

United Nations Office of the Outer Space(UNOOSA)

**15th UNOOSA Symposium
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**SPACE TOOLS AND SOLUTIONS FOR
MONITORING THE ATMOSPHERE AND LAND
COVER FOR RURAL DEVELOPMENT PROJECTS:
GEO-SPATIAL TECHNOLOGY PROCESSES AND
APPLICATION MODELS**

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OUTLINE OF THE PRESENTATION

LAND BASED VEGETATIVE MONITORING INDICATORS

LARGE SCALE APPLICATION AT MICRO LEVEL

POLICY SUPPORT

ROAD AHEAD

CONCLUDING REMARKS

LAND BASED VEGETATIVE MONITORING INDICATORS

VEGETATIVE MONITORING INDICATORS

□ NORMALISED DIFFERENCE VEGETATION INDEX :

$$\text{NDVI} = \frac{\text{NIR} - \text{Red}}{\text{NIR} + \text{Red}}$$

□ TRANSFORMED VEGETATION INDEX :

$$\text{TNDVI} = \sqrt{\text{NDVI} + 0.5}$$

□ RATIO VEGETATION INDEX :

$$\text{RVI} = \text{NIR} / \text{RED}$$

□ SQRT. (NIR / RED)

□ BAND DIFFERENCING : (NIR – RED)

VEGETATION INDICES

QUANTITATIVE MEASURES BASED ON DIGITAL VALUES OF AN IMAGE

ATTEMPT TO MEASURE THE BIOMASS CONCENTRATION , VEGETATIVE VIGOR.

DENSITY AND SEASONAL VARIATIONS(TEMPORAL CHANGES) IN VEGETATION PATTERN AND THEIR DISTRIBUTION.

DISCRIMINATE VARIOUS CROPS AND CROP PREDICTION.

NORMALIZED DIFFERENCE VEGETATION INDEX

AMOUNT AND VIGOR OF VEGETATION ON THE SURFACE OF THE LAND AND WATER.

MAGNITUDE OF NDVI IS DIRECTLY RELATED TO THE LEVEL OF PHOTOSYNTHETIC ACTIVITY IN THE OBSERVED VEGETATION.

$NDVI = (NEAR\ IR - RED\ BAND) / (NEAR\ IR + RED\ BAND)$

MONITORING DENSITY AND VIGOR OF GREEN VEGETATION GROWTH

RATIO OF VEGETATION INDEX (RVI)

RATIO OF NEAR INFRARED AND RED BANDS. $RVI = NIR/RED$

INDICATES VEGETATION VIGOR

RVI VALUES RANGE BETWEEN 0 AND 2

VEGETATION INDEX (VI)

BAND DIFFERENCING IS ONE OF THE SIGNIFICANT METHODS OF VEGETATION INDEX WHICH EXTRACTS INFORMATION ABOUT VEGETATION FROM A MULTI-SPECTRAL IMAGE.

$$VEGETATION\ INDEX = (NIR-RED)$$

SINCE, THE REFLECTANCES OF VEGETATION IN INFRARED AND RED BANDS ARE MORE PROMINENT AND ARE INVERSELY RELATED , THESE BANDS ARE USED TO OBTAIN VEGETATION INFORMATION.

TRANSFORMED VEGETATION INDEX (TVI)

SQUARE ROOT OF NORMALIZED DIFFERENCE VEGETATION INDEX AND ADDITION OF 0.5 TO AVOID NEGATIVE VALUE.

$$TVI = \sqrt{NDVI + 0.5}$$

TO AVOID WORKING WITH NEGATIVE NORMALIZED DIFFERENCE VALUES

TVI VALUES RANGE BETWEEN 0 AND 1.5.

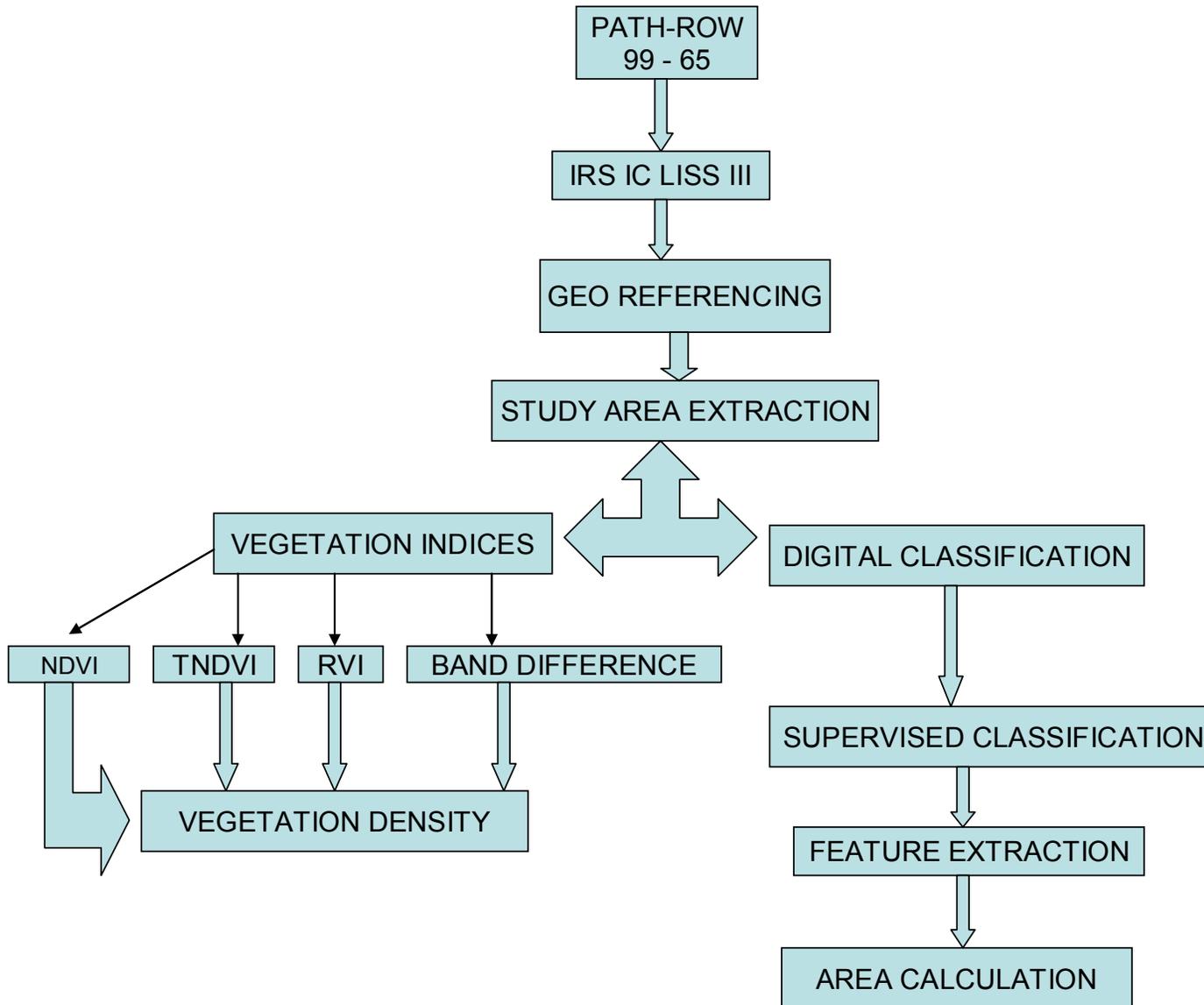
DIGITAL IMAGE CLASSIFICATION

SORTING OF PIXELS INTO FINITE NUMBER OF CLASSES BASED ON THE HOMOGENEITY IN THE PIXEL VALUES IN DIFFERENT SPECTRAL BANDS.

SUPERVISED AND UNSUPERVISED.

SUPERVISED CLASSIFICATION IS THE PROCESS OF CLASSIFYING PIXELS OF KNOWN IDENTITY BASED ON SEVERAL TRAINING FIELDS.

FLOW CHART



LARGE SCALE APPLICATION AT MICRO LEVEL

KERALA STATE, SOUTH INDIA

- **District** :Palakkad
- **Taluk** :Mannarkkad
- **Block** :Attappady
- **Panchayats** :Agali, Sholayur and Pudur
- **Revenue Village**: Ottappalam(Attappady Block)

- **Boundaries** (*With name of District around*)
 - North: Nilgiris (TN)
 - East: Coimbatore (TN)
 - South: Palakkad
 - West: Malappuram District

- **Geographical Details**
- **Total Geographical Extent: 745 sq.km**
- **Latitude : 10°55'10" and 11°14'19"**
- **North Longitude: 76°27'11" and 76°48'8" East**

LOCATION MAP

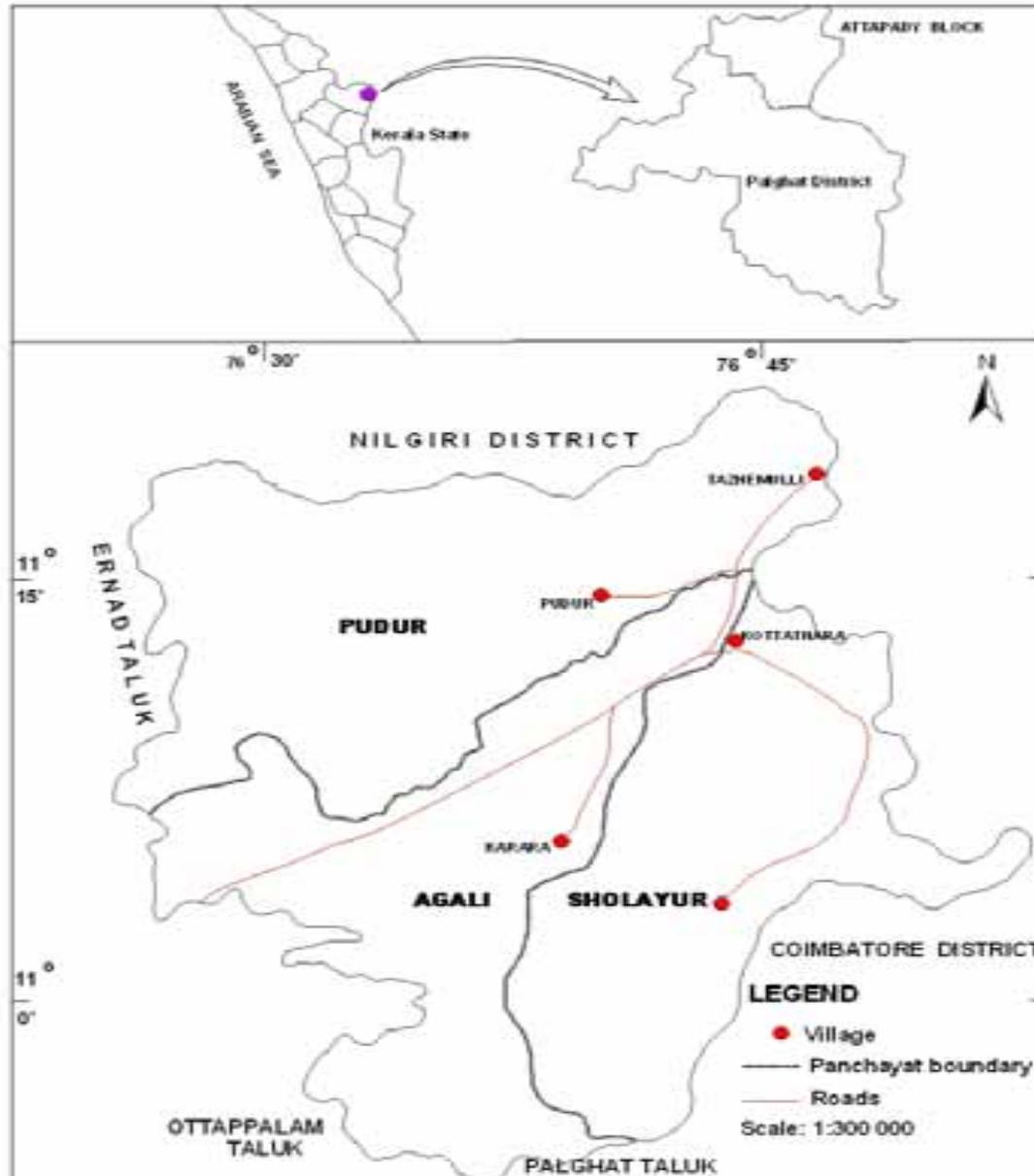
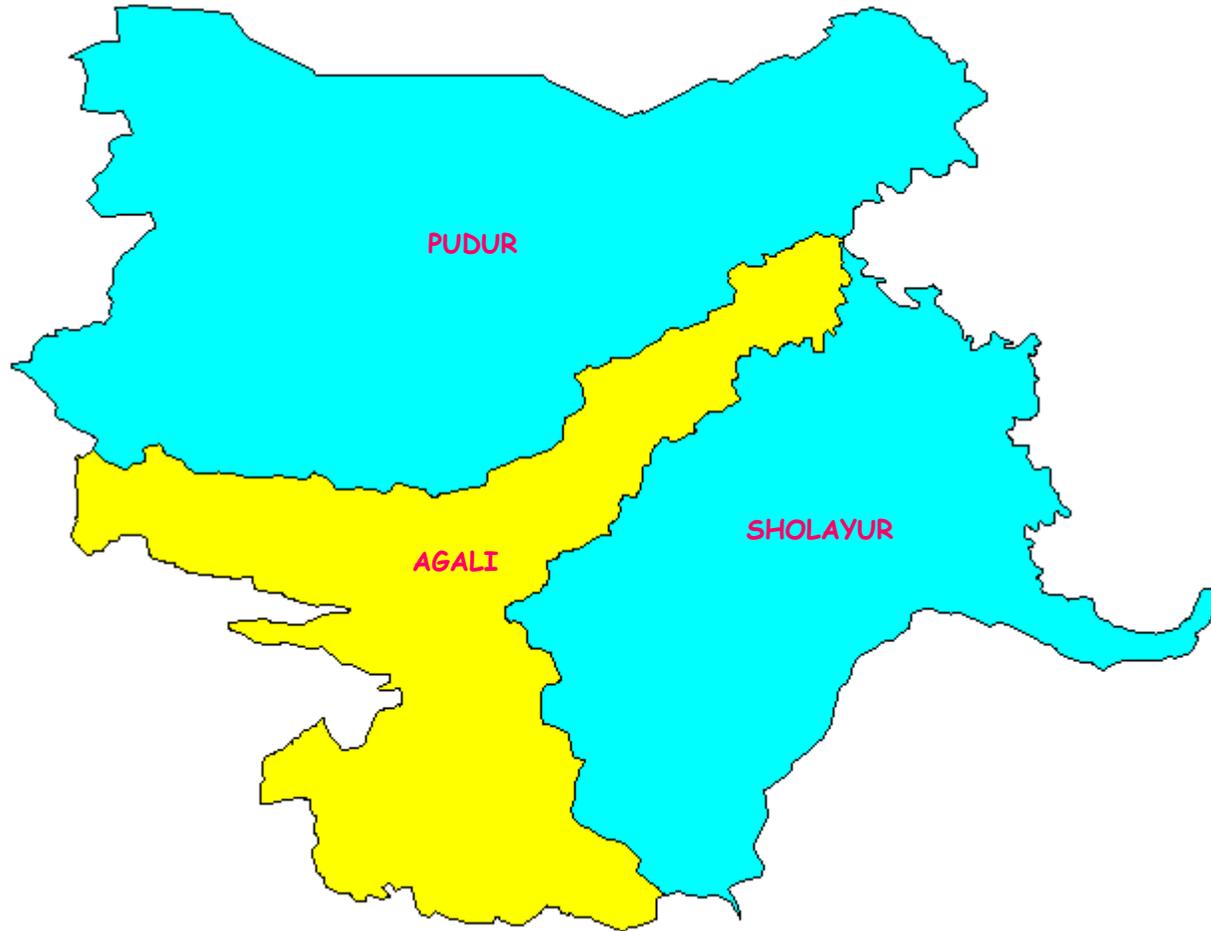


FIG.1 LOCATION MAP OF ATTAPADY BLOCK

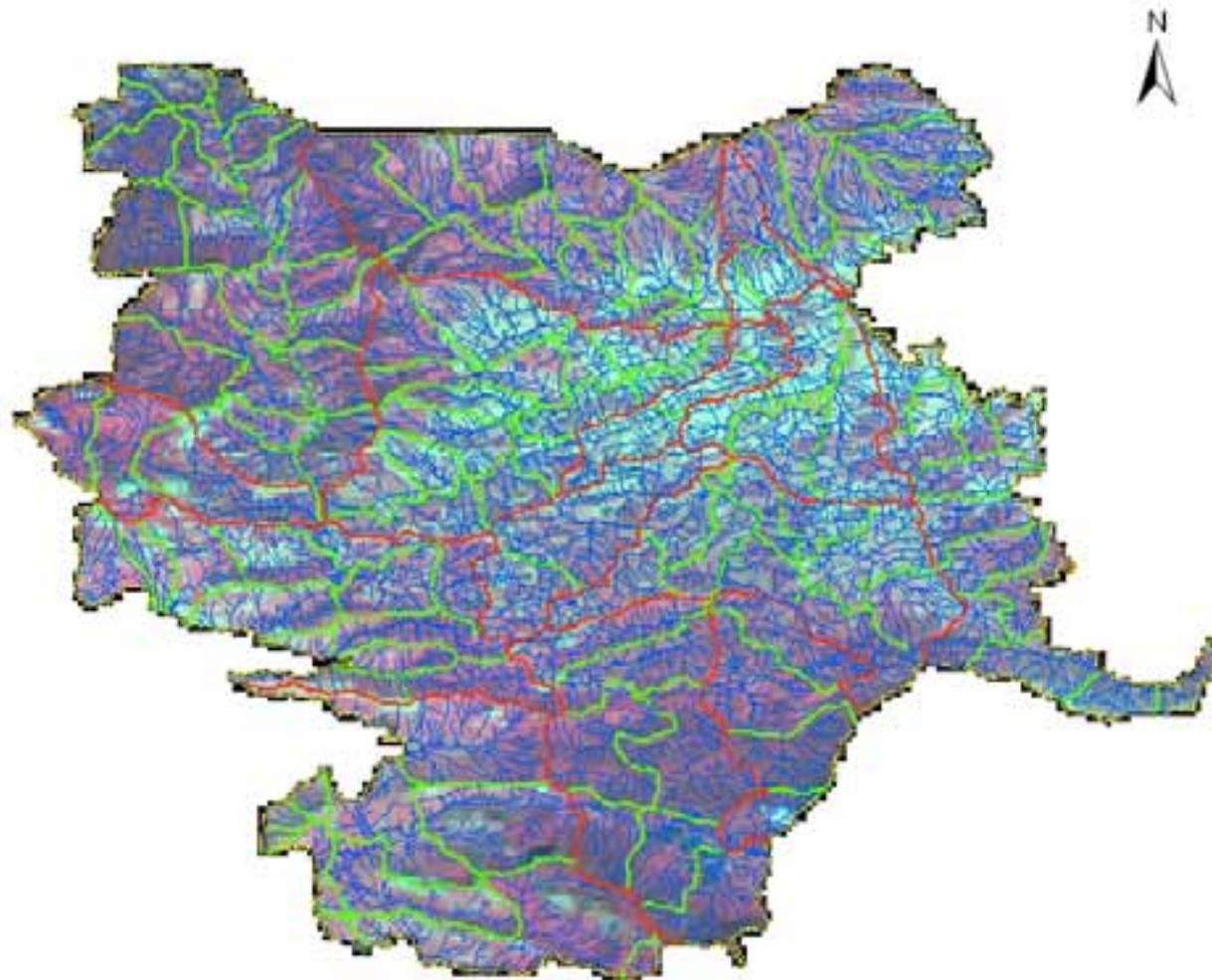
OBJECTIVES

1. TO STUDY CHANGES IN VEGETATION AREAS IN THE STUDY AREA
2. TO IDENTIFY THE CHANGES IN DENSITY OF VEGETATION
3. TO UNDERSTAND THE TEMPORAL CHANGES
4. ECOLOGICAL RESTORATION OF DEGRADED WASTELAND
5. DEVELOPMENT OF REPLICABLE MODELS OF PARTICIPATIVE ECO-RESTORATION, SO AS TO PREVENT FURTHER DEGRADATION
6. PROMOTE SUSTAINABLE METHOD OF LIVELIHOOD FOR THE LOCAL PEOPLE (WITH SPECIAL EMPHASIS ON TRIBAL POPULATION) IN HARMONY WITH RESOURCE BASE

ADMINISTRATIVE BOUNDARIES OF ATTAPPADY



DRAINAGE WITH WATERSHED BOUNDARIES OVERLAID ON SATELLITE IMAGE



LEGEND

- Study area boundary
- Drainage
- Development unit boundaries
- Micro-watershed boundaries

Scale : 1: 225000

ATTAPPADY BLOCK IN KERALA STATE HAS THE HIGHEST PROPORTION OF WASTELANDS IN KERALA.

ENVIRONMENTAL CONSERVATION

NILGIRIS BIOSPHERE RESERVE

AREA 788 SQ.KM

15 SUB WATERSHEDS 146 MICRO WATERSHEDS. 507 SQ. KM WASTELANDS

ATTAPPADY ECOSYSTEM- PROBLEMS

HIGHLY FRAGILE DUE TO PHYSIOGRAPHIC AND METEOROLOGICAL CHARACTERISTICS.

FRAGMENTED LANDHOLDINGS.

SOIL AND VEGETATION DEGRADED DUE TO UNSUSTAINABLE AGRICULTURE.

MASSIVE DEFORESTATION.

UNCONTROLLED GRAZING.

ATTAPPADY BLOCK, KERALA



FALSE COLOR COMPOSITE OF ATTAPPADY
IRS IC LISS III ;1ST MARCH 2001
SCALE : 1:250000

THE COLORS IN THE IMAGE ARE THE REFLECTANCE VALUES OF DIFFERENT FEATURES ON THE EARTH.

THIS IS A FALSE COLOR COMPOSITE BECAUSE THE COLORS ARE NOT THE TRUE COLORS OF THE FEATURES.

ALL THE RED SHADES (LIGHT PINK TO DARK RED) INDICATES ABOUT VEGETATION DEPENDING ON THE DENSITY.

THE LIGHT TONED AREAS ARE GENERALLY LESS VEGETATED AREAS.

THE WHITE PATCHES IN THIS IMAGE ARE CLOUDS AND ITS BLACK SHADES.

