

# Dhamdara and Kabrayter LAP Review



22nd August, 2022

# Overview of the presentation

- Objectives of the LAP Review
- Geotechnical Investigation
  - Slope Analysis
  - Hazard Analysis
- Existing Scenario
  - Dhamdara and Kabrayter LAP overview
  - Existing infrastructure
  - Existing Precinct
- Proposal
  - Proposed infrastructure
  - Precinct proposed
  - Plots with changed precincts
  - Plots that have been relocated
  - DCR

# Objectives of the LAP review

- To revisit the existing infrastructure and services in both the LAPs and prepare master plans
- To adapt the finding of Geotechnical Investigation and Slope Stability Assessment study
- To resolve the mismatch between precinct allocation on lagthram and ground reality

# Dhamdara and Kabrayter LAP overview

## Dhamdara LAP

- Covers an area of 150 acres
- LAP was prepared in 2014
- Land pooling 15%
- 15 minutes walk from town core

## Kabrayter LAP

- Covers an area of 117 acres
- First LAP was prepared in 2002 and the most recent LAP was prepared in 2014
- Land pooling 12%
- 2.5 km from the Phuentsholing town core

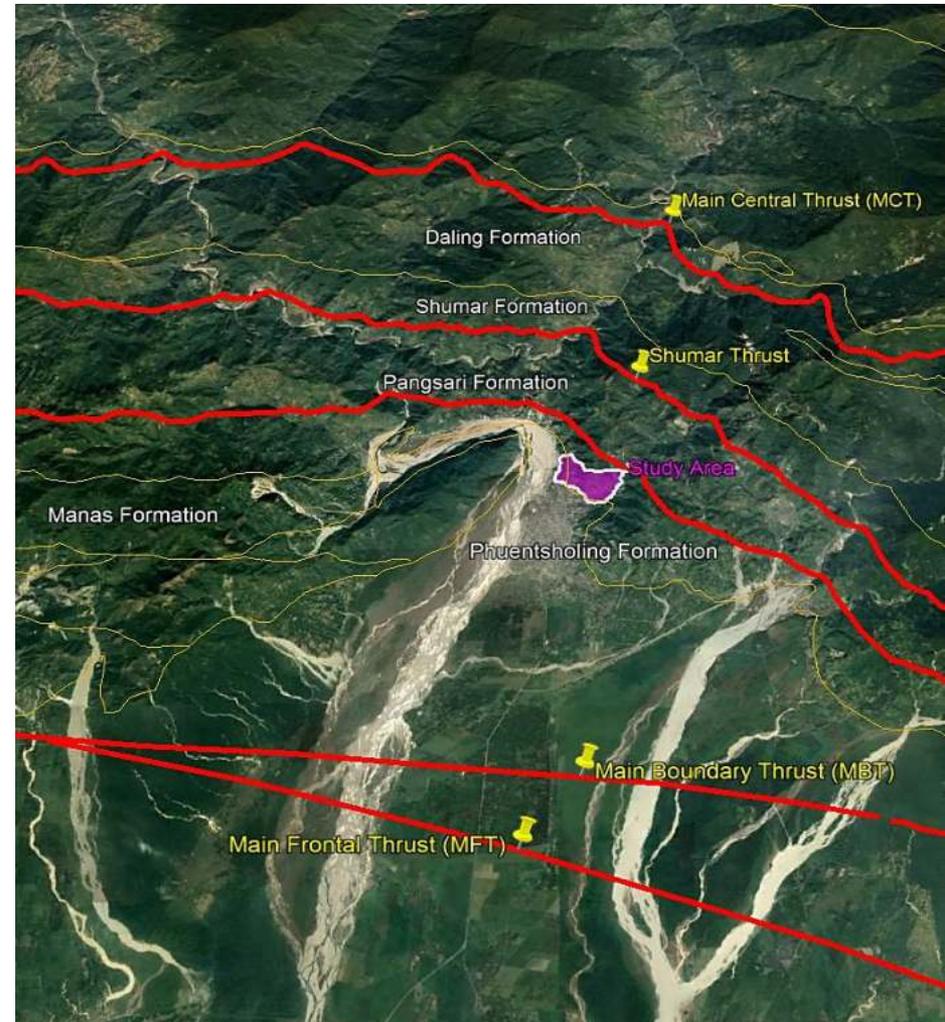


# **Geotechnical Investigation and Slope Stability Assessment study**

# Geotechnical and Geological understanding of the area along with EQ faults | Earthquake Fault Lines

## 5 faults within 50 km of the Phuentsholing Thromde.

- Faults are breaks in rocks
- Due to these faults the rocks in Phuentsholing are highly fractured.
- The rocks in Kabraytar and Dhamdara belongs to Phuentsholing Formation of Buxa group which comprises of variegated phyllite with white, purple and grey quartzite.

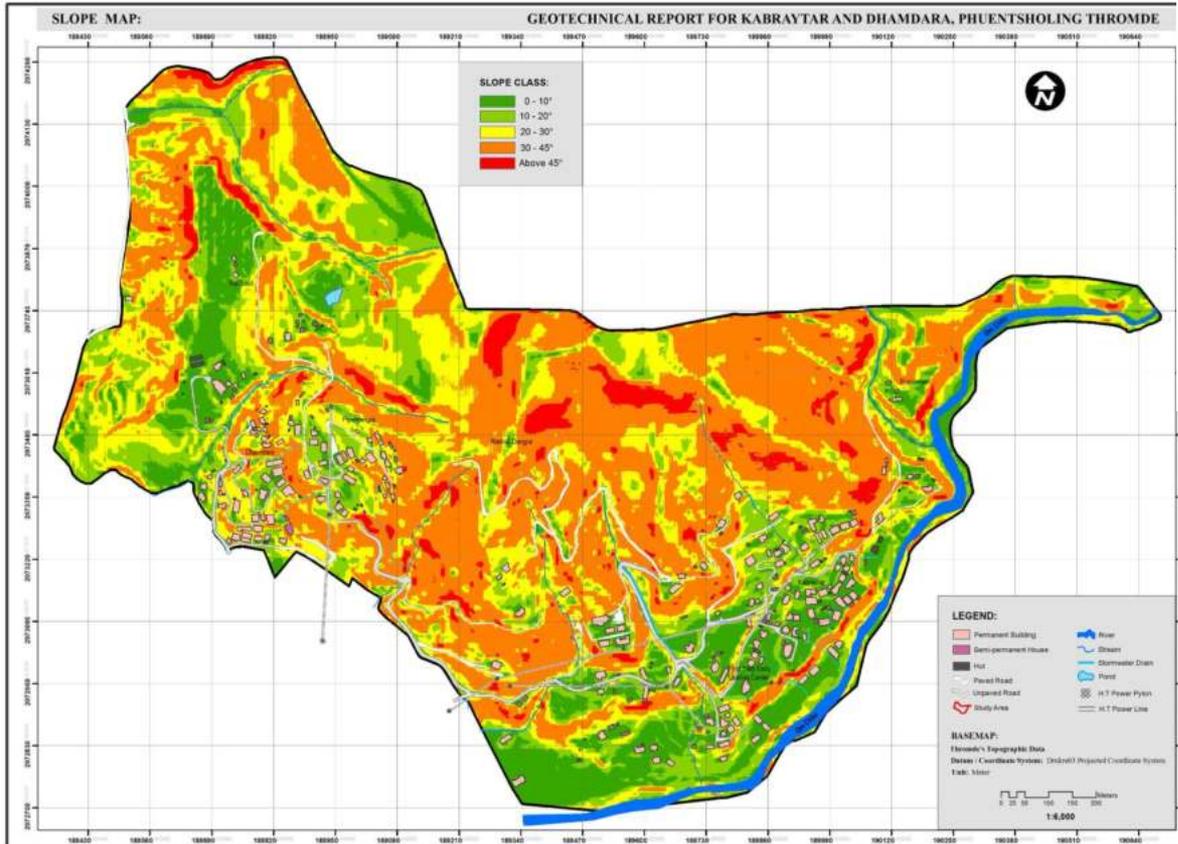


# Geotechnical and Geological understanding of the area along with EQ faults| Earthquake Fault Lines

- **Phyllite in action with water turns into clay (video)**
- Phuentsholing being one of the highest rainfall areas, we see a lot of slides during summer.
- Internal friction angle for clay is '0', which means it is highly unstable



# Geotechnical: Slope Analysis



Slope				Classification
No.	Degree	Percent	Ratio (V/H)	
1	0 - 20°	0 - 36%	0 to 1:2.75	Low
2	20° - 30°	36% - 58%	1:2.78 to 1:1.73	Medium
3	>30°	>58%	>1:1.73	High

- The slope of the area which is greater than 20 degree in most of the LAP contributes to the already fragile geological formation of the area*

# Geotechnical: Slope Analysis

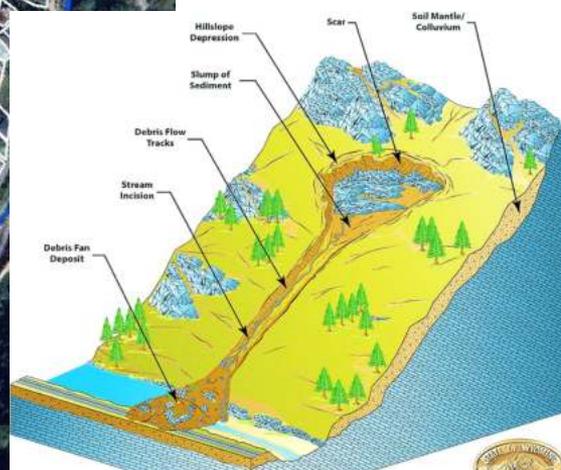
SLOPE ANALYSIS					
#	Slope Class	Area			
		(sq.km)	(acre)	(%)	(%)
1	0 - 10°	0.26	63.20	15.42%	35.32%
2	10 - 20°	0.33	81.50	19.89%	
3	20 - 30°	0.40	97.64	23.83%	23.83%
4	30 - 45°	0.61	151.37	36.94%	40.85%
5	> 45°	0.06	16.02	3.91%	
Total		1.66	409.72	100.00%	100.00%

***Only 35% of the area with slope less than 20 degree. These 35% includes excavated flat lands and slump deposit of the old slides (as in case of the recent slide which claimed a life in kabraytar).***

