Assessing Healthcare Liquid Waste Management of Hospitals in Kathmandu Valley, Nepal

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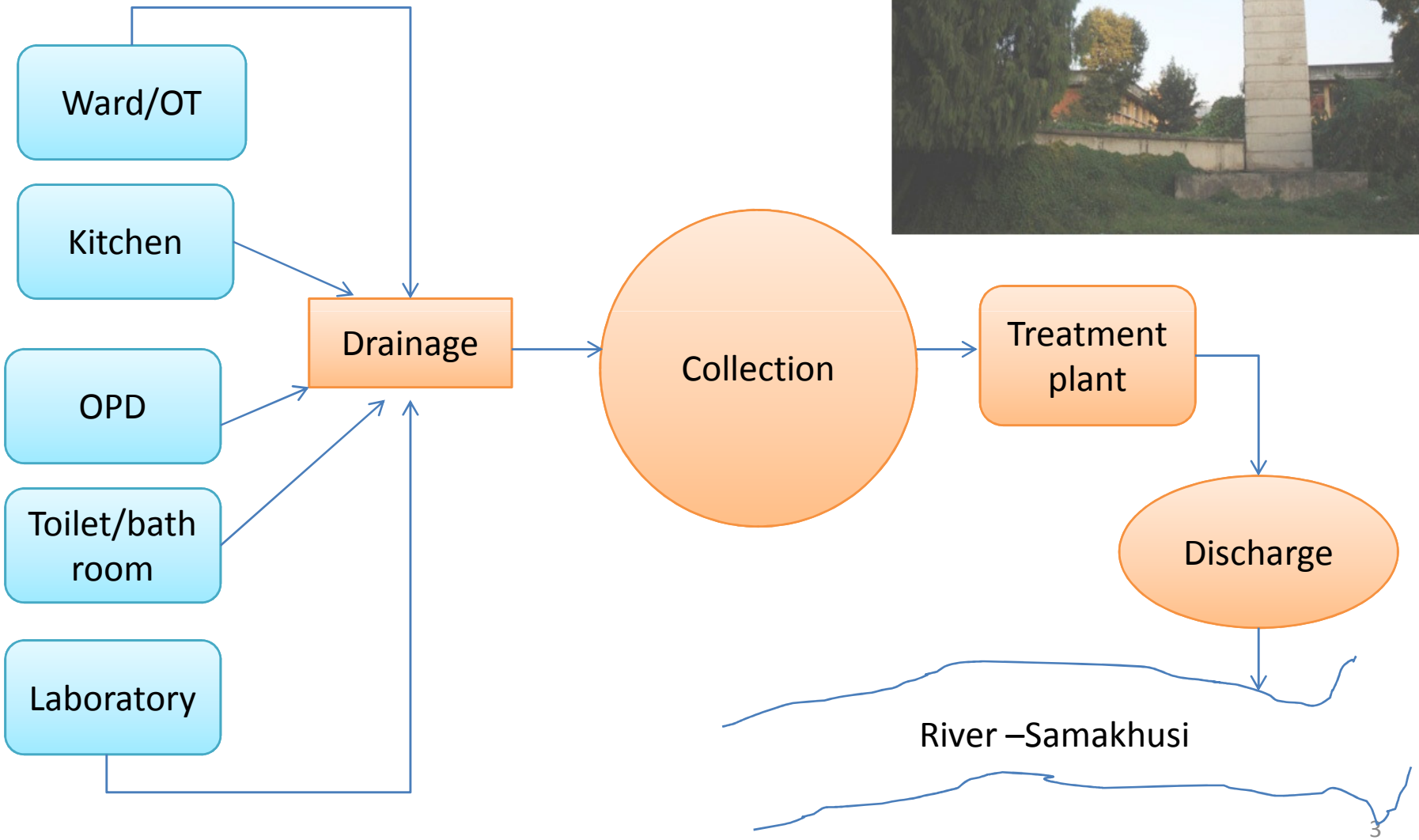
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Introduction

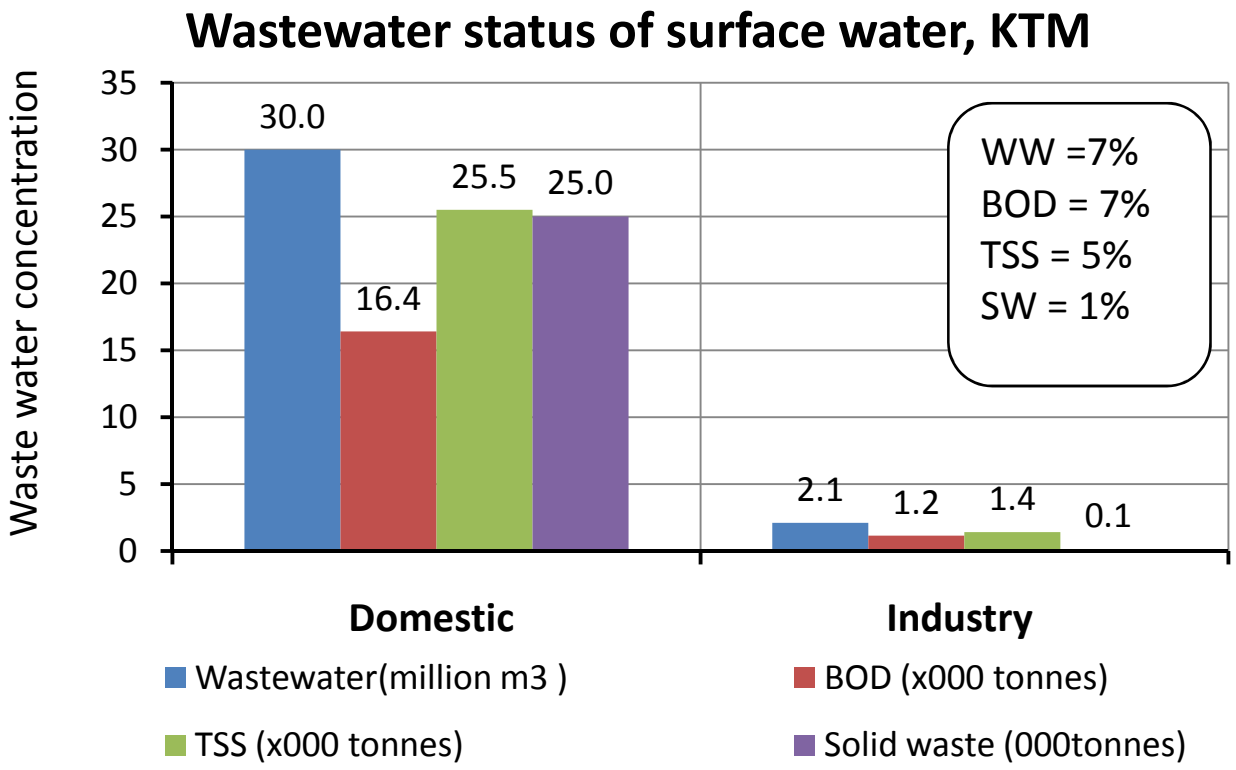
- Nepal got EPA in 1996 and since then all industries and hospitals must have approvals of EIA/IEE
- Hospitals being built before EPA 1996 required to comply with EIA/IEE within the stipulated time – 10 years
- About 95% water used in the hospitals being released as healthcare untreated liquid waste into the rivers, of which 20% hazardous

