Kathmandu, Nepal 14–16 November
REGIONAL CONFERENCE 2024
Climate Responsive Land Governance and Disaster Resilience: Safeguarding Land Rights

ASSESSMENT OF LAND DEGRADATION IN KHOTANG DISTRICT USING REMOTE SENSING AND GIS

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INTRODUCTION

•Reduction or loss of the biological or economic productivity and complexity of rain fed cropland, irrigated cropland, pasture, forest and woodlands (UNO, 2018)

•Occurs through different physical, chemical and biological processes.

•Key challenge for sustainable development, biodiversity, and climate adaptation (Goals et al., 2015)

• Important global issue for the 21st century affecting agriculture, the environment, food security, and overall quality of life.(H.Eswaran, R. Lal, P.F. Reich)

NEED FOR LAND DEGRADATION ASSESSMENT

•Rising Population: By 2050, a booming 10 billion people will need 70% more food (Goal et al., 2017).

•Land Under Pressure: Converting new land or intensifying existing farms puts stress on ecosystems.

•Degradation Threat: Already, 60% of ecosystem services, and 25% of land, are degraded or at risk (UNCCD, 2014).

•Competing Demands: Food, water, and other resources face growing competition, straining people and nature.

Source: The Guardian

Source: United Nations of University

OBJECTIVES

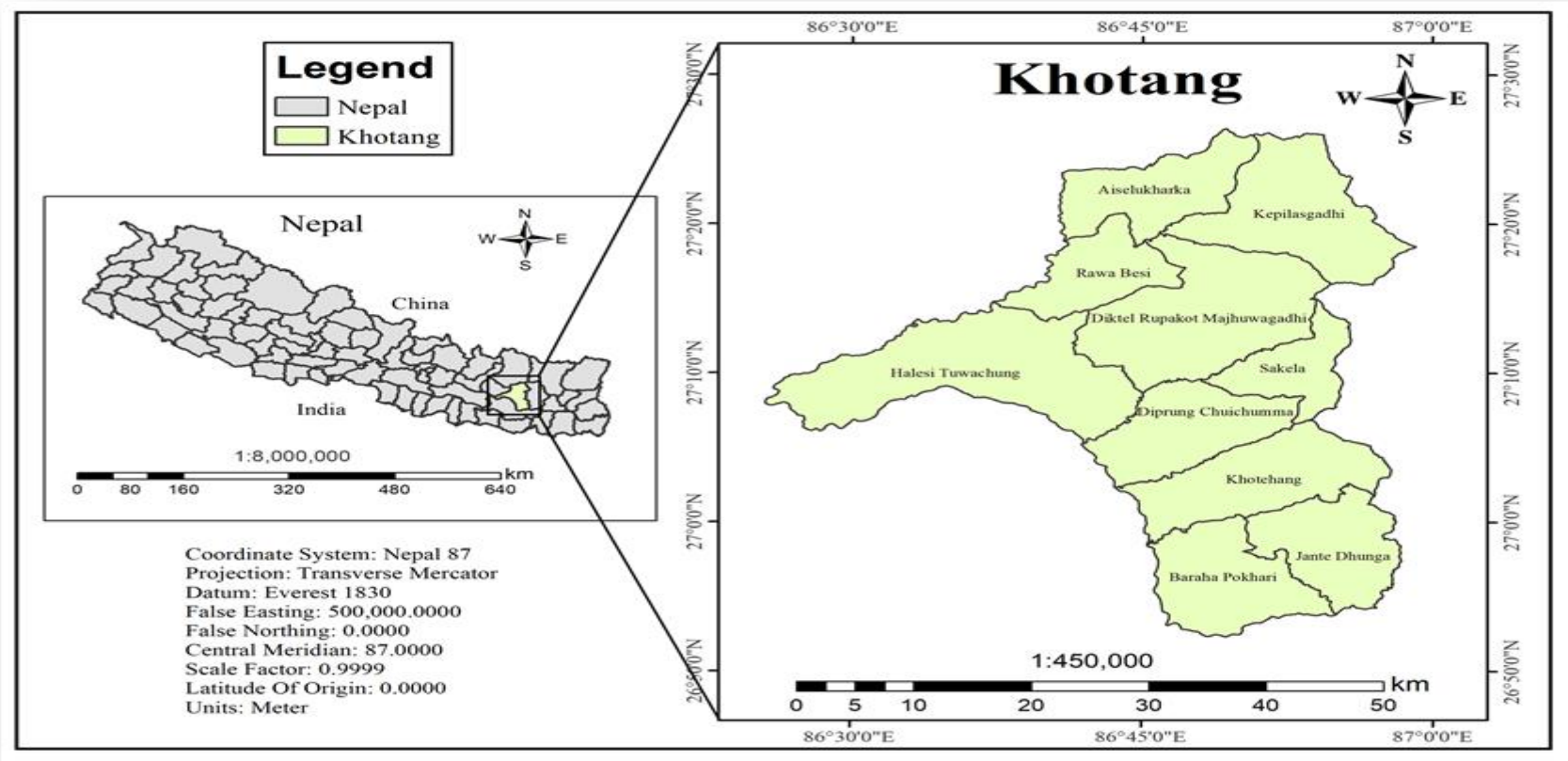
Primary Objective:

- To identify the land degradation and key indicators of degradation in khotang district

Secondary Objective:

- To identify criteria and develop the criteria map for land degradation.
- To prepare the land degradation map by using of AHP technique.
- To validate the land degradation area.

