create a water quality map in a Geographic Information System using ArcGIS.

\*Result at 12 July 2023

parameter	Unit	Huai Hat Sai				Kheow-Khao Chomphu			
		A1	A2	A2.1	A3	B1	B2	B3	B4
Temperature	degree Celsius	26.7	26.3	26.6	26.4	34	32.8	34.7	32.3
pH	-	6.78	6.47	6.22	6.09	7.64	6.99	7.98	7.11
Dissolved oxygen	mg/L.	4.8	3.79	4.11	3.33	5.18	4.02	5.7	3.32
Ammonium	mg/L.	0.2	0.2	<0.2	<0.2	0.6	0.6	0.4	0.4
Ammonia	mg/L.	-	-	-	-	-	-	-	-
Nitrate Nitrite	mg/L.	ND.	ND.	ND.	ND.	ND.	ND.	ND.	ND.
Phosphate	mg/L.	0.025	0.6	0.16	0.03	0.025	0.042	0.03	0.025

parameter	Unit	Huai Hat Sai				Kheow-Khao Chomphu			
		A1	A2	A2.1	A3	B1	B2	B3	B4
Conductivity	µS/cm	80.5	78.5	79.6	74.0	202	274.9	191.9	189.8
TDS	mg/L.	50.70	49.40	50.70	41.60	111.80	155.35	105.30	107.90
<b>CCME WQI</b>		<b>91.85</b>				<b>90.69</b>			

Note: “ND.” means not detected.  
“-” means the value cannot be found.

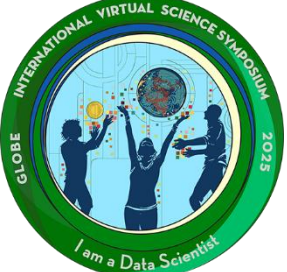



## Conclusion

Based on the survey and experiment, we concluded that the water quality around Huai Had Sai Waterfall is better than the water quality around Nong Nam Khiao Reservoir. This conclusion aligns with our hypothesis, as the conductivity values at the upstream points are lower than the values at the downstream, corresponding to the Total Dissolved Solids (TDS) values. Additionally, our discovery indicated that the amount of Ammonium ( $\text{NH}_4^+$ ) in the water was lower upstream than downstream, suggesting the presence of bacteria breaking down various wastes, excrement, and small amounts of living organisms.

## References

LESA. (2559). การเพิ่มขึ้นของจำนวนประชากรโลก.  
<http://www.lesa.biz/earth/global-change/world-population>

Badge	Description
	<ul style="list-style-type: none"> <li>- Looking for data representation for analysis and estimation in unexplored areas using the spatial IDW method.</li> <li>- Identifying data representation from different units using the CCME WQI water quality standard.</li> <li>- Presenting data in the form of bar charts and surface plots of the study area.</li> </ul>
	<ul style="list-style-type: none"> <li>- Consulted with professors at Burapha University, Thailand, who specialize in forestry, to improve the sampling process.</li> <li>- Consulted with professors at Chulalongkorn University, Thailand, who specialize in geology, for GIS work and geological studies of the sampling sites.</li> <li>- Consulted with teachers from different schools who provided guidance on using GIS data and its applications.</li> </ul>