GEOHYDROLOGICAL CATCHMENT ASSESSMENT OF BHAMA-ASKHED DAM AND PART CATCHMENT AREA OF CHAS-KAMAN DAM KHED TEHSIL,PUNE DISTRICT,MAHARASHTRA

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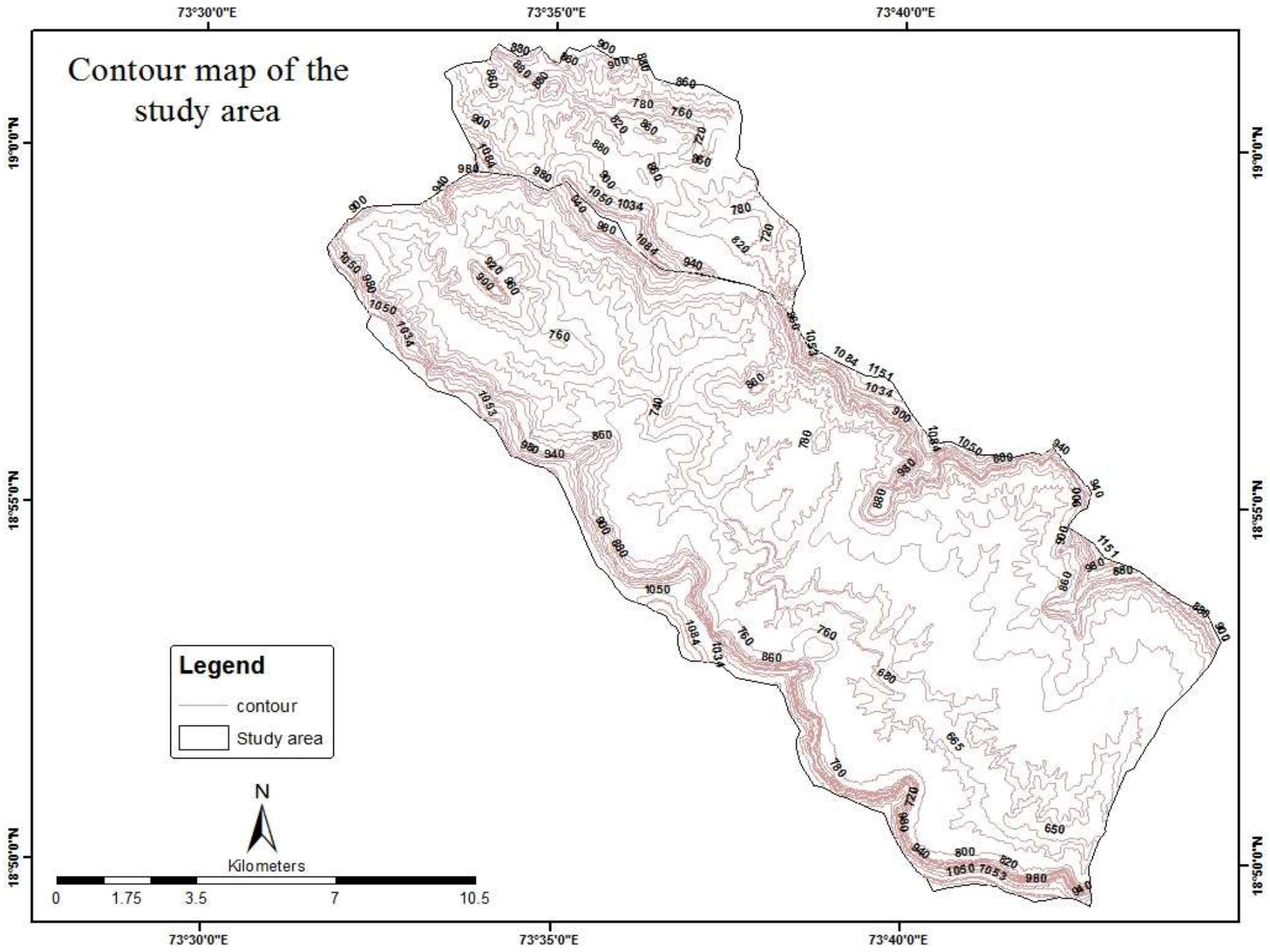
AIMS AND OBJECTIVES