STUDY AREA

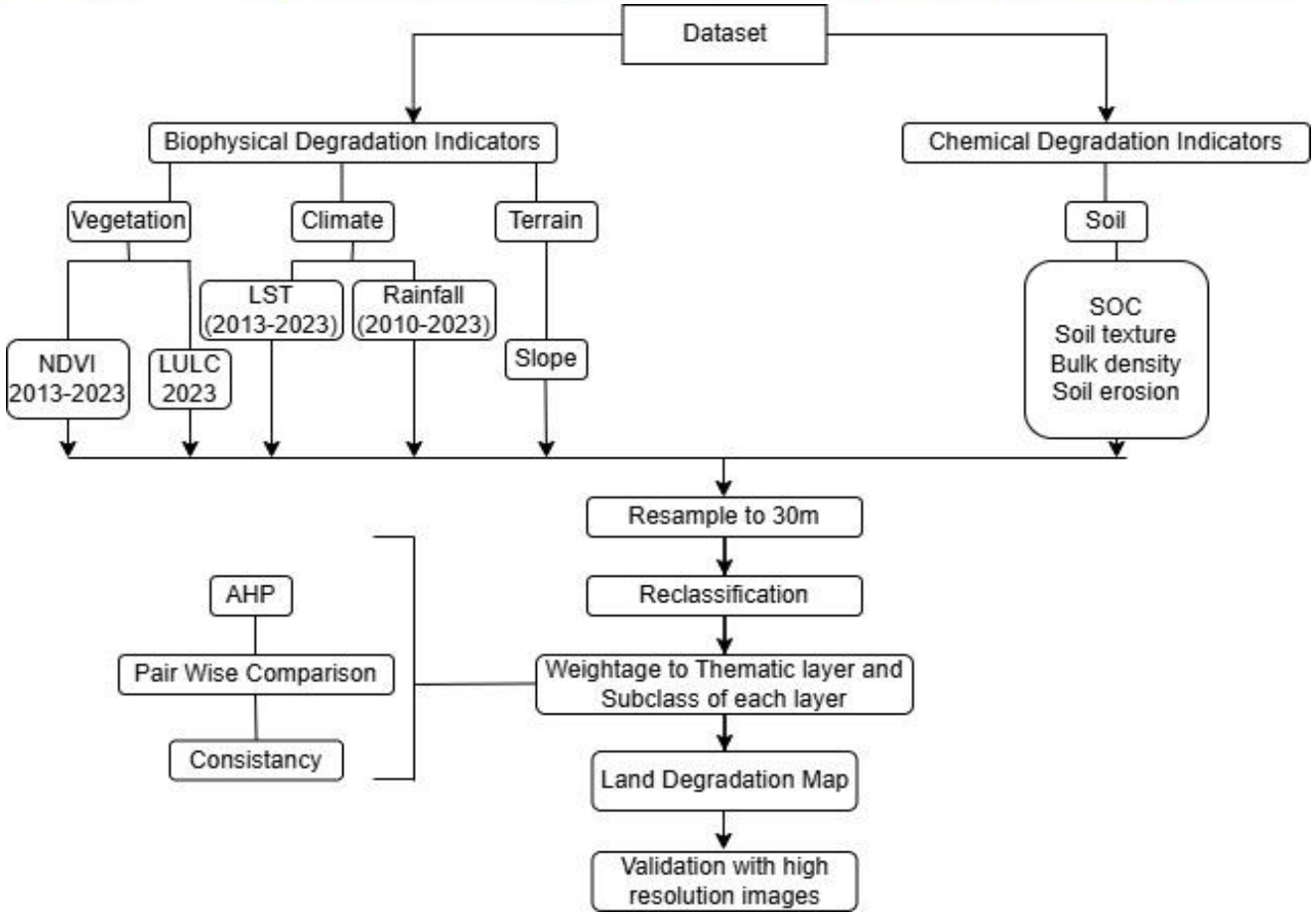

Legend
Nepal
Khotang
Nepal
China
India
1:8,000,000
0 80 160 320 480 640 km
Coordinate System: Nepal 87
Projection: Transverse Mercator
Datum: Everest 1830
False Easting: 500,000.0000
False Northing: 0.0000
Central Meridian: 87.0000
Scale Factor: 0.9999
Latitude Of Origin: 0.0000
Units: Meter
Khotang
86°30'0"E
86°45'0"E
87°0'0"E
27°30'0"N
27°20'0"N
27°10'0"N
27°0'0"N
26°50'0"N
Aiselukharka
Kepilasgadhi
Rawa Besi
Dăktel Rupakot Majhuwagadhi
Halesi Tuwachung
Sakela
Diprung Chuichumma
Khotehang
Jante Dhunga
Baraha Pokhari
1:450,000
0 5 10 20 30 40 50 km


NO POVERTY
CLEAN WATER AND SANITATION
ZERO HUNGER
QUALITY EDUCATION
GENDER EQUALITY
GOOD HEALTH AND WELL-BEING

DATA SOURCES

Dataset	Datatype	Resolution	Data Source
DEM	Raster	12.5m	ALOSPALSAR https://asf.alaska.edu/datasets/daac/alos-palsar-radiometric-terrain-correction/
SOC, Soil, Texture ,Bulk density	Raster	250m	ISRIC-World Soil Information https://www.isric.org/
Land Cover Map	Raster	10m	Harmonized Sentinel 2A
Rainfall Data	Vector	-	DHM https://www.dhm.gov.np/
LST	Raster	30m	LANDSAT 8
NDVI	Raster	30m	LANDSAT 8

METHODOLOGY



METHODOLOGY

Formula to calculate soil erosion:

$A = R \times K \times LS \times C \times P$

where,

A= soil loss(t ha−1 yr−1)