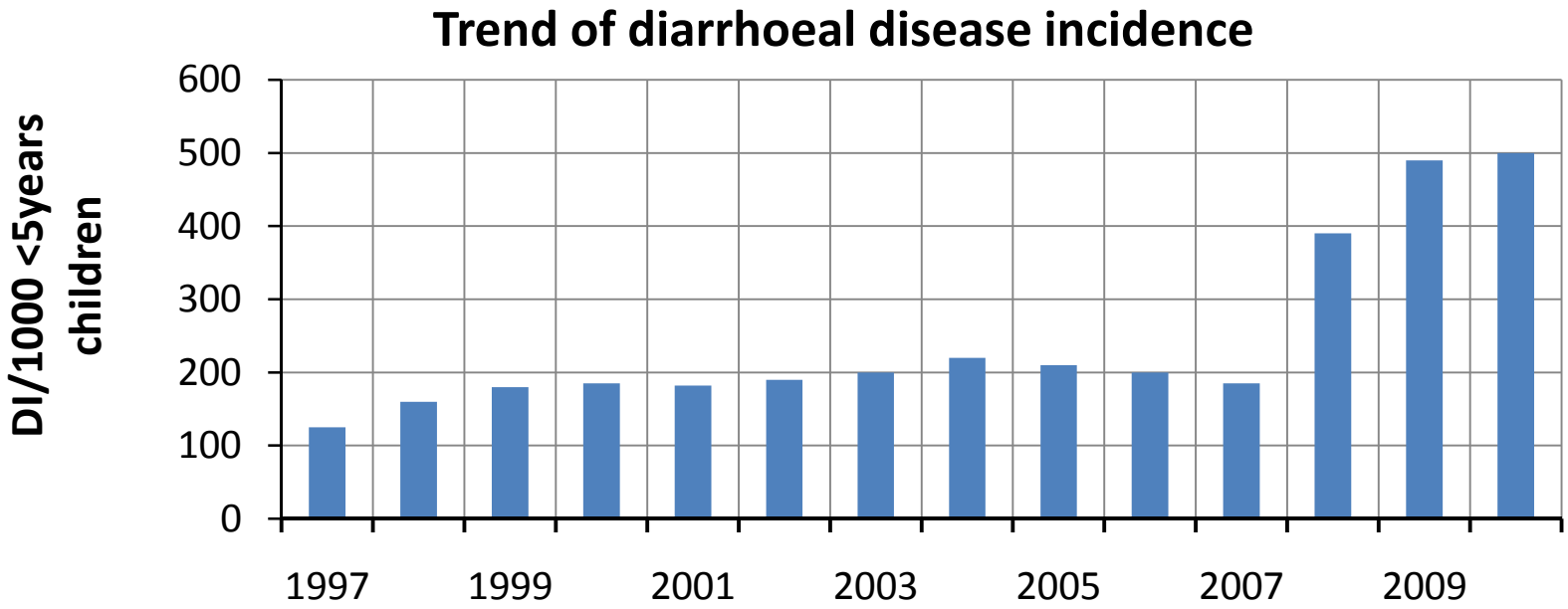
Low priority to HCLW- as only one hospital TUTH but not functioning





- People residing nearby the rivers have to use the river water for different domestic activities
- Total waste water – HCLW contribution 1%; Industrial wastewater = (6+1)%





- MDR bacteria – 100% effluent samples from hospitals
- Resistance of antibiotics including penicillin, various generations of
  Cephalosporin, Cotrimoxazole, Gentamycin and Quinolones
- about one third of deaths of under-five children due to water borne diseases such as cholera, typhoid fever, dysentery and gastro-enteritis