- To identify the Recharge vulnerable zones which need careful attention during the installation and execution of infrastructure projects

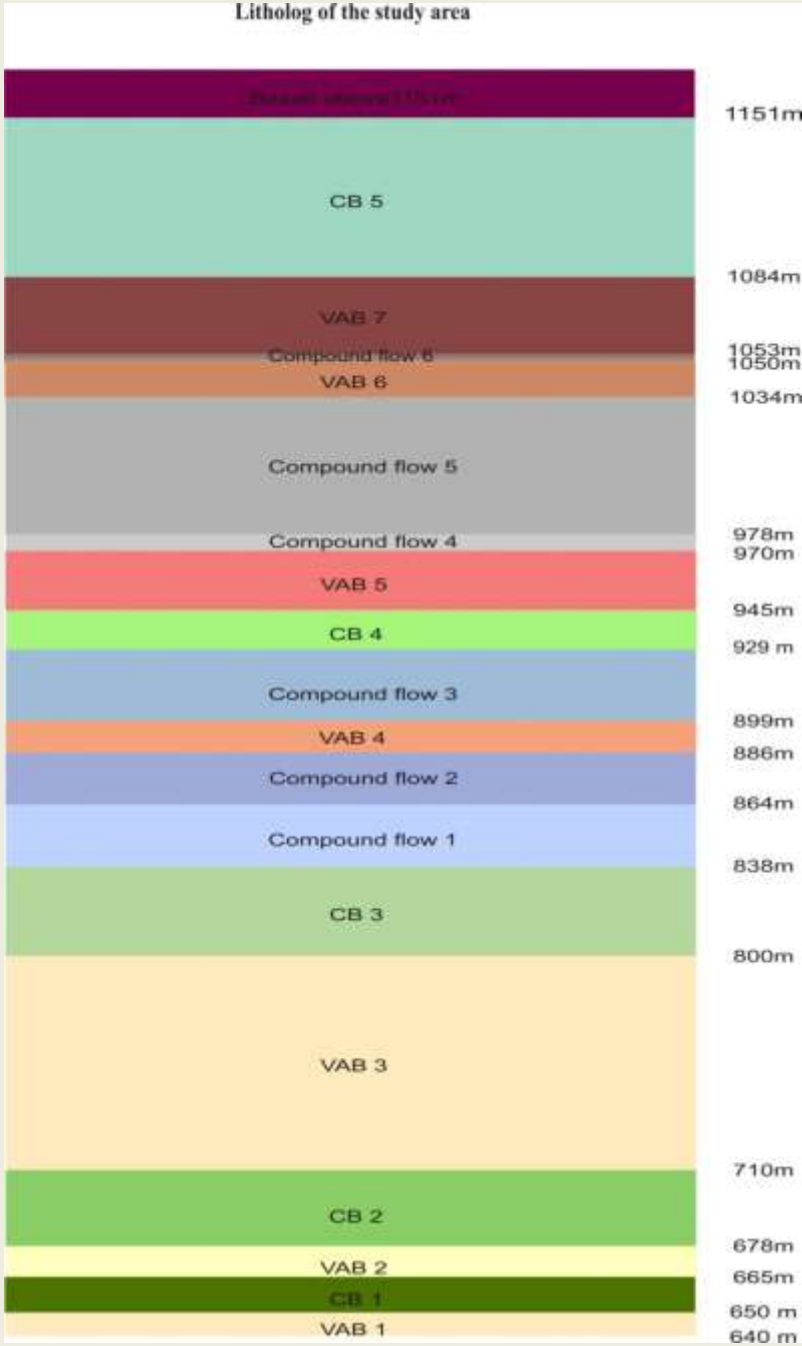
  - Geological mapping of the area
  - Drainage analysis
  - Preparation of maps
  - To give suggestions for construction of conservation structures in the area

GEOMORPHOLOGY OF THE STUDY AREA

- Northeast evergreen and semi evergreen belt of the Sahyadri range
- Most of the study area is drained by the Bhama river while other part by Bhima river and its tributaries
- Elevation difference between the highest (1293m) and the lowest points (640m) is about 653m within the distance of 214 sq.Km
- Main river channel exhibits meandering pattern almost all along its entire course
- Tributary drainage exhibits diverse drainage pattern