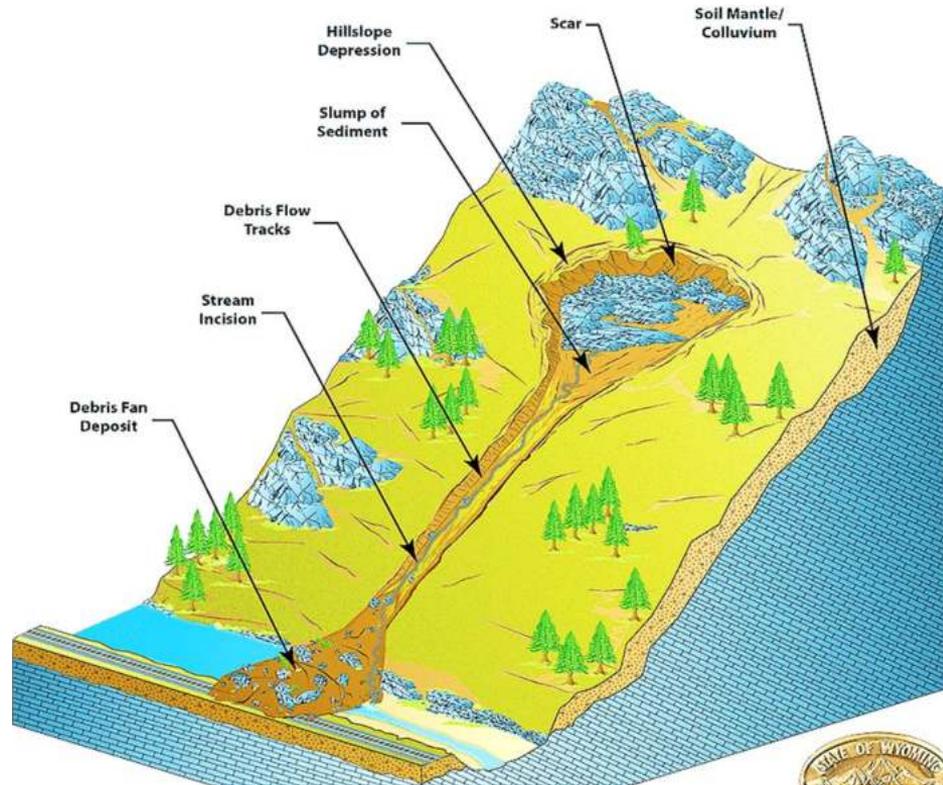
# Landslide Scars



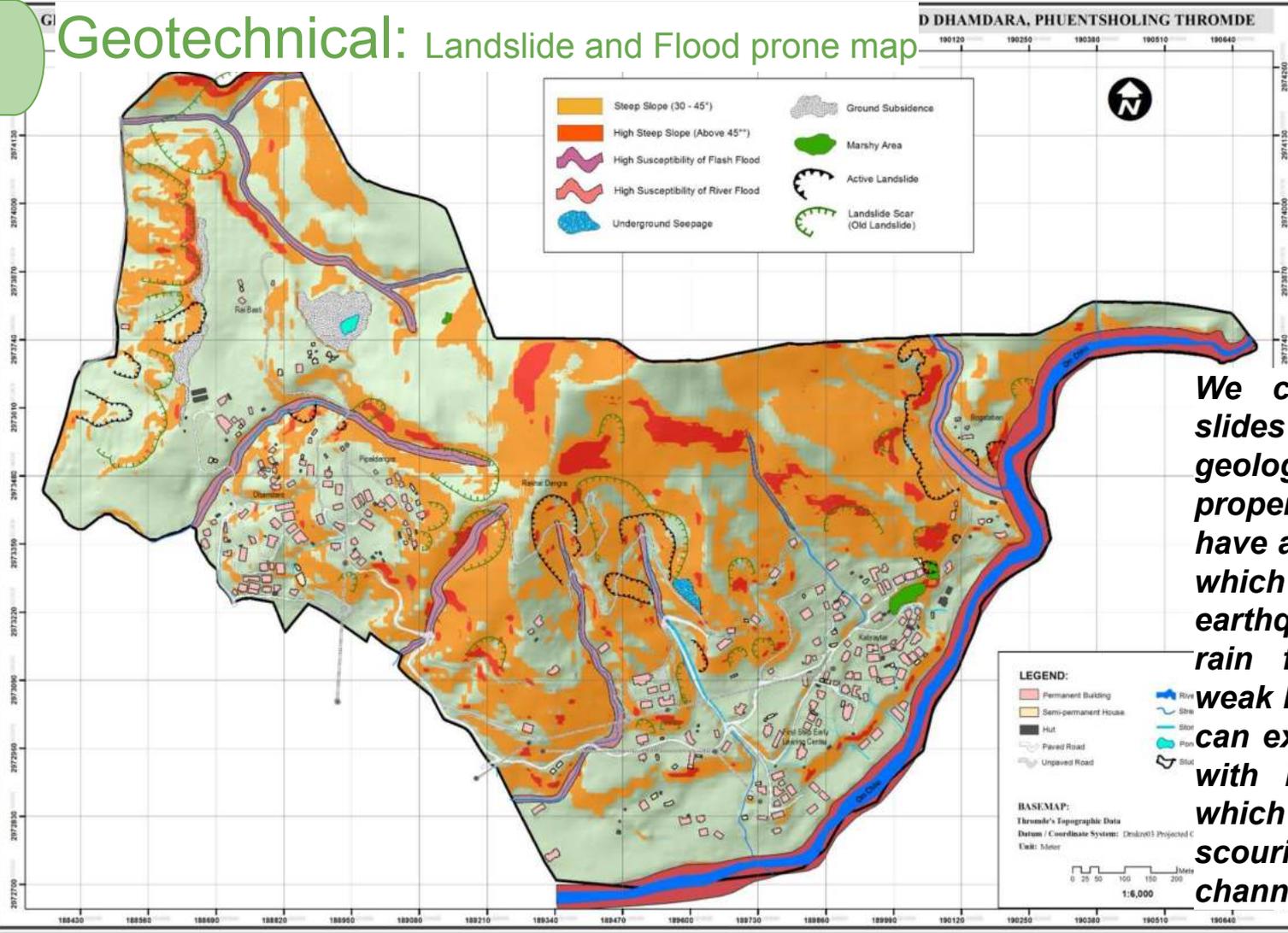
Image © 2022, CNES / Airbus



# Landslide Scars

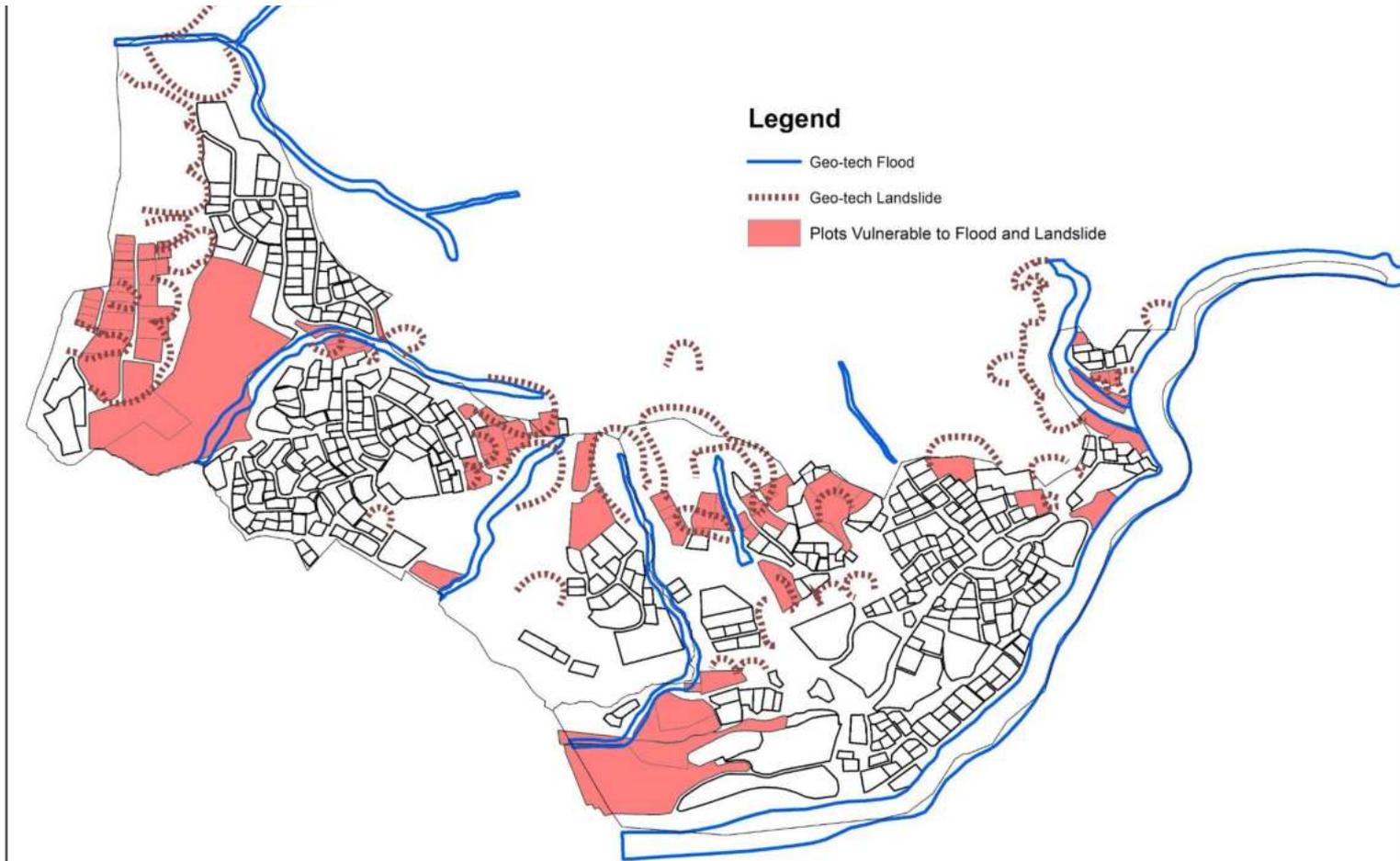


# Geotechnical: Landslide and Flood prone map

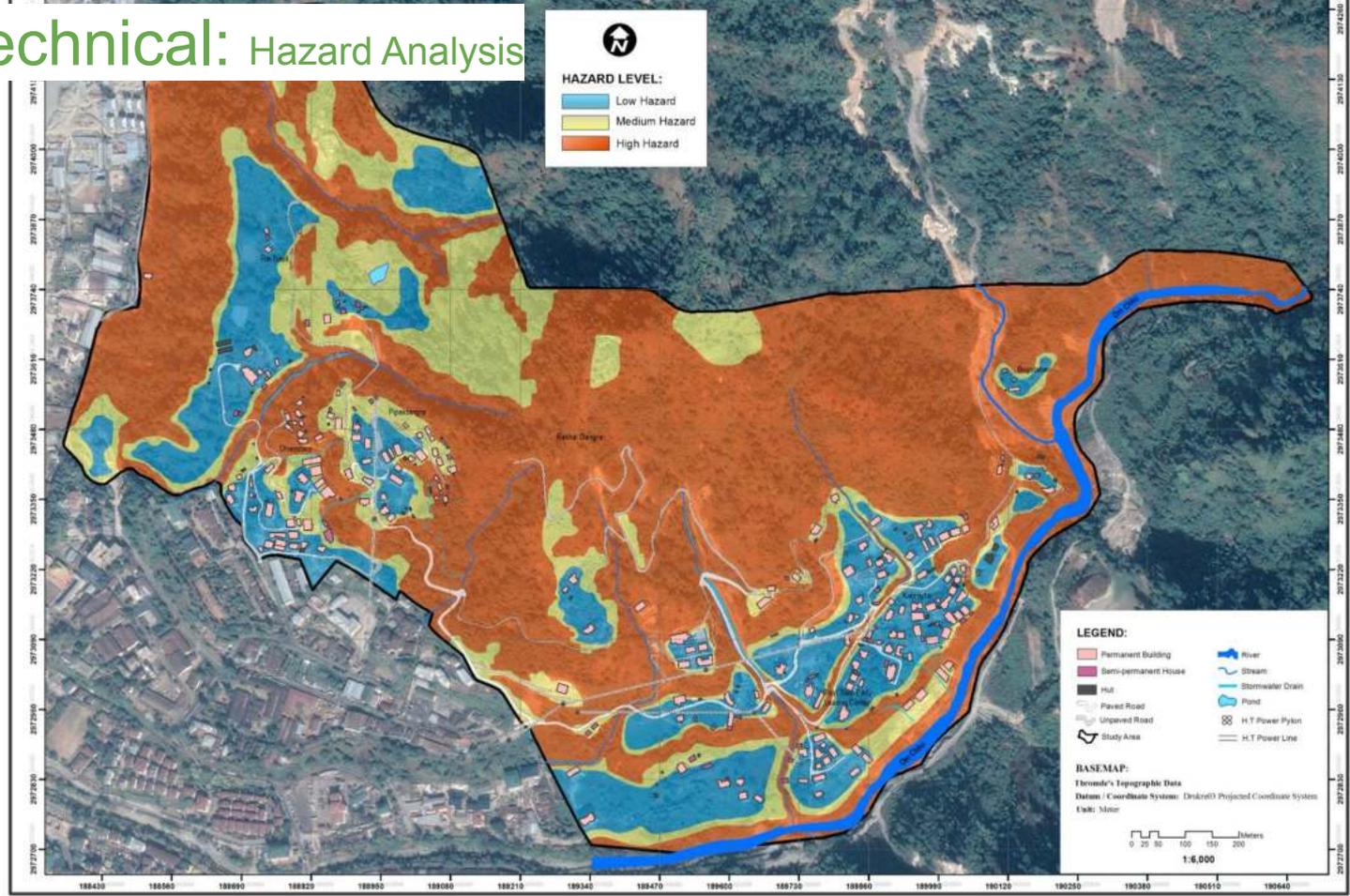


***We can expect frequent slides due to the existing geology and geotechnical properties of the soil. We have a weak rock formation which is weathered due to earthquake. Heavy summer rain further disturbs the weak lithology where by we can expect slides and river with huge sediment load which in turn can cause scouring