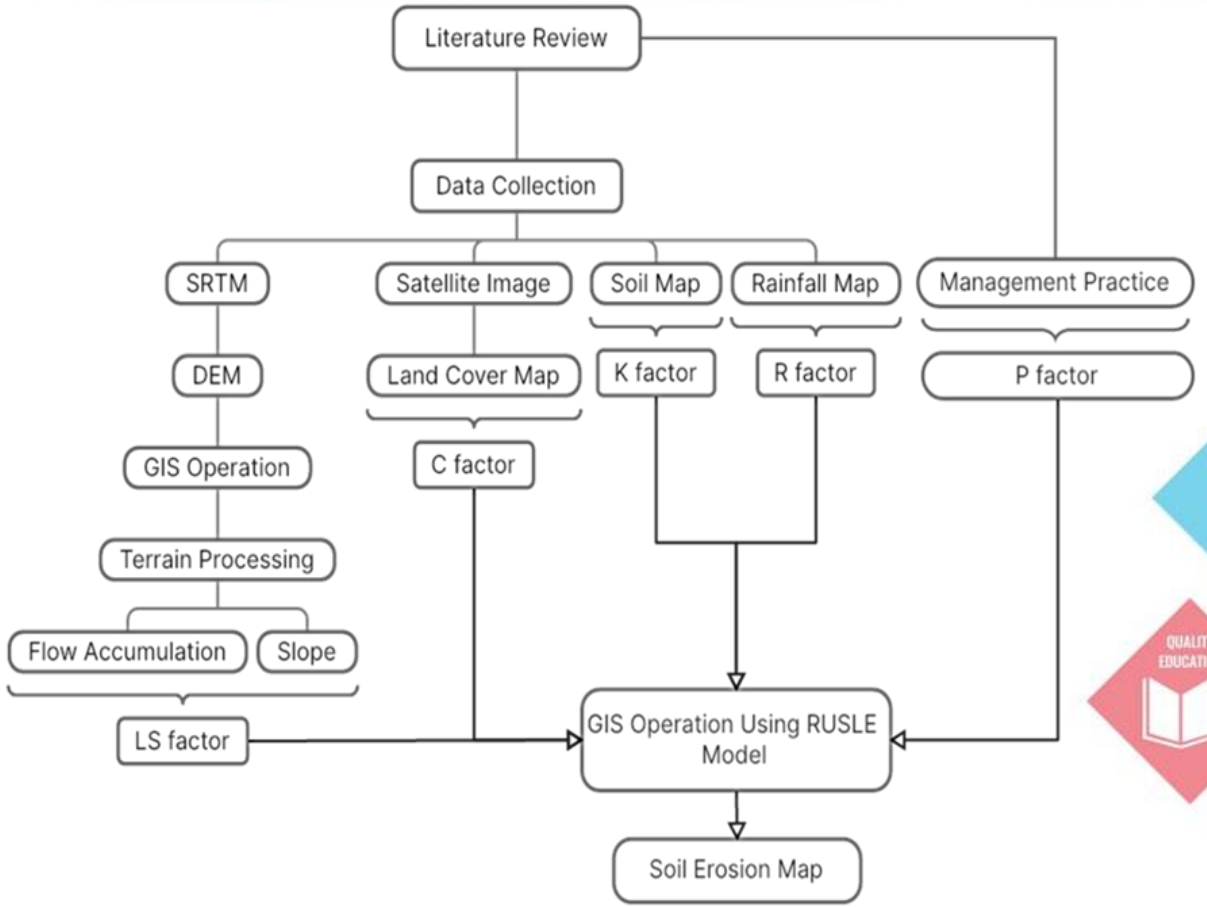
R=Rainfall Erosivity Factor

K=soil erodibility factor

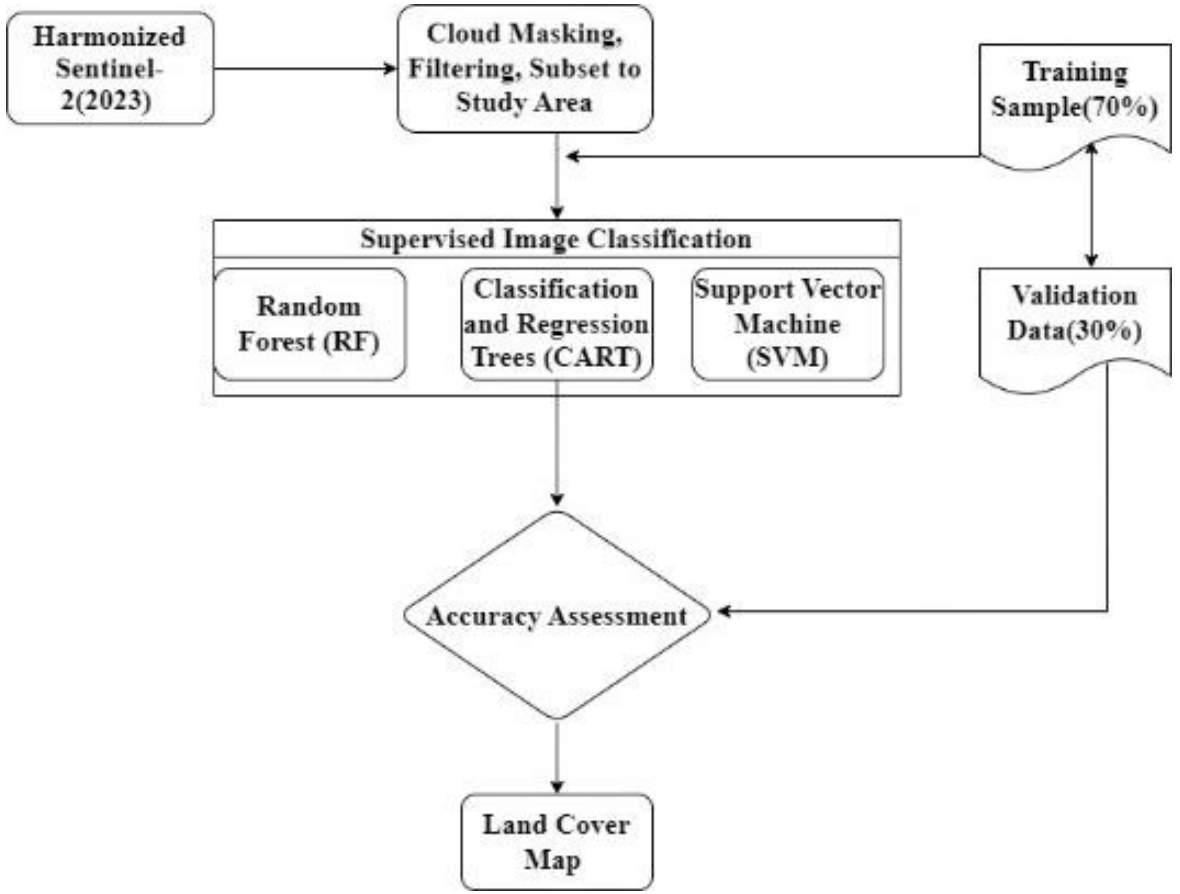
LS=(L- Slope length factor and S- Slope Steepness factor)