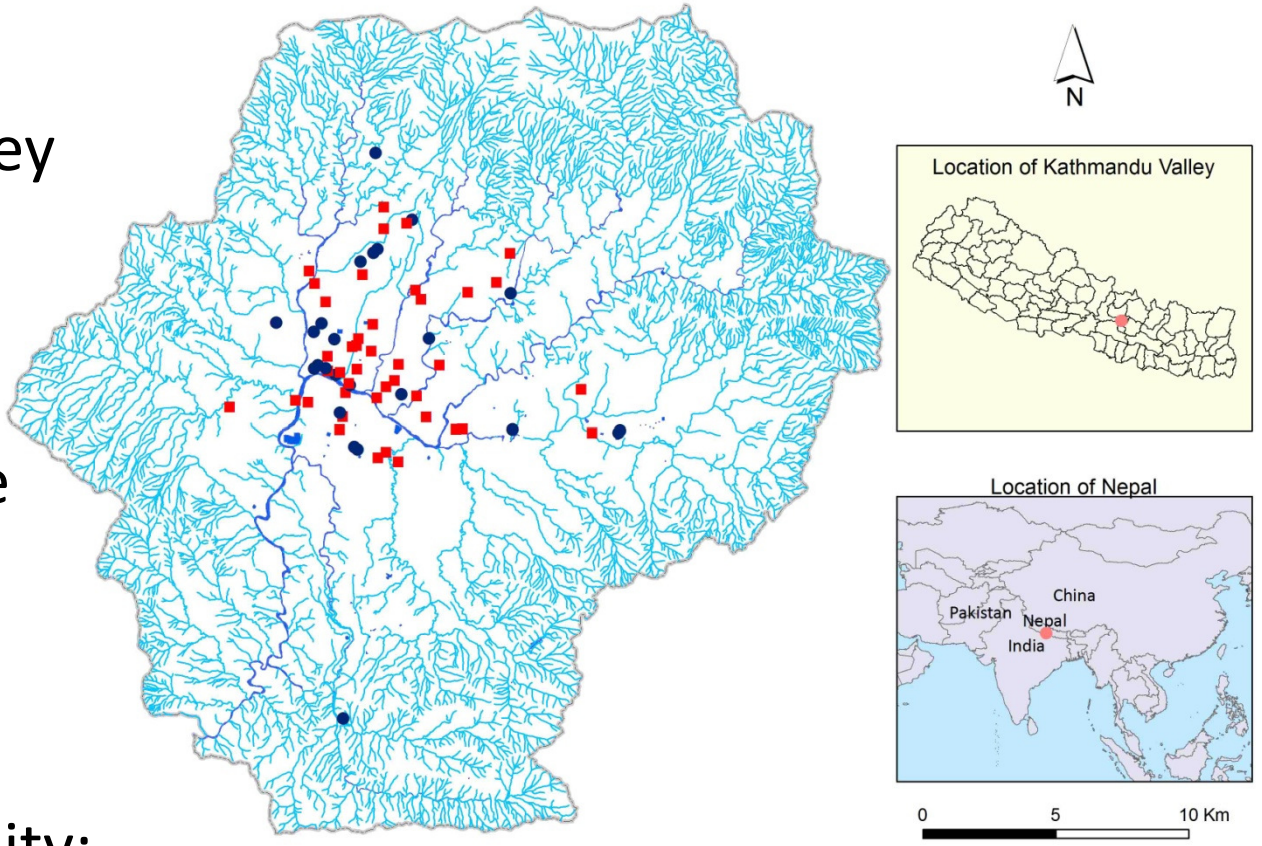
Objectives

- Analyze hospital liquid waste management practices and their possible impacts on the people, based in Kathmandu valley – the capital city

Research Design

Study area:

- Kathmandu Valley area: 570 km^2 comprises rural parts of three districts and five municipalities
- About 2 million population
- Population density: >3500/ km^2



Data Acquired

- Identified and located the hospitals (public and private) >50 beds within KTM and chosen 18 hospitals
- Observed HCLWM practice through observation protocol
- Laboratory analysis
  - Collected effluent samples
  - All chemical parameters including BOD and COD & bacteriological analysis, based on Standard Method (APHA 2000)

Findings

General characteristics of hospitals

H-type	H-bed (mean)	Total Staff (m)	Staff WM (%)	Staff LW
Private	96	200	15	No
Public	364	692	21	No

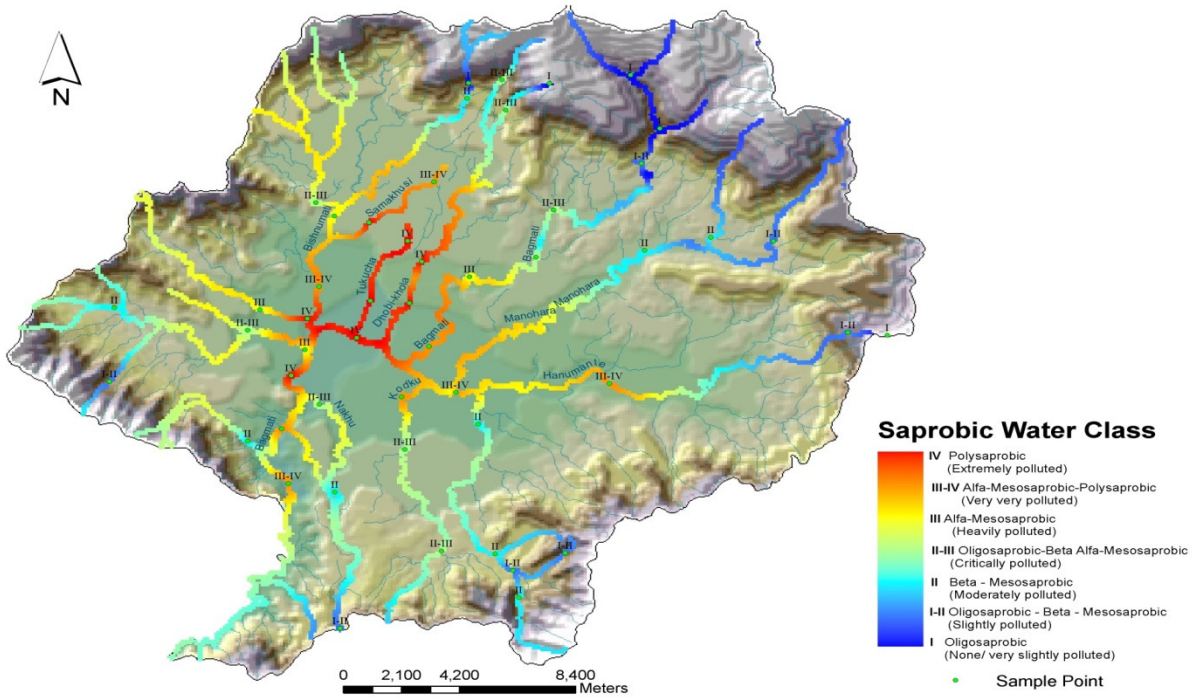
Note: H =hospital, WM – waste management, LW =liquid waste

Findings (contd.)