along the river channel***

# Geotechnical: Plots Vulnerable to Flood and Landslides



# Geotechnical: Hazard Analysis



<https://www.youtube.com/watch?v=vNkexByBZAK>

# Why do we have Precincts?

Precincts are based on;

1. Geotechnical and geological characteristics of the soil in and around the plot
2. Flood and flash flood Hazards
3. Seismic Hazards (Earthquake)
4. Slope instability

# Existing Scenario

## Existing Scenario: Existing Infrastructure



Narrow road

No road access

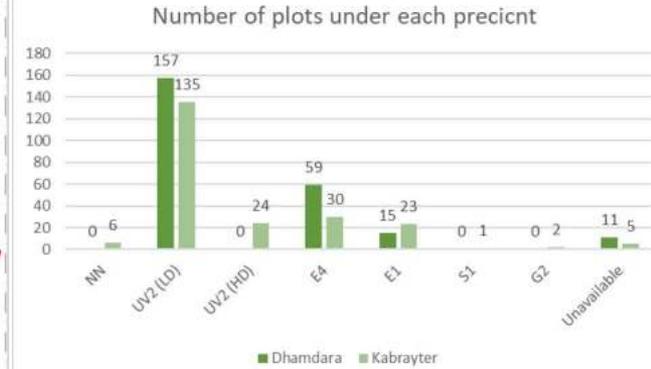
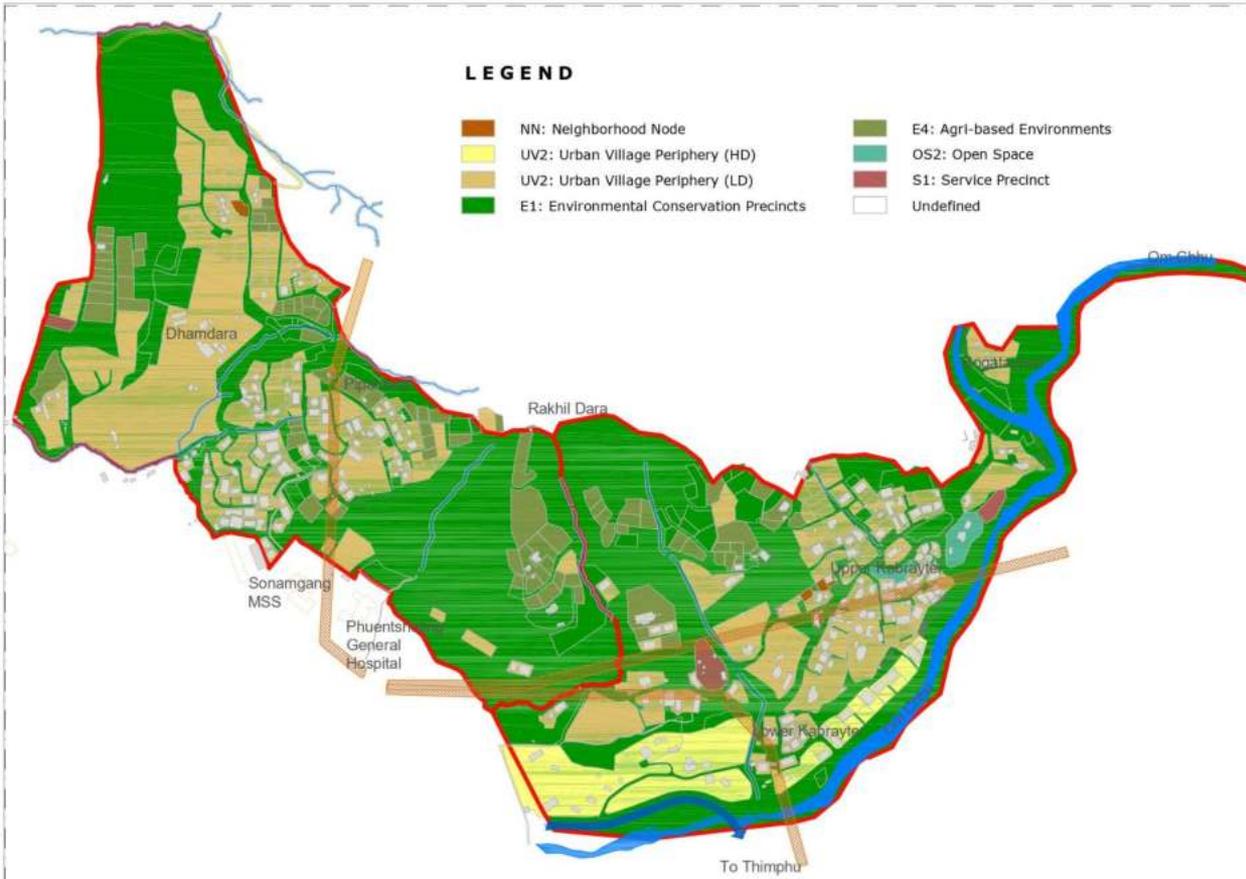
No Storm Water Drainage

