

IMPACT OF LAND COVER ON WATER QUALITY OF SARDU RIVER, DHARAN SUB-METROPOLITAN CITY, NEPAL

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INTRODUCTION

Land use & Land cover has significant impact on quality of water, surface runoff, ground water aquifers and available of water for both ecosystem functions and human uses (Haughton & Hackler, 2003; Kumar, 2014)

- Land use & land cover pattern of river basin is important driving force that affects the water quality, (Chen et al., 2016)
- Sardu River is the major source of water for Dharan sub-metropolitan city (IUCN, 2011)

Objectives:

The overall objectives of the research to study impacts of land cover on water quality of Sardu river

Specific objectives

To identify the land cover change situation of Sardu watershed.

MATERIALS AND METHODS

Study Area

- The study was carried out in Sardu watershed of Sunsari
- Sardu watershed lies in chure range
- Elevation ranges from 150 m above mean sea level to 1568 m.

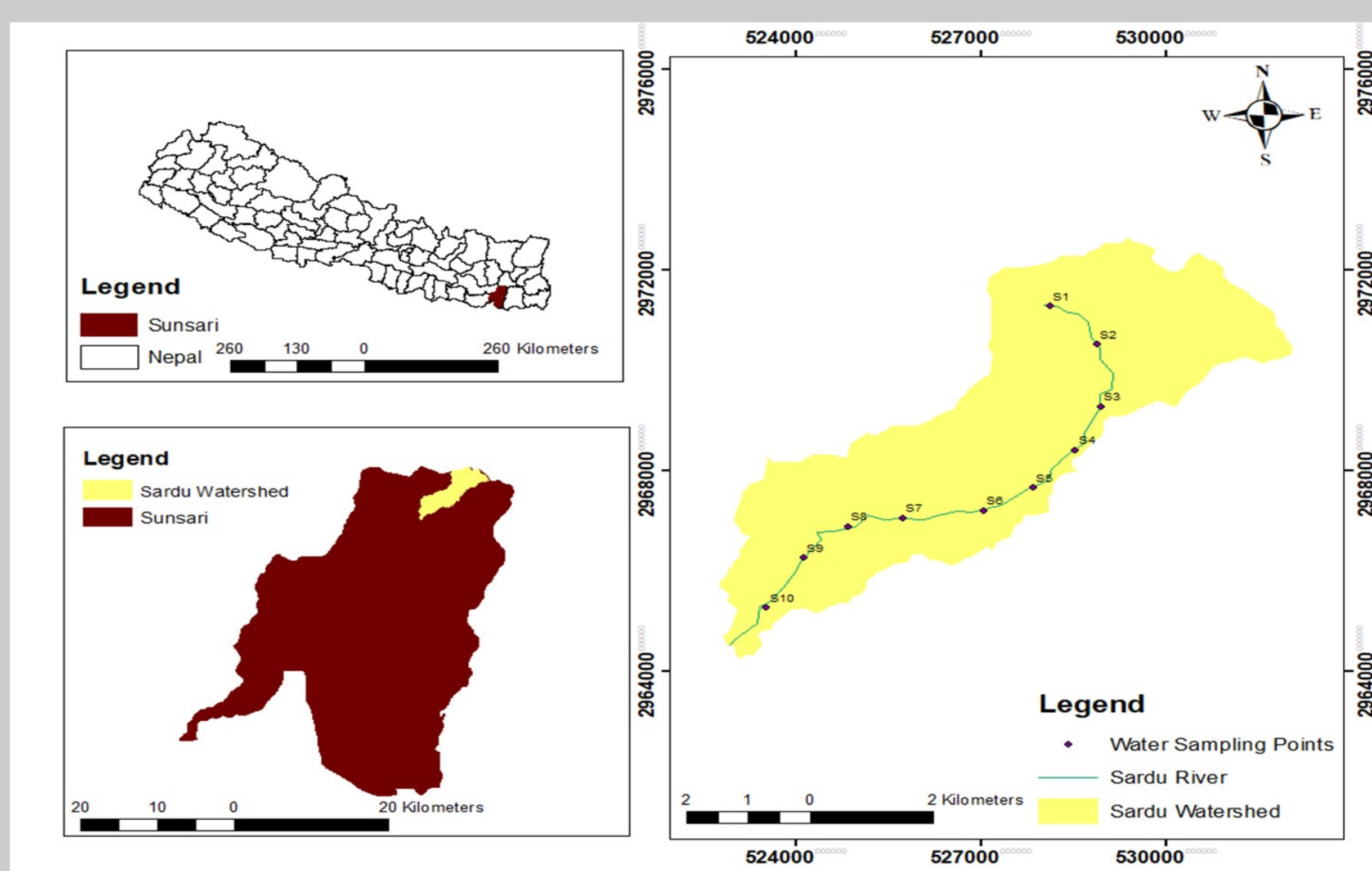


Fig: Study area; Sardu watershed

Data Collection

- Landsat image was used to assess the land cover change (1997-2017) and prepare land cover map of 1997 and 2017.
- 10 sampling points were randomly selected and 48 water samples were taken
- 14 different physico-chemical tests were performed
- ANOVA and Tukey's test was performed to test the statistical significance

RESULTS AND DISCUSSIONS

A. Land Cover Change

Table 1: Land Cover dynamics of Sardu watershed from 1997 to 2017

Land Cover	1997		2017		Change (%)
	Coverage (%)	Area (km ²)	Coverage (%)	Area (km ²)	
Agricultural Land	15.54	4.35	13.60	3.80	1.94
Forest & Shrub Land	57.04	15.96	59.12	16.54	2.08
Grassland & Barren Lands	16.18	4.53	12.75	3.57	3.43
Settlements	5.10	1.43	7.16	2.00	2.06
Streams & Flood plains	6.11	1.71	5.84	1.63	0.27

From 1997 to 2017, the agricultural land decreased by 4.96%, grassland by 0.14% and streams and flood plains by 0.92%. However forest cover and settlement were increased by 3.79% and 2.25% respectively.