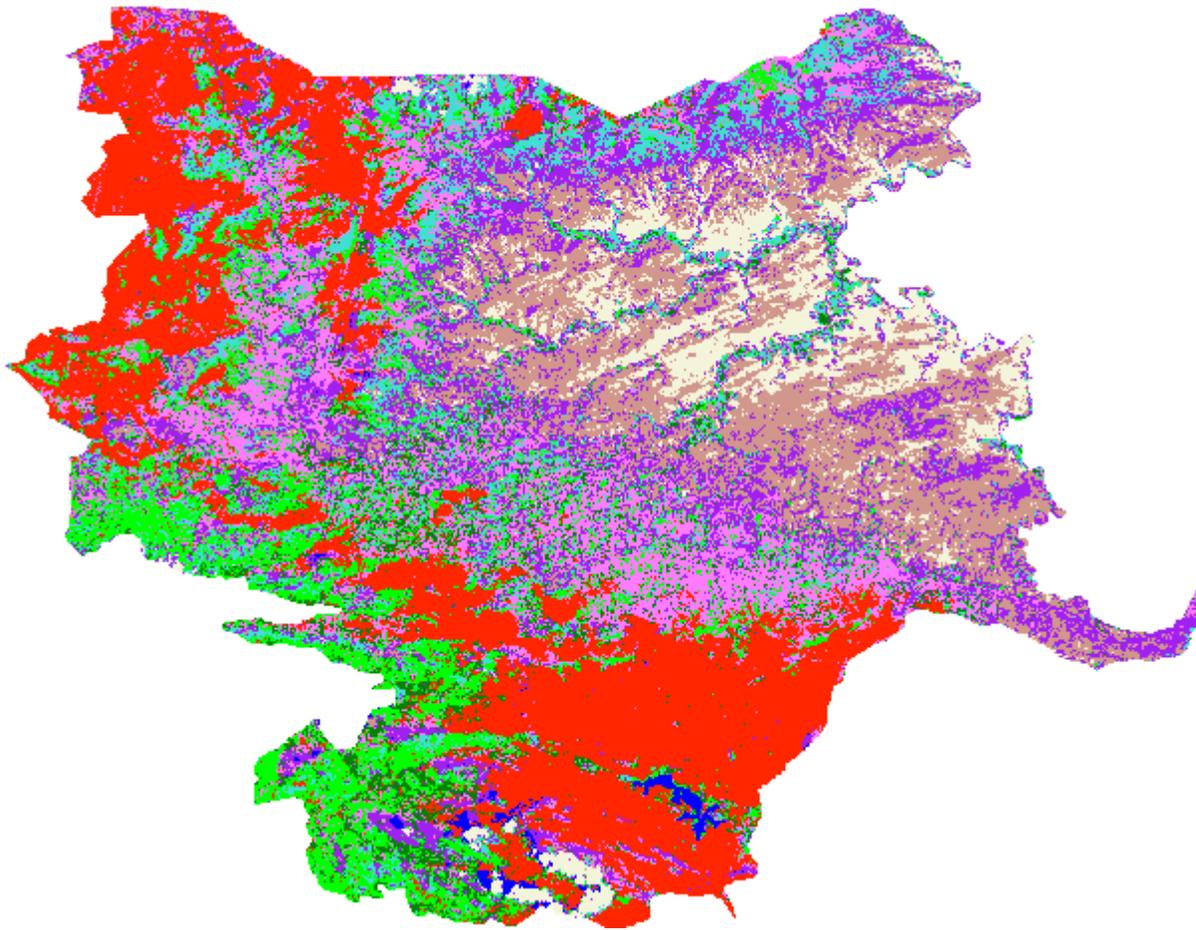
ATTAPPADY BLOCK, KERALA



FALSE COLOR COMPOSITE OF ATTAPPADY
IRS IC LISS III ; 8TH FEBRUARY 2005
SCALE : 1:250000

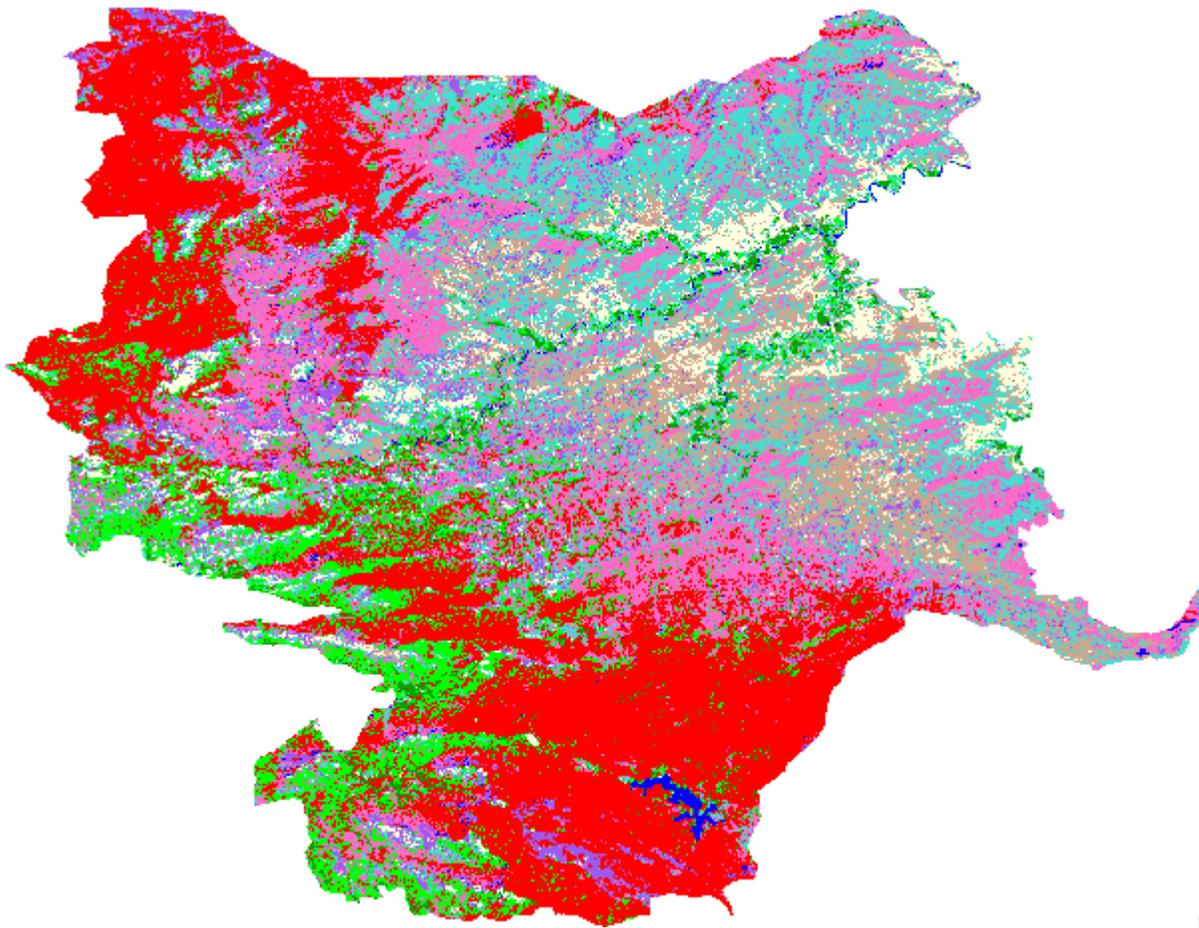
- THE CYAN COLORED AREAS IN THE IMAGE ARE THE VERY LESS VEGETATED OR BARREN AREAS WITHOUT VEGETATION AND WITH ROCK AND STONY WASTES.
- BLUE SHADES INDICATE WATER BODIES.
- THE PATTERNS , ASSOCIATION OF FEATURES, TONE AND TEXTURE WILL HELP US IN INTERPRETATION.
- GROUND TRUTH ALSO PLAYS AN IMPORTANT ROLE AT CLASSIFICATION LEVEL.

CLASSIFIED IMAGE OF ATTAPPADY 2001



- DENSE FOREST
- OPEN FOREST
- DEGRADED FOREST
- AGRIL. CROPS
- AGRIL. PLANTATION
- LAND WITH SCRUB
- LAND WITHOUT SCRUB
- BARREN AREA WITH / WITHOUT ROCKS
- WATER

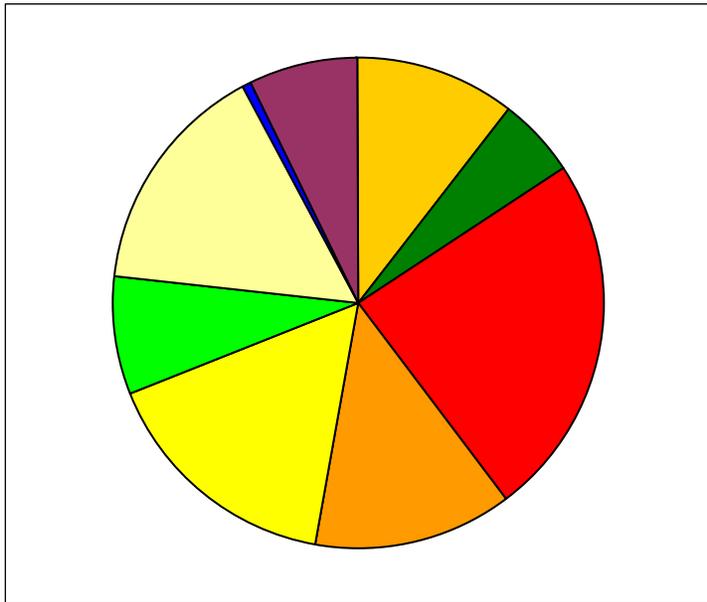
CLASSIFIED IMAGE OF ATTAPPADY 2005



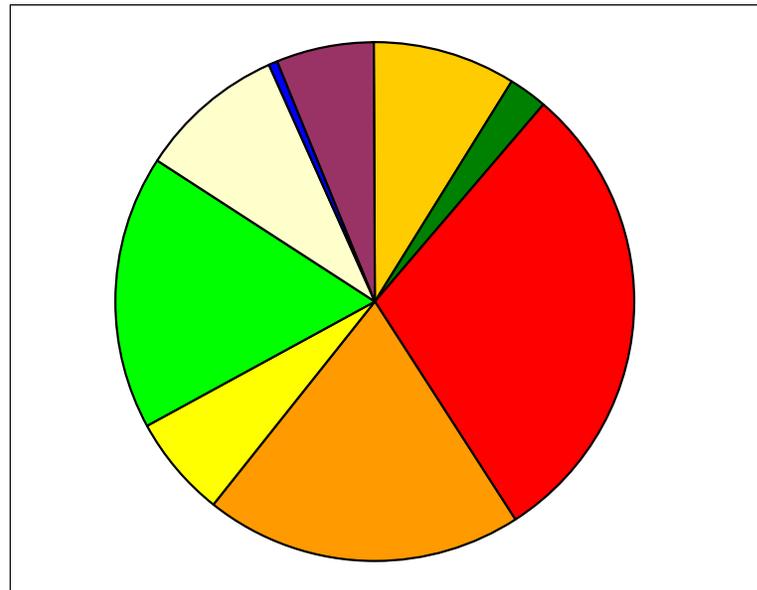
- DENSE FOREST
- OPEN FOREST
- DEGRADED FOREST
- AGRIL. CROPS
- AGRIL. PLANTATION
- LAND WITH SCRUB
- LAND WITHOUT SCRUB
- BARREN AREA WITH / WITHOUT ROCKS
- WATER

LAND USE PATTERN IN ATTAPPADY

2001



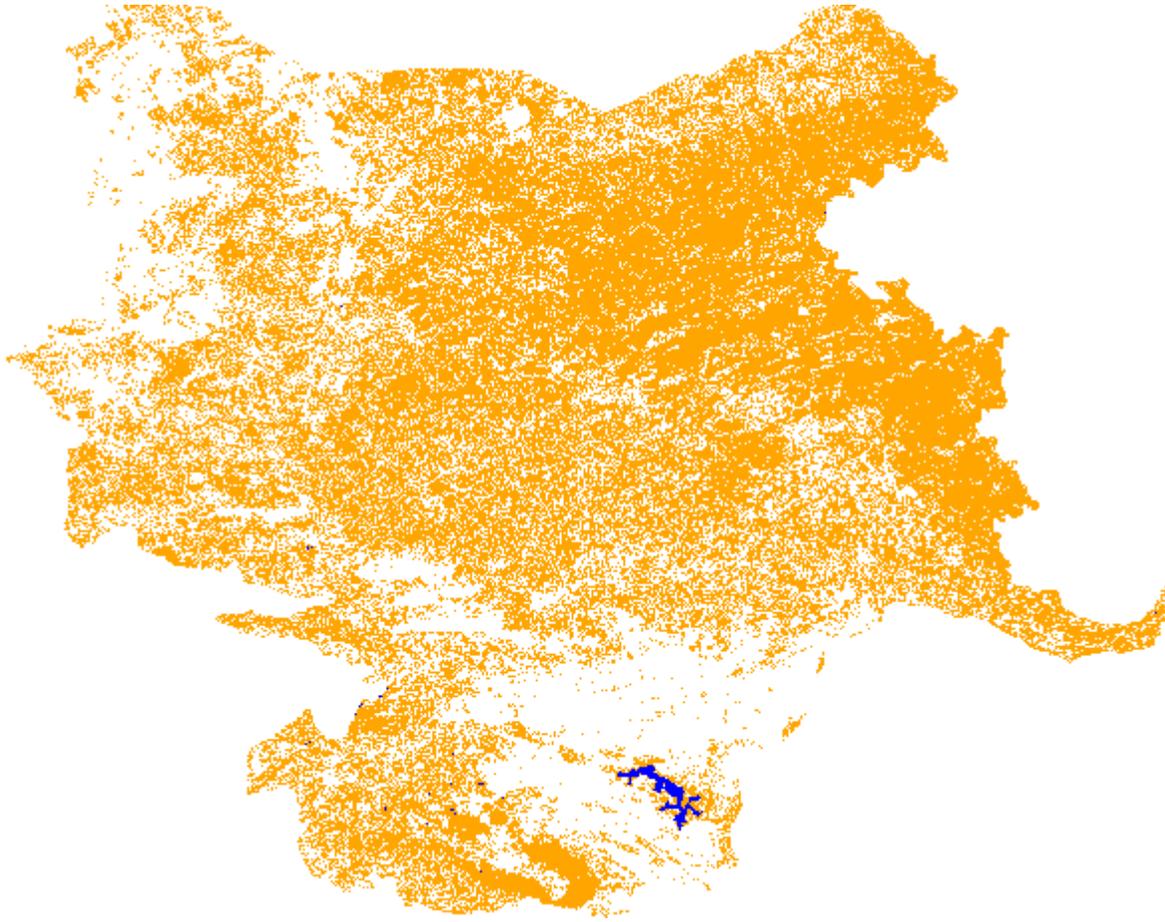
2005



- DENSE FOREST
- OPEN FOREST
- DEGRADED FOREST
- AGRIL.CROPS
- AGRIL.PLANTATION

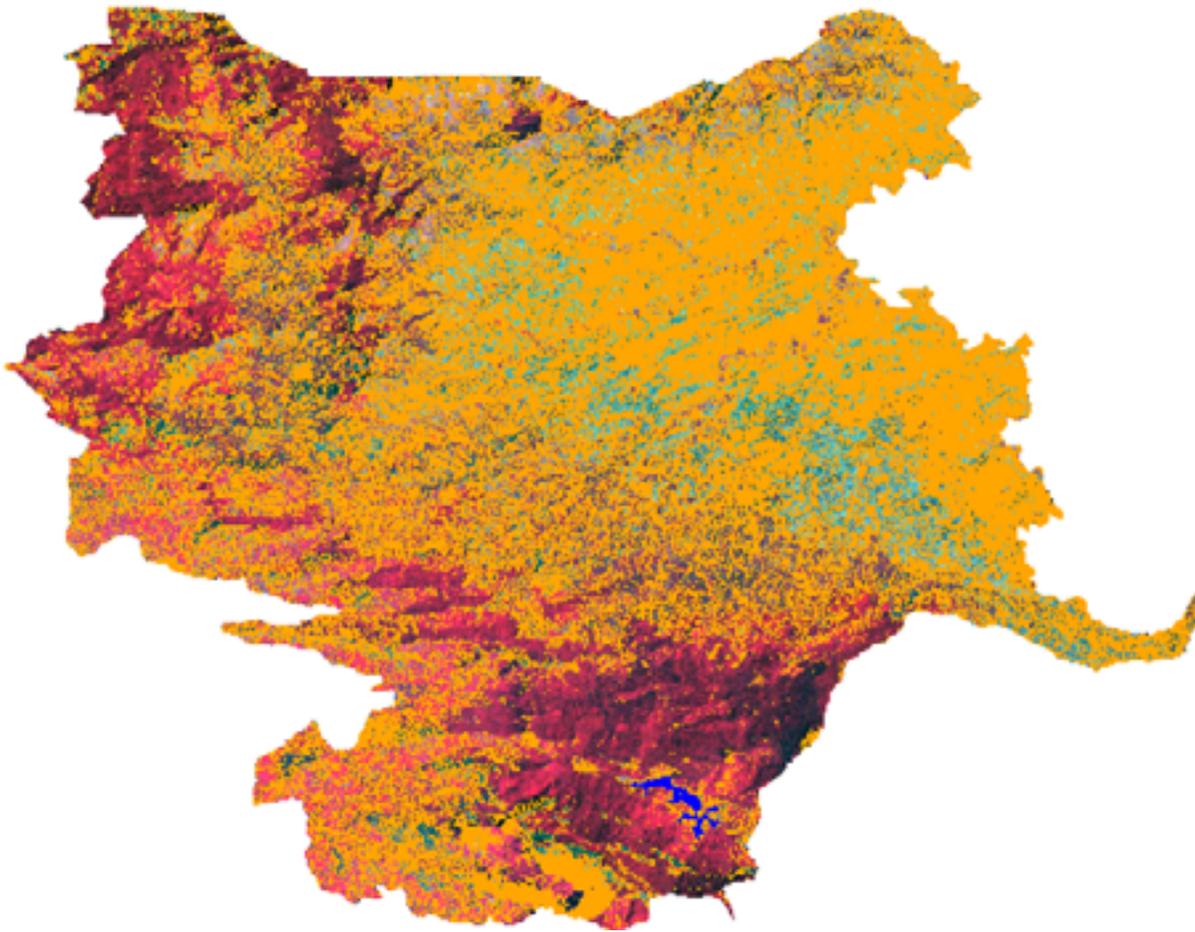
- LAND WITH SCRUB
- LAND WITHOUT SCRUB
- BARREN AREA
- WATER

MATRIX LAYER



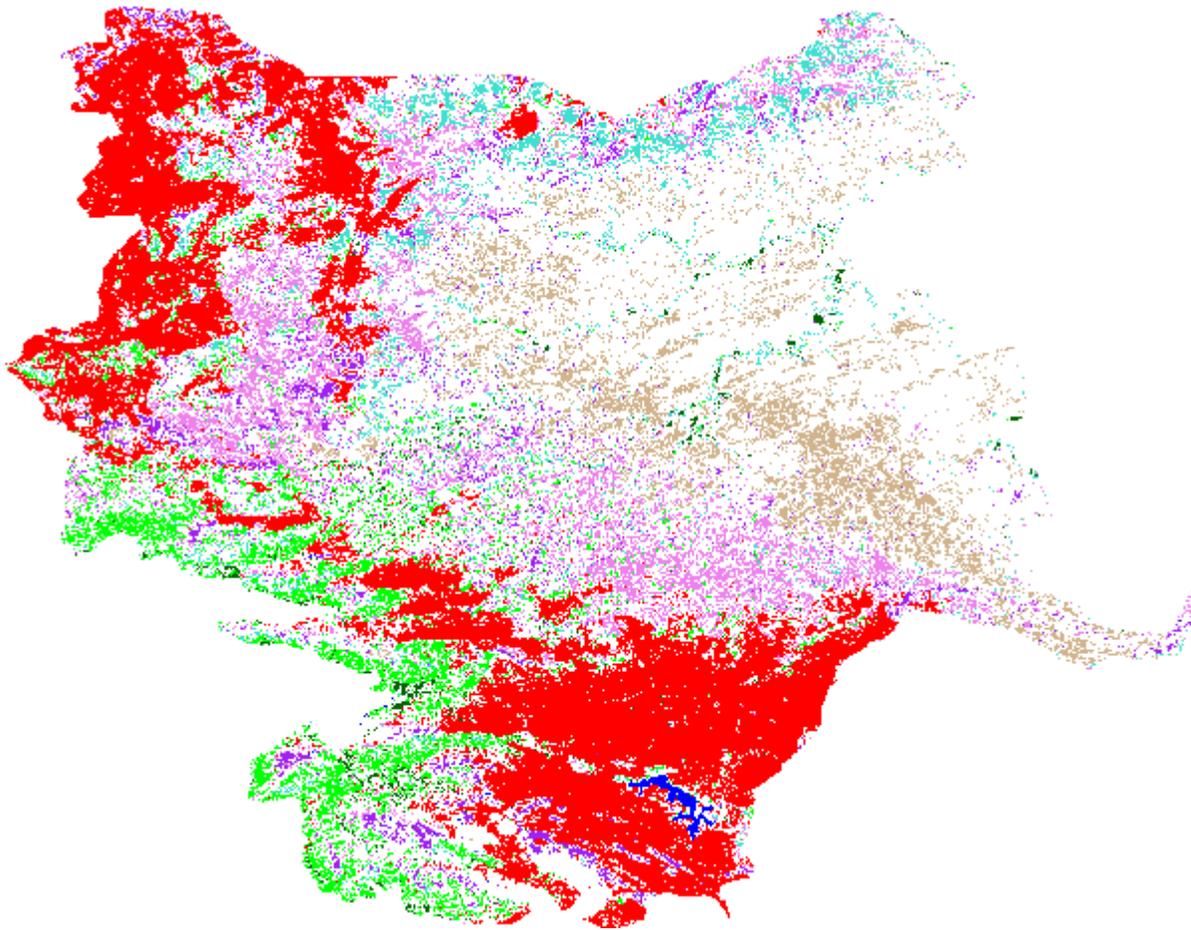
- THE CHANGE LAYER OR THE MATRIX LAYER IS SHOWN HERE.
- THE SAFFRON COLOR IS THE AREA THAT HAS SHOWED THE CHANGE TEMPORALLY.
- THE CHANGE CAN BE IN ALL CLASSES OF THE CLASSIFIED IMAGE.

MATRIX IMAGE OVERLAID ON 2001 FCC



- MATRIX IS USED TO IDENTIFY THE CHANGE BETWEEN TWO CLASSIFIED IMAGERY.
- IN THE IMAGE, ALL THE SAFFRON COLOR INDICATES THE AREA WHICH HAS CHANGED FROM 2001 TO 2005.
- THE REMAINING PORTION IS THE ORIGINAL 2001 IMAGE.

MATRIX LAYER



- THE IMAGE SHOWS THE MATRIX LAYER WHICH HAS UNCHANGED IN THE YEARS 2001 AND 2005.
- THE DIFFERENT COLORS REPRESENT,
- DENSE FOREST
- OPEN FOREST
- DEGRADED FOREST
- AGRIL. CROPS
- AGRIL. PLANTATION
- LAND WITH SCRUB
- LAND WITHOUT SCRUB
- BARRAN AREA
- WATER

MATRIX LAYER OVERLAID ON 2001 FCC

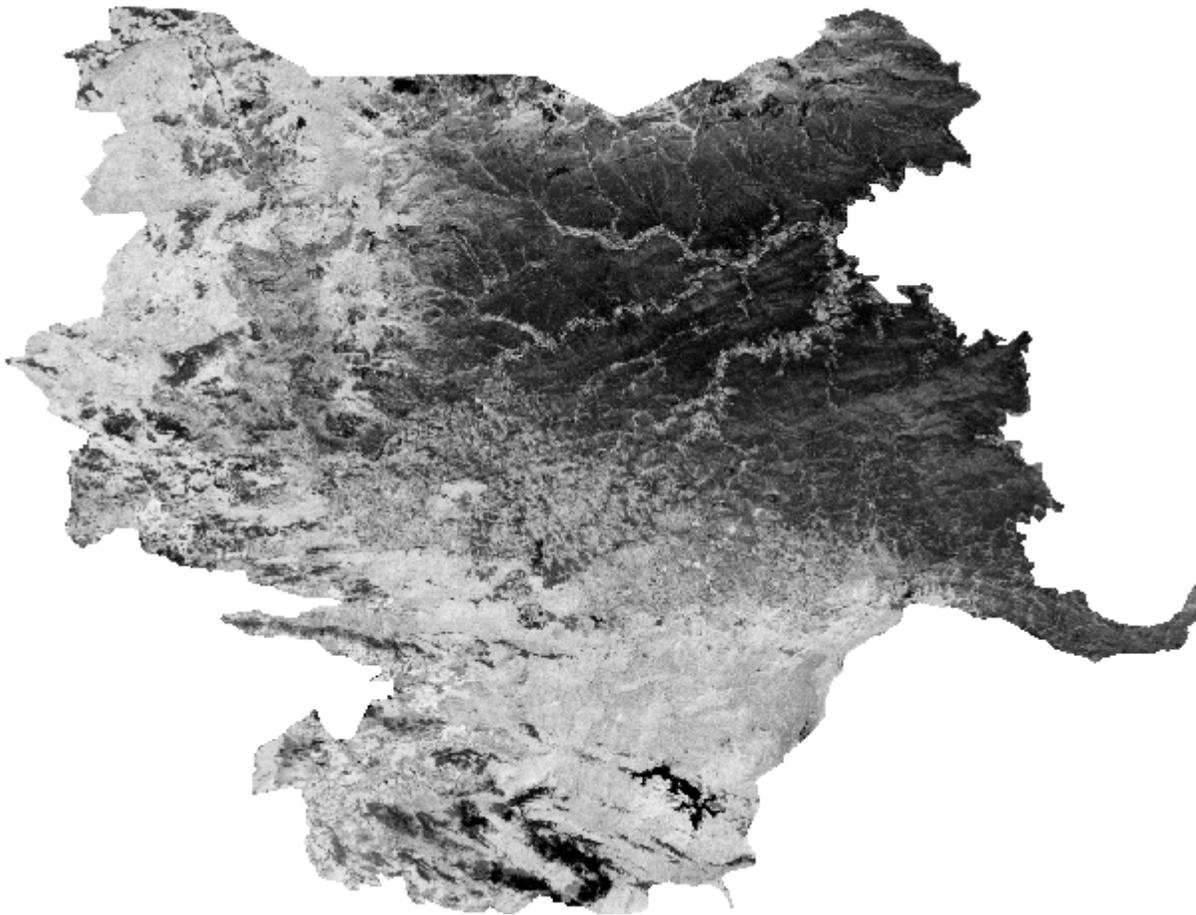


- THIS IMAGE SHOWS THE AREA WHICH HAS REMAINED UNCHANGED IN THE YEARS 2001 AND 2005.
- THE CLASSIFIED COLORS REPRESENT THE UNCHANGED AREAS.
- THE REMAINING PORTIONS ARE FROM THE FCC OF 2001.