No Proper footpath

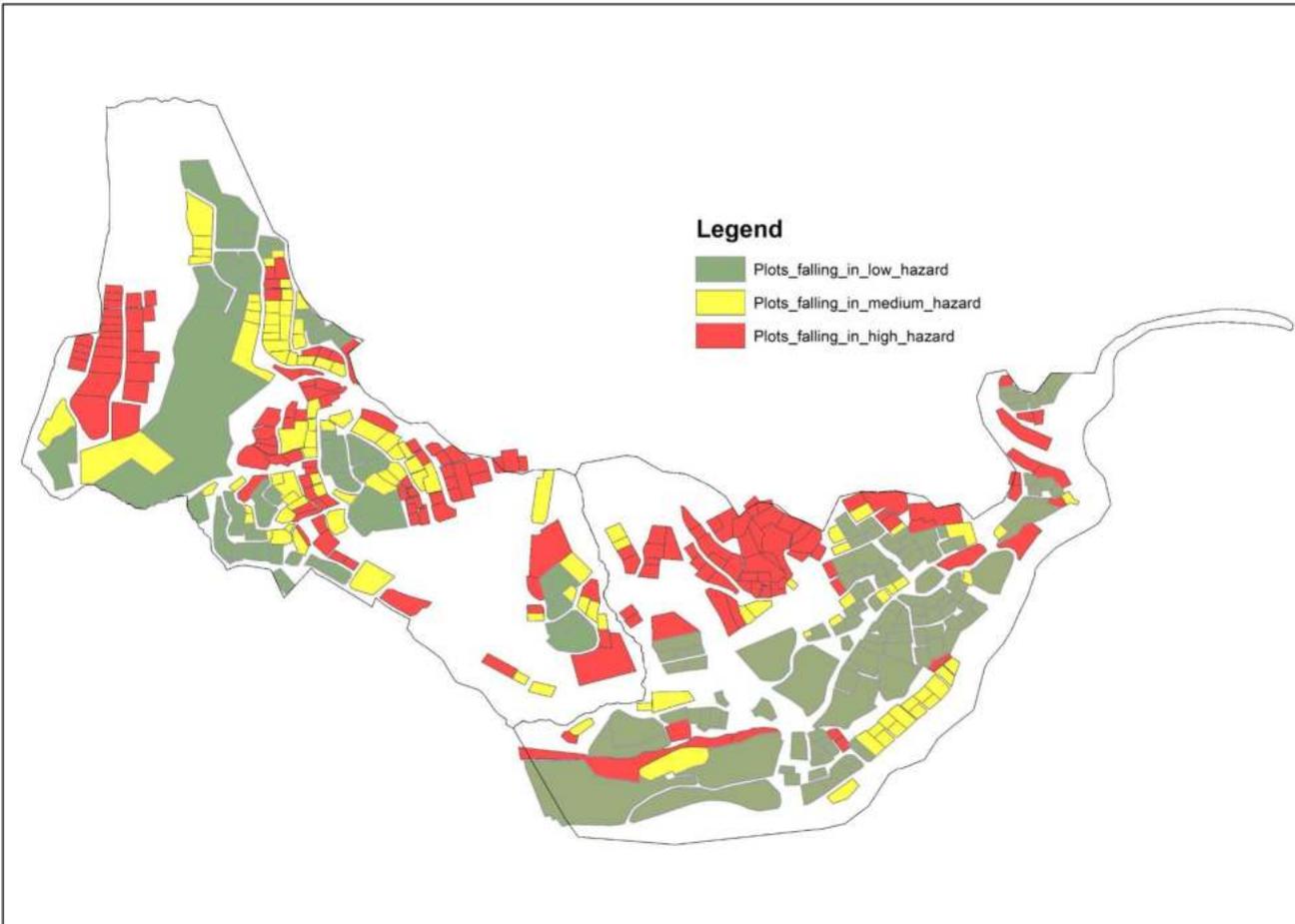
## Existing Scenario: Existing Infrastructure



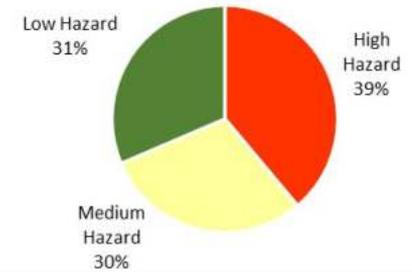
# Existing Scenario: Existing Precinct



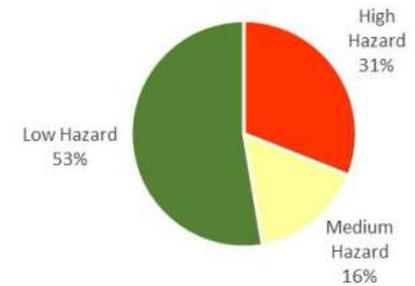
# Existing Scenario: Plots as per Hazard Analysis



### Dhamdara LAP



### Kabrayter LAP

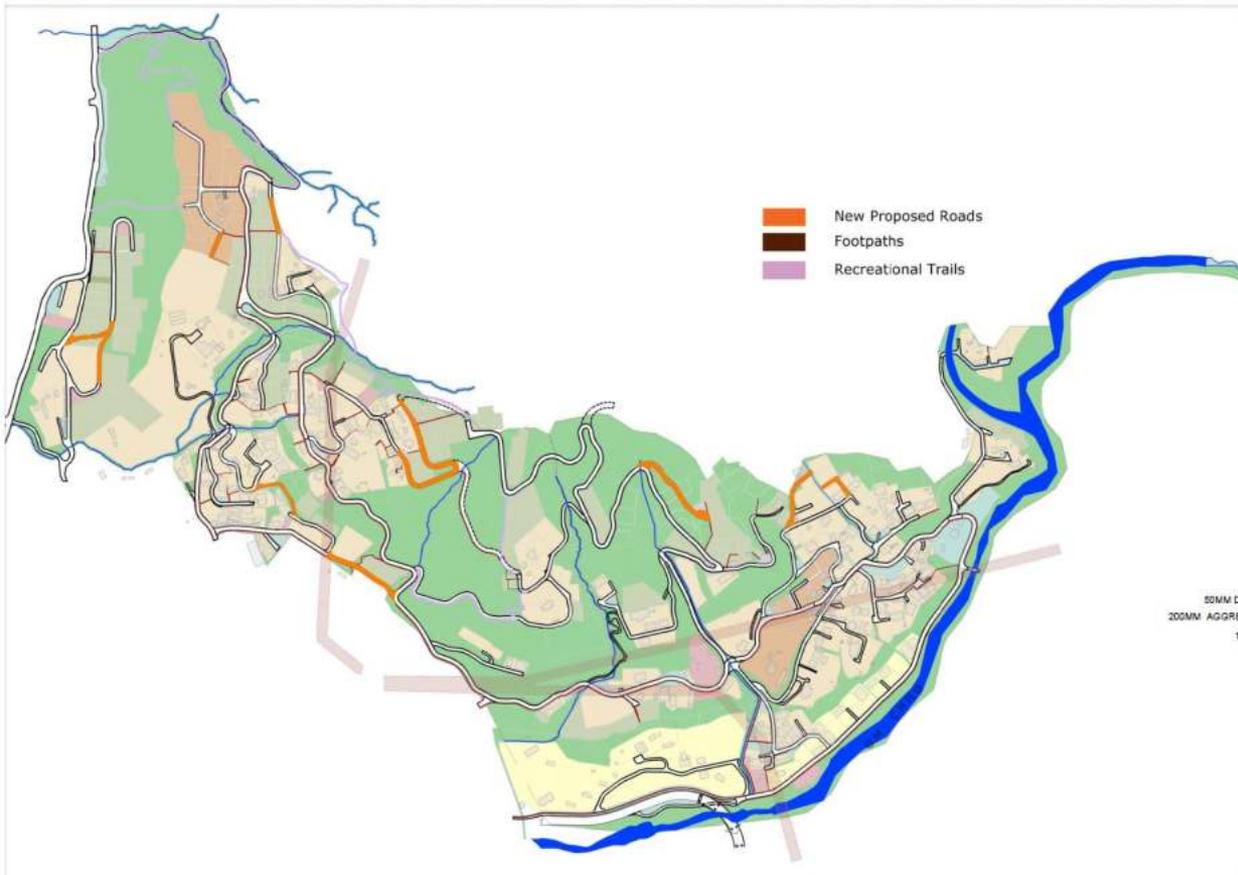


# PROPOSALS

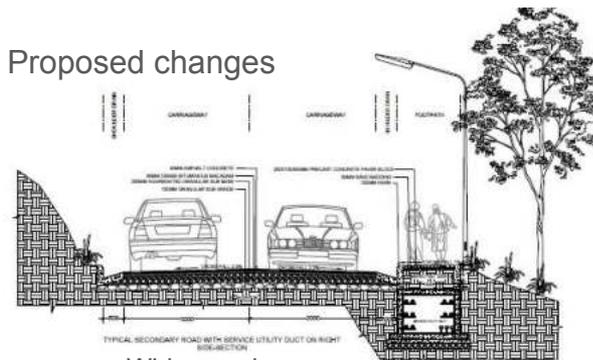
# Proposal: Precinct

	<b>Physical Determinants/ Criteria for Precinct Determination</b>		
<b>Precincts</b>	<b>Slope (%)</b>	<b>Hazard</b>	<b>Other Criteria</b>
E1	Above 58%	High	3m, 5m and 15m buffers from minor streams, Bogataybari chhu and Om Chhu respectively.
E4	30-58%	Low-Medium	
OS-2	0-50%	Low-Medium	Available vacant government plots/ excess/ pooled land
S1	0-50	Low-Medium	Vacant government plot
UV2-LD	0-30%	Low-medium	Existing buildings constructed under UV2 LD precinct
UV2-HD	0-20%	Low-medium	Existing buildings constructed under UV2 HD precinct
NN	0-30%	Low-medium	Centrally located in the LAP