C=Cover Management Factor

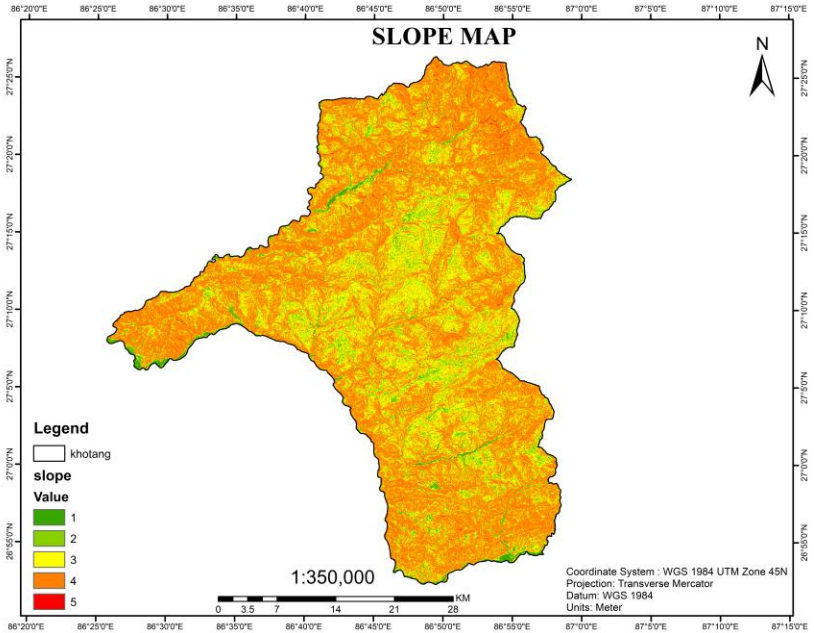
P=Conservation practice factor

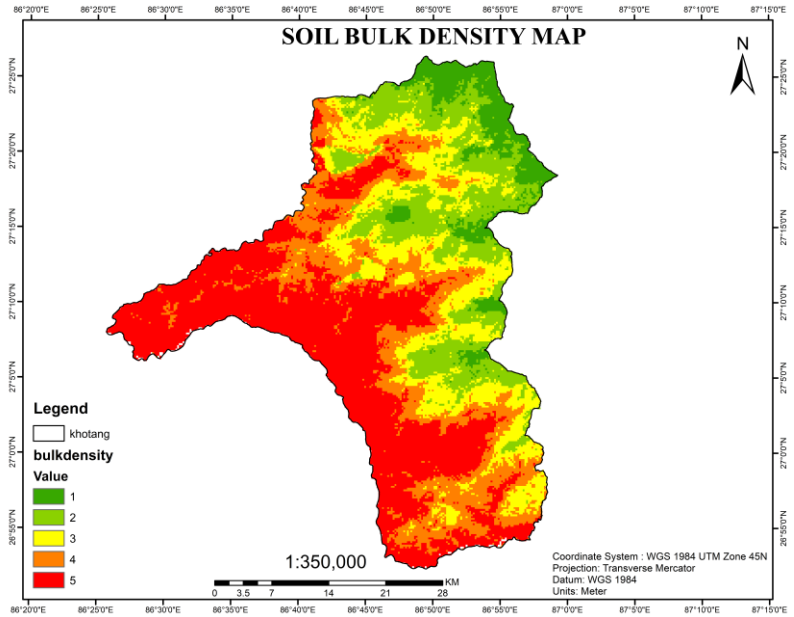


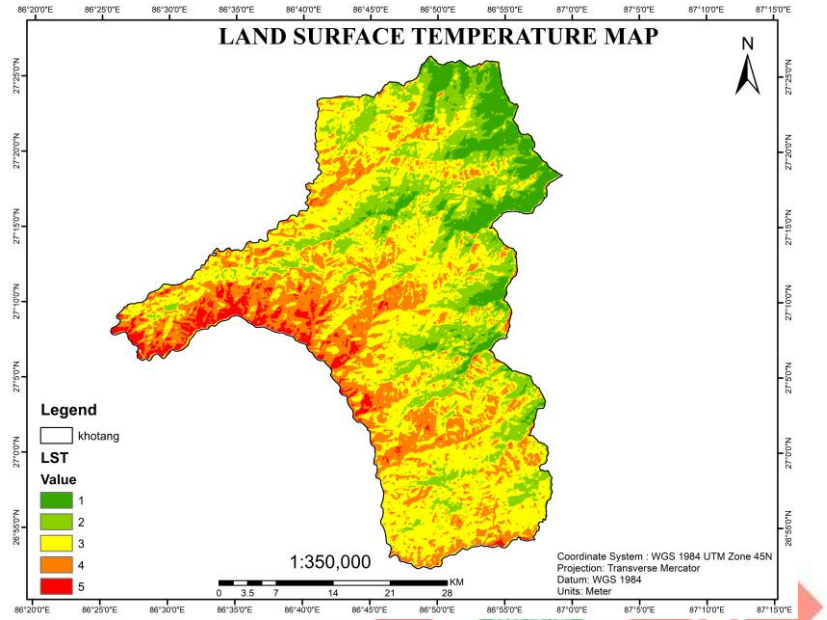
METHODOLOGY



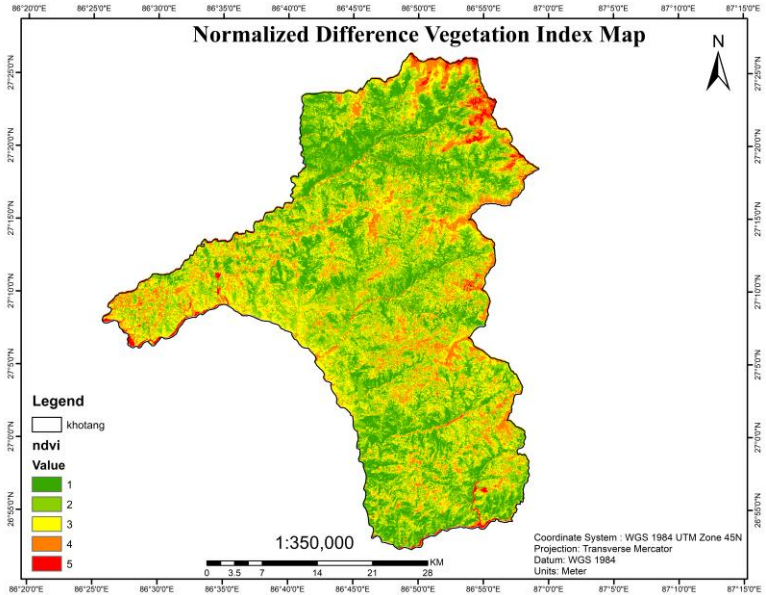
FACTORS INFLUENCING LAND DEGRADATION

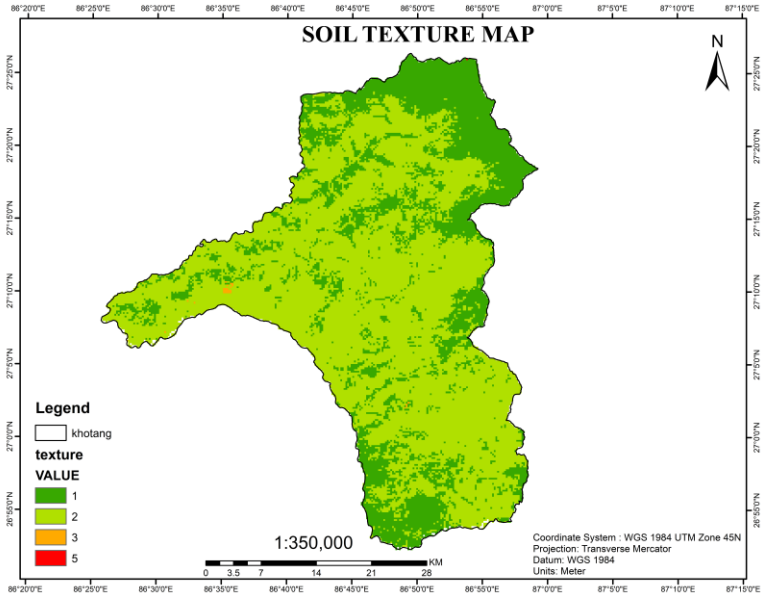


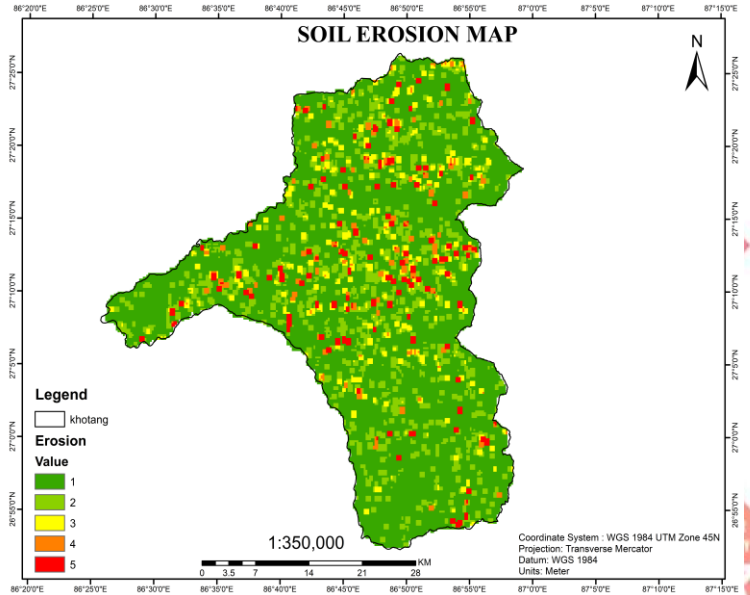




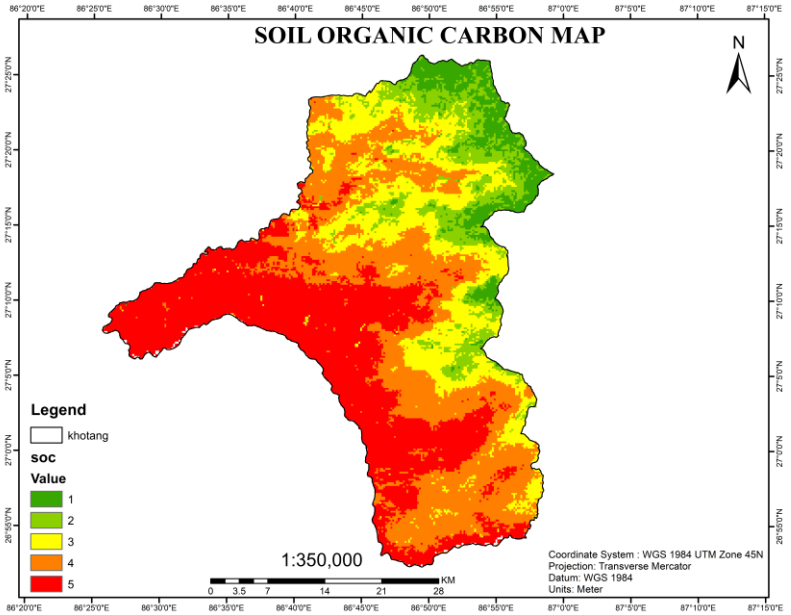
FACTORS INFLUENCING LAND DEGRADATION