AREA UNDER DIFFERENT FEATURES IN ATTAPPADY

NAME OF THE CLASS	2001 - AREA IN SqKm.	2005 - AREA IN SqKm.	CHANGE
Agricultural crops	84.69	70.34	-14.35
Agricultural plantation	40.63	20.14	-20.49
Dense forest	190	234.84	+44.84
Open forest	105	156.77	+51.77
Degraded forest	127.87	51.27	-76.60
Land with scrub	61.24	135.33	+74.09
Land without scrub	124.23	73.37	-50.86
Water bodies	4	4.6	+0.60
Barren rocky area	52	43	-9.00
Total	789.66	789.66	

NORMALISED DIFFERENCE VEGETATION INDEX IMAGE OF ATTAPPADY 2001



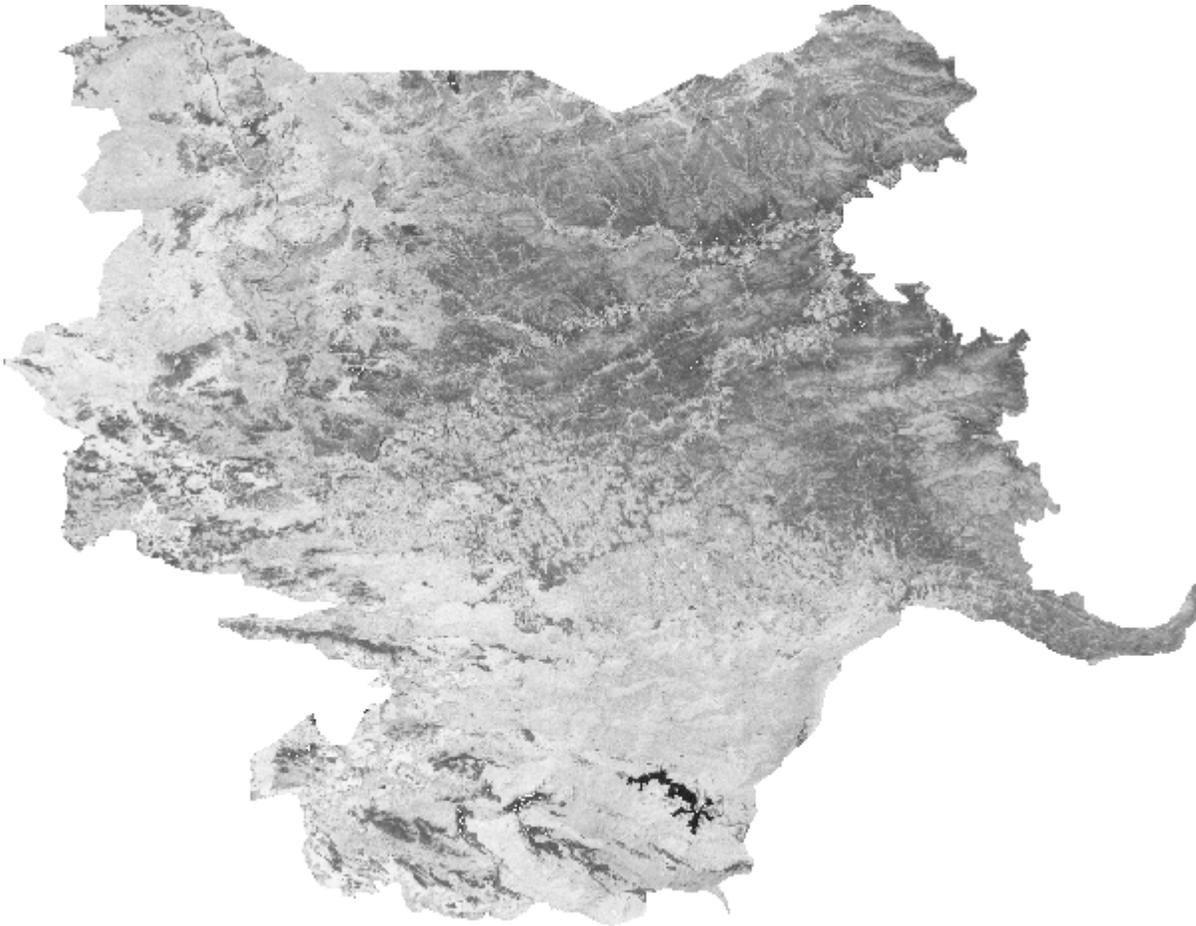
NDVI VALUES LIES BETWEEN -1 AND +1.

THIS IS USED TO ELIMINATE THE SEASONAL SUN ANGLE DIFFERENCE AND MINIMIZE ATMOSPHERIC EFFECTS.

HIGHER VALUES INDICATE MORE DENSITY AND VIGOR OF THE VEGETATION .

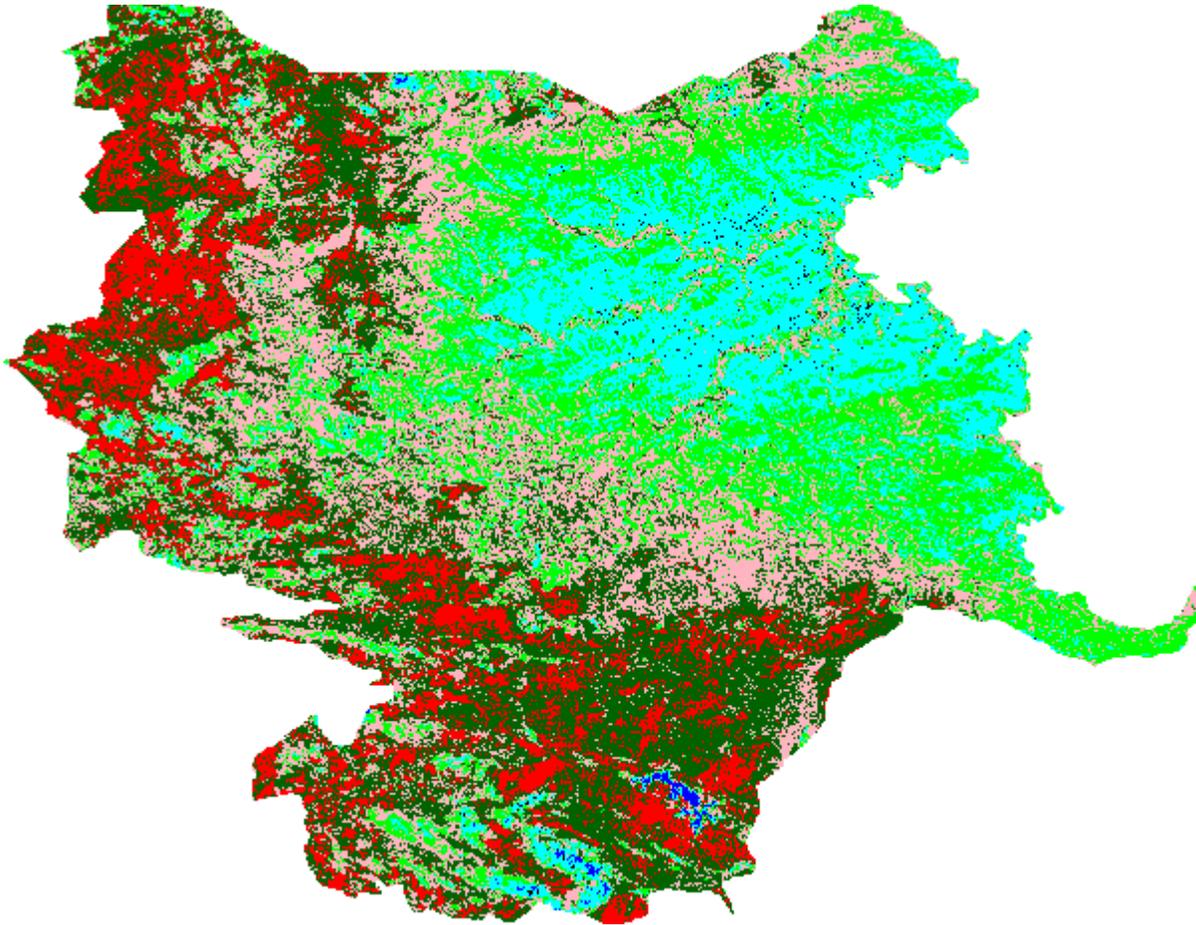
NDVI IS EXTENSIVELY USED TO DETECT SEASONAL VARIATIONS AMONG VEGETATION.

NDVI IMAGE OF ATTAPPADY 2005



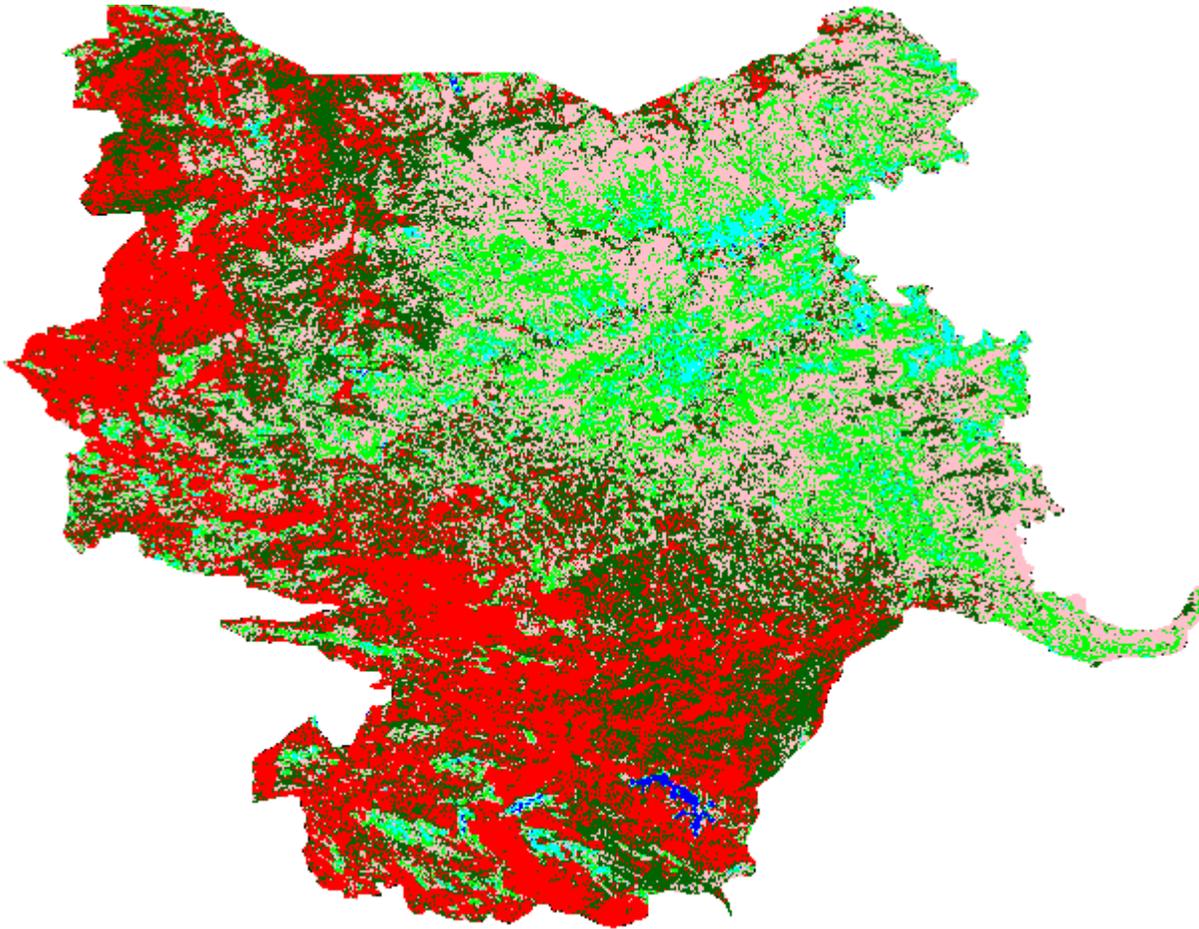
- IN THE IMAGE, BRIGHTER AREAS INDICATE HIGHER REFLECTANCE VALUES AND DARKER AREAS LOWER VALUES.
- VEGETATION IN GOOD CONDITION SHOWS HIGHER NDVI VALUES.
- GENERAL RANGE OF NDVI VALUES ARE,
<0.1 = BARREN ROCK/SAND/SNOW
0.2-0.3 =LOW DENSITY (SHRUBS/GRASS LANDS)
0.6-0.8 =HIGH DENSITY (TEMPERATE AND TROPICAL RAIN FORESTS.)

CLASSIFIED NDVI IMAGE 2001



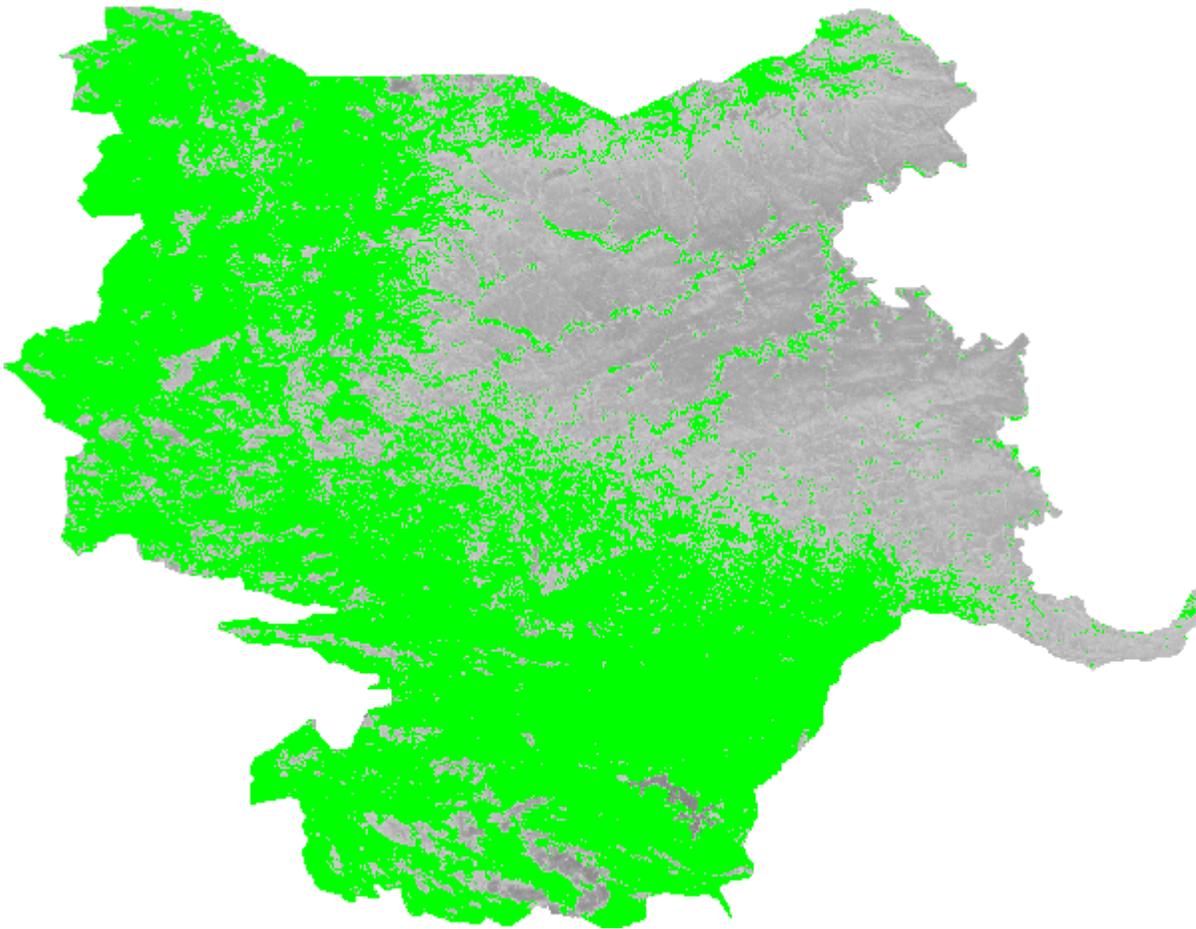
- NDVI CLASSIFICATION IS TO INDICATE THE DISTRIBUTION OF DENSITY AND VIGOR AMONG VEGETATION.
- HERE, WE CLASSIFIED AS,
 - 0-0.1 = **BARREN ROCK**
 - 0.1-0.25 = **LOW DENSITY**
 - 0.26-0.43 = **MEDIUM DENSITY**
 - 0.44-0.56 = **HIGH DENSITY AND**
 - 0.56-0.8 = **VERY HIGH DENSITY.**

CLASSIFIED NDVI IMAGE 2005



- FROM THE IMAGE,
- **CYAN** COLOR INDICATES THE BARREN ROCK AREA,
- **LIGHT GREEN** COLOR IS THE AREA UNDER LOW DENSITY OF VEGETATION,
- **PINK** COLOR IS VEGETATION WITH MEDIUM DENSITY,
- **DARK GREEN** AREAS ARE HIGH DENSITY VEGETATION AREAS
- AND
- **RED** PORTIONS INDICATES VERY HIGH DENSITY AREAS.
- (**BLUE** COLOR IS WATER)

CLASSIFIED TRANSFORMED VEGETATION INDEX IMAGE 2001



- TVI IS DEVELOPED TO AVOID WORKING WITH NEGATIVE NORMALIZED DIFFERENCE VALUES AND DEPENDENCE OF VARIANCE OR MEAN VALUE.
- TVI VALUES IN GENERAL RANGES FROM 0 TO 1.5.

THE GREEN COLOR HERE IN THE IMAGE SHOWS THE VEGETATED AREA.

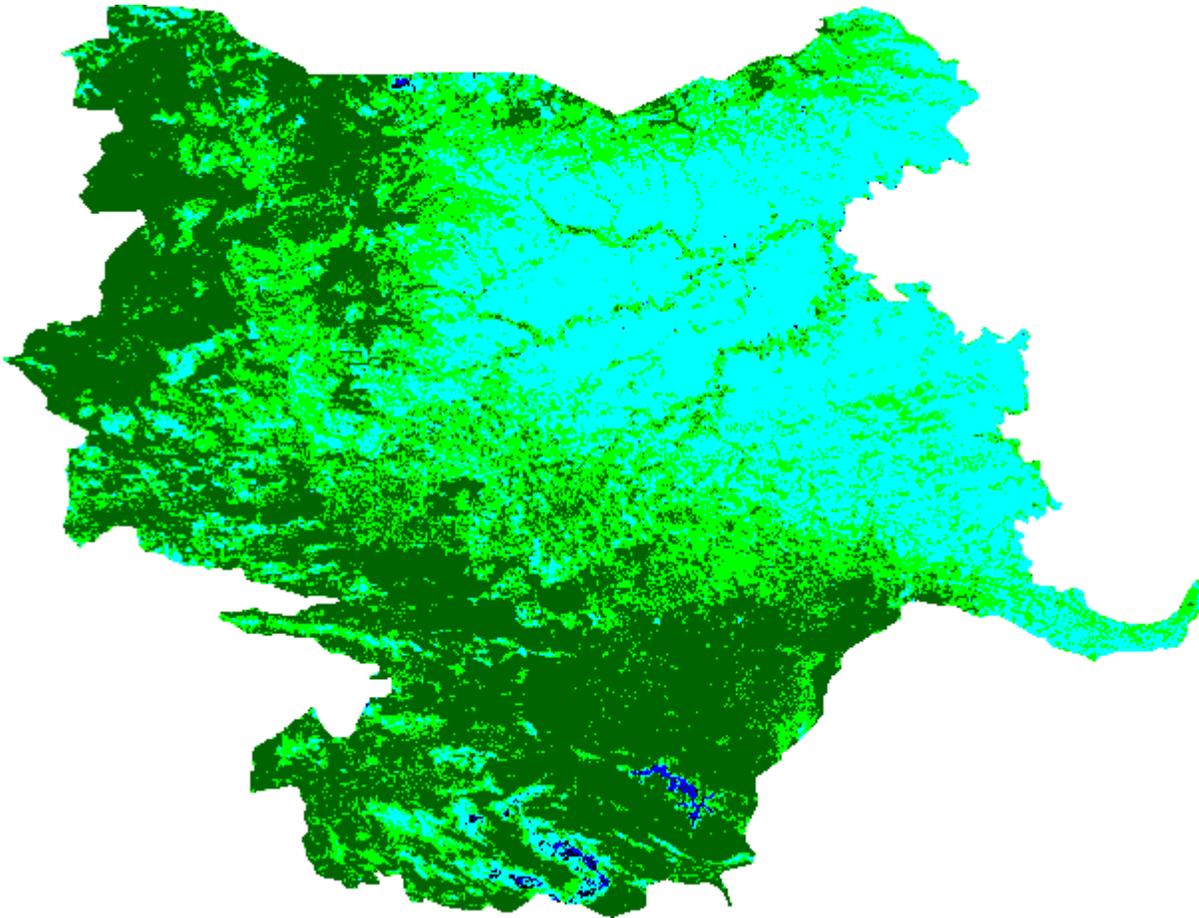
HIGHER THE TVI VALUES HIGHER WILL BE THE DENSITY OF THE VEGETATION.