Waste Management Status

Hospital type	WM policy/ guideline		EIA /I EE approval		Total
	Yes	No	Yes	No	Number
Private	3 (33)	6 (66)	3	3*+3	9
Public	4 (44)	5 (55)	1	8	9

Note: *ToR approved for IEE study of the hospital



Water used and wastewater generated and treatment plants status by hospitals types

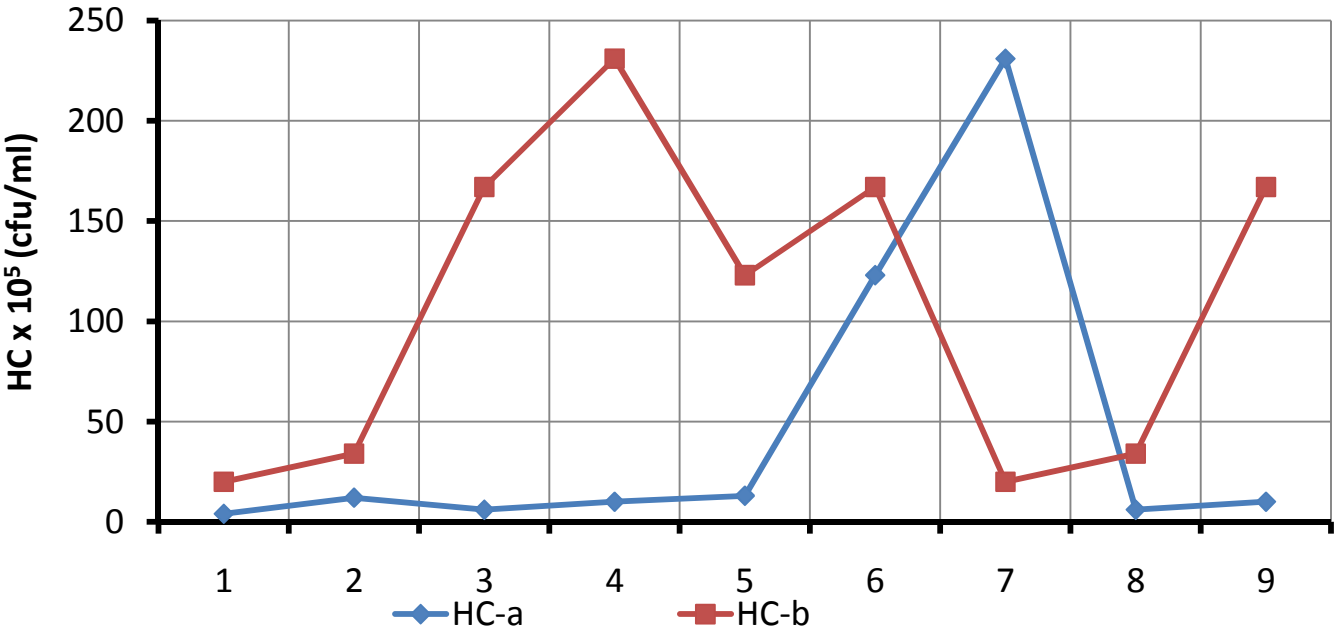
H type	Water used (l/day m3)	HCLW /day (m3)	LWTP		Total
			Yes	No	
Private	38.5	34.6	0	5*+4	9
Public	112.1	100.9	1	2*+ 6	9
Total	151.6	136.5	1 (6)	17 (94)	18