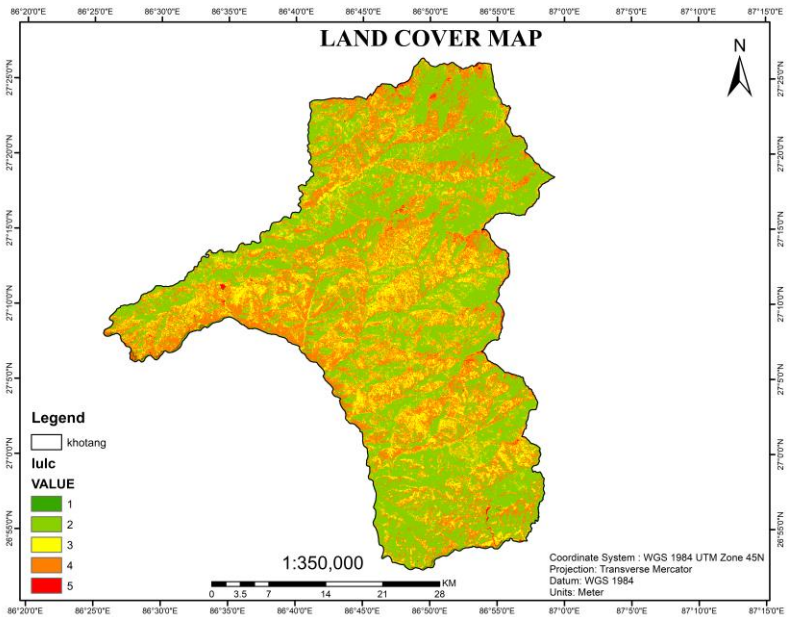


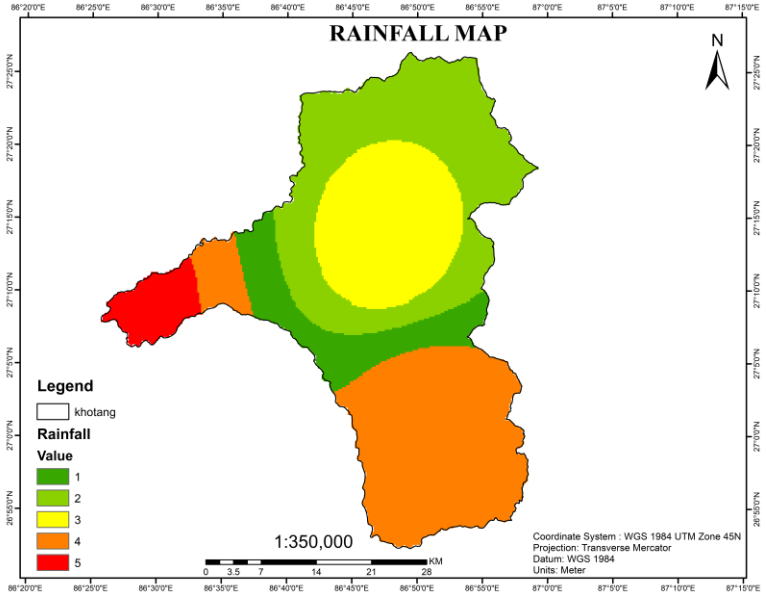




FACTORS INFLUENCING LAND DEGRADATION





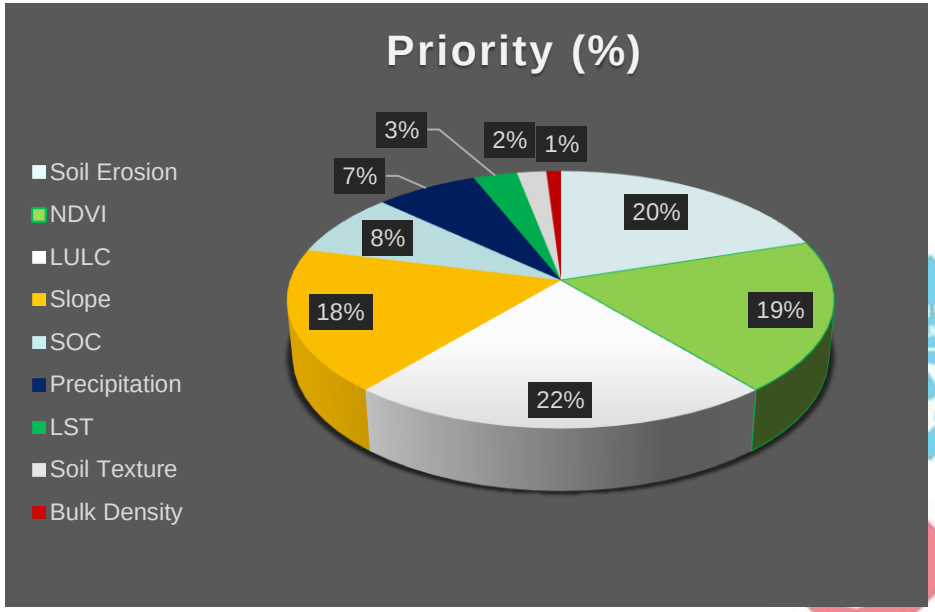


COMPUTATION OF CRITERIA WEIGHT

Criteria	Soil Erosion	NDVI	LULC	Slope	SOC	Precipitation	LST	Soil Texture	Bulk Density	Computation of Citation Weight(%)
Soil Erosion	0.20	0.31	0.10	0.26	0.22	0.18	0.17	0.17	0.16	**20**
NDVI	0.10	0.16	0.10	0.39	0.22	0.18	0.14	0.20	0.14	**19**
LULC	0.40	0.31	0.20	0.07	0.17	0.30	0.22	0.12	0.14	**22**
Slope	0.10	0.05	0.40	0.13	0.28	0.12	0.17	0.17	0.16	**18**
SOC	0.05	0.04	0.07	0.03	0.06	0.12	0.17	0.10	0.12	**8**
Precipitation	0.07	0.05	0.04	0.07	0.03	0.06	0.08	0.15	0.12	**7**
LST	0.03	0.03	0.03	0.02	0.01	0.02	0.03	0.05	0.09	**3**
Soil Texture	0.03	0.02	0.04	0.02	0.01	0.01	0.01	0.02	0.07	**2**
Bulk Density	0.02	0.02	0.03	0.01	0.01	0.01	0.01	0.01	0.02	**1**
Sum										**100(Checked)**