CLASSIFIED TVI IMAGE 2005



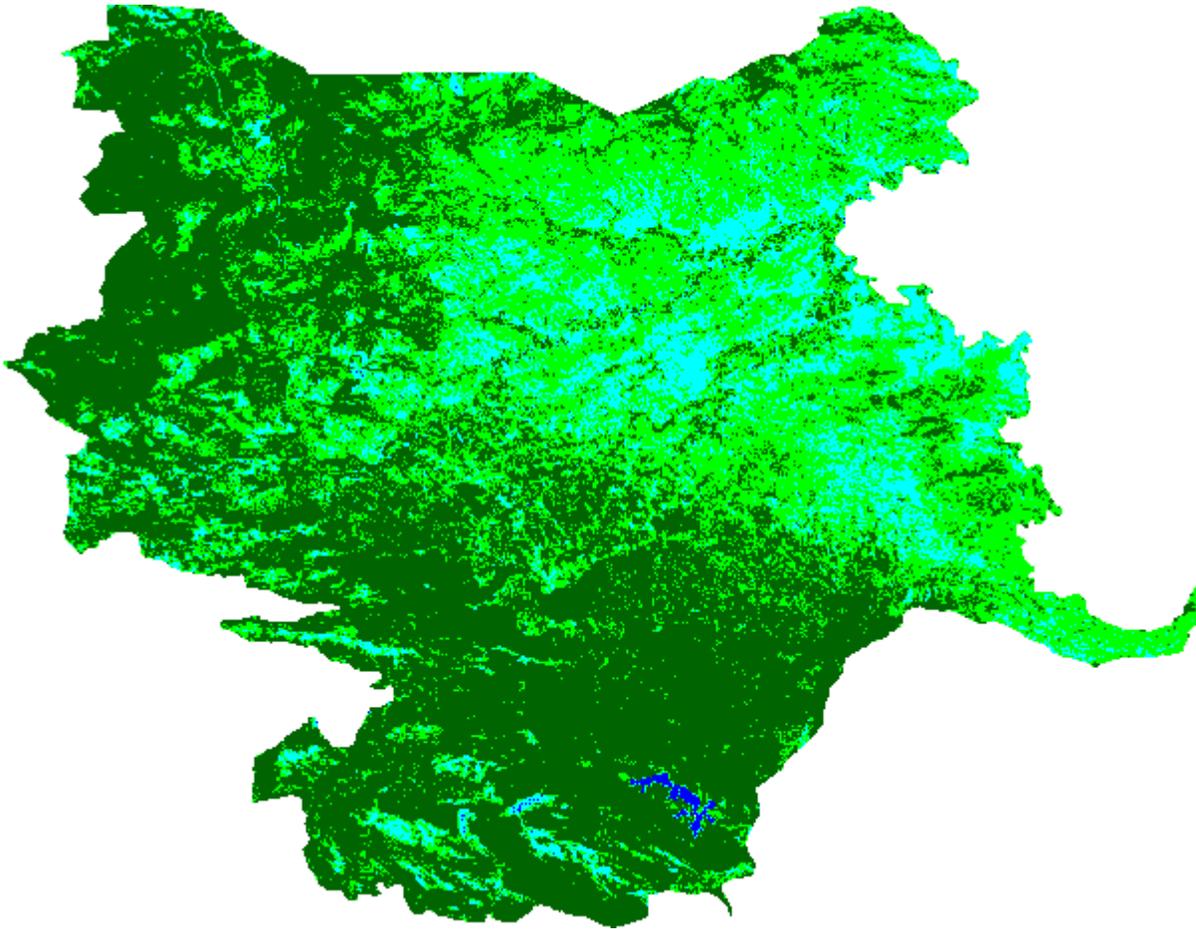
- FROM THE IMAGE,
- THE LIGHT GREEN COLOR DIIPICTS THE VEGETATED AREA.
- LIGHT GREY COLORED AREAS ARE WITH VERY LOW LEVELS OF VEGETATION OR WITHOUT ANY VEGETATION.
- THE TVI VALUE FOR THE VEGETATION FOR THIS IMAGE STARTS FROM 0.9 AND RANGES UPTO 1.126

CLASSIFIED RATIO VEGETATION INDEX IMAGE 2001



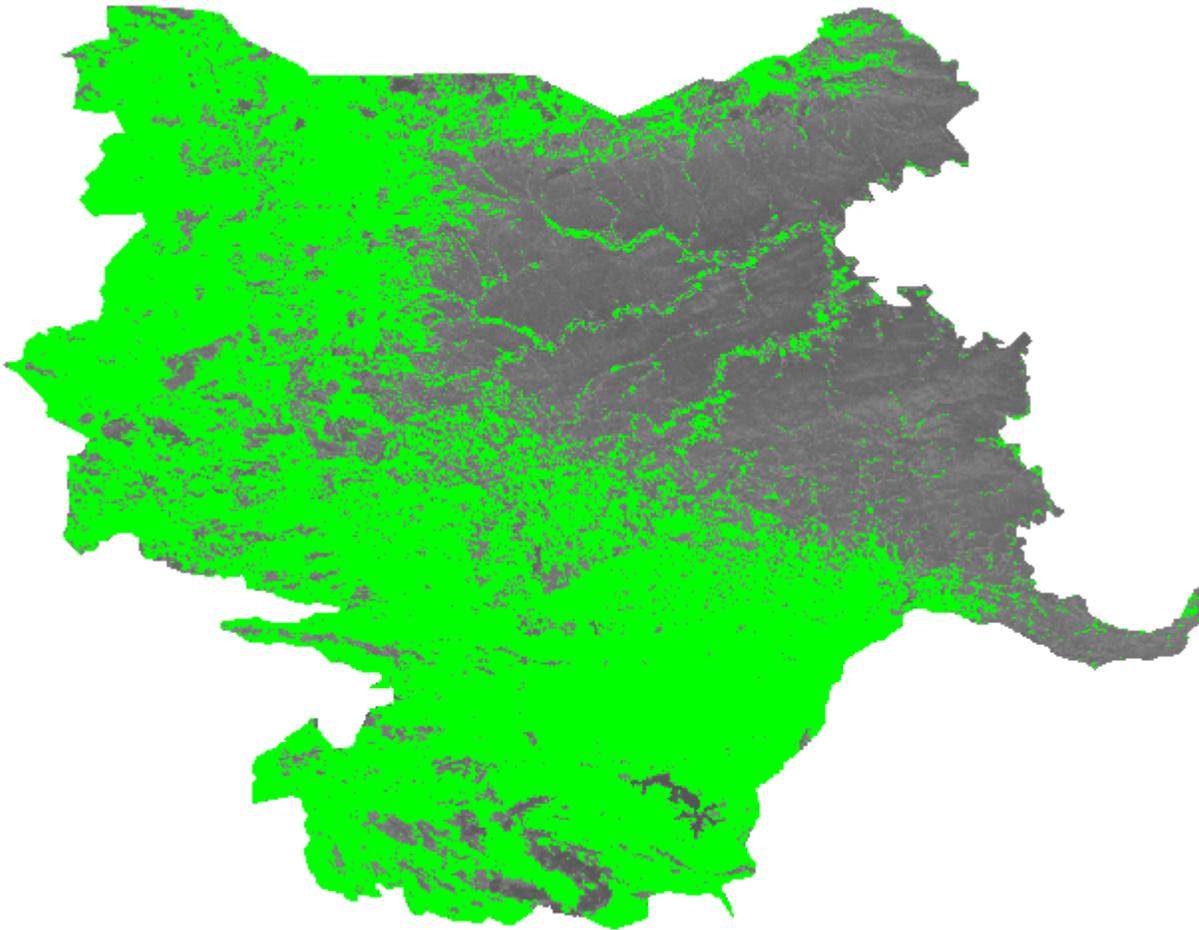
- RVI IS USED TO STUDY TRANSMISSION OF FOREST CANOPIES.
- RVI VALUES IN NORMAL CONDITIONS RANGES FROM 0 TO 20.
- RVI VALUES INDICATES THE VEGETATION VIGOR AND ABUNDANCE.
- HIGHER VALUES INDICATES HIGHER VEGETATION VIGOR AND DENSITY.

CLASSIFIED RVI IMAGE 2005



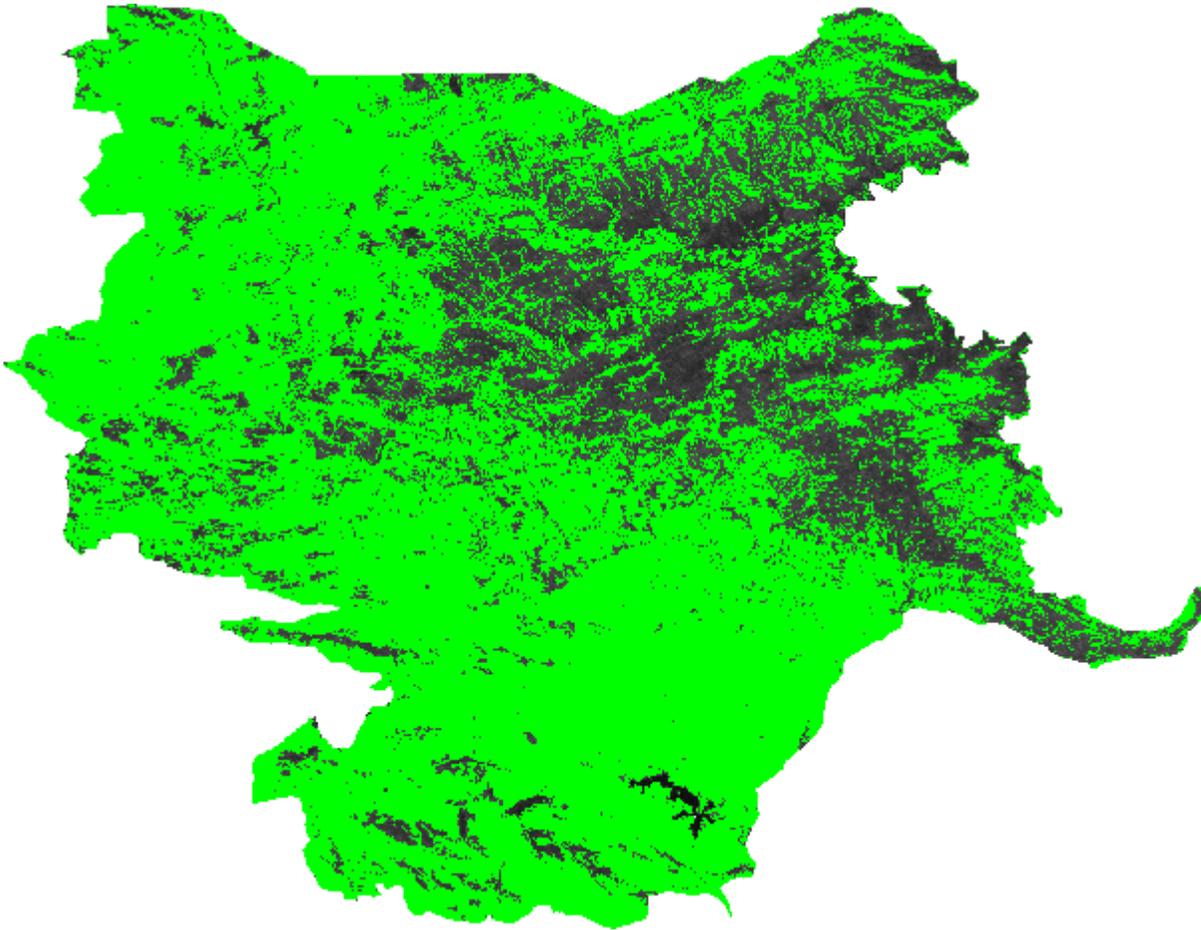
- FROM THE IMAGE,
- THE **CYAN (0.9-0.15)** COLOR INDICATES THE AREAS WITH VERY LOW VEGETATION OR WITHOUT ANY VEGETATION.
- **LIGHT GREEN (1.5-2.5)** COLOR INDICATES AREAS WITH LESS DENSITY OF VEGETATION.
- AND THE **DARK GREEN(2.6-7.8)** IS FOR THE ARTEAS OF HIGH DENSITY.
- **BLUE** COLOR IS WATER

CLASSIFIED SQRT.IR/R INDEX IMAGE 2001



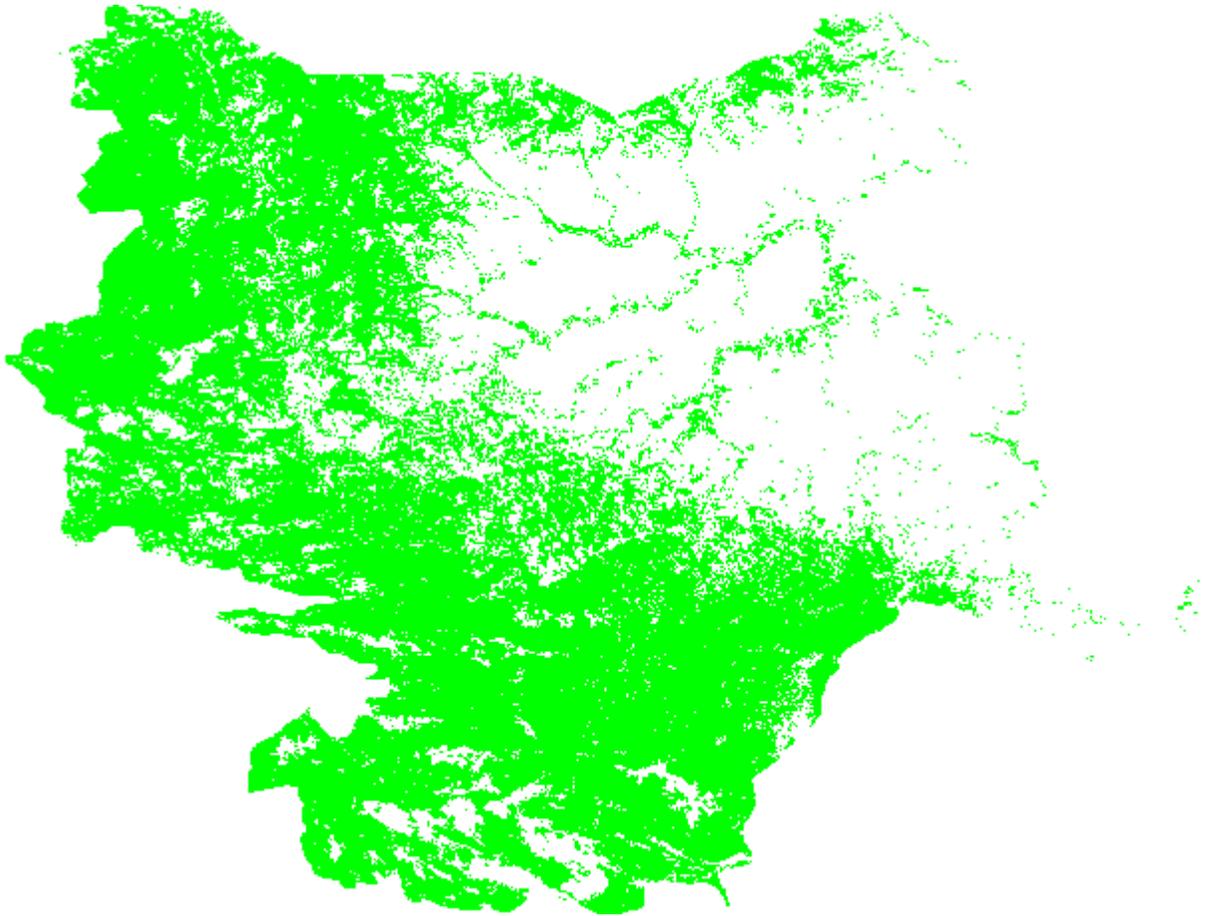
- THIS GIVES THE ABUNDANCE OF VEGETATION.
- THIS IS TO AVOID DECIMAL POINTS IN THE RVI AND FOR EASY HANDLING OF THE DATA.
- AND THIS RANGES FROM 0 TO 2.5 FOR THE 2001 IMAGE AND FOR 2005 IMAGE THE HIGHEST VALUE IS 2.7.
- HIGHER THE VALUE HIGHER WILL BE THE DENSITY OF VEGETATION.

CLASSIFIED SQRT.IR/R INDEX IMAGE 2005



- FROM THE IMAGE, GREEN COLOR IS FOR VEGETATED AREAS.
- AND THE GREY COLOR IS FOR LESS VEGETATED AND NO VEGETATED AREAS.

CLASSIFIED VEGETATIVE INDEX IMAGE 2001

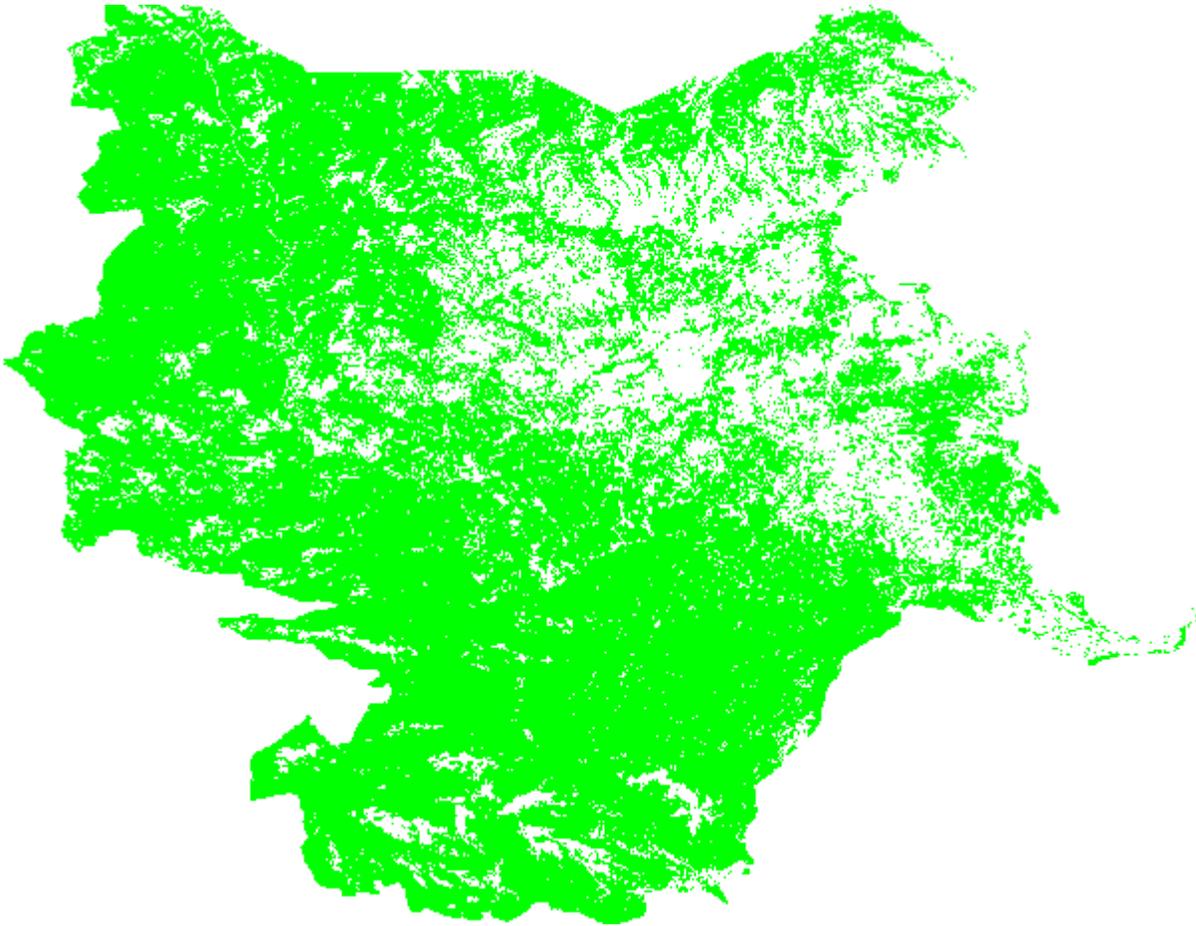


BAND DIFFERENCING IS A METHOD TO EXTRACT THE NEEDED INFORMATION FROM A MULTISPECTRAL IMAGE.

HERE WE TOOK THE BAND DIFFERENCE BETWEEN INFRARED AND RED BANDS TO GET THE INFORMATION OF VEGETATION.

THE REFLECTANCES OF VEGETATION IN INFRARED AND RED BANDS ARE MORE PROMINENT AND ARE INVERSELY RELATED.

CLASSIFIED VEGETATIVE INDEX IMAGE 2005



- FROM THE IMAGE,
- ALL DARK COLOR IS FOR THE VEGETATED AREAS AND
- WHITE COLOR INDICATES VERY LESS VEGETATED OR NO VEGETATED AREA.

- IN THIS IMAGE, RANGE OF VALUES ARE FROM -96 TO 156 IN CASE OF 2001 IMAGE
- AND FOR 2005 IMAGE THE RANGE IS FROM -24 TO 199.21.
- THESE VALUES ARE THE DIFFERENCED REFLECTANCE VALUE.

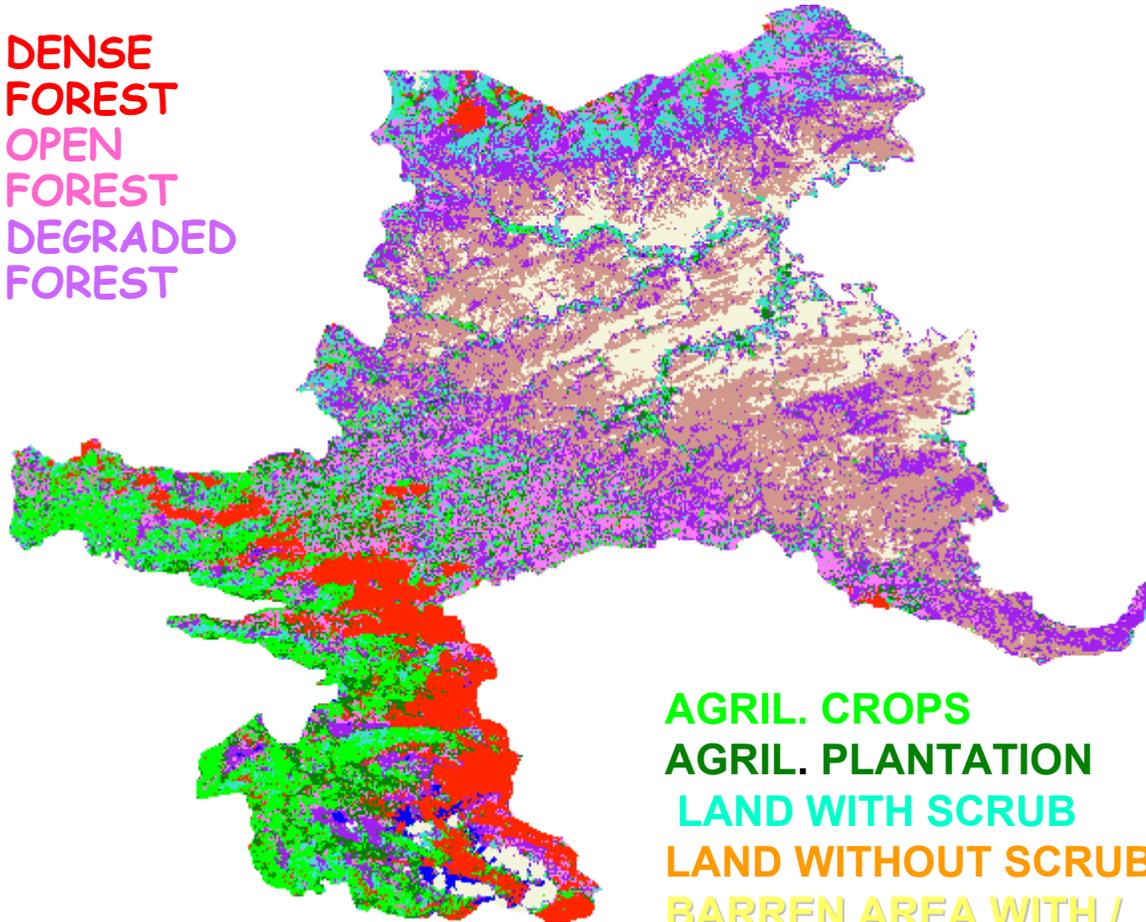
ATTAPADY BIOSPHERE ZONES



- ATTAPADY BLOCK IS DIVIDED INTO THREE BIOSPHERE ZONES ACCORDING TO THE HUMAN INTERFERENCE AND DEGRADATION.
- MANIPULATION ZONE IS FOR THE UTILISATION OF RESOURCES IN A SUSTAINABLE MANNER.
- RESTORATION ZONE HAS THE DIRECT AND INDIRECT INTERFERENCES BY HUMAN. THIS IS MEANT FOR RESTORATION ACTIVITIES.
- RESERVE ZONE IS THE LEAST DISTURBED ZONE HAVING DIVERSE FLORA AND FAUNA.