* Primary treatment





Heterotrophic counts from the Hospital Effluent

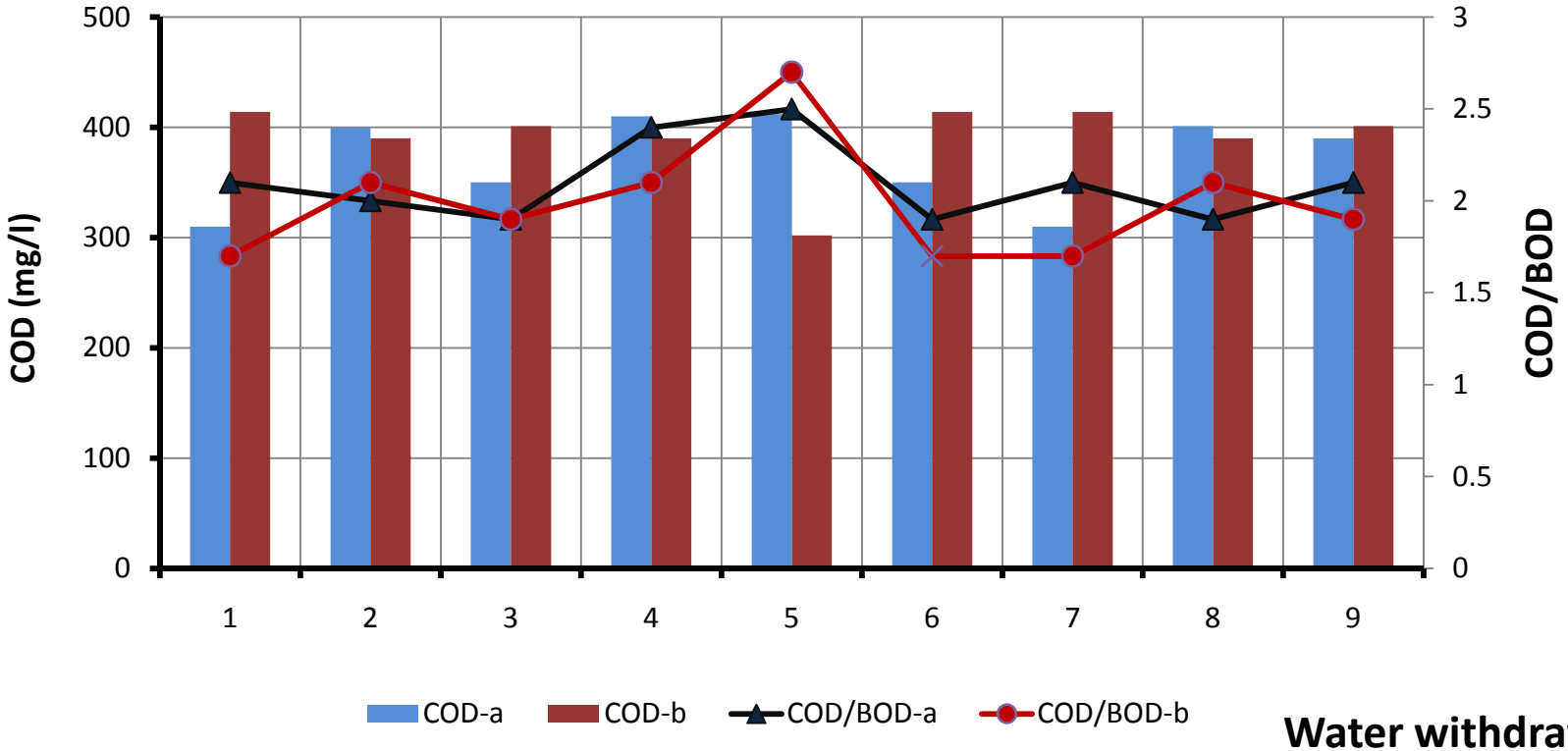




Parameter	p value
H count (cfu/ml)	0.04



Pollutant load in the Effluent of Public and Private Hospitals



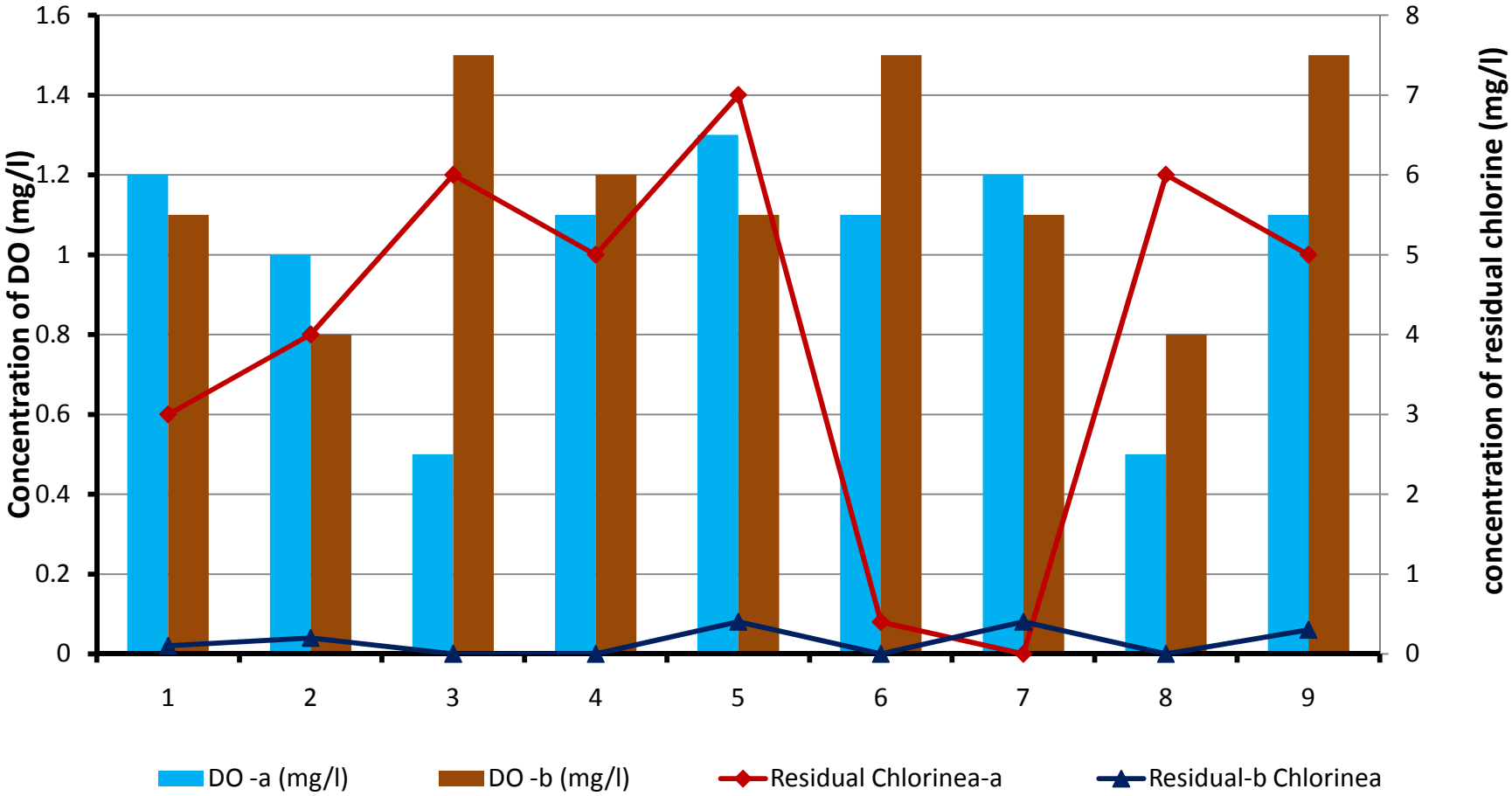
Parameter	p value
COD (mg/l)	0.2
COD/BOD	0.5