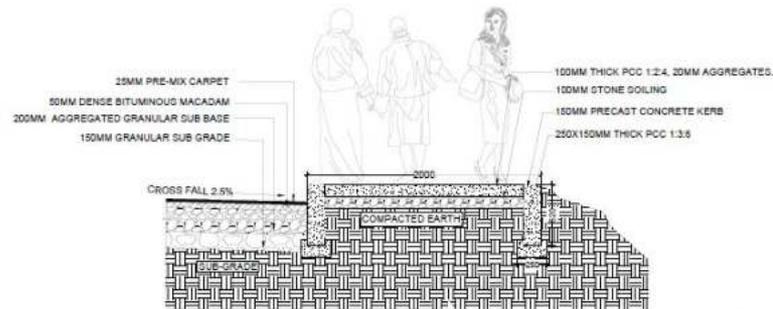
# Proposal: Infrastructure



## Proposed changes



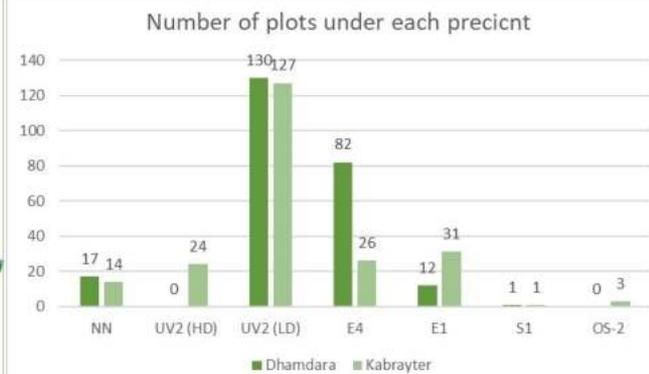
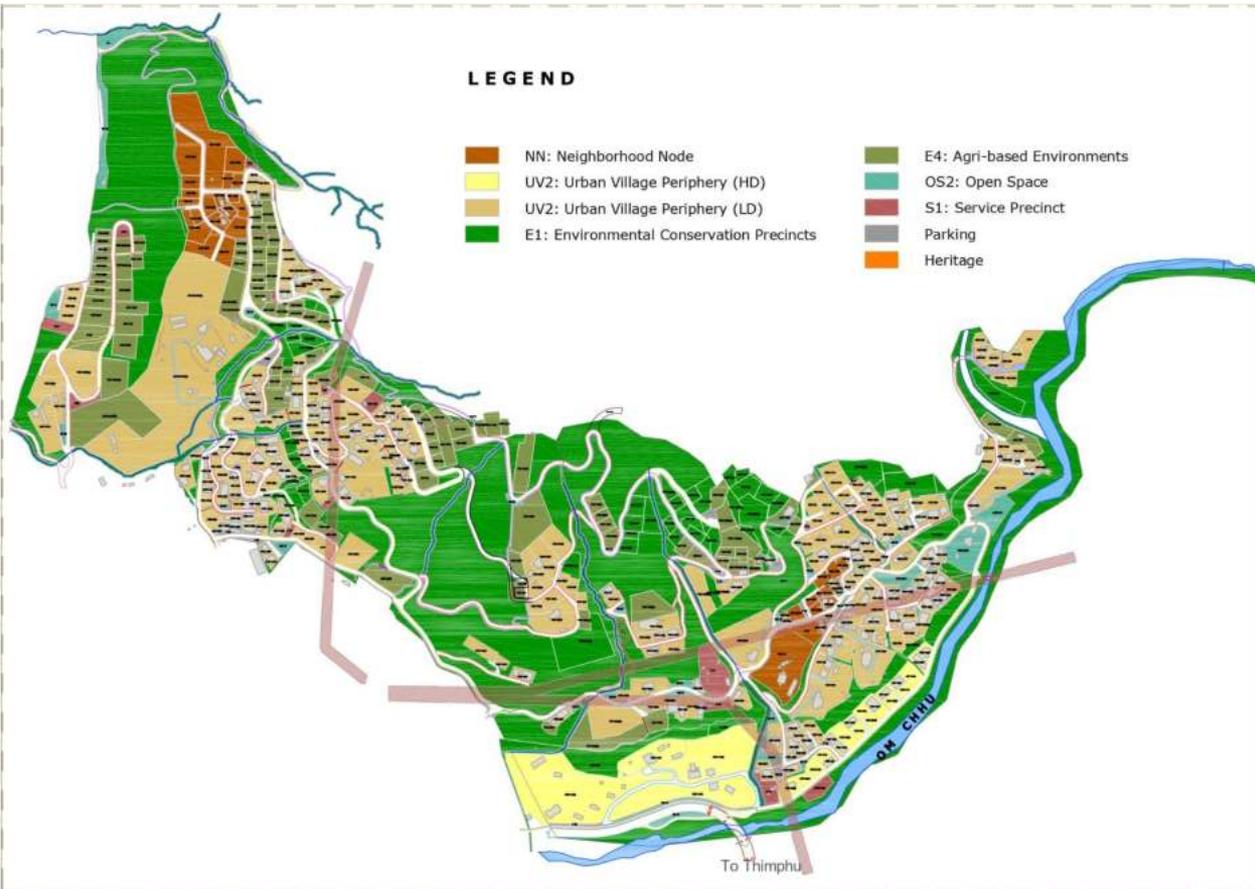
- Wider roads
- New Road Connections
- Proper Storm Water Drainage
- Proper Sewerage System



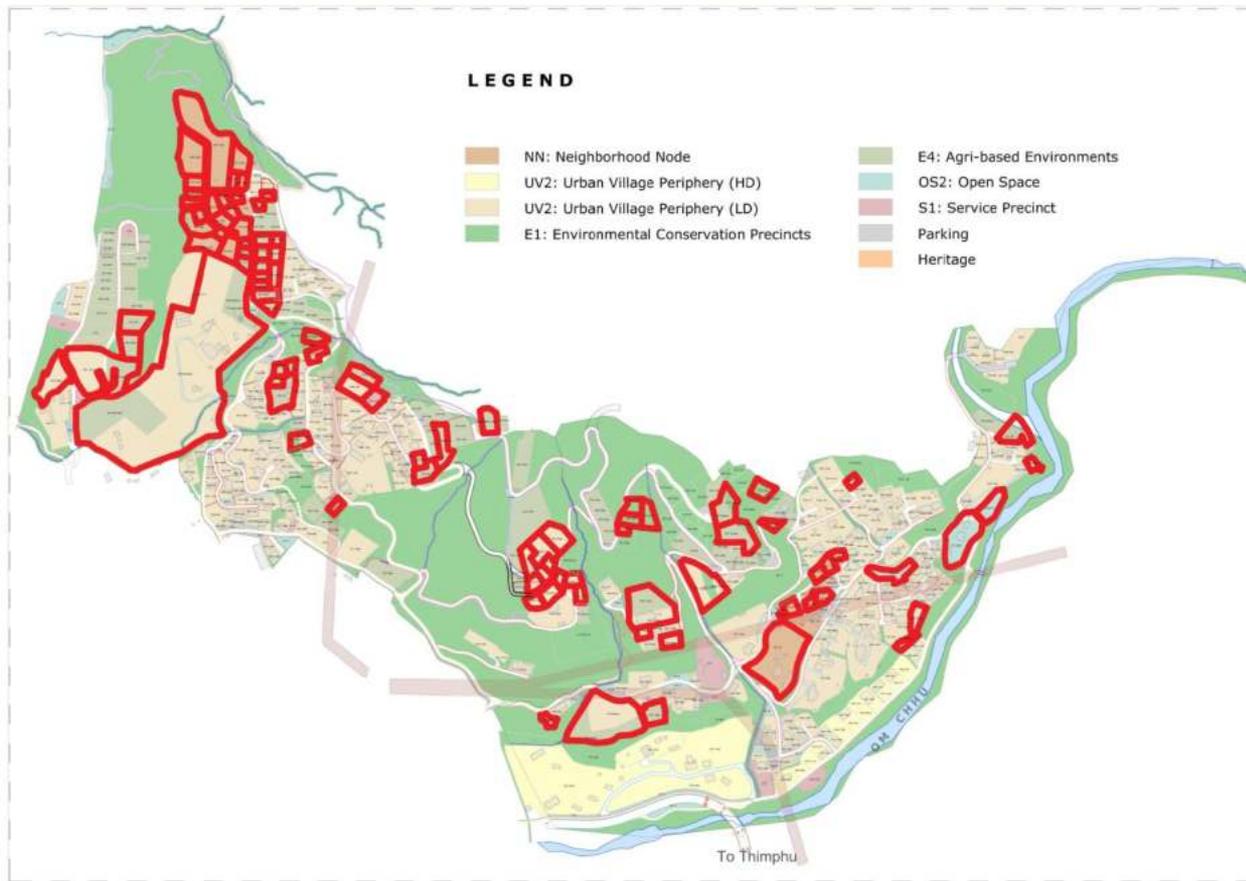
TYPICAL RECREATIONAL TRAIL DETAIL ALONG ROAD