RESTORATION ZONE OF ATTAPPADY 2001

- DENSE FOREST
- OPEN FOREST
- DEGRADED FOREST



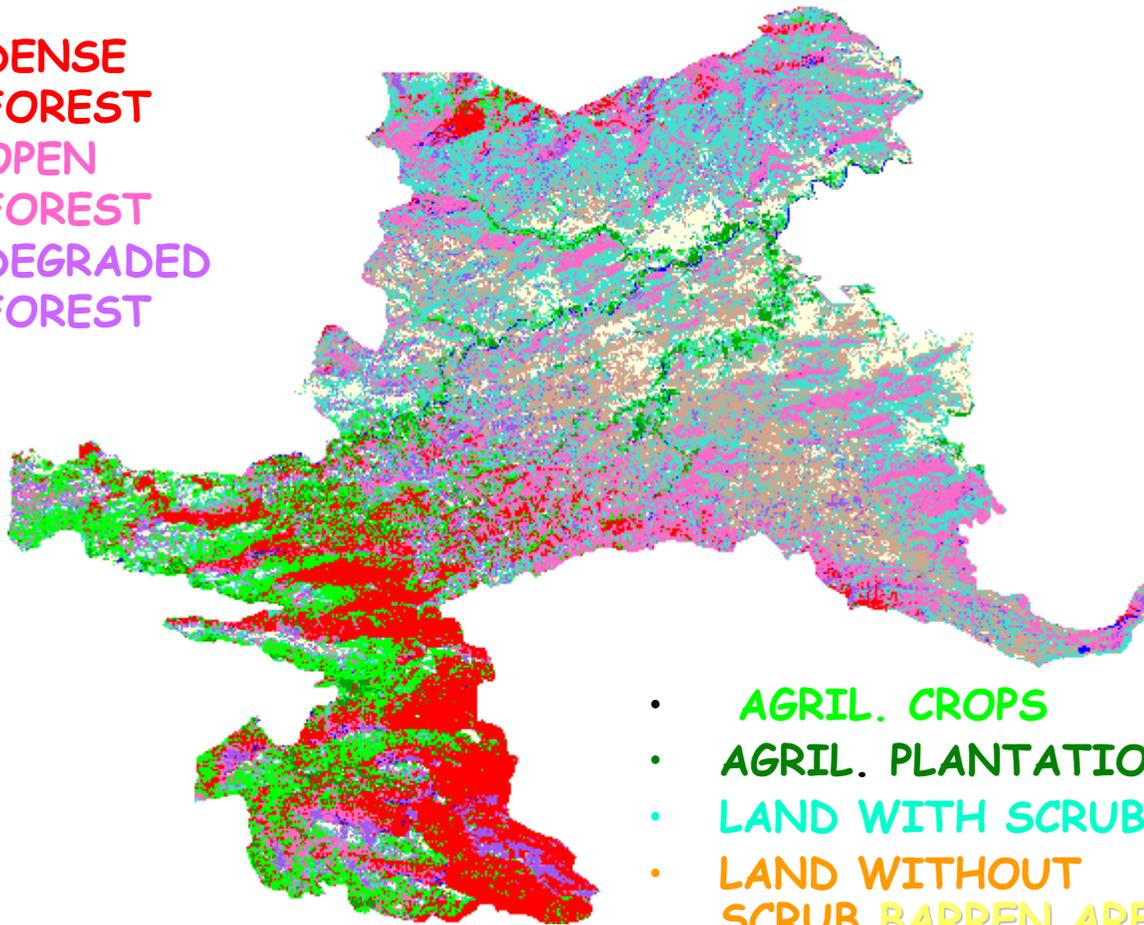
- AGRIL. CROPS
- AGRIL. PLANTATION
- LAND WITH SCRUB
- LAND WITHOUT SCRUB
- BARREN AREA WITH / WITHOUT ROCKS
- WATER

- FROM THE IMAGE, THE AREA UNDER AGRICULTURE IS MORE.
- DEGRADED FORESTS AND LAND WITHOUT SCRUB ARE SIGNIFICANTLY HIGH IN AREA.
- BARREN AREA IS ALSO MORE.
- THE TREND IS TOWARDS DEGRADATION OF LAND UNDER FOREST AREA.



RESTORATION ZONE OF ATTAPPADY 2005

DENSE
FOREST
OPEN
FOREST
DEGRADED
FOREST



- AGRIL. CROPS
- AGRIL. PLANTATION
- LAND WITH SCRUB
- LAND WITHOUT SCRUB BARREN AREA WITH / WITHOUT ROCKS
- WATER

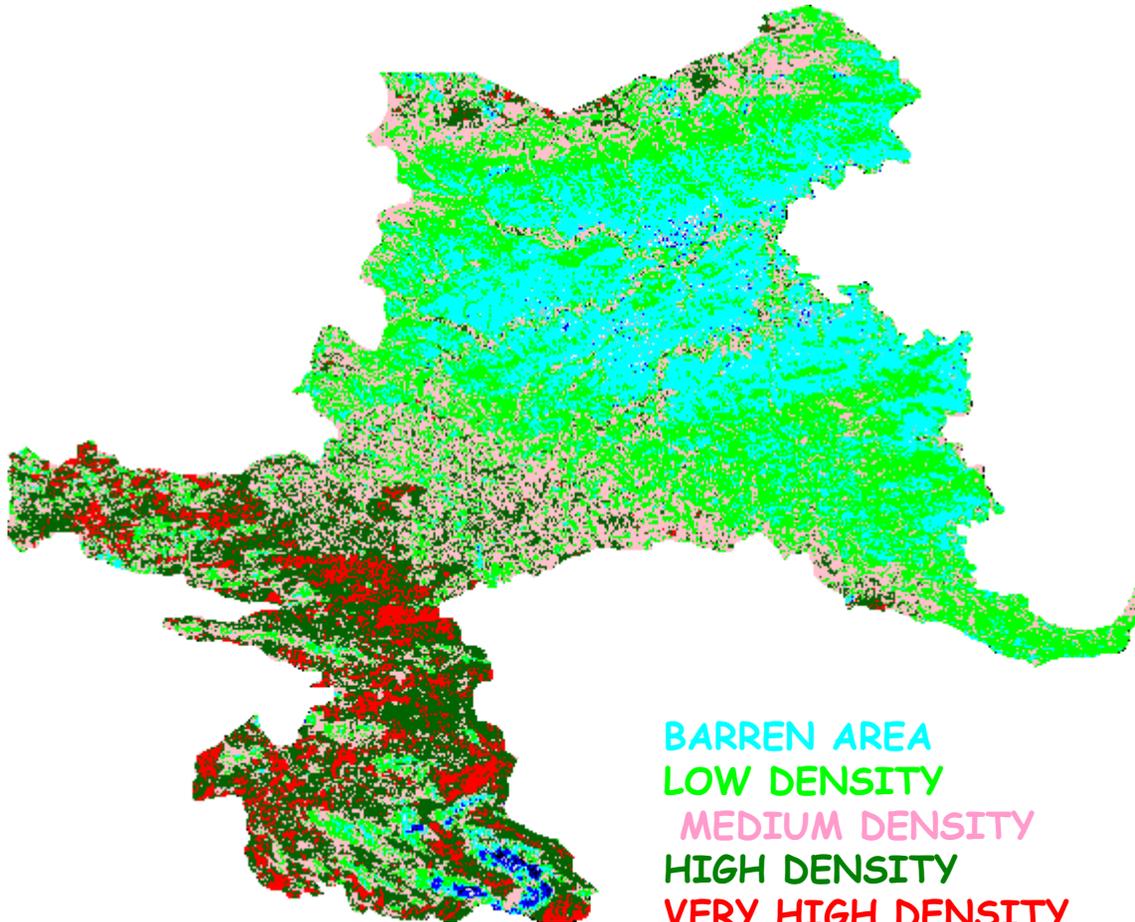
- IN 2005, THE FOREST AREA HAS INCREASED PROFUSELY BY 61.7%.
- OPEN FORESTED AREA ALMOST DOUBLED WHEN COMPARED WITH 2001.
- SCRUB LAND AREA ALSO INCREASED BY A VERY GOOD AMOUNT.
- THIS IMAGE SHOWS A POSITIVE TREND TOWARDS AFFORESTATION AND GREENING OF THE AREA.



RESTORATION ZONE OF ATTAPPADY

Feature	2001 Area in Sq. Km	2005 Area in Sq. Km	change
Dense Forest	44.27	71.59	+27.32
Open forest	48.79	99.45	+50.66
Degraded Forest	102.93	31.58	-71.35
Agri. Crops	60.01	53.37	-6.64
Agril. Plantation	29.19	16.4	-12.79
Land with scrub	41.18	118.04	+76.86
Land without scrub	119.85	69.83	-50.02
Barren rocky area	57.19	43.07	-14.12
Water	2.34	2.49	+0.15

NDVI IMAGE OF RESTORATION ZONE 2001

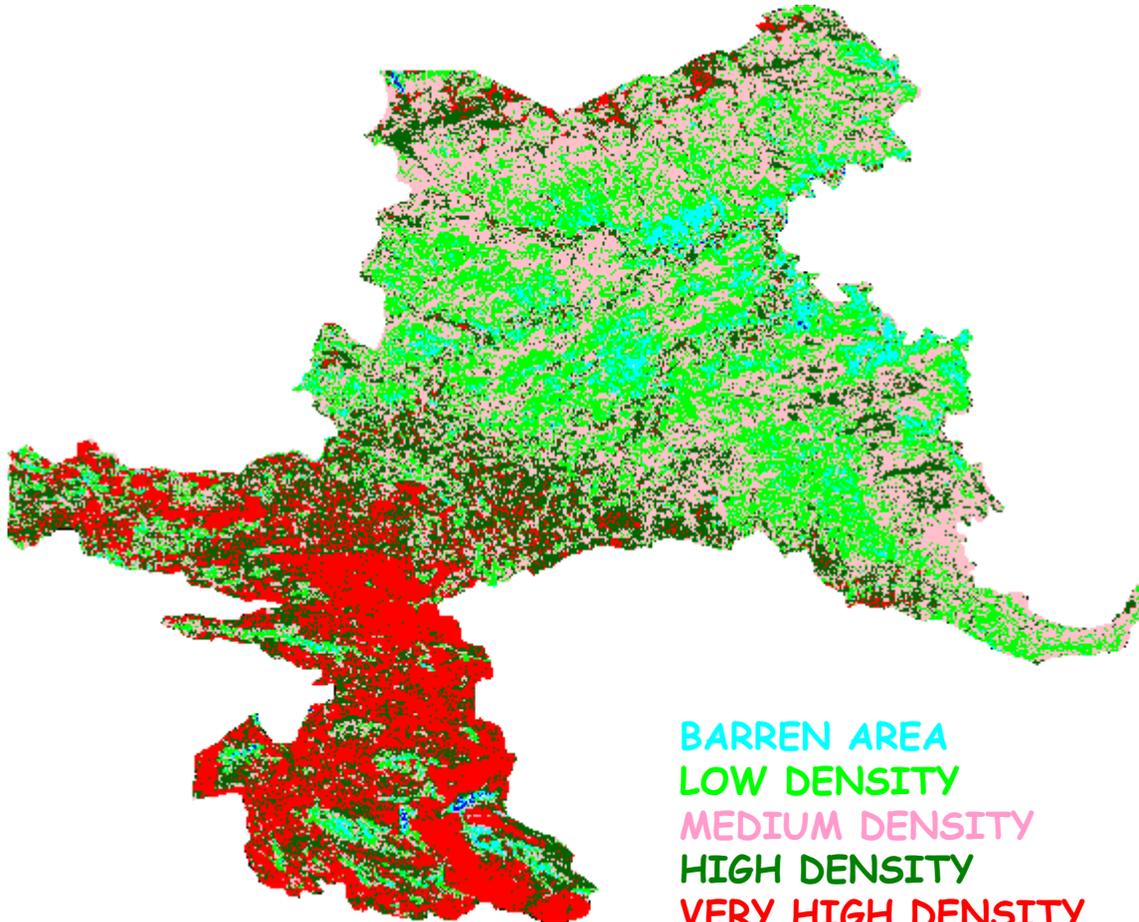


- FROM THE IMAGE, LOW DENSITY AND BARREN AREA WITH ROCKS ARE HIGHLY PRONOUNCED.
- MEDIUM DENSITY IS VERY LOW AND THE HIGH DENSITY AREAS ARE ALSO LESS.
- THE IMAGE IN THIS ZONE SHOWS A VERY POOR DENSITY IN TERMS OF VEGETATION.



NDVI IMAGE OF RESTORATION ZONE 2005

DENSITY CHANGE

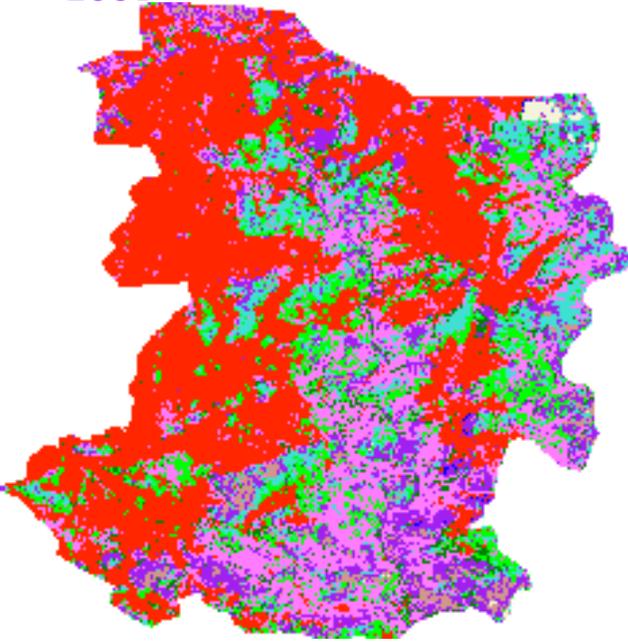


- THIS IMAGE SAYS A OVERAL INCEASE IN VEGETATED AREA.
- HIGH DENSITY AREAS HAS INCEASED WHICH APPEARS IN BRIGHT RED AND GREEN COLORS.
- LIGHT GREEN AREAS ARE LOW DENSITY AREAS AND PINK IS FOR MEDIUM DENSITY.
- CYON COLOR WHICH TELLS ABOUT BARREN ROCK AREAS HAS DECREASED DRASTICALLY WHEN COMPARED TO 2001.



CLASSIFIED IMAGE OF MANIPULATION ZONE

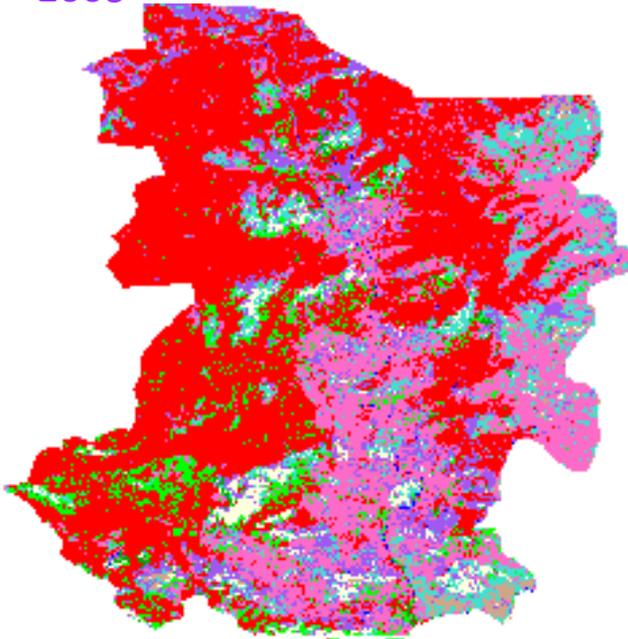
2001



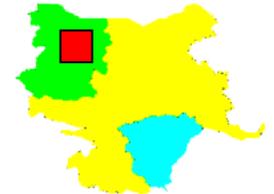
THE AREA UNDER FOREST HAS INCREASED BY A SMALL AMOUNT. THE AGRICULTURAL AREA AND LAND WITHOUT SCRUB HAS DECREASED WHILE SCRUB HAS INCREASED BY LITTLE AMOUNT.

- DENSE FOREST
- OPEN FOREST
- DEGRADED FOREST
- AGRIL. CROPS
- AGRIL. PLANTATION
- LAND WITH SCRUB
- LAND WITHOUT SCRUB
- BARREN AREA WITH / WITHOUT ROCKS
- WATER

2005

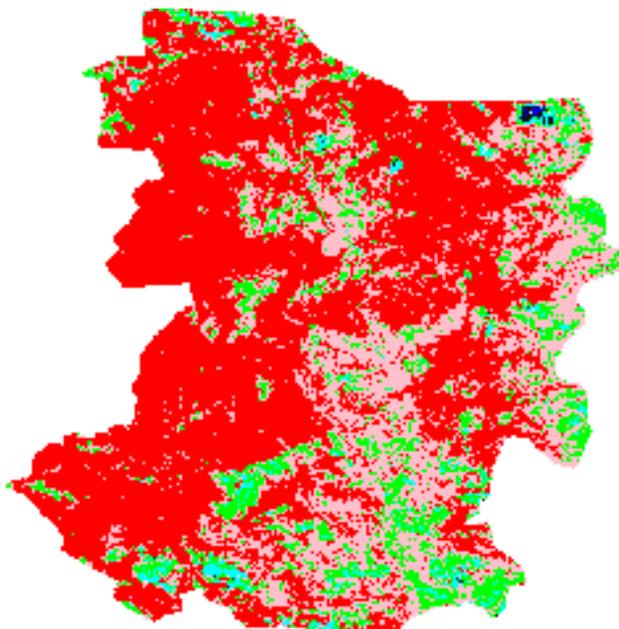


Feature	2001 Area in Sq. Km	2005 Area in Sq. Km	change
Dense Forest	76.5	84.62	+8.12
Open forest	36.85	39.8	+2.95
Degraded Forest	20.97	17.2	-3.77
Agri. Crops	18.58	10.96	-7.62
Agri. Plantation	6.8	1.61	-5.19
Land with scrub	12.88	14.49	+1.61
Land without scrub	4.14	3.14	-1
barrenrocky area	0.7	5.37	+4.67
Water	0.14	0.37	+0.23



CLASSIFIED NDVI IMAGE OF MANIPULATION ZONE

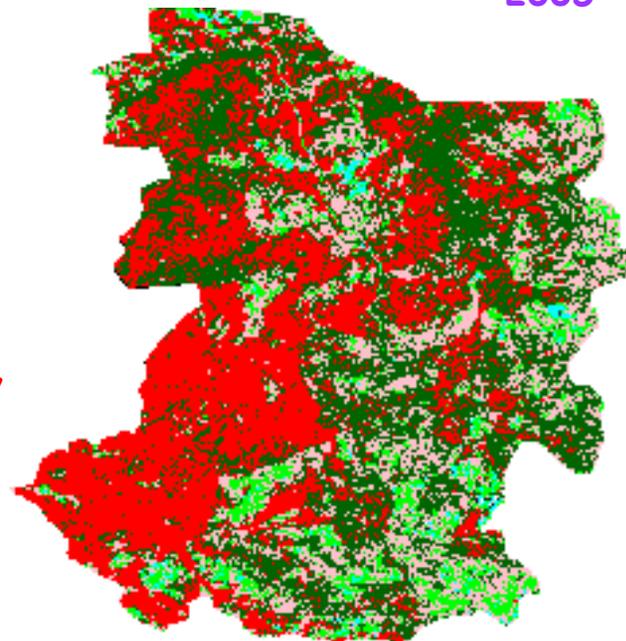
2001



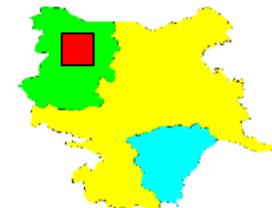
DENSITY CHANGE

BARREN AREA
LOW DENSITY
MEDIUM DENSITY
HIGH DENSITY
VERY HIGH DENSITY

2005

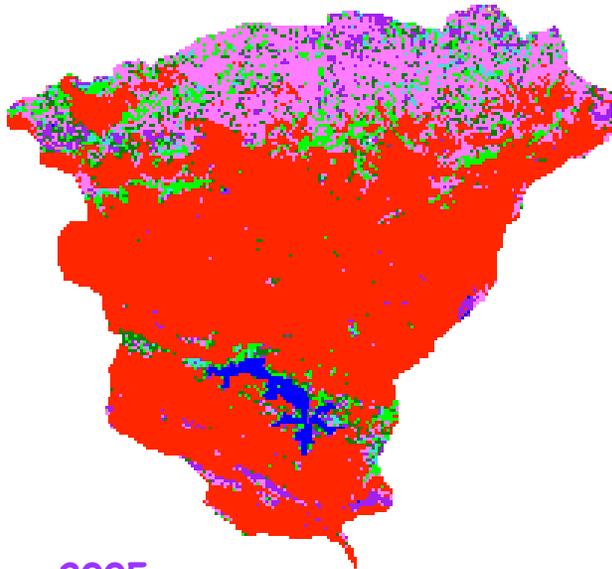


THE HIGH DENSITY AREA IS INCREASED . A PORTION OF VERY HIGH DENSED AREA HAS BROUGHT UNDER HIGH DESED AREA AND MEDIUM DENITY IS CONVERTED INTO HIGH DENSITY AREA WHEN COMPARED TO 2001 IMAGE.



CLASSIFIED IMAGE OF RESERVE BIO ZONE

2001



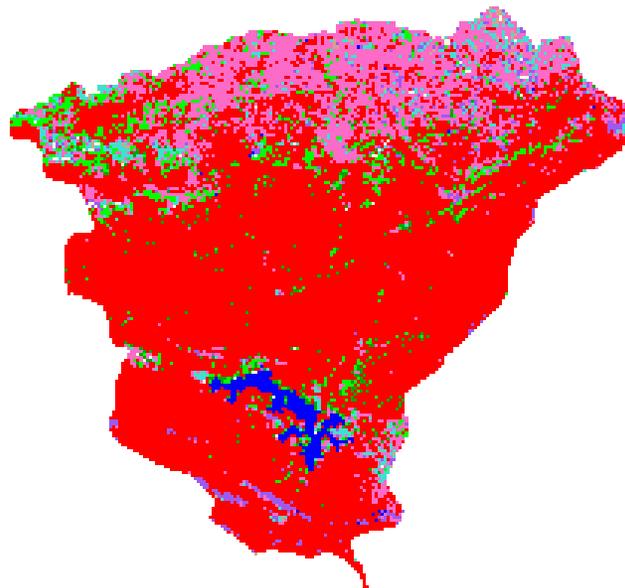
FORESTED AREA AND SCRUBBED AREAS HAS INCREASED AND THE AGRICULTURAL AREA HAS DECREASED BY A SMALL AMOUNT(MAY BE DUE TO SEASON).