Contour map of the study area
73°30'0"E
73°35'0"E
73°40'0"E
19°0'0"N
18°55'0"N
18°50'0"N
Legend
contour
Study area
N
Kilometers
0
1.75
3.5
7
10.5

GEOLOGY OF THE AREA



- Vesicular amagdolidal basalt (VAB) is weathered and each VAB unit is overlain by denser, compact basalt
- The compact basalt in the area is dense and massive

LINEAMENTS

Study area Characteristics:

- The VAB shows parallel to sub-parallel sheet joints this attributes them a higher hydraulic conductivity when compared to compact basalts
- The compact basalt is jointed and most joints are subvertical
- Compound basalts show cavities, often filled with the minerals while others are empty
- The major regional trends is in the North-West part of the area and are observed in two directions – 1. NE-SW 2. NNE-SSW.

Map of drainage overlay on geology for the study area

73°30'0"E

19°0'0"N

18°50'0"N

Legend

Stream Order

1
2
3
4
5

GEOLOGY

- BASALT ABOVE 1151m
- CB 5
- VAB 7
- Compound flow 6
- VAB 6
- Compound flow 5
- Compound flow 4
- VAB 5
- CB 4
- Compound flow 3
- Study area
- VAB 4
- Compound flow 2
- Compound flow 1
- CB 3
- VAB 3
- CB 2
- VAB 2
- CB 1
- VAB 1
- Red Layers
- Lineaments