Direct discharge of HCLWW

Water withdrawal for DW

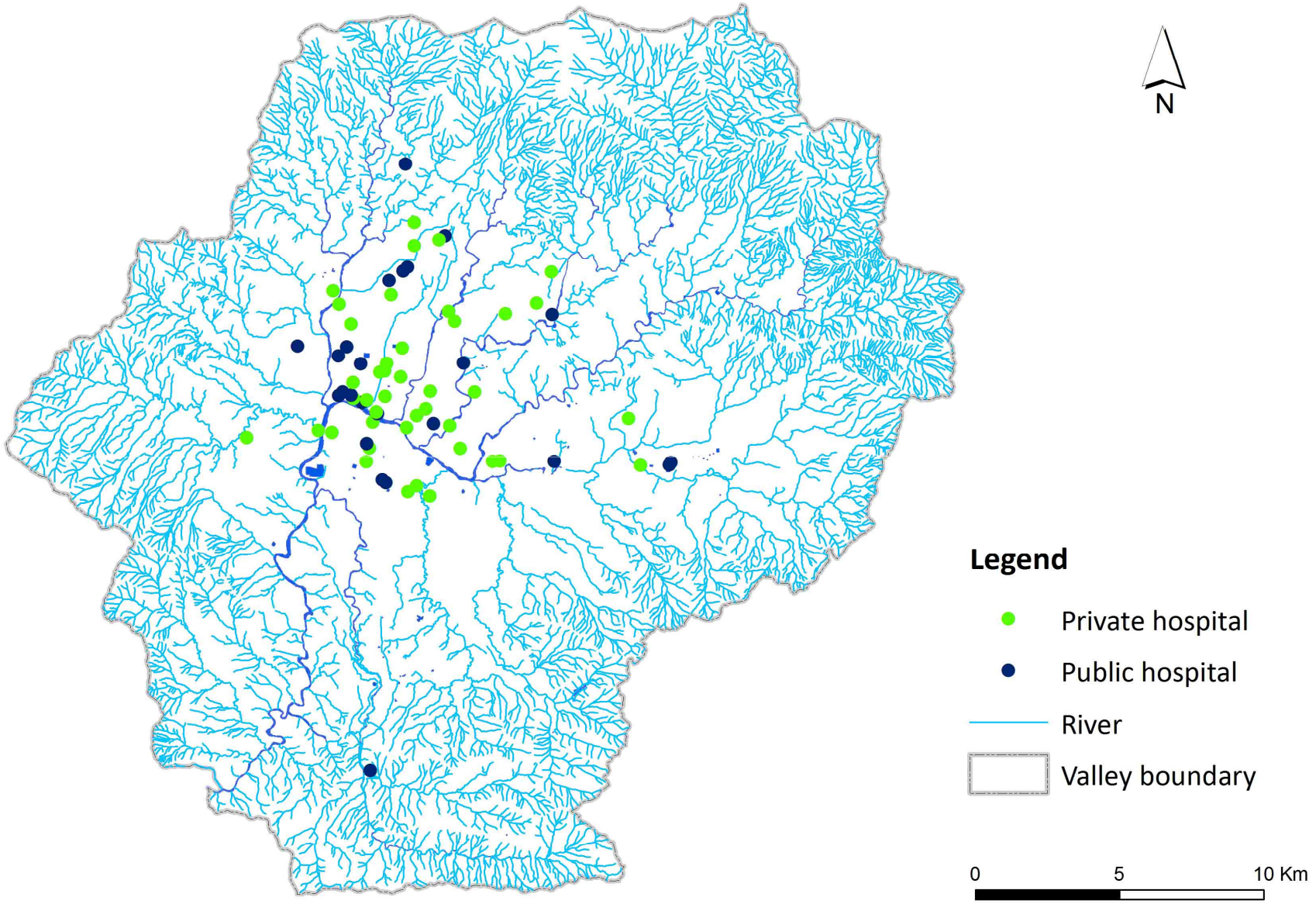


R-Chlorine and DO status in public and private hospitals