- Proper connectivity through Footpaths

# Proposal: Precinct map

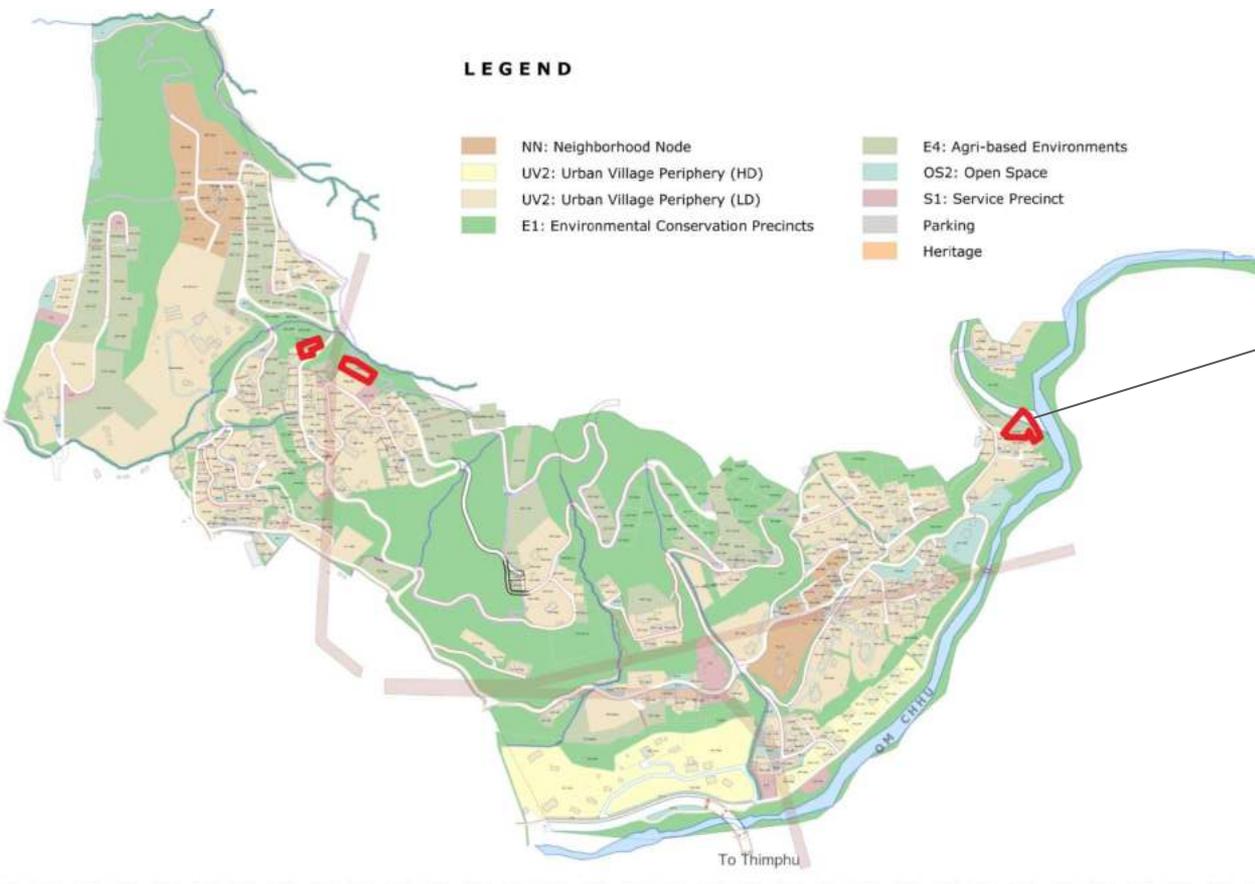


# Proposal: Plots with changed precincts



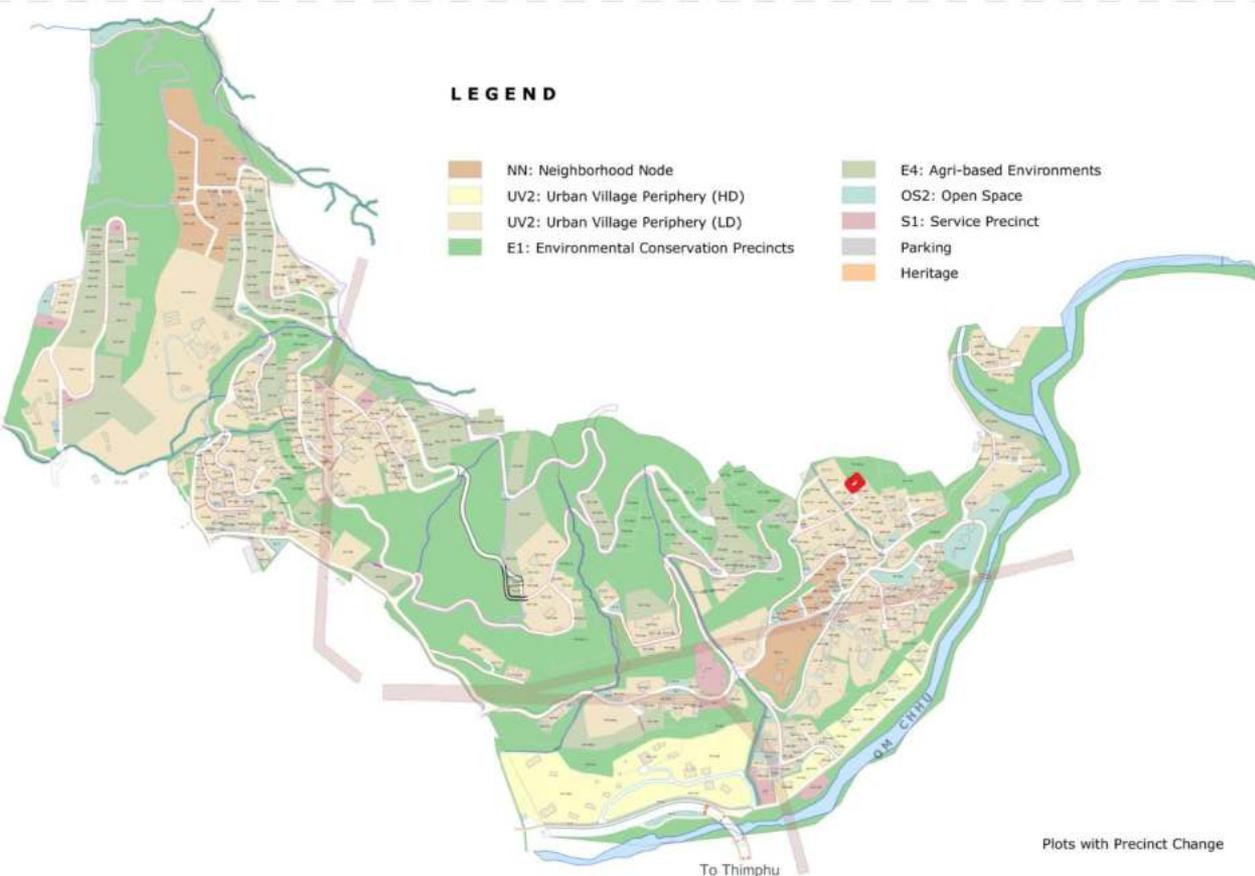
Number of Plots with Precinct change	
E1 to E4	6
E1 to UV2LD	1
E4 to E1	9
E4 to UV2LD	18
UV2LD to E1	2
UV2LD to E4	33
UV2LD to NN	25
<b>TOTAL</b>	<b>94 Plots</b>

# Proposal: Plots with changed precincts (E1 to E4) - 6 Plots



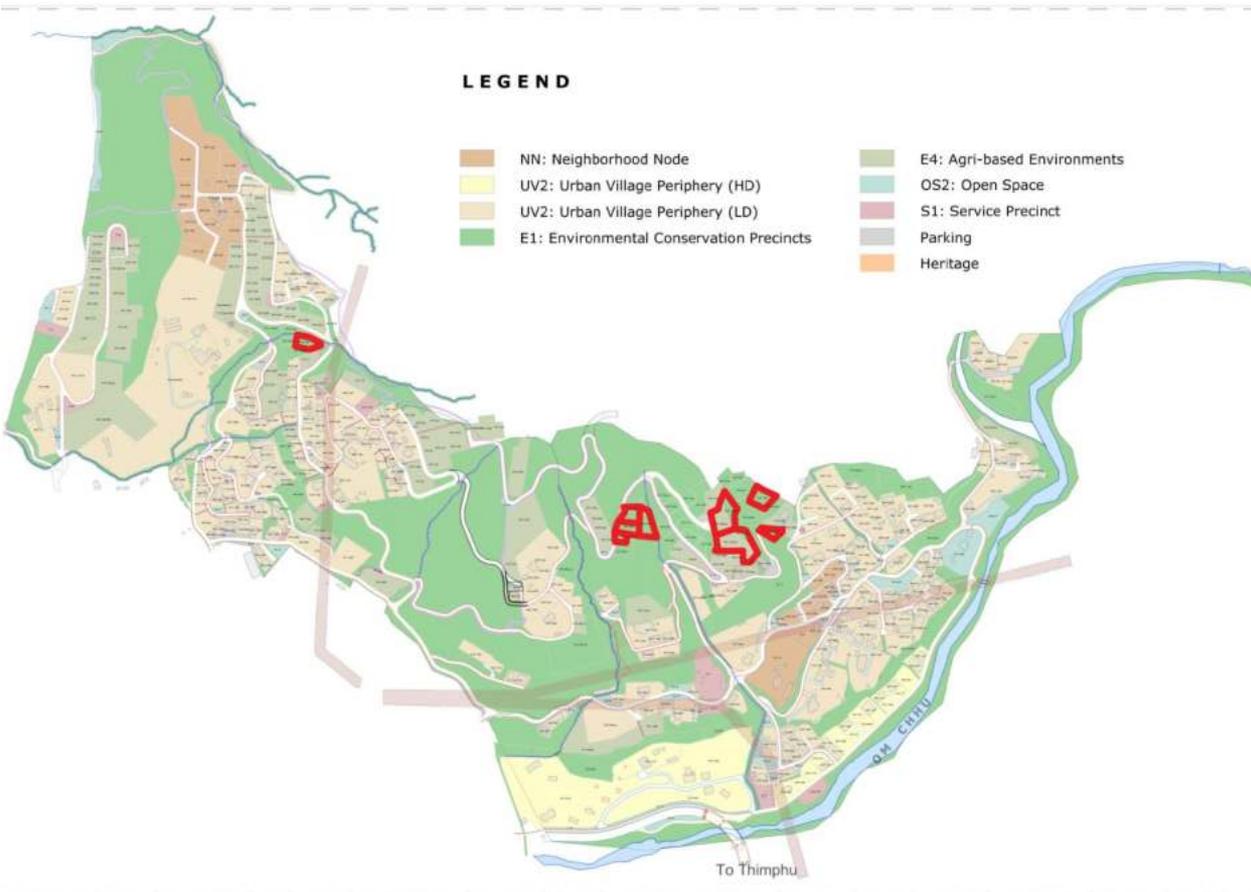
Plot_ID	Area_decimal	Existing Precinct	Proposed Precinct
PGT-1248	11.05395	E1	E4
PGT-48	36.00848	E1	E4
PGT-71	17.00336	E1	E4
PGT-862 (c)	17.13045	E1	E4
PGT-921	39.60058	E1	E4
PGT-922(a)	31.27101	E1	E4

# Proposal: Plots with changed precincts (E1 to UV2LD) - 1 Plot



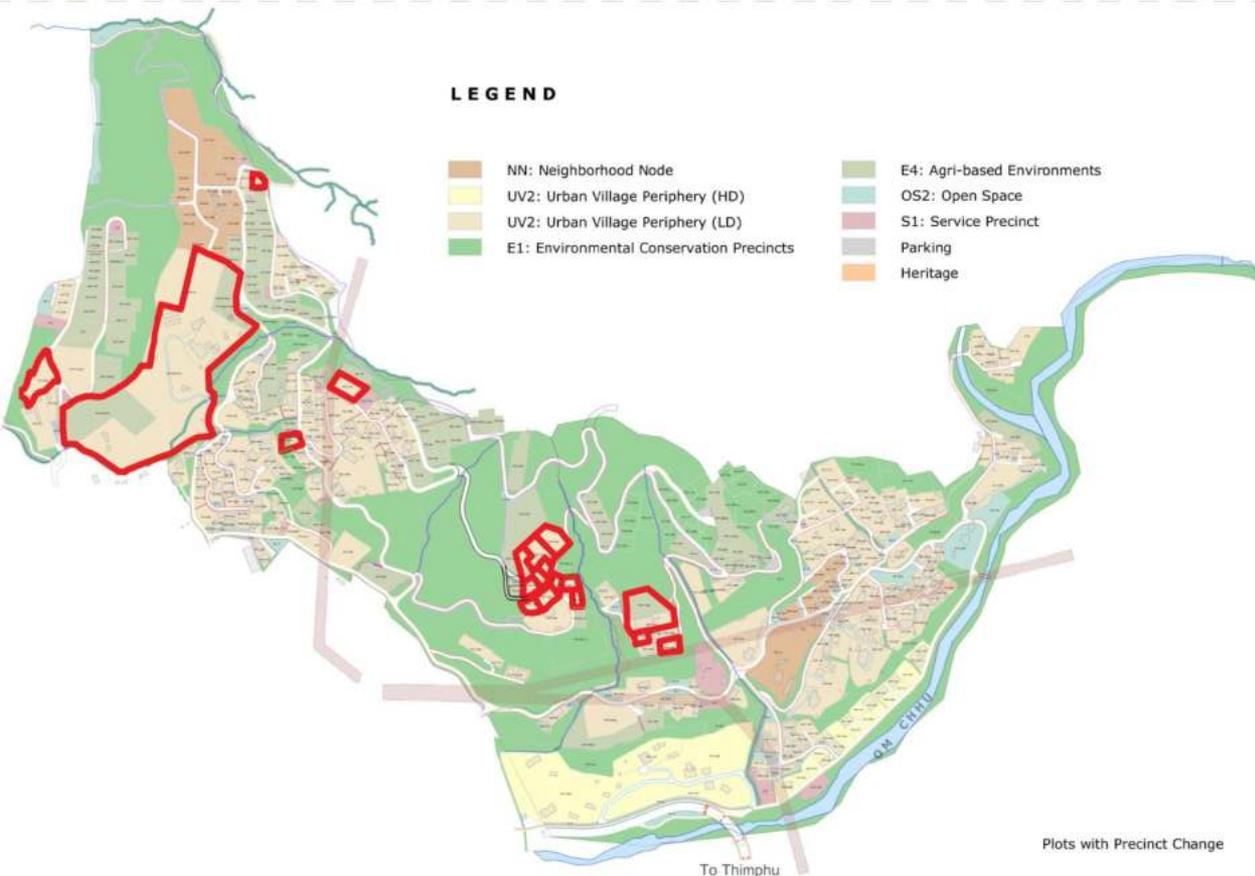
Plot_ID	Area_decimal	Existing Precinct	Proposed Precinct
PGT-1575	8.799225	E1	UV2 (LD)