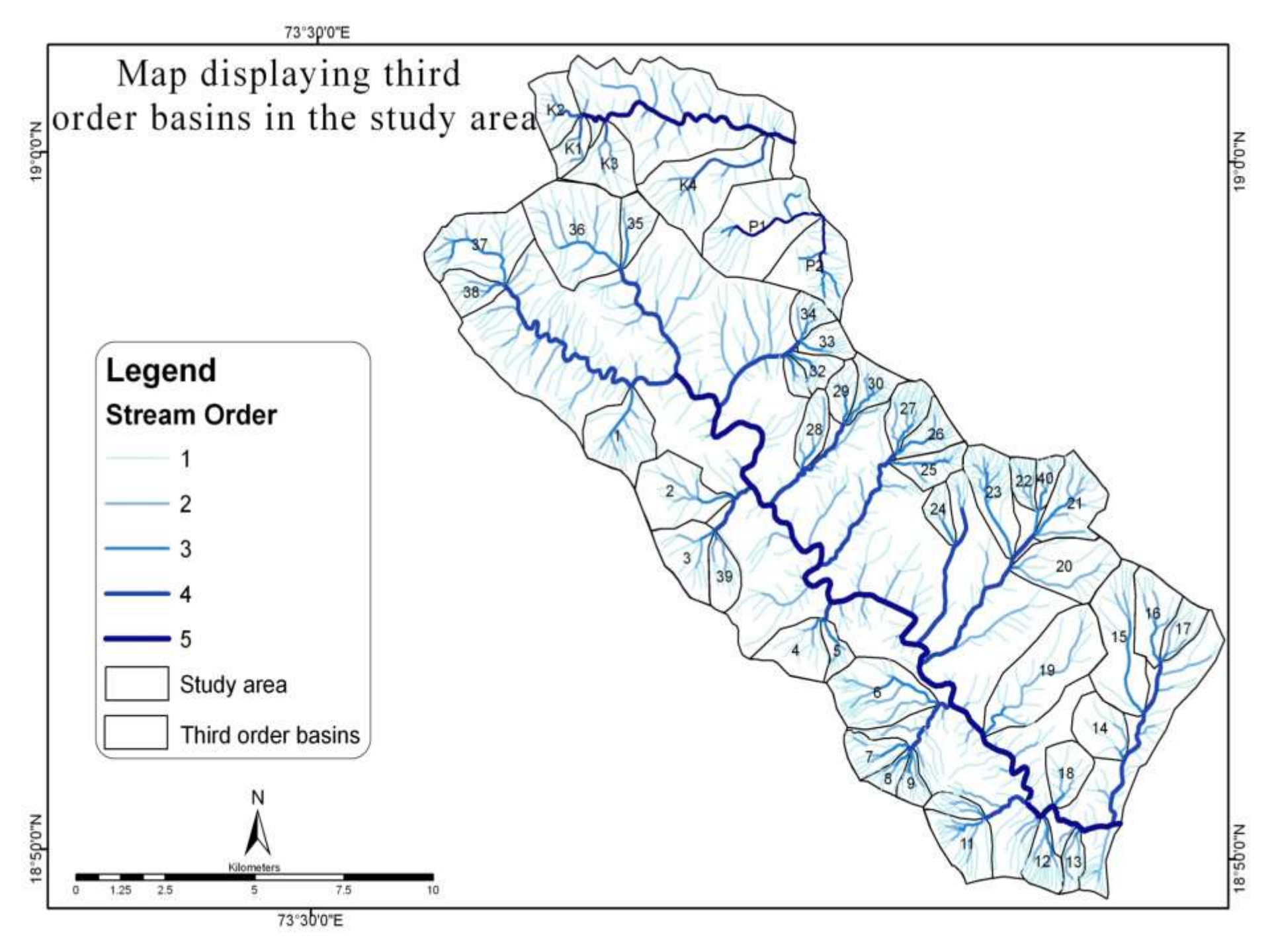
N

Kilometers

0 1.25 2.5 5 7.5 10

DRAINAGE BASIN ANALYSIS

- Investigations for zones of adequate groundwater potential
- Sites selection for construction of artificial recharge structure
- Information about the erosional process
- Reflect the nature (permeability) of surfaces exposed in the basin


Map displaying third order basins in the study area
73°30'0"E
19°0'0"N
18°50'0"N
Legend
Stream Order
1
2
3
4
5
Study area
Third order basins
N
Kilometers
0
1.25
2.5
5
7.5
10
K1
K2
K3
K4
P1
P2
1
2
3
4
5
6
7
8
9
11
12
13
14
15
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32
33
34
35
36
37
38
39
40

CHARACTERS STUDIED

BIFURCATION RATIO (BF_o):

No. Of streams of order n / No. Of streams of order (n+1)

Study area Characteristics:

- 66% sub basins are structurally controlled
- 61% basins are mountainous controlled by slopes

DRAINAGE DENSITY:

- Length of the stream per unit area.

- Higher drainage density values indicate greater relief and lower permeability of surfaces.

Drainage density value	Drainage Density
0-2	Low
2-4	Moderate
4-6	High
>6	Very high

Study area Characteristics:

- Areas have moderate to very high relief and moderate to low permeability of surfaces

- About 24% sub basins have very high drainage density and 30% basins have high drainage density

- Remaining 46% sub basins have moderate drainage density

STREAM FREQUENCY:

- Ratio of the total number of streams of all orders within a given basin, to the basin area

- Higher stream frequency indicates steeper gradients and lower permeability of surface

Stream Frequency value	Stream Frequency
0-2	Very poor
2-4	Poor
4-6	Moderate
>6	Very high

Study area Characteristics:

- 25% basins have poor to moderate stream frequency

- 75% basins have very high stream frequency

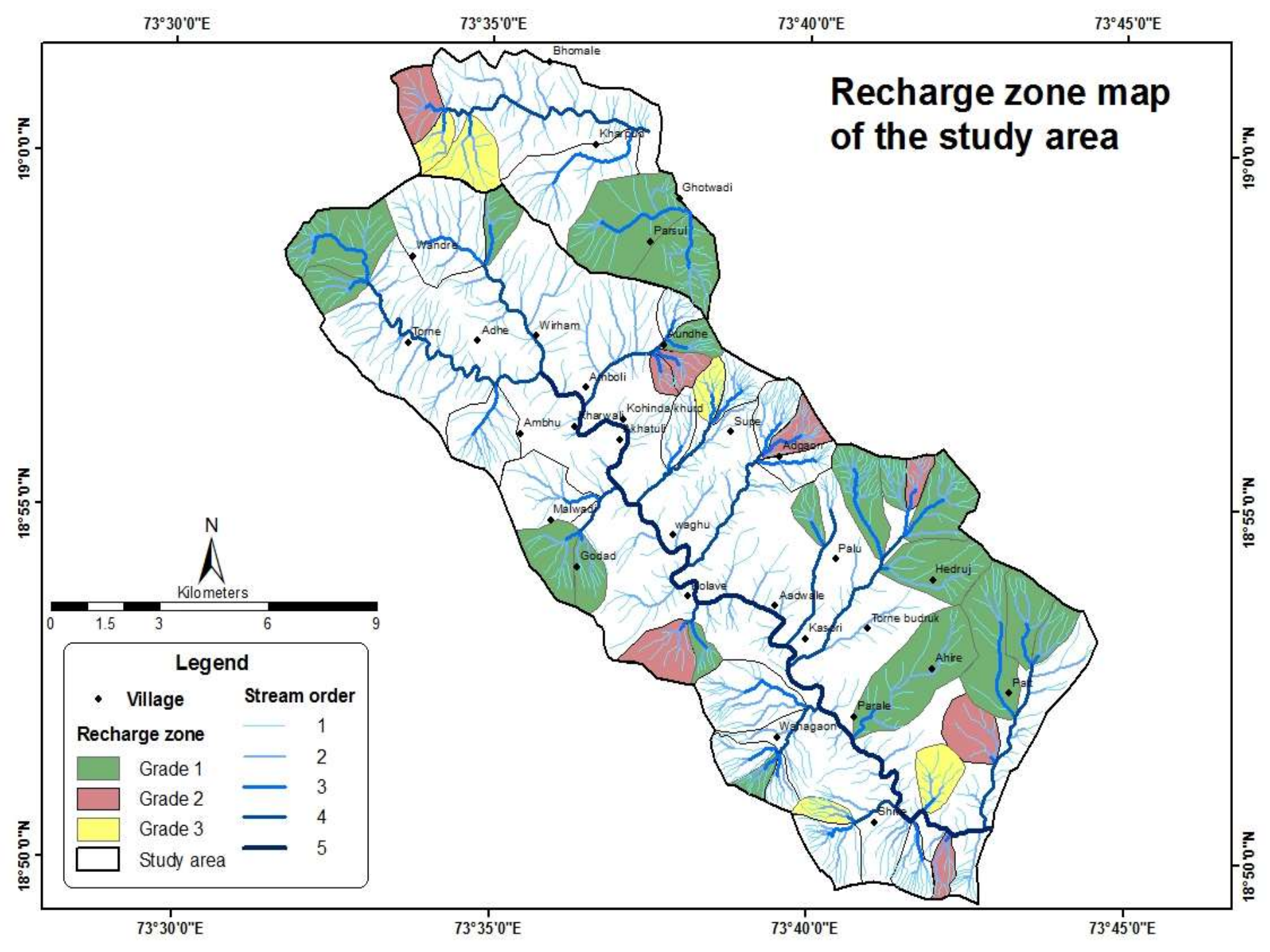
- Area have steeper gradients and lower permeability of surface. Hence there will be the lower rate of infiltration of the surface water

DRAINAGE TEXTURE:

- Drainage texture is a product of drainage density and stream frequency
- Texture below 4 is designated as coarse and 4 to 10 as intermediate

Study area Characteristics:

- 8% sub basins have intermediate texture
- 92% sub basins have very fine texture


Recharge zone map of the study area
73°30'0"E
73°35'0"E
73°40'0"E
73°45'0"E
19°0'0"N
18°55'0"N
18°50'0"N
Bhomale
Kharpud
Ghotwadi
Parsul
Wandre
Torne
Adhe
Wirham
Kundhe
Amboli
Kohinde khurd
Kharwali
Khatuli
Ambhu
Supe
Adgaon
Malwad
waghu
Godad
Palu
Hedruj
Asdwale
Kasari
Torne budruk
Ahire
Parale
Wahagaon
N
Kilometers
0
1.5
3
6
9
Legend
Village
Stream order
1
2
3
4
5
Recharge zone
Grade 1
Grade 2
Grade 3
Study area

RECHARGE VULNERABILITY INDEX

- The concept of RECHARGE VULNERABILITY recognizes the risk to groundwater recharging potential on account of any externality

Two formulae have been developed to integrate two scenarios, in estimating the RVI