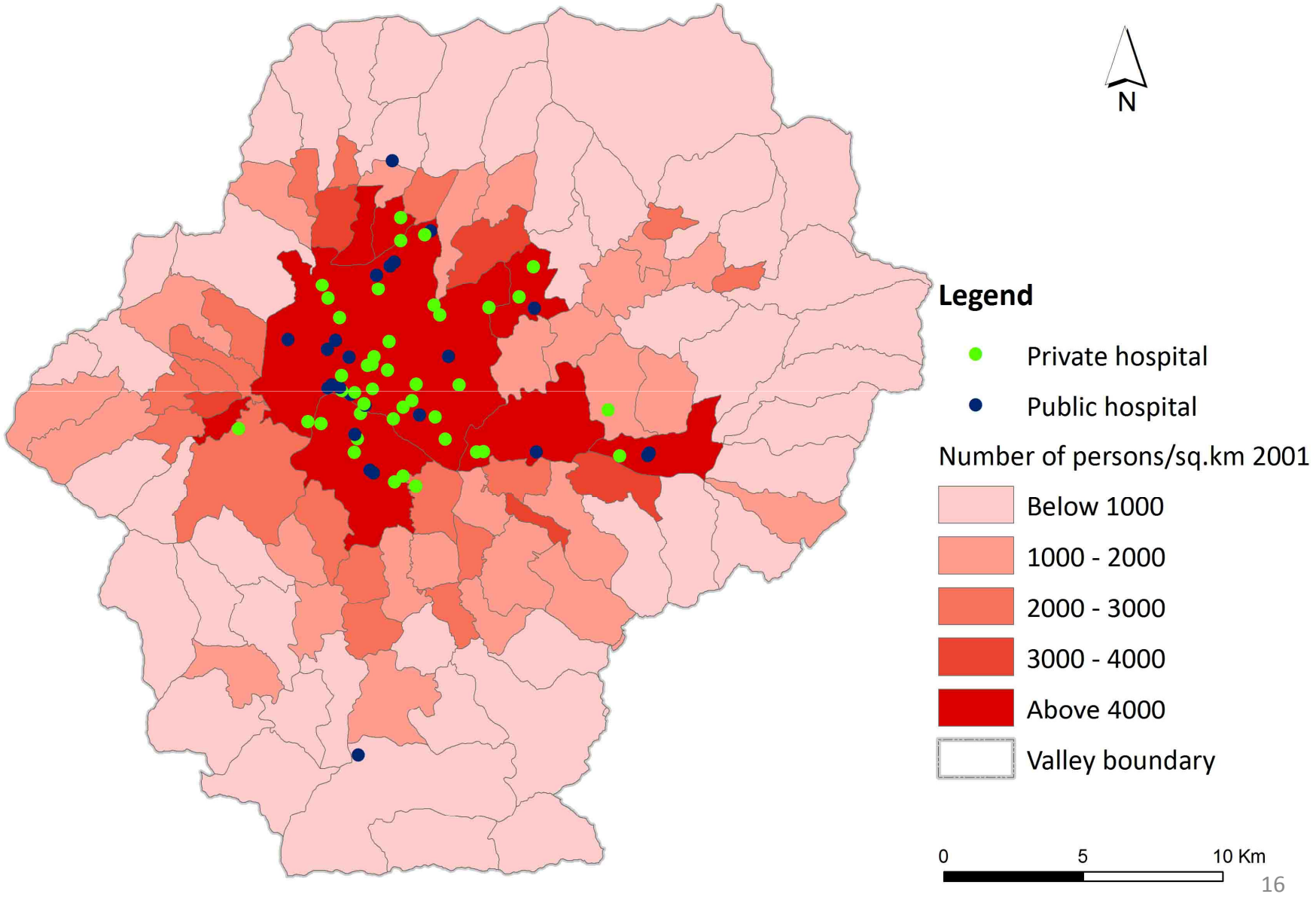


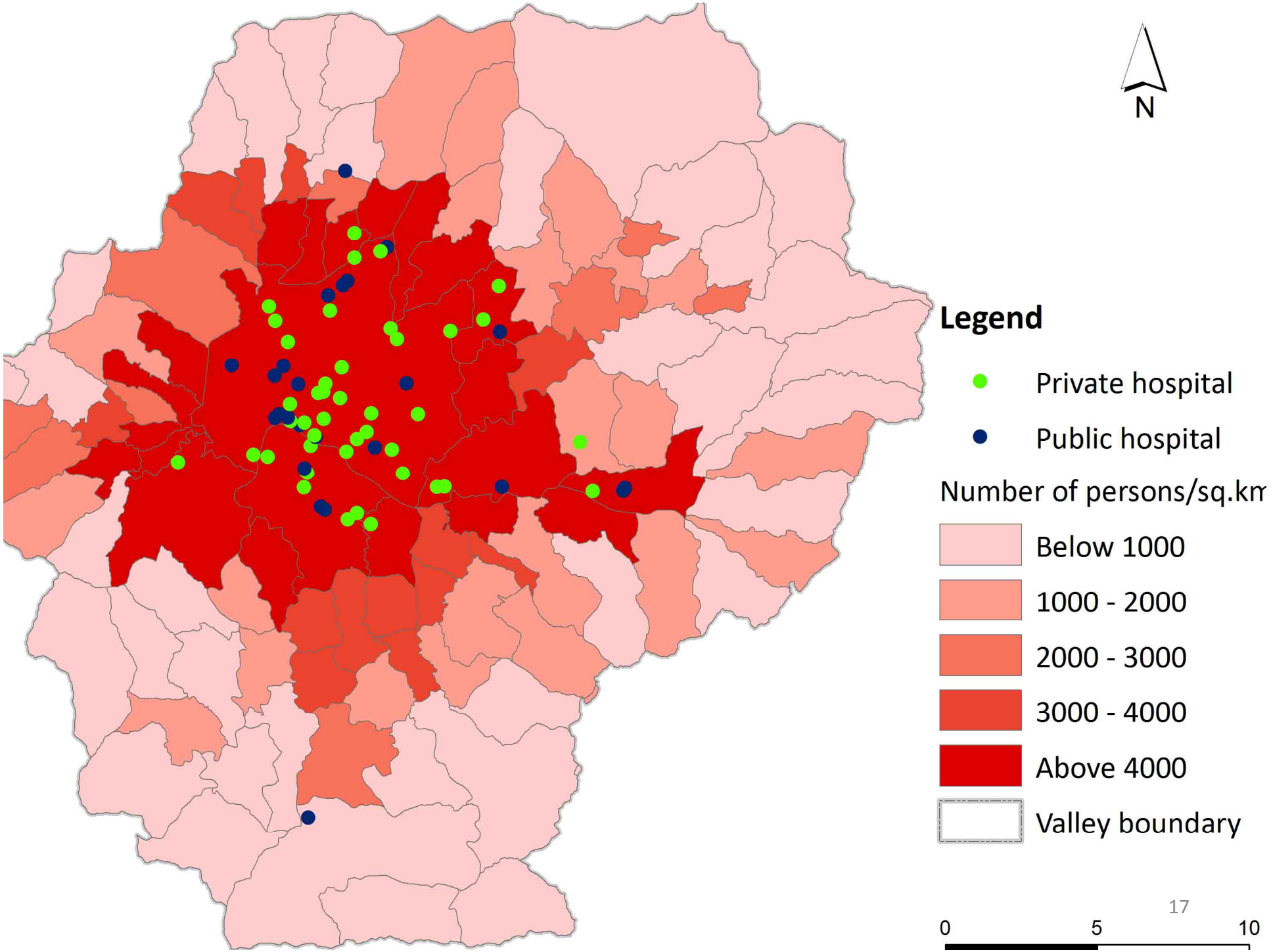
Parameter	p value
DO (mg/l)	0.2
R-Cl (mg/l)	0.02