- DENSE FOREST
- OPEN FOREST
- DEGRADED FOREST
- AGRIL. CROPS
- AGRIL. PLANTATION
- LAND WITH SCRUB
- LAND WITHOUT SCRUB
- BARREN AREA WITH / WITHOUT ROCKS
- WATER

AREA CHANGE

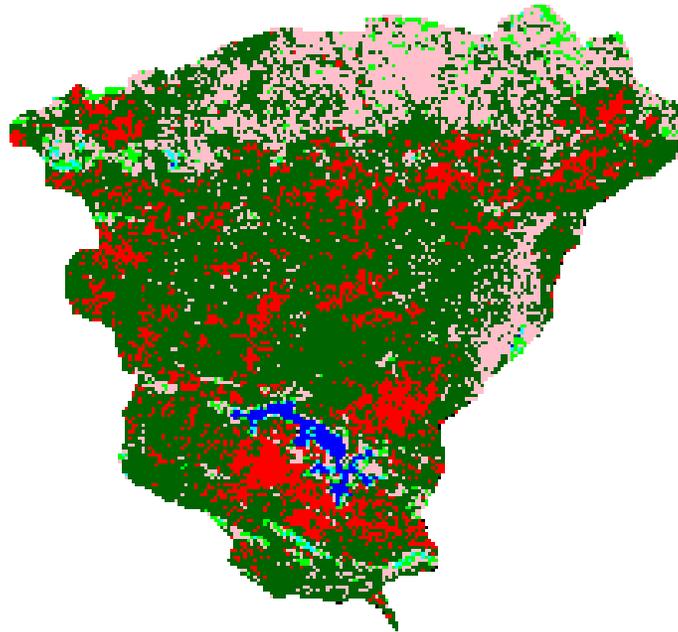
Feature	2001 Area in Sq. Km	2005 Area in Sq. Km	change
Dense Forest	69	74.73	+5.73
Open forest	19.65	17.68	-1.97
Degraded Forest	4.18	2.29	-1.89
Agri. Crops	6.2	5.42	-0.78
Agri. Plantation	4.68	1.91	-2.77
Land with scrub	1.62	2.73	+1.11
Land without scrub	0.22	0.4	+0.18
Barrenrocky area	0.01	0.31	+0.3
Water	1.58	1.68	+0.1

2005



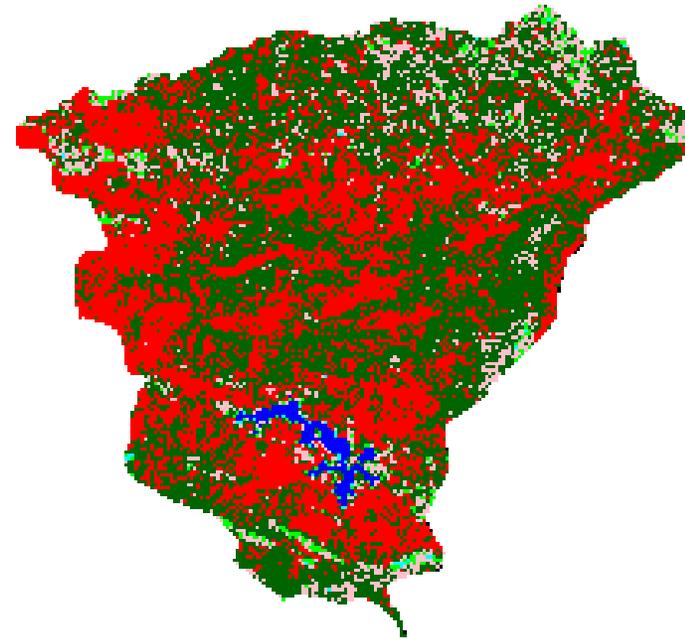
CLASSIFIED NDVI IMAGE OF RESERVE BIO ZONE

2001



DENSITY CHANGE

2005

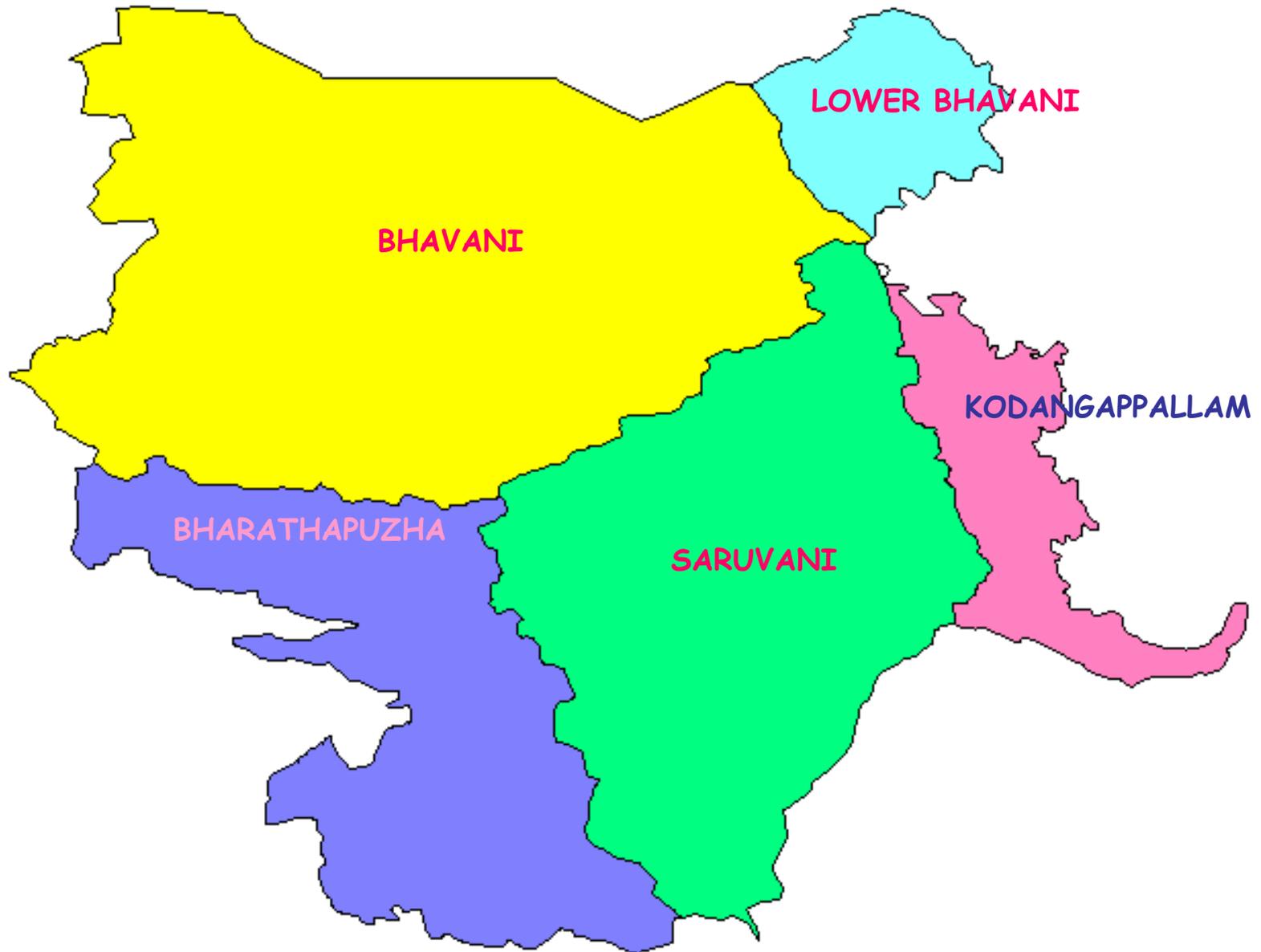


BARREN AREA
LOW DENSITY
MEDIUM DENSITY
HIGH DENSITY
VERY HIGH DENSITY

VERY HIGH DENSED AREAS HAS INCREASED AND ARE INDICATED BY THICK RED COLOR. MOST OF THE AREAS CAME UNDER HIGH DENSITY AREAS WHEN COMPARED TO 2001.

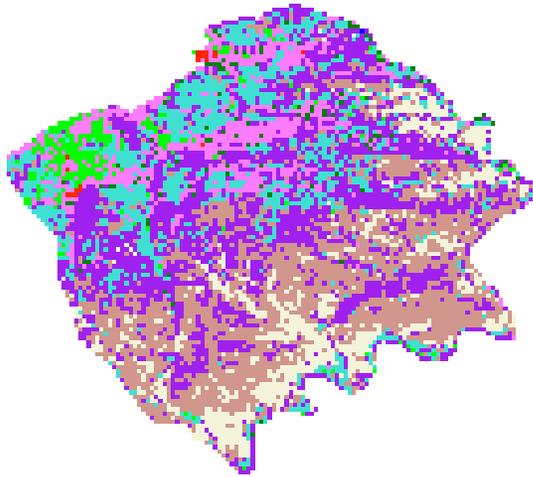


BASINS OF ATTAPPADY BLOCK

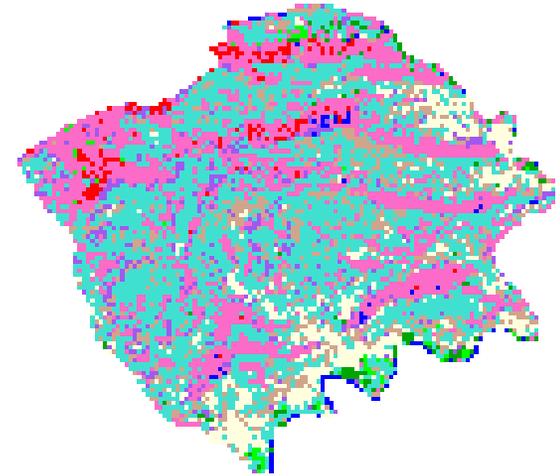


LOWER BHAVANI BASIN

2001



2005



- DENSE FOREST
- OPEN FOREST
- DEGRADED FOREST
- AGRIL. CROPS
- AGRIL. PLANTATION
- LAND WITH SCRUB
- LAND WITHOUT SCRUB
- BARREN AREA WITH / WITHOUT ROCKS
- WATER

AREA CHANGE

LAND WITH SCRUB HAS INCREASED PROFUSELY AND THE AREA UNDER DEGRADED FOREST HAS DECREASED BY A GOOD AMOUNT.

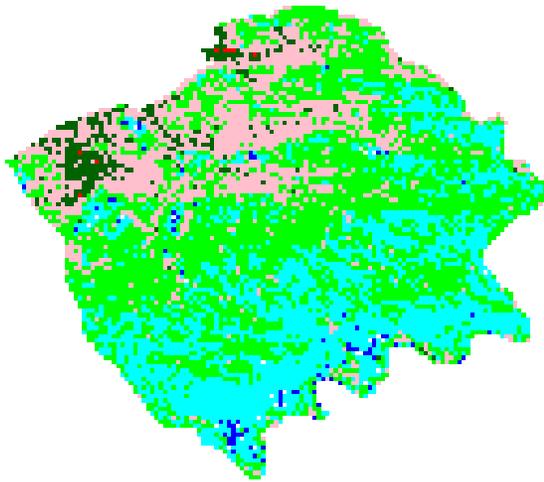


Feature	2001 Area in Sq. Km	2005 Area in Sq. Km	change
Dense Forest	0.074	0.81	+0.736
Open forest	4.03	11.16	+7.13
Degraded Forest	12.46	2.28	-10.18
Agri. Crops	1.27	0.4	-0.87
Agril. Plantation	0.54	0.58	+0.04
Land with scrub	5.85	16.49	+10.64
Land without scrub	11.49	4.46	-7.03
Barrenrocky area	4.73	3.9	-0.83
Water	0.008	0.4	+0.392

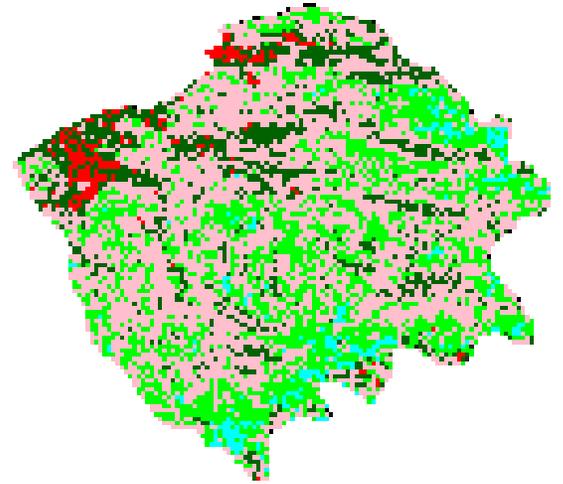
LOWER BHAVANI BASIN

2001

DENSITY CHANGE



BARREN AREA
LOW DENSITY
MEDIUM DENSITY
HIGH DENSITY
VERY HIGH DENSITY



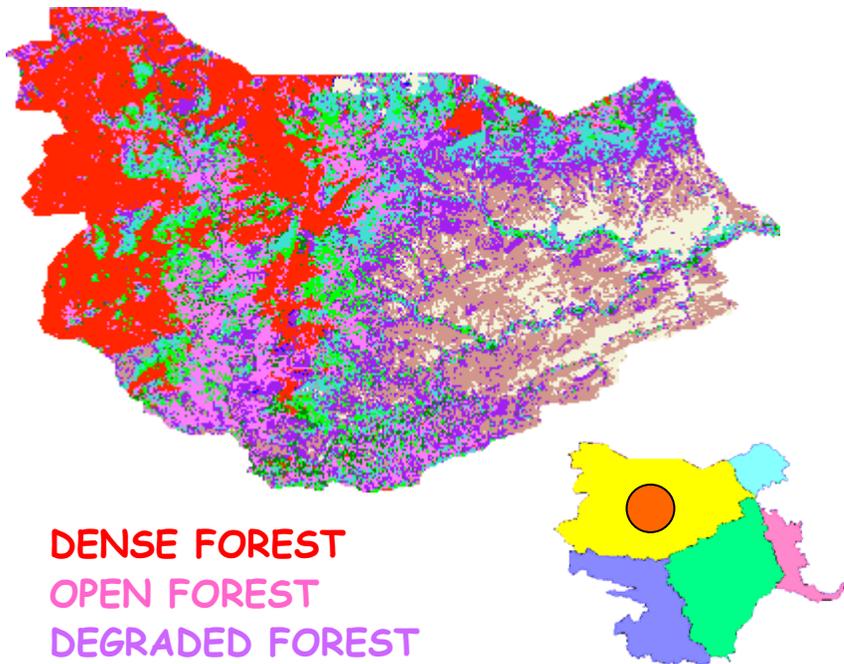
LOW DENSITY AREAS WHICH ARE IN LARGE PROPORTIONS ARE CONVERTED INTO MEDIUM DENSED AREAS AND A SMALL PORTION OF AREA HAS CAME UNDER HIGH DENSITY AREA WHEN COMPARED T 2001.



2001

BHAVANI BASIN

2005



AREA CHANGE

Feature	2001 Area in Sq. Km	2005 Area in Sq. Km	change
Dense Forest	66.87	76.25	+9.38
Open forest	40.54	63.38	+22.84
Degraded Forest	55.28	26.22	-29.06
Agri. Crops	21.71	12.35	-9.36
Agri. Plantation	10.02	5.88	-4.14
Land with scrub	28.87	63	+34.13
Land without scrub	49.84	27.35	-22.49
barren rocky area	23.18	20.8	-2.38
Water	0.21	1.35	+1.14

- DENSE FOREST
- OPEN FOREST
- DEGRADED FOREST
- AGRIL. CROPS
- AGRIL. PLANTATION
- LAND WITH SCRUB
- LAND WITHOUT SCRUB BARREN AREA WITH / WITHOUT ROCKS
- WATER

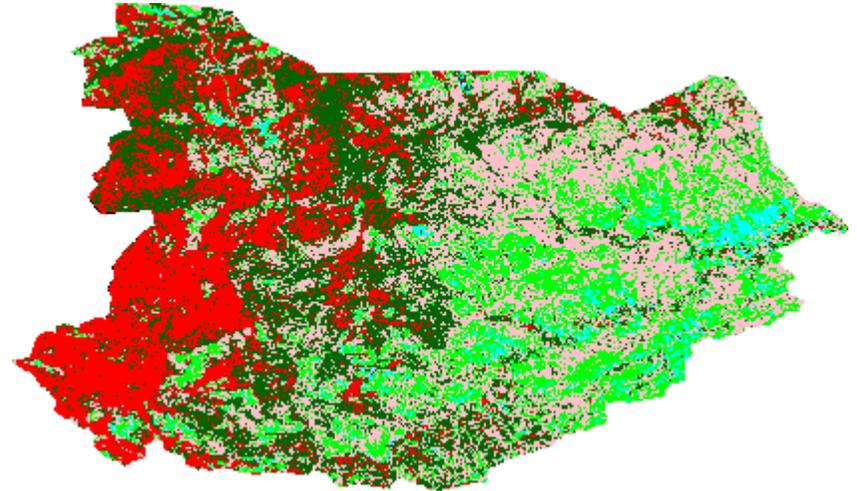
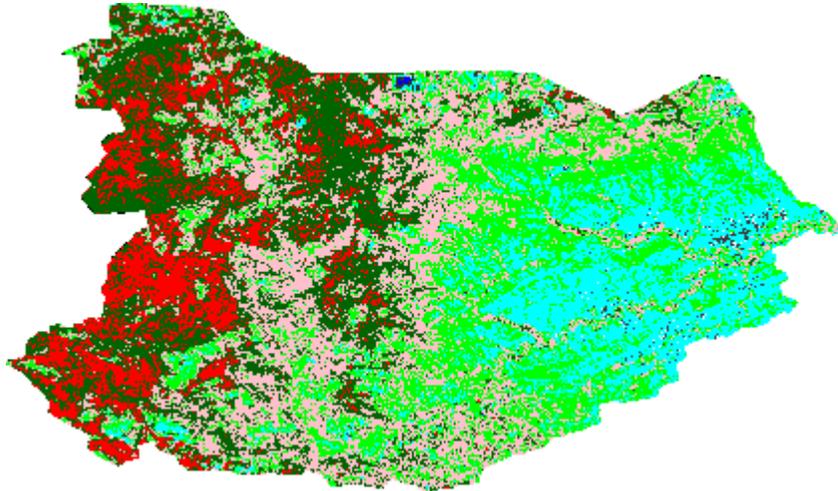
FOREST AREA HAS INCREASED ALMOST BY 72% AND SCRUB AREA HAS ALMOST DOUBLED. LAND WITHOUT SCRUB HAS CAME UNDER SCRUB LAND.

BHAVANI BASIN 2005

2001

2005

DENSITY CHANGE



BARREN AREA
LOW DENSITY
MEDIUM DENSITY
HIGH DENSITY
VERY HIGH DENSITY

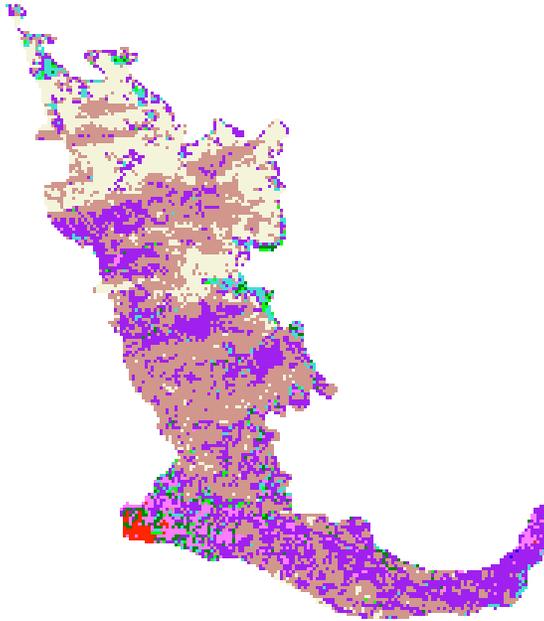
VERY HIGH DENSITY AREAS HAS INCREASED AND BARREN AREAS CAME UNDER LOW DENSITY AREAS WHEN COMPARED TO 2001.



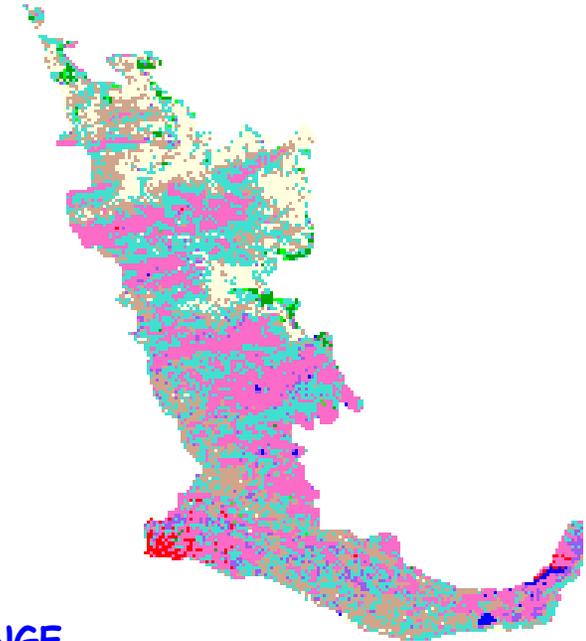
2001

KODANGAPPALLAM BASIN

2005



- DENSE FOREST
- OPEN FOREST
- DEGRADED FOREST
- AGRIL. CROPS
- AGRIL. PLANTATION
- LAND WITH SCRUB
- LAND WITHOUT SCRUB
- BARREN AREA WITH / WITHOUT ROCKS
- WATER



AREA CHANGE

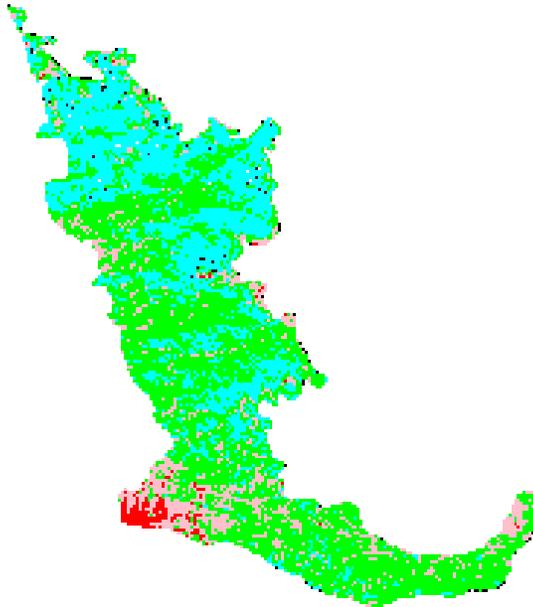
THE AREA UNDER DEGRADED FOREST HAS COME DOWN DRASTICALLY AND THE AREA UNDER FOREST HAS INCREASED. AGRICULTURAL AREA HAS INCREASED BY A GOOD AMOUNT.



Feature	2001 Area in Sq. Km	2005 Area in Sq. Km	Change
Dense Forest	69.97	80.39	+10.42
Open forest	36	44.9	+8.9
Degraded Forest	26.73	8.26	-18.47
Agri. Crops	12.55	27.58	+15.03
Agri. Plantation	10	5.6	-4.4
Land with scrub	8	27.57	+19.57
Land without scrub	38.12	29.8	-8.32
Barren rocky area	15.8	9.17	-6.63
Water	1.6	1.93	+0.33

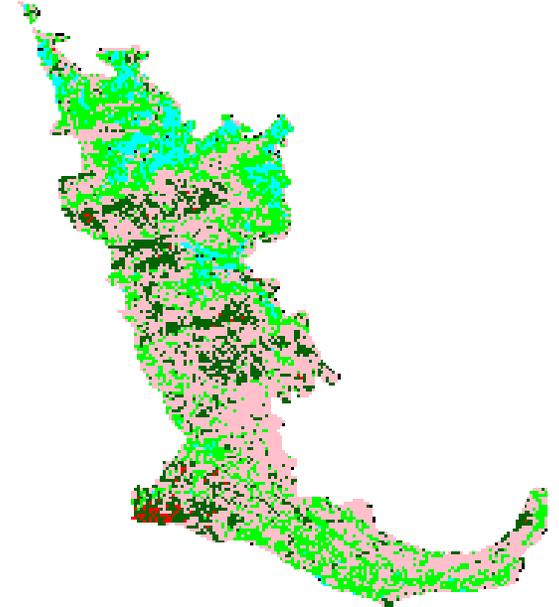
KODANGAPPALLAM BASIN

2001



DENSITY CHANGE

2005



BARREN AREA
LOW DENSITY
MEDIUM DENSITY
HIGH DENSITY;
VERY HIGH DENSITY

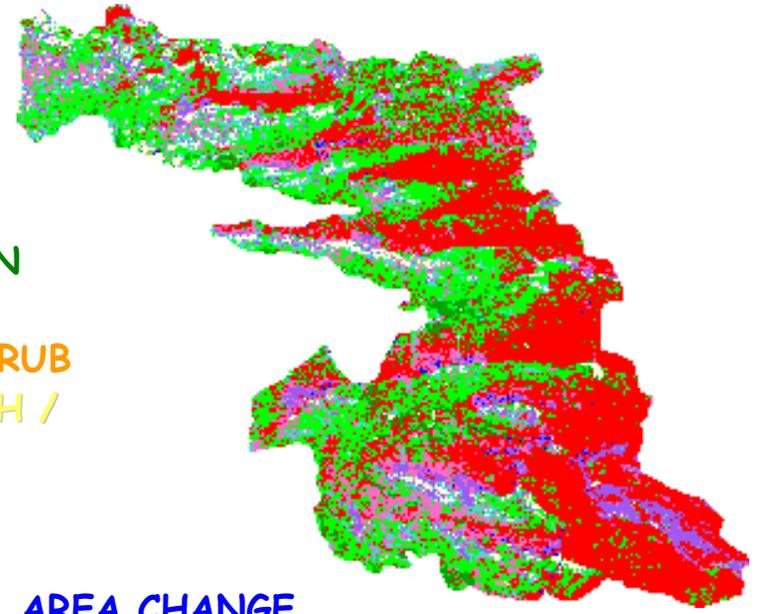
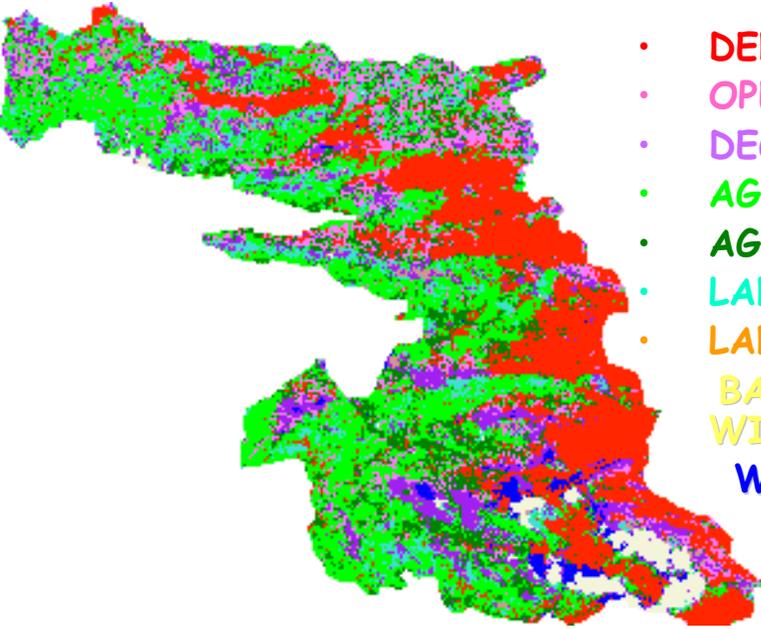
IN 2001 MOST OF THE AREA IS UNDER LOW DENSITY OF VEGETATION AND COMING TO 2005 MEDIUM DENSED AND HIGH DENSED AREAS HAS INCREASED



BHARATHAPUZHA BASIN

2001

2005



- DENSE FOREST
- OPEN FOREST
- DEGRADED FOREST
- AGRIL. CROPS
- AGRIL. PLANTATION
- LAND WITH SCRUB
- LAND WITHOUT SCRUB
- BARREN AREA WITH / WITHOUT ROCKS
- WATER

AREA CHANGE

OPEN FORESTED AREA HAS INCREASED AND DEGRADED FOREST HAS DECREASED BY A GOOD AMOUNT. LAND WITH SCRUB HAS INCREASED BY 15 TIMES.