- If Bifurcation ratio is more than 5 then,

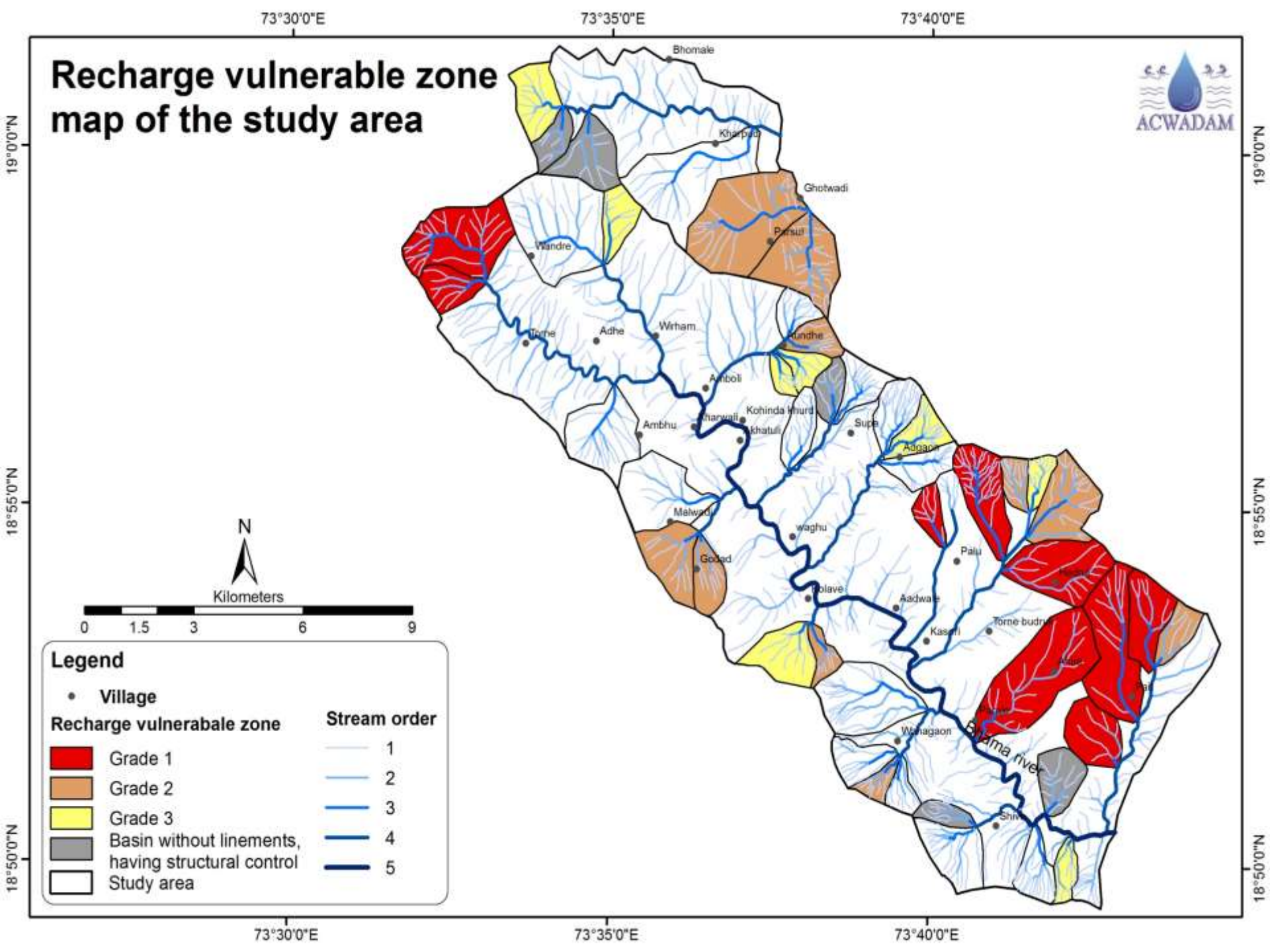
  Vulnerability Index = (Bifurcation ratio* Number of lineaments) / Slope