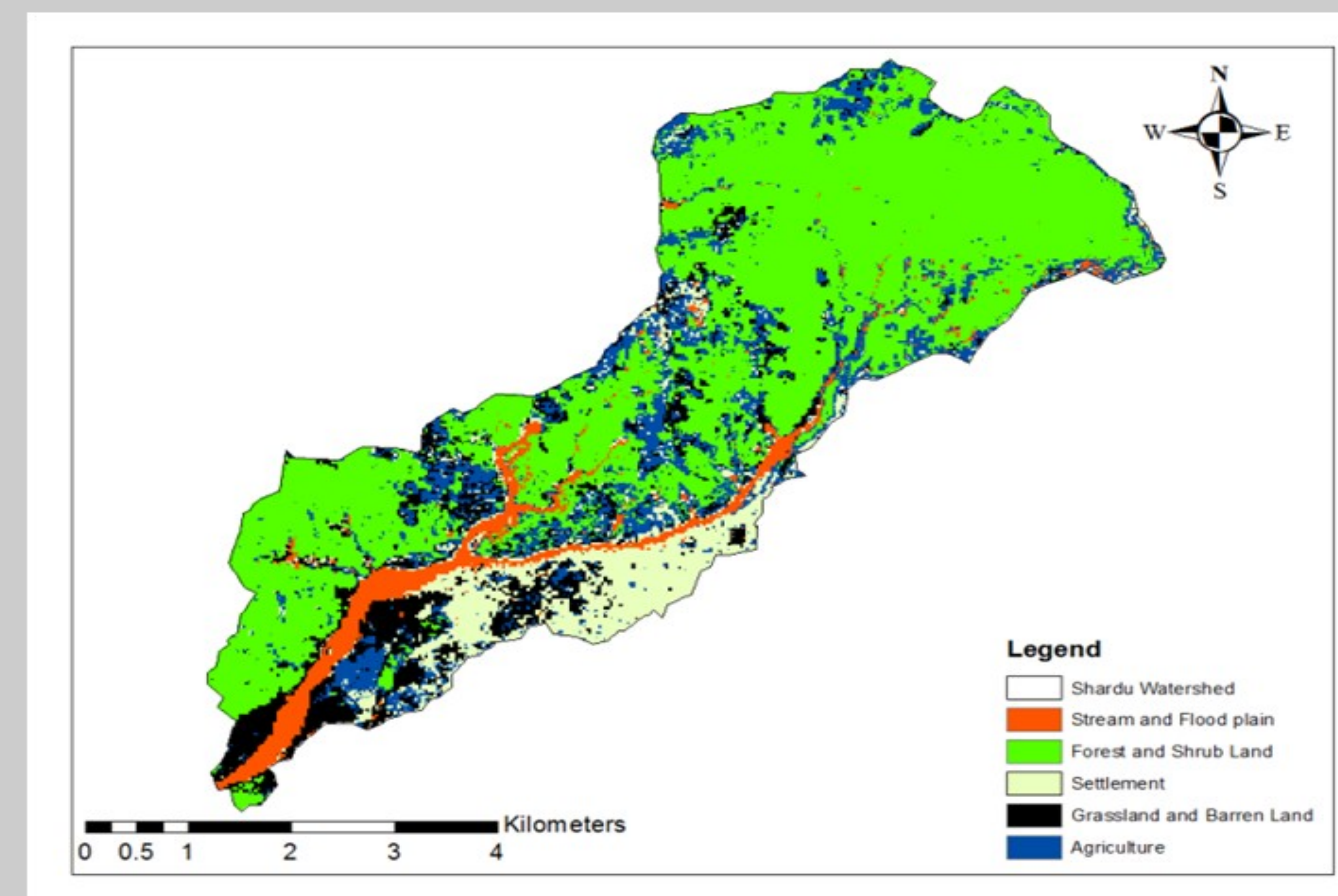


Figure 2: Land Cover map of Sardu Watershed for 2017

The increase in the settlement shows the rapid urbanization of Dharan due to the migration and population growth. Sardu watershed conservation program and community forestry contributed to the rise of forest area in Sardu watershed.

B. Land Cover and Water Quality

Water quality parameters of Sardu River were found significantly changing with the land cover change. Dissolved oxygen, alkalinity, hardness, total solid, total suspended solid, chloride, turbidity, phosphate and nitrate was found significantly different to the forest, agriculture and settlement.

Table 2: Relation of water quality parameters with land cover

Parameters	P-Value	Significance
Dissolved Oxygen	7.11e ⁻⁰⁵	***
pH	0.146	
Electrical Conductivity	0.054	
Total Alkalinity	0.000898	***
Total Hardness	2.66e ⁻⁰⁵	***
Ammonia	0.101	
Total Solid	0.0152	*
Total Suspended Solid	0.00205	**
Total Dissolved Solid	0.3924	
Chloride	7.96e ⁻¹⁴	***
Turbidity	0.00109	**
Total Phosphate	7.51e ⁻⁰⁶	***
Total Nitrate	0.00041	***

But pH, electronic conductivity, ammonia, total dissolved solid was found insignificant with the change in land cover type.

CONCLUSION

Sardu watershed was urbanizing significantly while the effective conservation effort resulted the dominant forest cover in watershed. Water quality parameters were greatly affected by the settlement and agricultural areas.

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