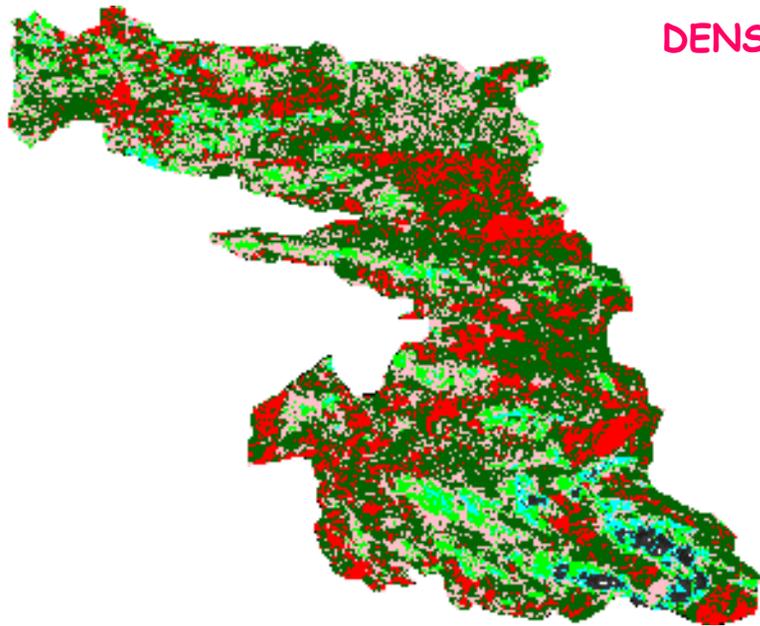


Feature	2001 Area in Sq. Km	2005 Area in Sq. Km	increase
Dense Forest	0.31	0.59	+0.28
Open forest	1.88	16.03	+14.15
Degraded Forest	15.73	1.7	-14.03
Agri. Crops	0.505	0.26	-0.245
Agril. Plantation	1	0.67	-0.33
Land with scrub	1.58	16.74	+15.16
Land without scrub	22.65	10.57	-12.08
Barrenrocky area	10.14	7.02	-3.12
Water	0.0041	0.24	+0.2359

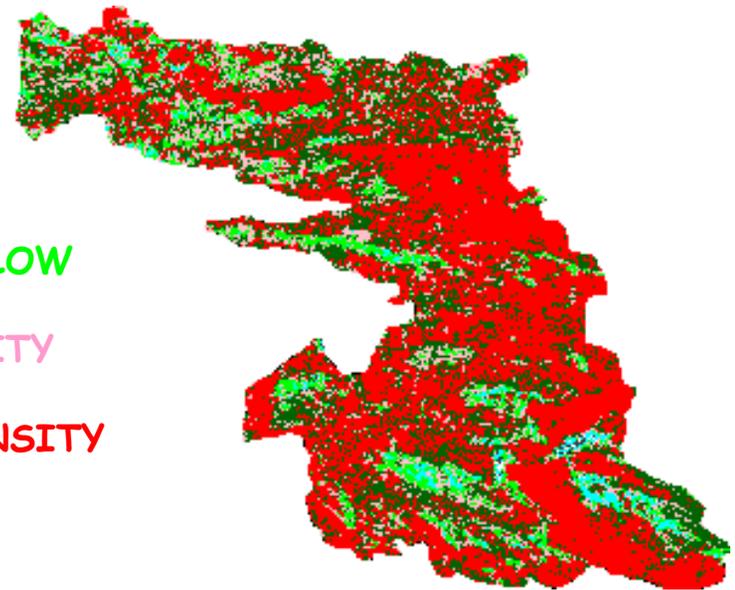
BHARATHAPUZHA BASIN

2001

2005



DENSITY CHANGE



BARREN AREA LOW
DENSITY
MEDIUM DENSITY
HIGH DENSITY
VERY HIGH DENSITY

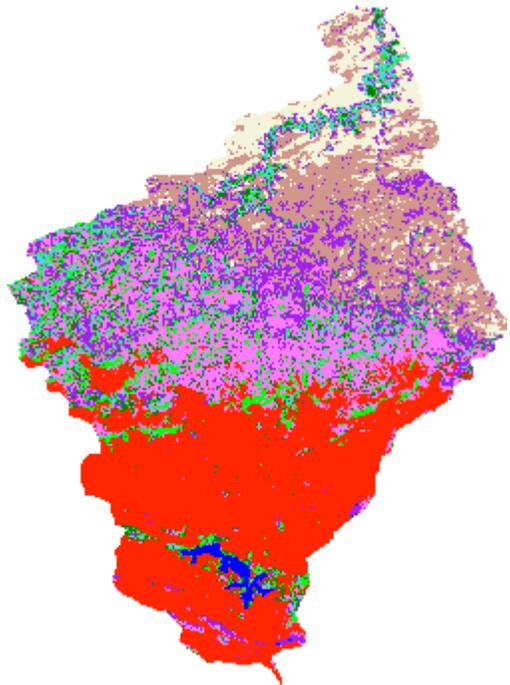
MOST OF THE HIGH DENSITY AREAS ARE CONVERTED TO VERY HIGHLY DENSED AREAS WH ARE INDICATED BY RED COLOR. AND LOW DENSED AREAS ARE INTO HIGH DENSITY AREAS.



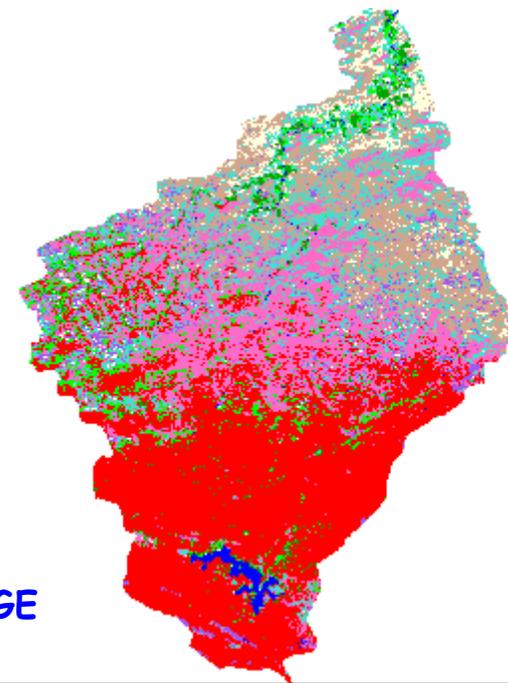
2001

SARUVANI BASIN

2005



- DENSE FOREST
- OPEN FOREST
- DEGRADED FOREST
- AGRIL. CROPS
- AGRIL. PLANTATION
- LAND WITH SCRUB
- LAND WITHOUT SCRUB
- BARREN AREA WITH / WITHOUT ROCKS
- WATER



AREA CHANGE

DEGRADED FOREST AREA HAS CONVERTED TO OPEN FOREST AREA AND LAND WITHOUT SCRUB HAS GROWN INTO SCRUB LANDS.



Feature	2001 Area in Sq. Km	2005 Area in Sq. Km	change
Dense Forest	40.9	60.15	+19.25
Open forest	16.32	16.43	+0.11
Degraded Forest	14.66	10.16	-4.5
Agri. Crops	55.51	41.66	-13.85
Agril. Plantation	17.83	6.76	-11.07
Land with scrub	10.4	10.37	-0.03
Land without scrub	1.94	1.26	-0.68
Barrenrocky area	4.35	6.7	+2.35
Water	2.25	0.56	-1.69

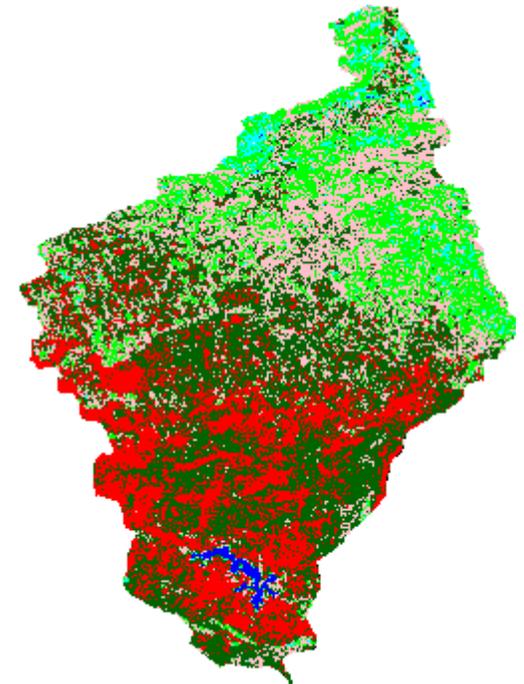
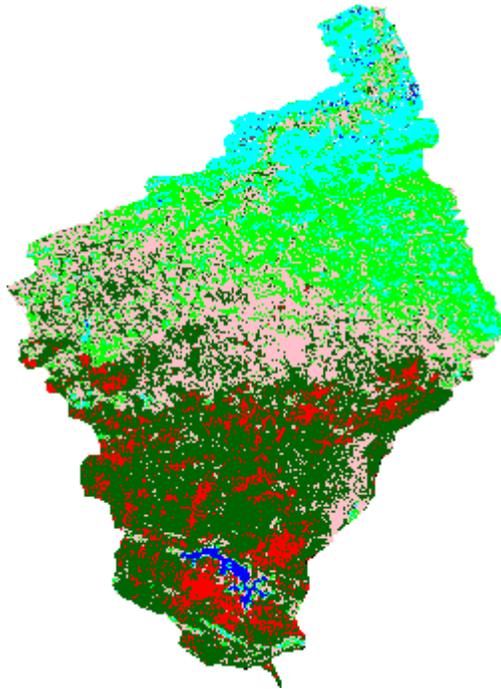
SARUVANI BASIN

2001

DENSITY CHANGE

2005

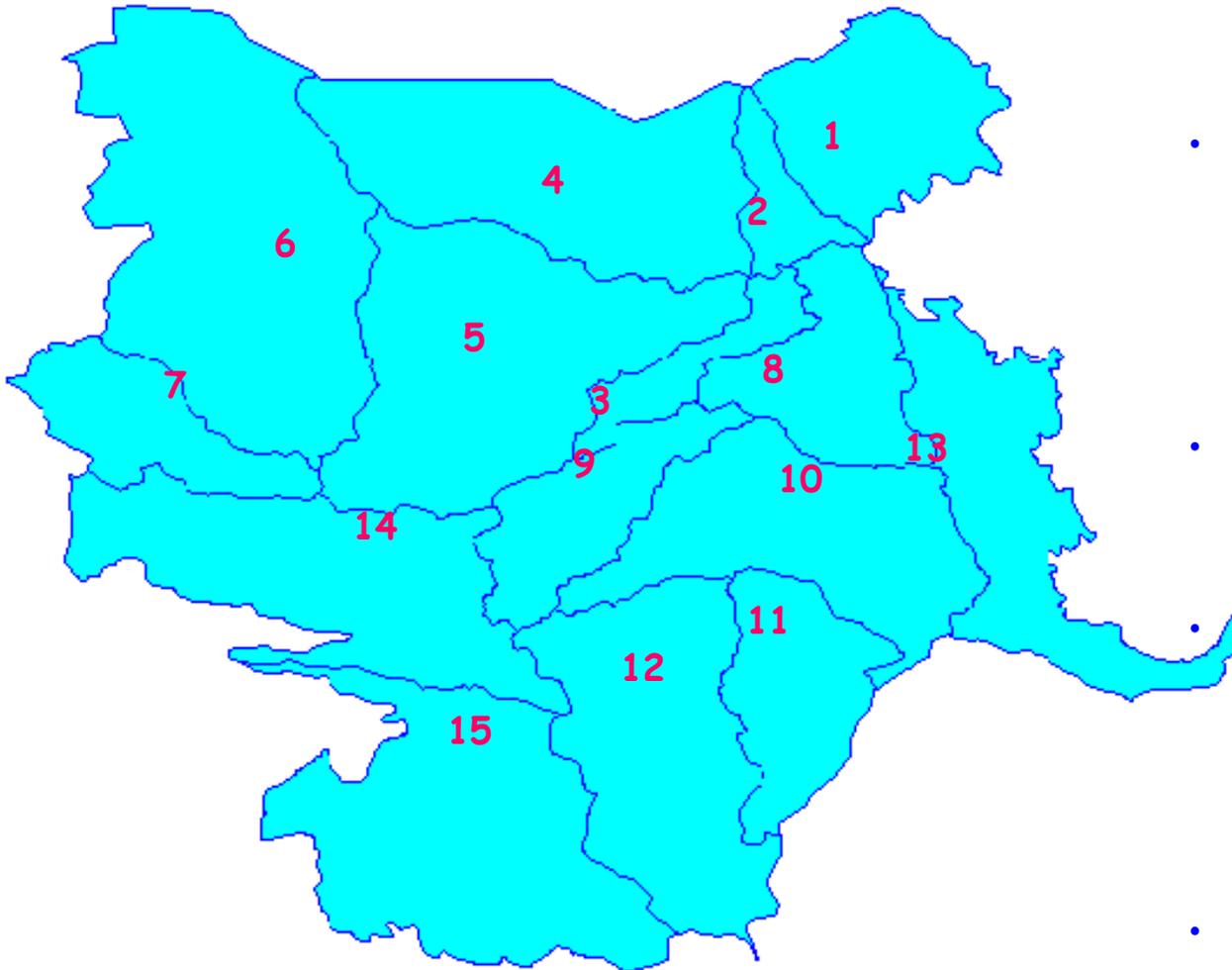
BARREN AREA
LOW DENSITY
MEDIUM DENSITY
HIGH DENSITY
VERY HIGH DENSITY



VERY HIGH DENSITY AREAS ARE PRONOUNCED HIGHLY WHEN COMPARED TO 2001 IN 2005 AND LOW DENSITY HAS CONVERTED TO MEDIUM DENSITY AREAS.



DEVELOPEMENTAL UNITS

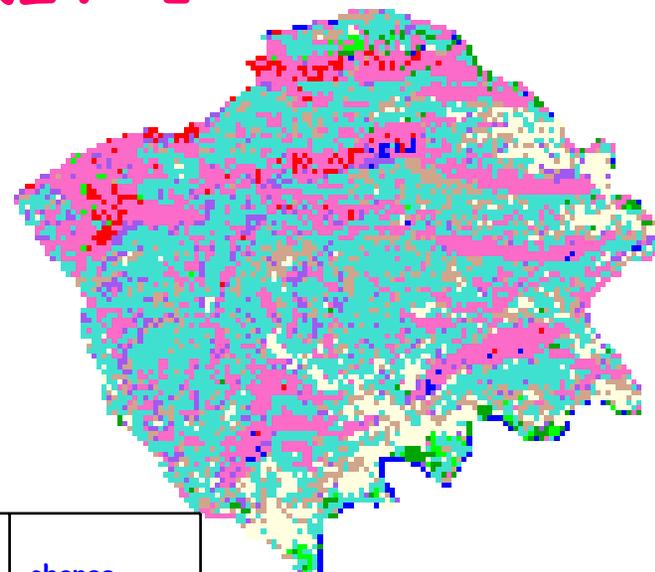
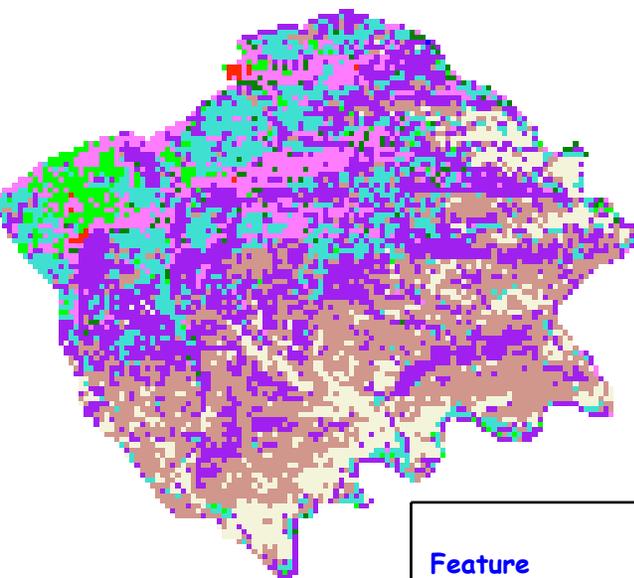


- THE WHOLE ATTAPADY BLOCK HAS BEEN DIVIDE INTO 15 DEVELOPEMENTAL UNITS.
- MOST OF THESE ARE DISTINCT WATERSHED.
- THIS DIVISION IS TO FECILITATE THE DEVELOPEMENTAL ACTIVITIES WITHOUT LEAVING ANY AREA.
- THESE 15 UNITS CAN BE CALLED AS SUB WATERSHEDS.

2001

DEVELOPMENT UNIT-1

2005



AREA CHANGE

Feature	2001 Area in Sq. Km	2005 Area in Sq. Km	change
Dense Forest	0.07	0.80	+0.73
Open forest	4.03	11.16	+7.13
Degraded Forest	12.46	2.28	-10.18
Agri. Crops	1.27	0.41	-0.86
Agril. Plantation	0.54	0.58	+0.04
Land with scrub	5.85	16.49	10.64
Land without scrub	11.52	4.46	-7.06
barrenrocky area	4.73	3.90	-0.83
Water	0.01	0.40	+0.39
	40.48	40.48	



- **DENSE FOREST;**
OPEN FOREST;
DEGRADED FOREST;
- **AGRIL. CROPS;**
AGRIL. PLANTATION;
LAND WITH SCRUB;
- **LAND WITHOUT SCRUB;**
- **BARREN AREA WITH / WITHOUT ROCKS; WATER**

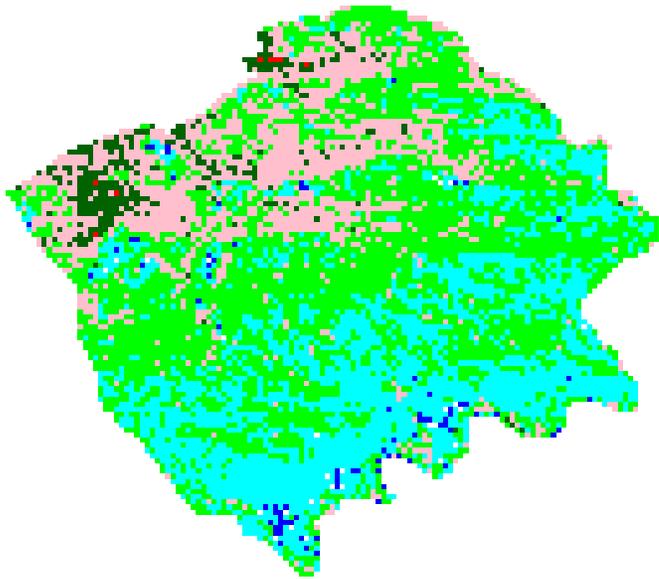
DEGRADED FOREST HAS DECREASED SIGNIFICANTLY AND PLANTATIONS HAS INCREASED.

DEVELOPMENT UNIT-1

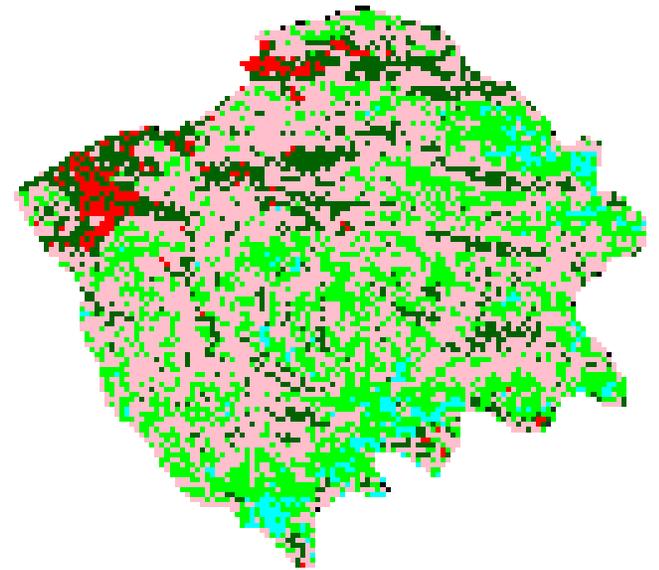
2001

2005

DENSITY CHANGE



BARREN AREA
LOW DENSITY
MEDIUM DENSITY
HIGH DENSITY
VERY HIGH DENSITY



LOW DENSED AREA HAS GROWN INTO MEDIUM AND HIGH DENSED AREAS. BARREN AREA HAS DECREASED IN 2005.