- If Bifurcation ratio is equal to 2 then,

  Vulnerability Index = Number of lineaments / Slope

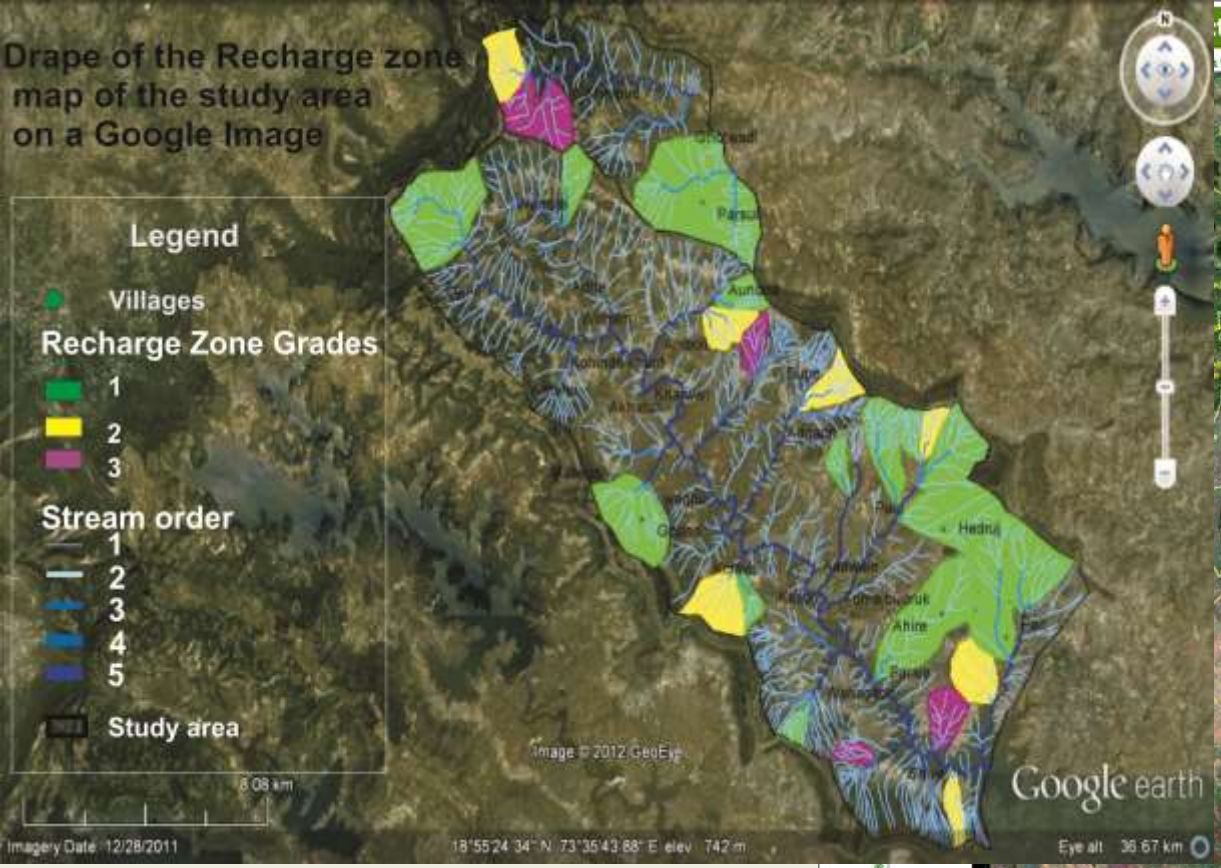
- level of risk for groundwater recharging potential is more in grade1 vulnerable zones while lesser in grade 3 vulnerable zones