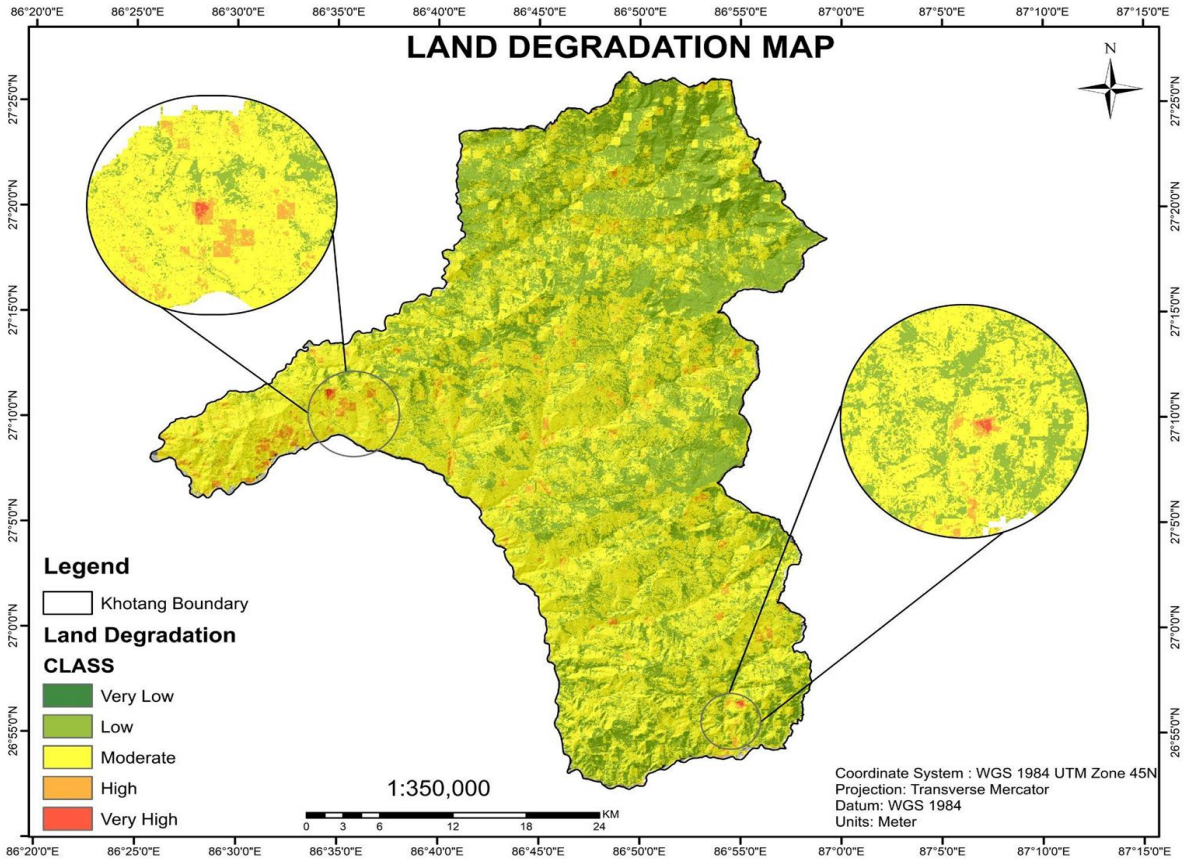
RESULT AND DISCUSSION

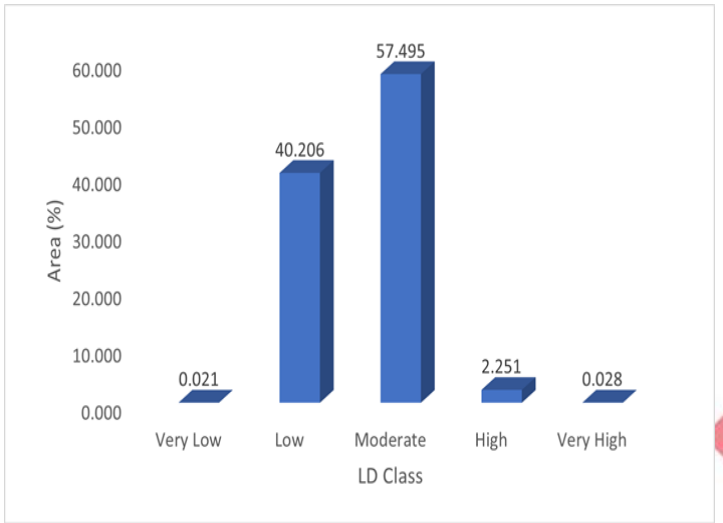
Criterion	Priority (%)
LULC	22
Soil Erosion	20
NDVI	19
Slope	18
SOC	8
Precipitation	7
LST	3
Soil Texture	2
Bulk Density	1
Total	100% (Checked)



CR = 0.096 < 0.10

RESULT AND DISCUSSION

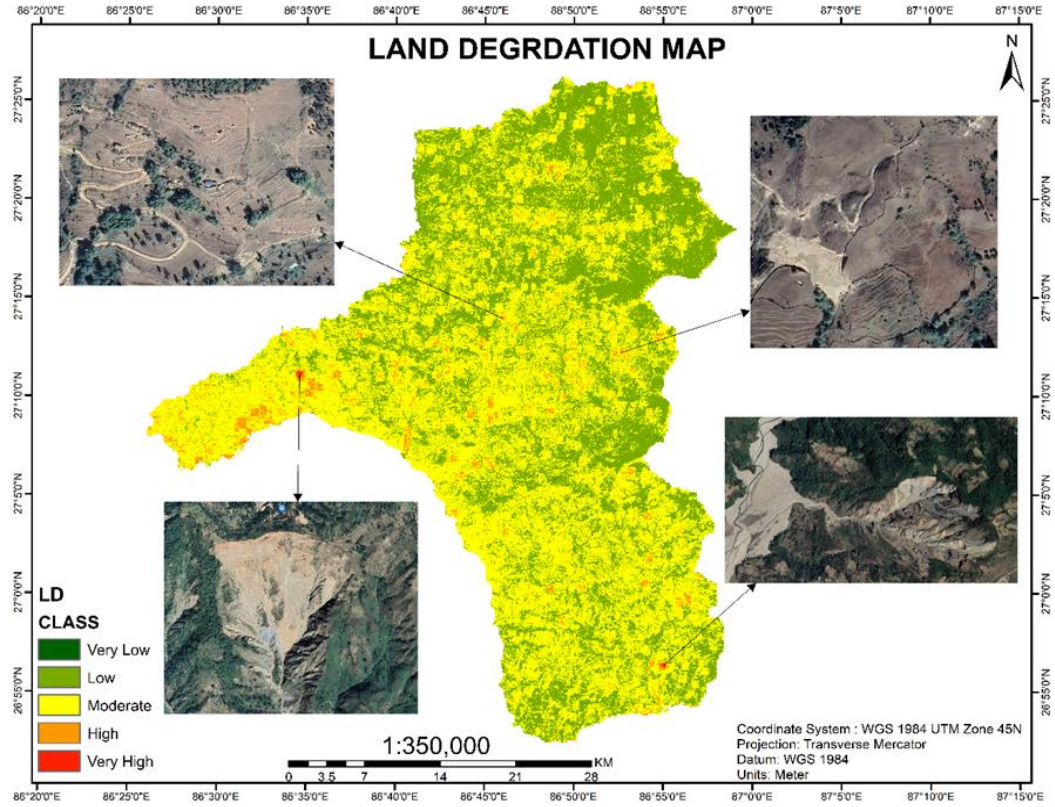




RESULT AND DISCUSSION

Class	Area%									
	Rupakot	Halesituwachung	Diprung	Khotehang	Kepilashgadhi	Aaiselukharka	Rawa Besi	Jantedhunga	Barahapokhari	Saakela
Very Low	0.012	0.00	0.05	0.000	0.054	0.032	0.01	0.000	0.000	0.10
Low	40.14	19.52	38.72	30.20	65.54	59.02	44.71	34.64	39.23	50.56
Moderate	57.66	74.13	59.37	68.46	33.63	40.20	54.78	63.33	59.79	47.52
High	2.18	6.25	1.86	1.329	0.766	0.75	0.50	2.018	0.968	1.82
Very High	0.00	0.10	0.00	0.000	0.00	0.00	0.00	0.119	0.006	0.00
Total (High & Very High)	2.18	6.35	1.86	1.33	0.77	0.75	0.50	2.14	0.97	1.82

VALIDATION


LAND DEGRDATION MAP
N
LD
CLASS
Very Low
Low
Moderate
High
Very High
1:350,000
0 3.5 7 14 21 28 KM
Coordinate System : WGS 1984 UTM Zone 45N
Projection: Transverse Mercator
Datum: WGS 1984
Units: Meter

CONCLUSION

- Identification of Land Degradation and key indicators of degradation in Khotang District
- Moderate land degradation is the most prevalent, covering 57.49% of the district.
- Halesi Tuwachung (**6.35%)** followed by Rupakot (**2.18%),** and Jantedhunga(**2.14%)** municipality exhibits the highest degradation in khotang district

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Thank you!