# Proposal: Plots with changed precincts (E4to E1) - 9 Plots



Plot_ID	Area_decimal	Existing Precinct	Proposed Precinct
PGT-1147(b)	11.29694	E4	E1
PGT-1284	26.39623	E4	E1
PGT-1983(b)	22.24169	E4	E1
PGT-2437	25.00231	E4	E1
PGT-2444	25.00171	E4	E1
PGT-2447	35.00114	E4	E1
PGT-2947	11.9512	E4	E1
PGT-2967	8.802255	E4	E1
PGT-3539	19.64381	E4	E1

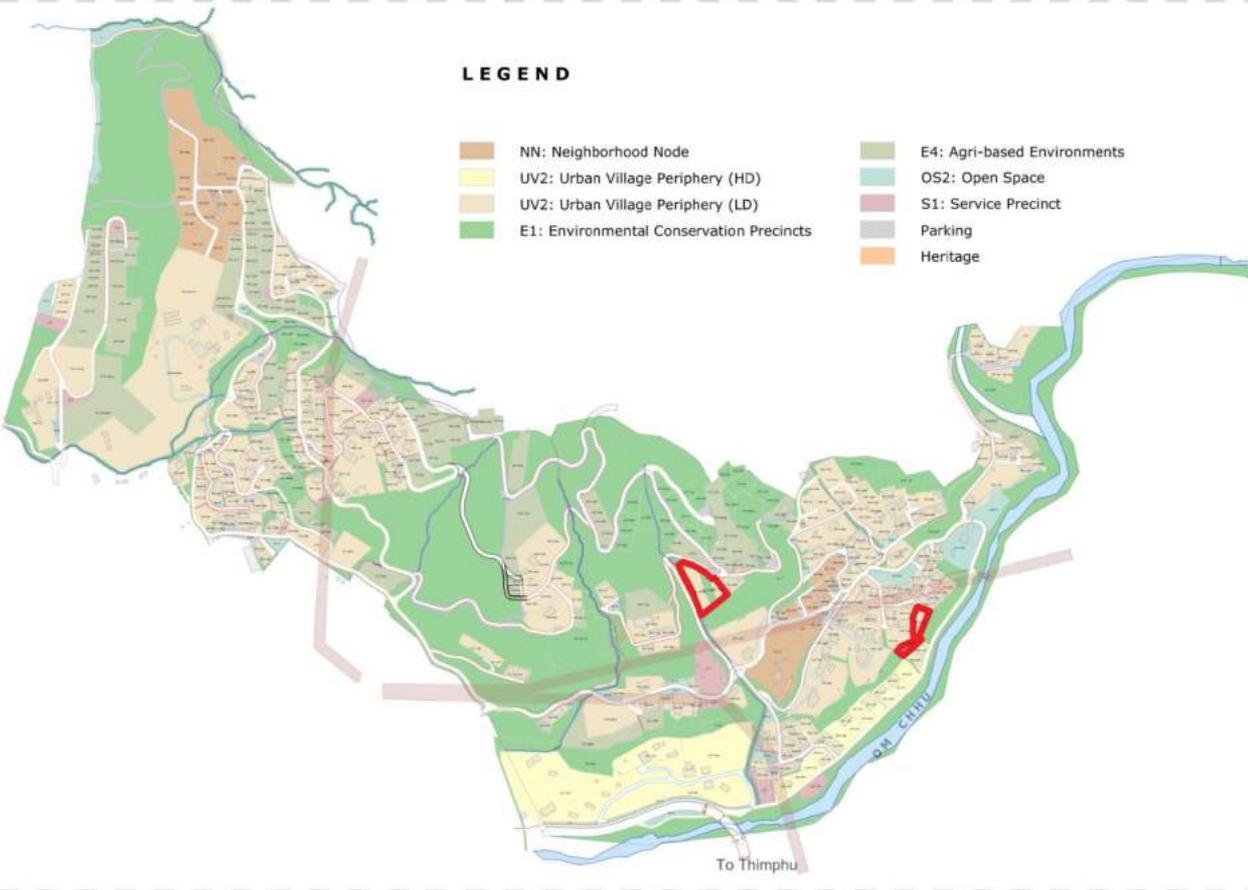
# Proposal: Plots with changed precincts (E4 to UV2LD) - 18 Plots



Plot_ID	Area_decimal
PGT-1019	26.18086
PGT-1567	41.65477
PGT-1654(a)	9.203165
PGT-172(b)	51.55684
PGT-1992	17.00378
PGT-237	17.00334
PGT-238	12.75144
PGT-2436	45.06022
PGT-2440	45.06026
PGT-2507	42.25623
PGT-2777	11.9077
PGT-2939	13.19916

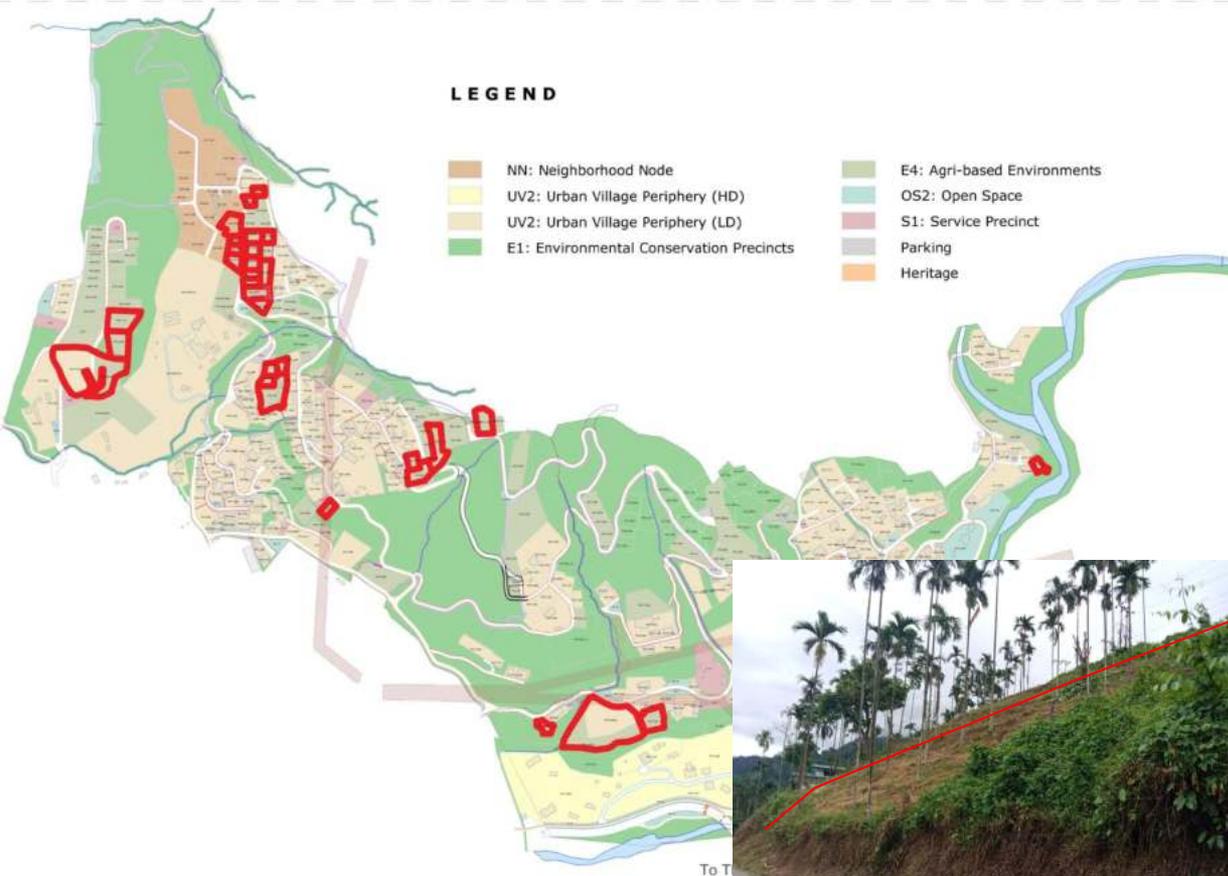
Plot_ID	Area_decimal
PGT-2940	67.06706
PGT-2956	18.5703
PGT-2980	20.00031
PGT-3585	72.01498
PGT-3939	13.0033
PGT-3953	13.00344