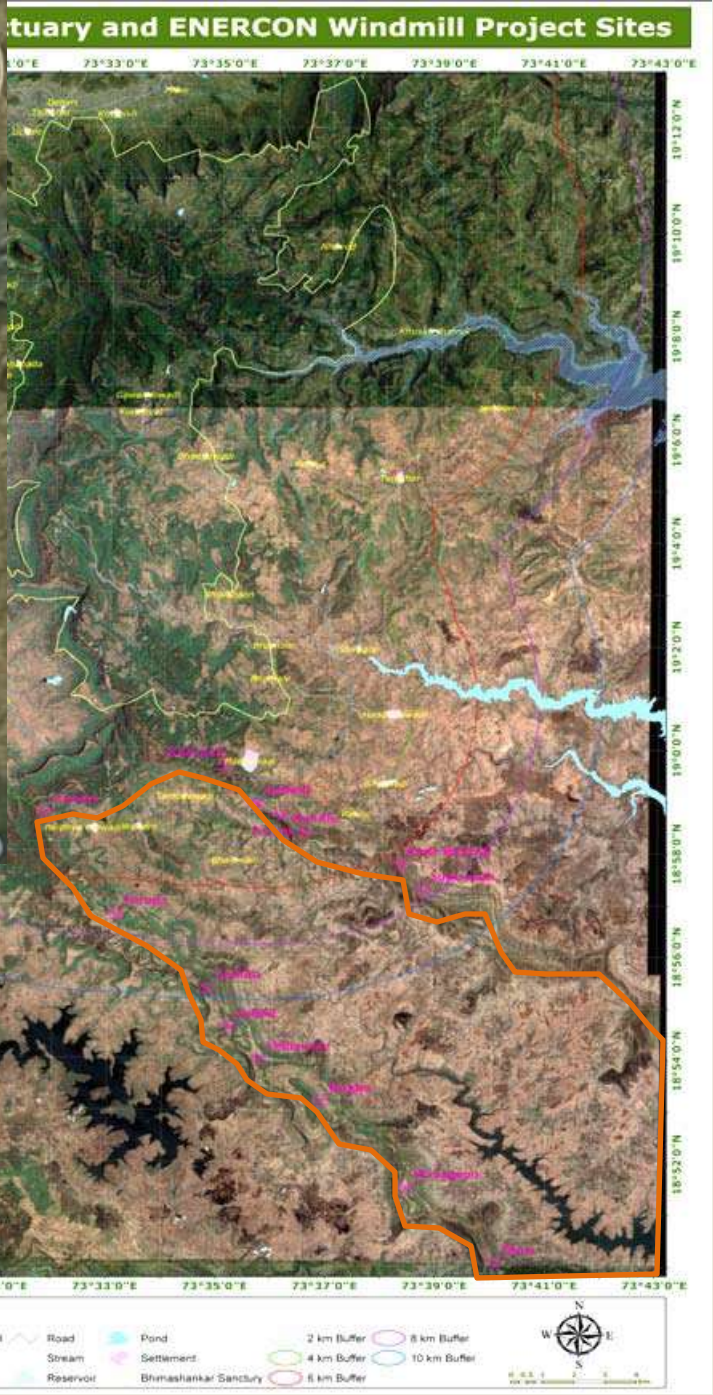
Vulnerability Grade	Bifurcation ratio	Vulnerability index
Grade1	5	> 250
	2	> 30
Grade2	5	250 to 60
	2	30 to 15
Grade3	5	< 60
	2	< 15


Recharge vulnerable zone map of the study area
ACWADAM
73°30'0"E
73°35'0"E
73°40'0"E
19°0'0"N
18°55'0"N
18°50'0"N
Bhomale
Khanpur
Ghotwadi
Parsul
Wandre
Torne
Adhe
Wrham
Aamboli
Kohinda khurd
Ambhu
Supe
Malwadi
waghu
Palu
Aadwale
Kasari
Torne budruk
Wahagaon
Bhama river
N
Kilometers
0
1.5
3
6
9
Legend
Village
Recharge vulnerabale zone
Grade 1
Grade 2
Grade 3
Basin without linements, having structural control
Study area
Stream order
1
2
3
4
5

CONCLUSION AND RECOMMENDATIONS

- In the recharge zones, the “knick points” are most vulnerable, and are the points of potential recharge
- Wherever such points coincide with the tops of vesicular-amygdaloidal basalts or compound basalt units or are part of a fracture-bearing linear feature, they are definite recharge areas for the underlying aquifers
- These potential recharge zones play a crucial role in maintaining the potential of underlying aquifers
- These zones can be the potential areas where conservation and percolation related activities can be undertaken
- Debris resulting from infra-projects is often littered on such recharge zones, which in the longer-term, could preclude recharge to underground aquifers





- Grade 1: 10 of 19
- Grade 2: 5 of 8
- Grade 3: 4 of 5

recharge zones are already disturbed to various degrees on account of land-use/land-cover disturbances resulting from windmill installations.

Map is given by Atul Kale & made by Science and Technology park, Pune.

Examples of disturbances of natural recharge zones in the region as a result of infrastructure creation for windmill projects

Source: Prof. (Dr.) Madhav Gadgil's ppt.


THANK YOU....!!!