

HYDROLOGICAL FORENSIC INVESTIGATION COMBINING HIERARCHICAL CLUSTER ANALYSIS: A CASE STUDY OF 16TH LUM NAM JONE RESERVOIR, CHACHOENGSAO, THAILAND

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Study Area

16th Lum Nam Jone Reservoir

- 1.97 million cubic meters freshwater reservoir
- located 500 meters north of 304 Industrial
 Park in Chachoengsao province
- complaints regarding water quality since 2019
- pH 2.5-3.5
- EC \approx 1,400 $\mu\text{S/cm}$
- contaminated by heavy metals : Fe, Mn, Cu, Zn





-• Study area (16th Lum Nam Jone Reservoir, Chachoengsao, Thailand)

Objectives

To identify the source of contamination and contamination transport pathway

Challenging

- multiple contamination events
- mixing of many contamination sources
- adsorption on clay mineral
- co-precipitation of minerals
- heterogeneous lithological distribution



Methodology

02 Field Site Investigation

Geology and geophysical survey

01 Data collection

Land use, Topography

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Methodology

01



Hydrogeological Investigation

Lithological logging, Monitoring well installation, Groundwater Sampling, Water level measurement



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04 Data Interpretation

Hydrogeochemical data, Groundwater flow direction, Hierarchical cluster analysis



Result

2 D Resistivity

Resistivity



Hypothesis: low pH area or high EC -> low resistivity



hydrogeological conceptual model (AA' line)



Hydrogeochemistry

parameter	concentration in contaminated	Maximum Acceptable
	area	Concentration
	(mg/L)	(mg/L)
Fe	7- 3,327	1
Mn	1-803	0.5
Cu	2-500	1.5
Zn	10-340	15
Cl	336 - 14,955	600
SO ₄	276 – 7,938	250



Mn



276 – 7,938

SO₄



HEN N

Fe



Hierachical cluster analysis

517400



10

BH05

MVV10 MW09

BH21

15

Group 1.1

20

Data set : Groundwater samples and water sample from Lum Nam Jone Reservoir Subset : Fe, Mn, Cu and Zn Ward's method and Euclidean distance measure



THANK YOU