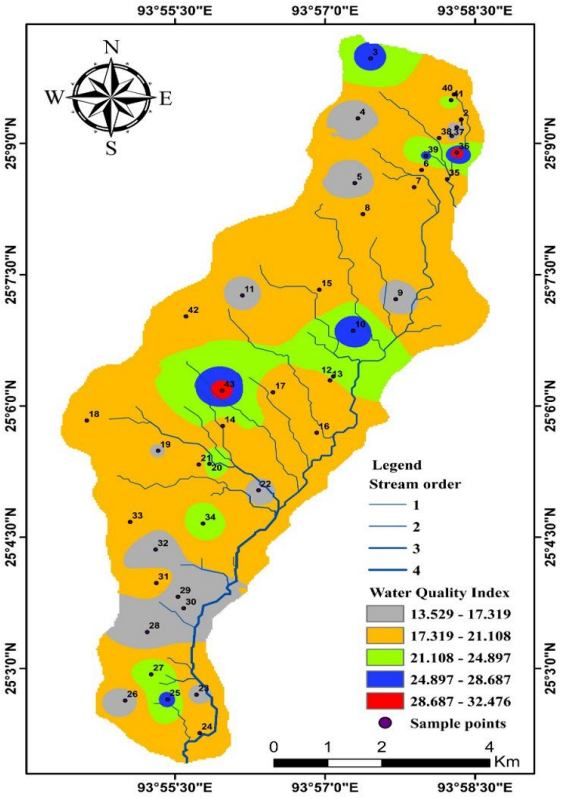
Goldschmidt 2025 Abstract
https://doi.org/10.7185/gold2025.25229

Sustainable evaluation and non-carcinogenic health assessment of spring and open well water in Kangpokpi hill district, Manipur, India.

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Due to less development and accessibility, tough terrain, and poor water management systems in hilly region, it becomes a big challenge for settlers to have potable water, especially during monsoon and summer. This investigation provides first-window data details on the hydrogeochemistry of the Kangpokpi watershed a hill district in Manipur state. A total of 43 spring and open wells water samples were collected from a defined Kangpokpi watershed. The methods and plots used to understand hydrochemistry are the Water Quality Index, Inverse Distance Weight (GIS), Piper, Gibbs, Durov, Wilcox diagrams, Health quotient, and numerical analysis. NO_3^- a widely used fertilizer in terrace cultivation, is considered for validating non-carcinogenic risk for different age group ranges using WHO and BIS standards. The most and least dominant anions and cations are HCO_3^- (62.13%), F^-(0.28%); Ca^{+2}(44.33%), K^+(6.27%) respectively. Piper's diagram shows the predominant Ca-HCO3 type of water, while Gibbs' plot explains the rock-dominant condition of the environment. As per Durov's classification, the hydrogeochemistry ions source are from mixing reactions of various origins. All the samples value falls below WQI<50, which categorizes the excellent water quality of the study area. NO_3^- Health Quotient value is <1 in all age groups, though infants and children are concerned as their HQ values are close to 1, which is a future risk for cancer. Northeast states are prone to frequent landslides, mudflows, and small-scale earthquakes, which trigger extreme life for people. Therefore, the findings suggest it is the right time to preserve the ground and surface water, preserve nature from increasing population, clearing forests, and climate change in recent times.



Quality Index	Range	Unit	References	Class	No. of samples	Percentage contribution (%)
WQI	<50	value	Brown et al.1970	Excellent water	43	100.00
	50.00 -100			Good water	--	
	100.01-200			Poor water	--	
	200.01-300			Very poor water	--	
	>300			Unfit for drinking	--	
Health Quotient (Nitrate)	>1	Infant	USEPA, 2004	No risk	43	100.00
	<1	Infant		Non-carcinogenic risk	---	
	>1	Child		No risk	43	100.00
	<1	Child		Non-carcinogenic risk	---	
	>1	Adult		No risk	43	100.00
	<1	Adult		Non-carcinogenic risk	---	
SAR	<10	meq/L	Richard, 1954	Excellent	43	100.00
	10-18			Good	--	
	18-26			Doubtful	--	
	>26			Unsuitable	--	
PI	>75	%	Doneen, 1962	Excellent	11	25.58
	25-75			Good	32	74.42
	<25			Poor	--	--
RSC	<1.25	meq/L	Eaton E M, 1950	Good	43	100.00
	1.25-2.50			Doubtful	--	
	>2.50			Unsuitable	--	