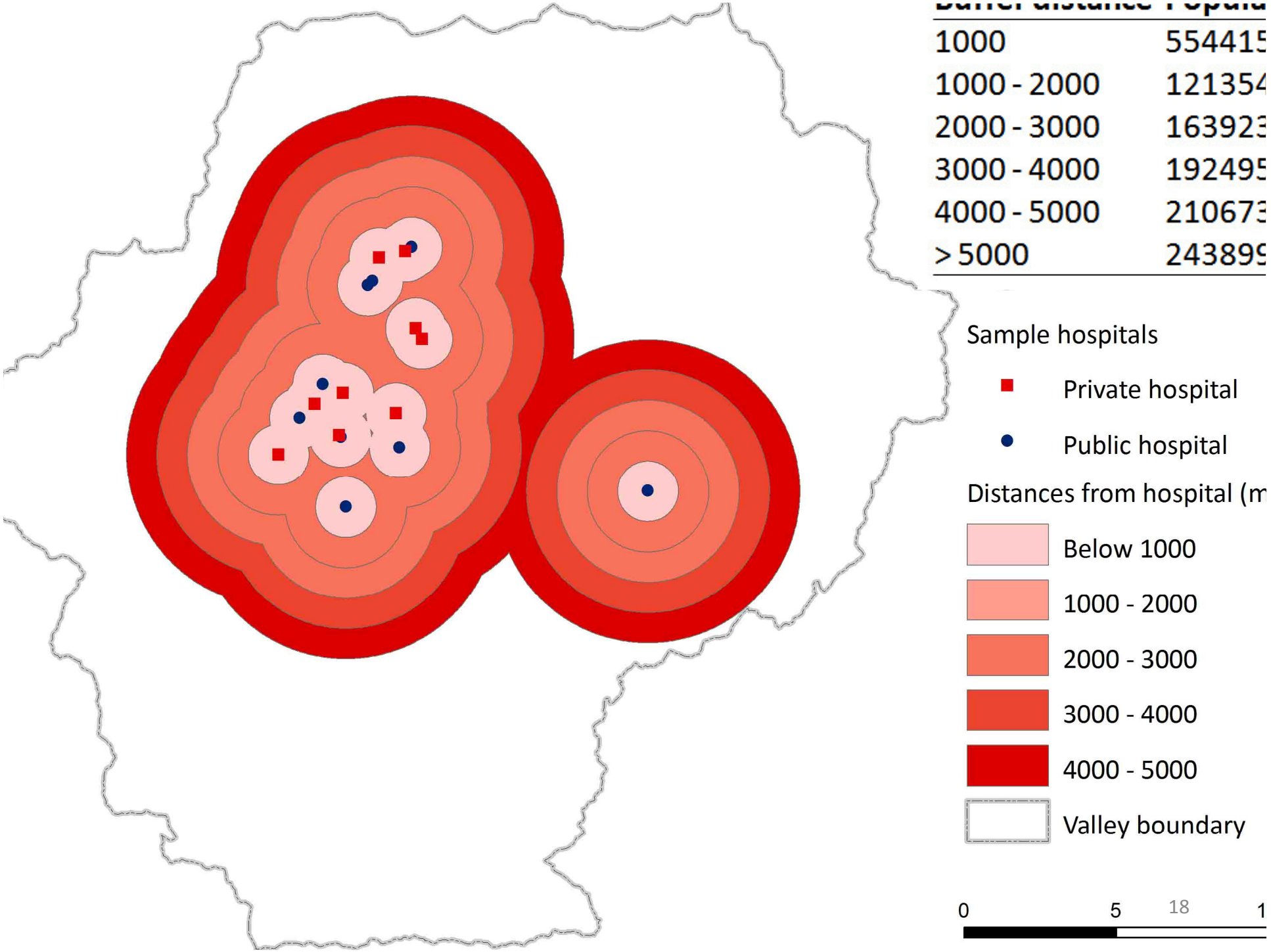
Potential health hazard



Potential health hazard spatial analysis




N
Legend
Private hospital
Public hospital
Number of persons/sq.km
Below 1000
1000 - 2000
2000 - 3000
3000 - 4000
Above 4000
Valley boundary
0
5
10


1000 554415
1000 - 2000 121354
2000 - 3000 163923
3000 - 4000 192495
4000 - 5000 210673
> 5000 243899
Sample hospitals
Private hospital
Public hospital
Distances from hospital (m
Below 1000
1000 - 2000
2000 - 3000
3000 - 4000
4000 - 5000
Valley boundary
0
5
18
1

Conclusions

- Direct discharge into nearby river
- Bacteriological load in the HCLW higher in public hospitals than in private hospital
- Weak monitoring of EIA /IEE of hospitals
- Use of river water for different purposes – lack of awareness
- Potential health impacts of hospital effluents to population living nearby hospitals/rivers
- Yet to ascertain HCLW direct impacts between private and public hospitals on population

Recommendations

- Healthcare without harm principle should be strictly followed by constructing reliable HCLW treatment plants
- Monitoring – hospitals have followed EIA/IEE treatment of effluents
- Awareness to both population and healthcare stakeholders about the health impacts of HCLW
- Research/bench mark data generation on health impacts of HCLW