# Proposal: Plots with changed precincts (UV2LD to E1) - 2 Plots



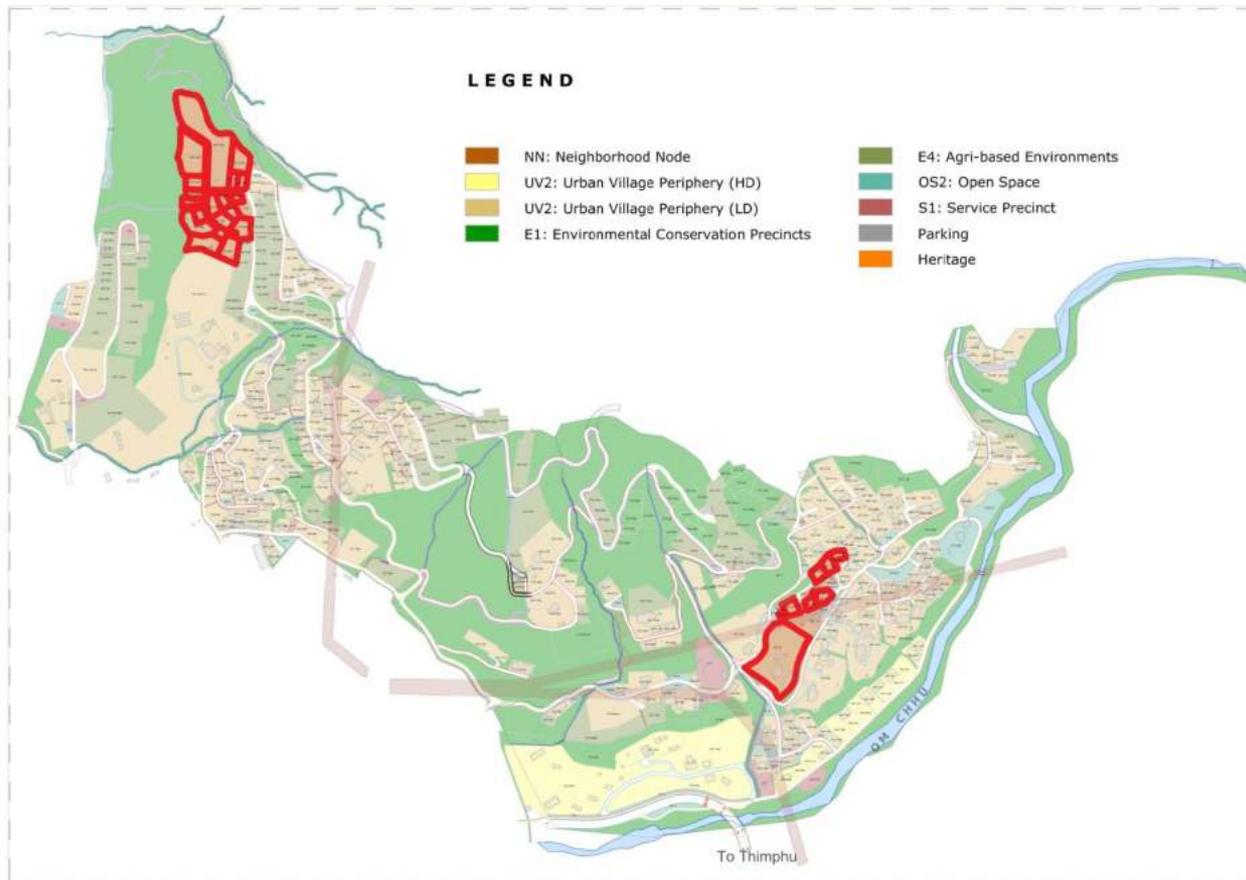
Plot_ID	Area_decimal	Existing Precinct	Proposed Precinct
PGT-1237(b)	15.87006	UV2 (LD)	E1
PGT-1839(c)	24.32968	UV2 (LD)	E1

# Proposal: Plots with changed precincts (UV2LD to E4) - 33 Plots



Plot_ID	Area	Plot_ID	Area	Plot_ID	Area
Ashi Savitri(b)	234.5	PGT-1394	12.8	PGT-3588	14.5
PGT-1027	10.9	PGT-1429	29.8	PGT-49	56.5
PGT-1029	10.9	PGT-1616	25.5	PGT-62	28.1
PGT-1076	11.1	PGT-1671	15.6	PGT-771	11.1
PGT-1085	36.1	PGT-2025	31.4	PGT-780	17.0
PGT-1117	16.2	PGT-2198	42.5	PGT-808(b)	104.3
PGT-1119	8.2	PGT-2287	22.1	PGT-89	8.5
PGT-115	45.9	PGT-2443	11.1		
PGT-1212	40.8	PGT-259	8.5		
PGT-1261	11.1	PGT-2751	11.4		
PGT-1294	13.6	PGT-2784	10.6		
PGT-1324(b)	79.1	PGT-327	16.8		
PGT-134	15.8	PGT-345	11.1		

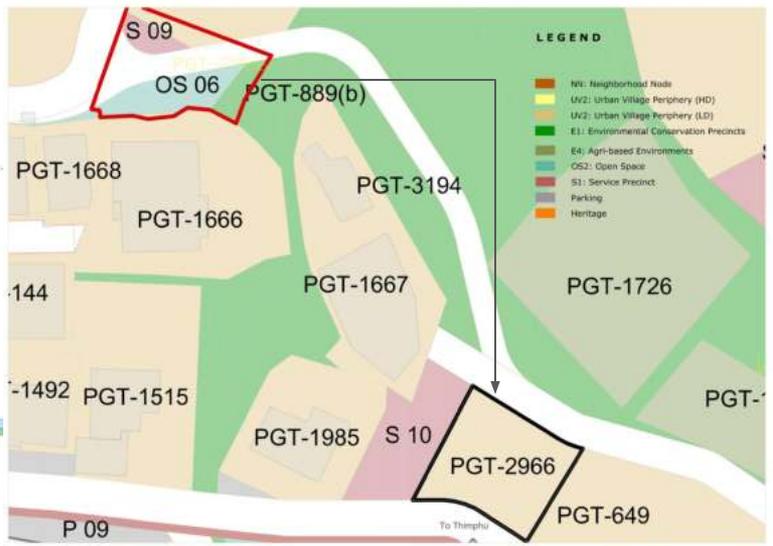
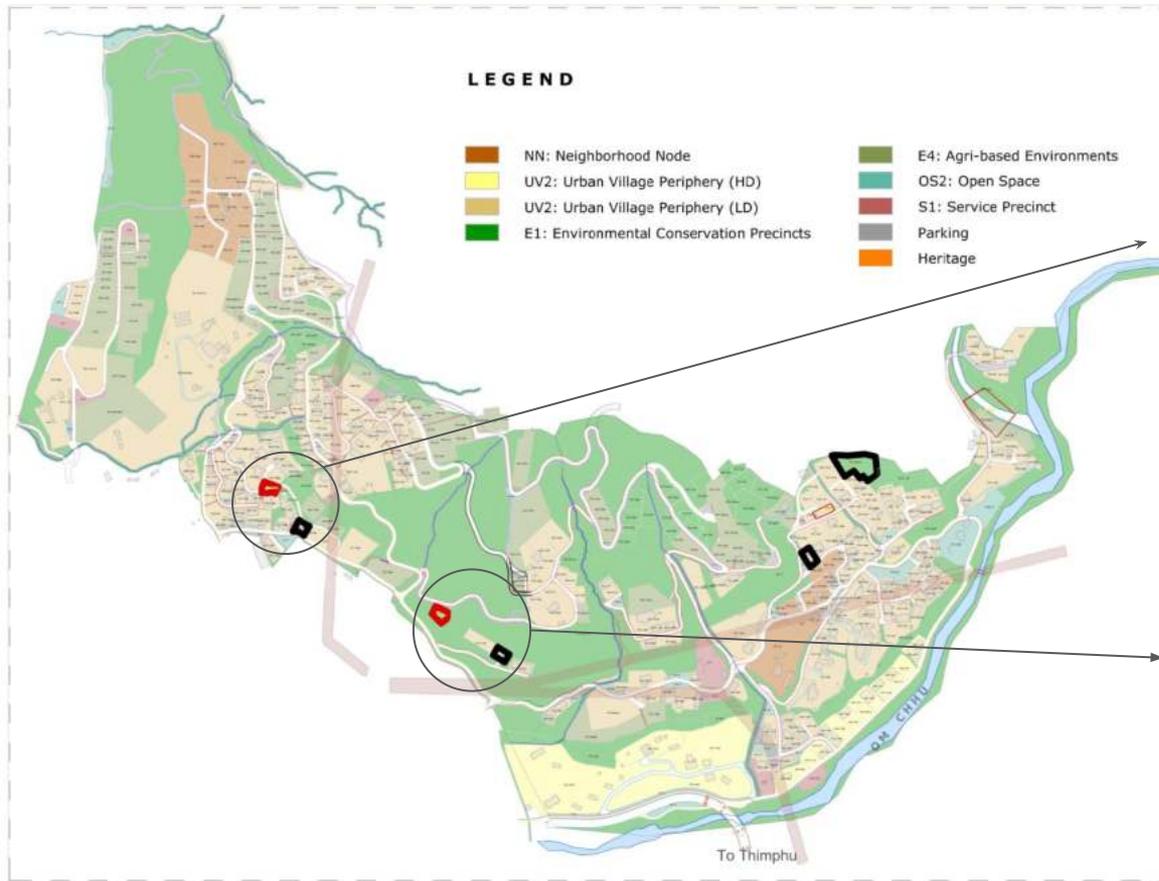
# Proposal: Plots with changed precincts (UV2LD to NN) - 25 Plots



Plot_ID	Area_decimal
PGT-1087	8.50182
PGT-1116	12.750257
PGT-1144	12.75301
PGT-1198	12.75321
PGT-13	206.80617
PGT-1525	42.509071
PGT-1535	42.507685
PGT-1571	21.255786
PGT-1635	38.258825
PGT-1737	14.956762
PGT-1762	21.255736
PGT-1832	196.19013
PGT-1979	10.560382

Plot_ID	Area_decimal
PGT-2010	16.719242
PGT-254	16.103111
PGT-3053	78.378519
PGT-3595	11.439626
PGT-3959	12.802777
PGT-47	13.60241
PGT-478	34.006923
PGT-636	12.752758
PGT-843	21.242889
PGT-860	14.069311
PGT-892	14.961076
PGT-894	3.00049

# Proposal: Relocated plots

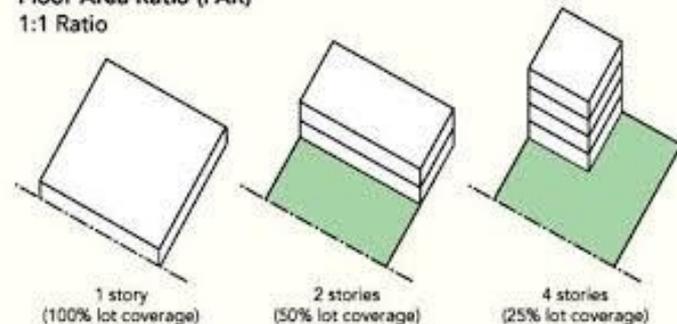




# Proposal: DCR

Precinct	Max. Permissible F. A. R	Max. Permissible No. of Floors	Minimum setbacks (metres)*	Min. Plot Size (Decimal)
Urban Village 2 (UV-2 HD)	2.5	5	2.5 m (on one side) 3 m (on three sides)	9.1
Urban Village 2 (UV-2 LD)	1.5	3	2.5 m (on one side) 3m (on three sides)	9.1
Neighbourhood Node (NN)	1.5	3	2.5 m (on one side) 3m (on three sides)	9.1
Service Precinct1 (S – 1)	1.5	3	3m on all sides.	-
Environmental Precinct (E-4)	0.6	2	2.5 m (on one side) 3m (on three sides)	15

Floor Area Ratio (FAR)  
1:1 Ratio





Thank You