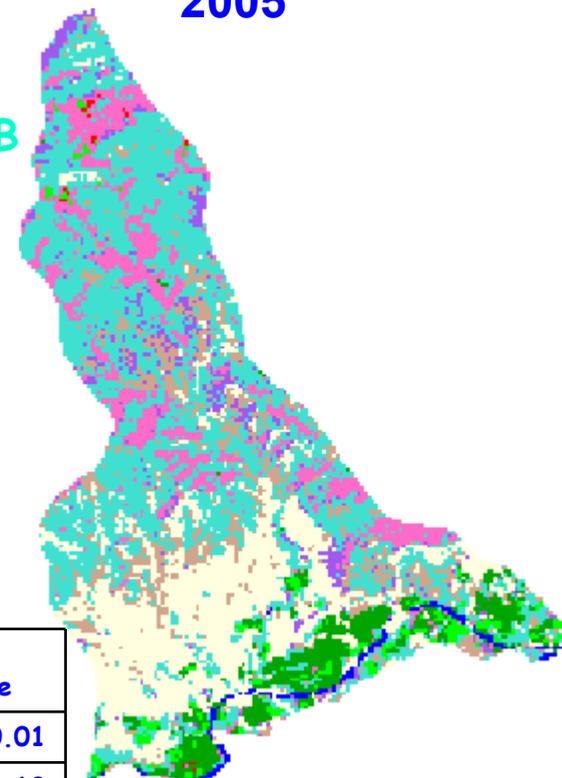
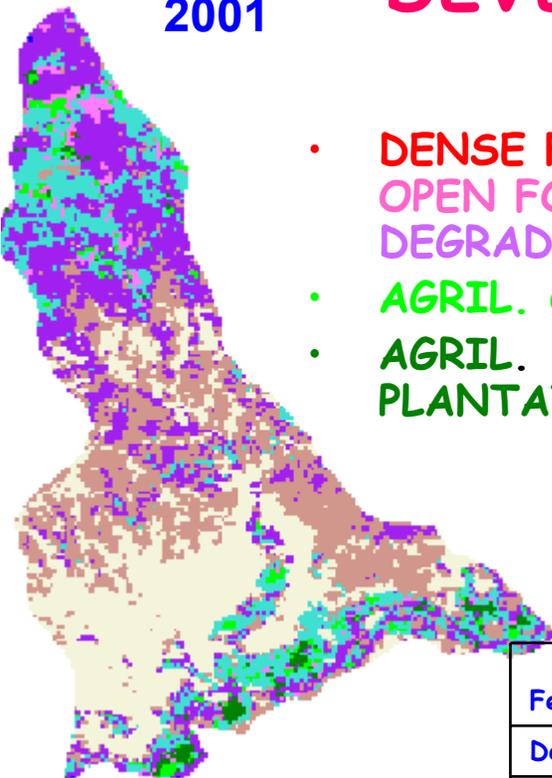


DEVELOPMENT UNIT-2

2001

2005

- DENSE FOREST
- OPEN FOREST
- DEGRADED FOREST
- AGRIL. CROPS
- AGRIL. PLANTATION
- LAND WITH SCRUB
- LAND WITHOUT SCRUB
- BARREN AREA WITH / WITHOUT ROCKS
- WATER



AREA CHANGE

Feature	2001(SqKm)	2005(SqKm)	change
Dense Forest	0.01	0.00	-0.01
Open forest	0.26	1.44	+1.18
Degraded Forest	2.98	0.58	-2.4
Agri. Crops	0.25	0.30	+0.05
Agril. Plantation	0.19	0.89	+0.7
Land with scrub	1.80	4.90	+3.1
Land without scrub	3.37	1.32	-2.05
barrerocky area	3.68	3.01	-0.67
Water	0.00	0.10	+0.1
	12.54	12.54	



LAND WITHOUT SCRUB HAS DECREASED AND PLANTATIONS HAS INCREASED SIGNIFICANTLY..

DEVELOPMENT UNIT-2

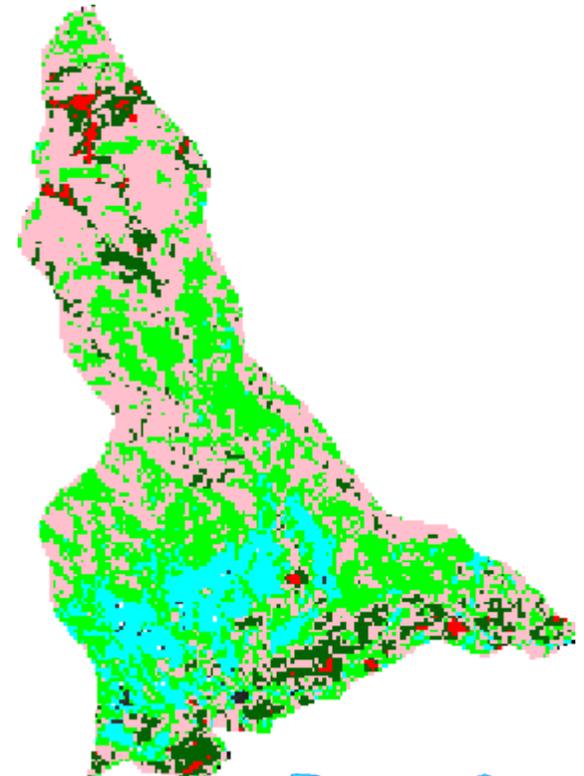
2001

2005

DENSITY CHANGE



BARREN AREA
LOW DENSITY
MEDIUM DENSITY
HIGH DENSITY
VERY HIGH DENSITY



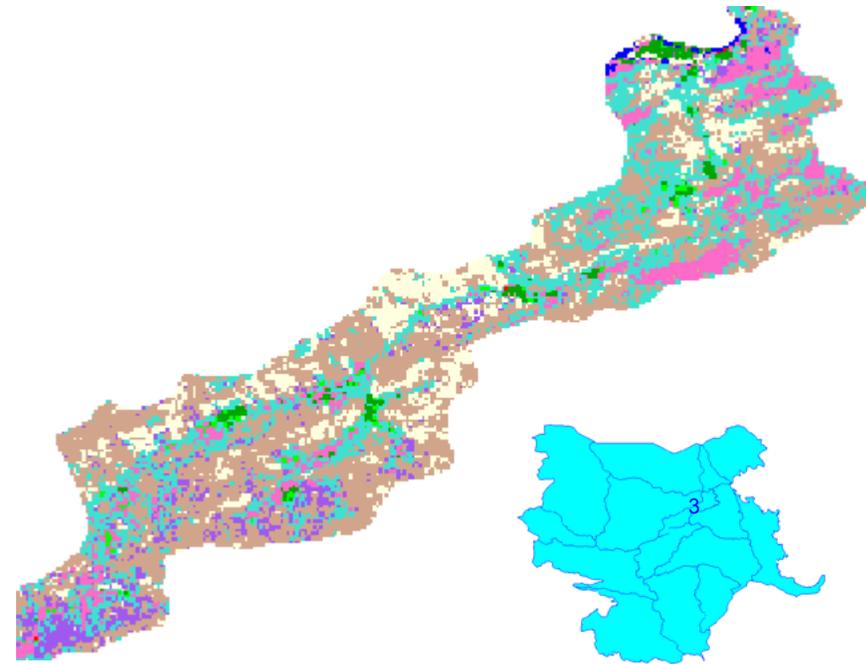
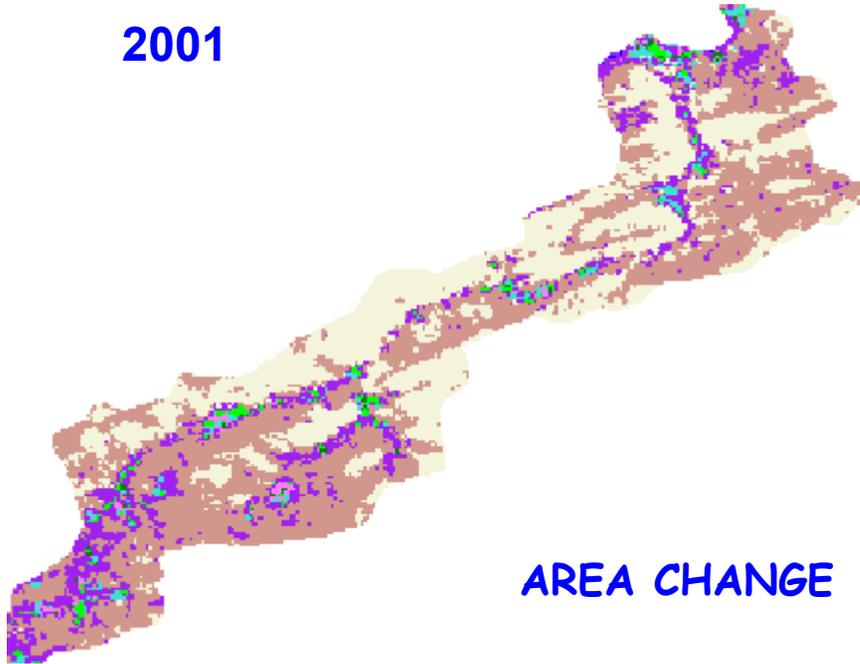
MAJOR AREA IN 2001 IS UNDER BARREN AND LOW DENSITY OF VEGETATION. THIS HAS CONVERTED INTO MEDIUM DENSITY AND HIGH DENSITY AREAS IN 2005.



DEVELOPMENT UNIT-3

2005

2001



AREA CHANGE

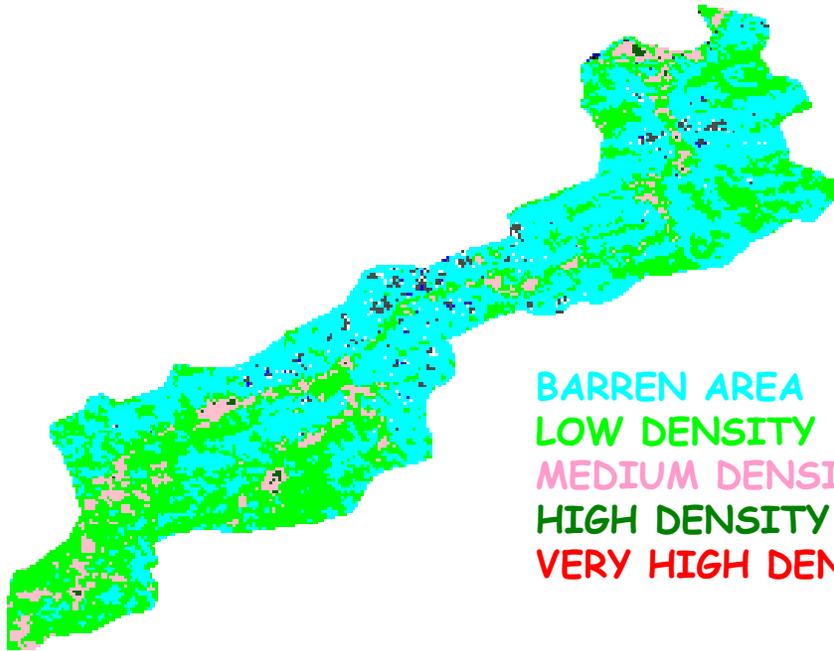
Feature	2001 Area in Sq. Km	2005 Area in Sq. Km	change
Dense Forest	0.00	0.00	+0.00
Open forest	0.10	1.33	+1.23
Degraded Forest	1.90	0.89	-1.01
Agri. Crops	0.21	0.19	-0.02
Agril. Plantation	0.06	0.27	+0.21
Land with scrub	0.28	3.66	+3.38
Land without scrub	6.95	6.04	-0.91
barranrocky area	5.02	2.08	-2.94
Water	0.00	0.06	+0.06
	14.52	14.52	

AGRICULTURAL AREA AND FOREST AREA HAS INCREASED. BARREN AREA AND DEGRADED FOREST HAS DECREASED.

DENSE FOREST; OPEN FOREST;
DEGRADED FOREST; AGRIL. CROPS;
AGRIL. PLANTATION; LAND WITH
SCRUB; LAND WITHOUT SCRUB;
BARREN AREA WITH / WITHOUT
ROCKS; WATER

DEVELOPMENT UNIT-3

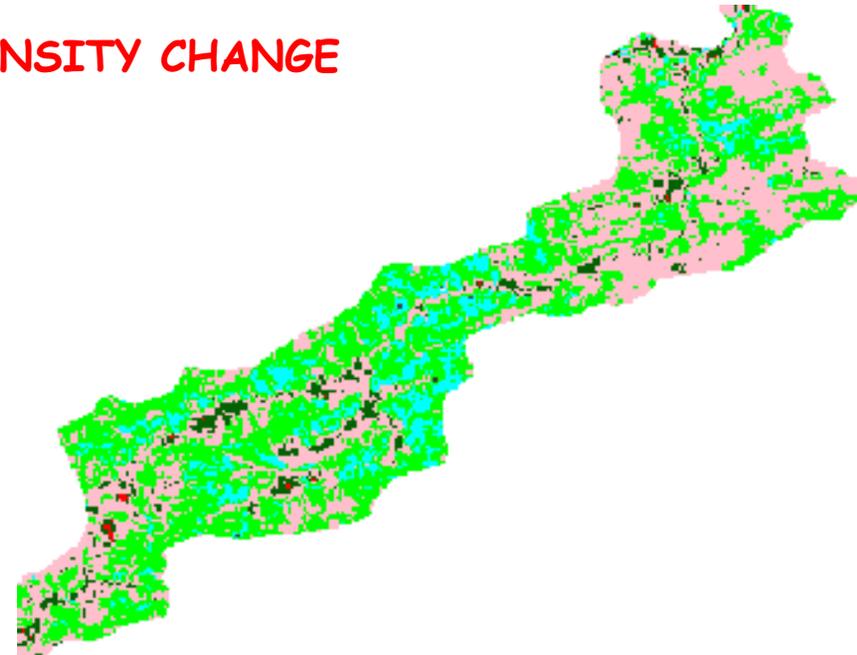
2001



BARREN AREA
LOW DENSITY
MEDIUM DENSITY
HIGH DENSITY
VERY HIGH DENSITY

2005

DENSITY CHANGE

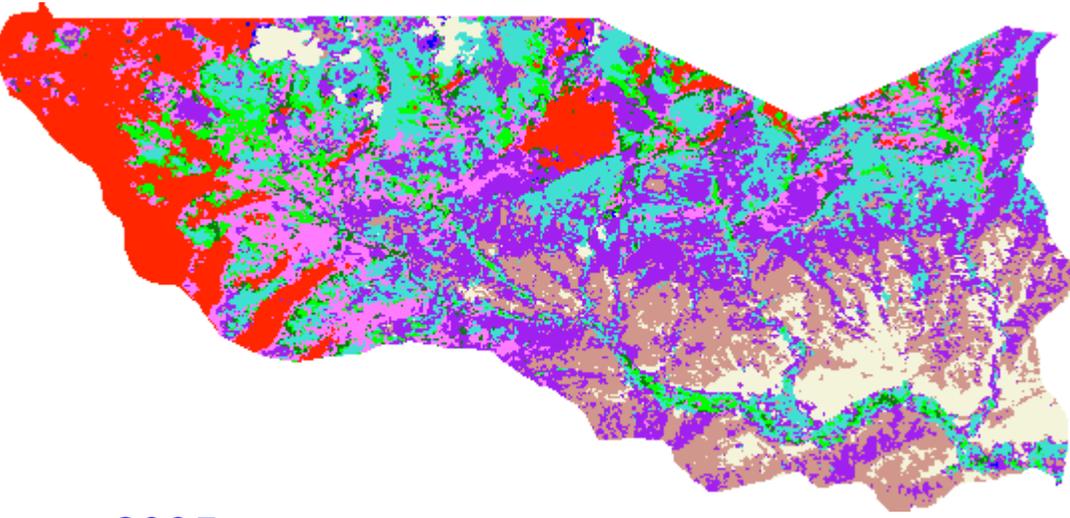


BARREN AND LOW DENSITY AREAS IN 2001 HAS CHANGED INTO LOW DENSITY AND MEDIUM DENSED AREAS IN 2005 COSEQUENTLY. A SMALL PORTION OF HIGH DENSED AREA CAN ALSO BE OBSERVED IN 2005.

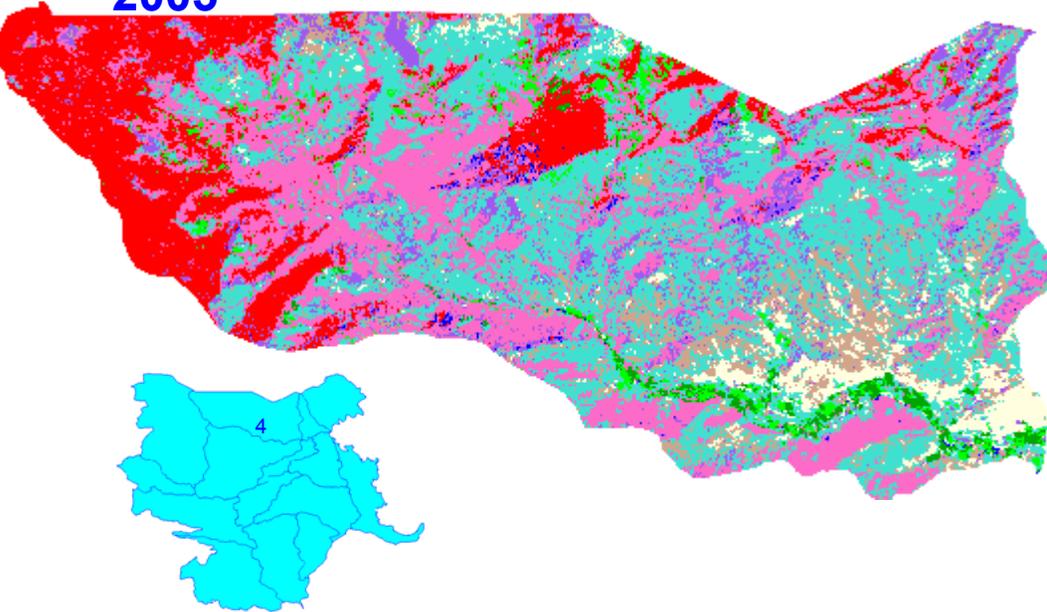


DEVELOPMENT UNIT-4

2001



2005



AREA CHANGE

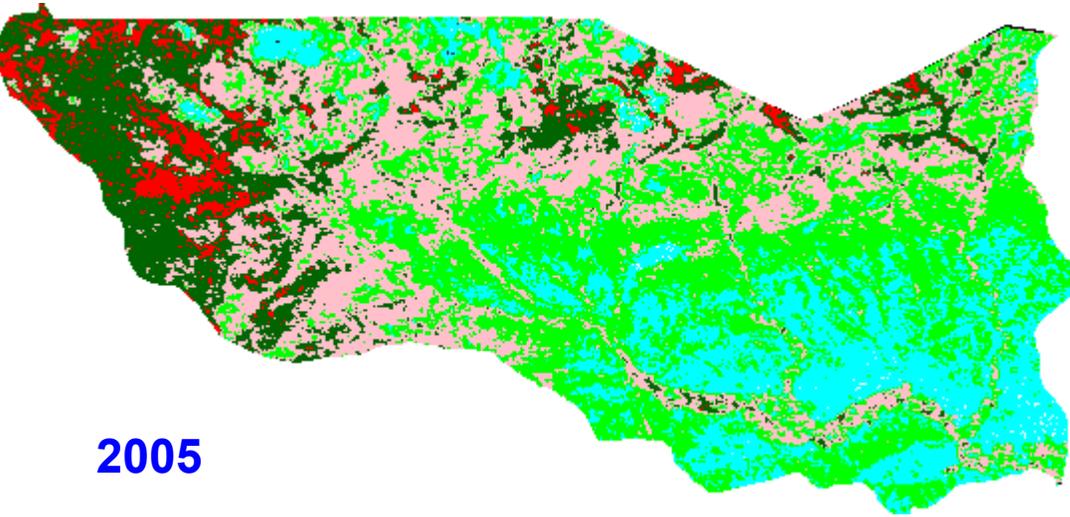
Feature	2001 Area in Sq. Km	2005 Area in Sq. Km	change
Dense Forest	9.6	11.9	+2.30
Open forest	8.84	20.42	+11.58
Degraded Forest	19.04	5.45	-13.59
Agri. Crops	4.17	1.94	-2.23
Agril. Plantation	2.33	1.2	-1.13
Land with scrub	12.58	24.78	+12.20
Land without scrub	12.06	5.87	-6.19
barren rocky area	6.74	3.58	-3.16
Water	0.07	0.29	+0.22
	75.43	75.43	

FOREST AREA AND SCRUBBED AREA HAS INCREASED SIGNIFICANTLY. LAND WITHOUT SCRUB AND AGRICULTURAL AREAS HAS DECREASED .

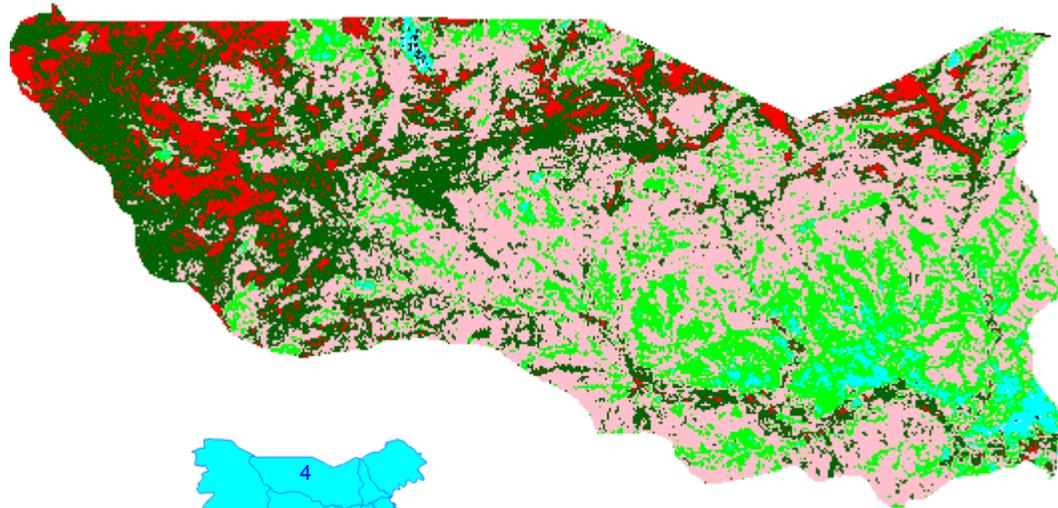
- DENSE FOREST; OPEN FOREST; DEGRADED FOREST; AGRIL. CROPS; AGRIL. PLANTATION; LAND WITH SCRUB; LAND WITHOUT SCRUB; BARREN AREA WITH / WITHOUT ROCKS; WATER**

DEVELOPMENT UNIT-4

2001



2005



DENSITY CHANGE

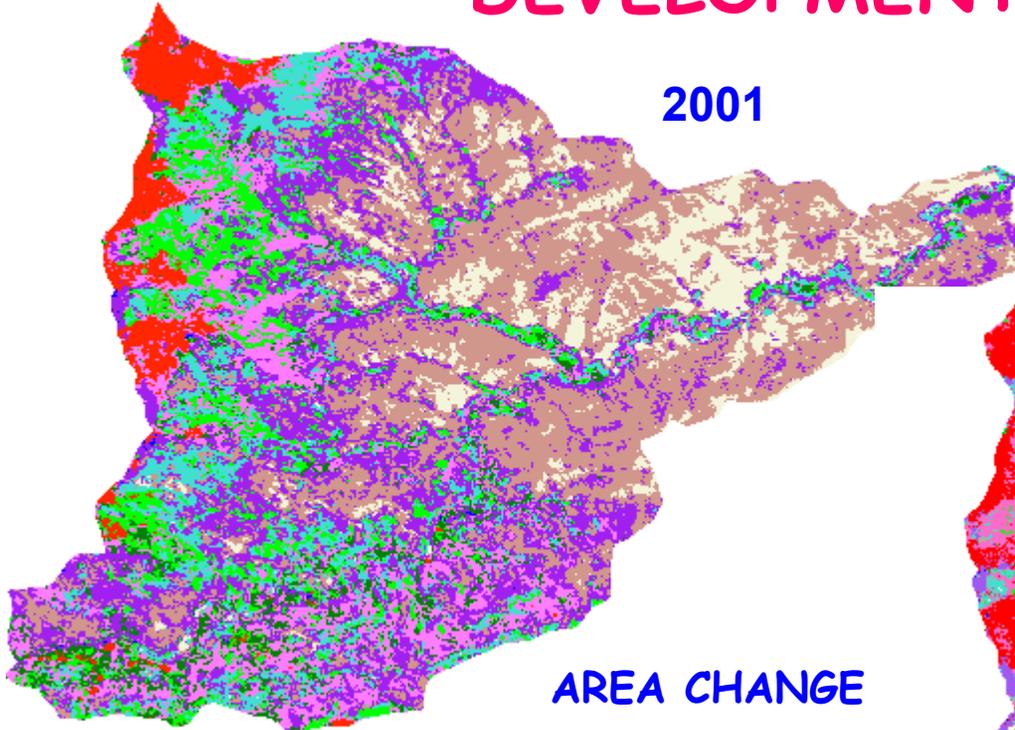
LOW DENSED AREAS HAS CHANGED TO MEDIUM DENSED AREA AND HIGH DENSITY AREAS HAS INCREASED IN 2005 COMPARED TO 2001.

BARREN AREA
LOW DENSITY
MEDIUM DENSITY
HIGH DENSITY
VERY HIGH DENSITY



DEVELOPMENT UNIT-5

2001

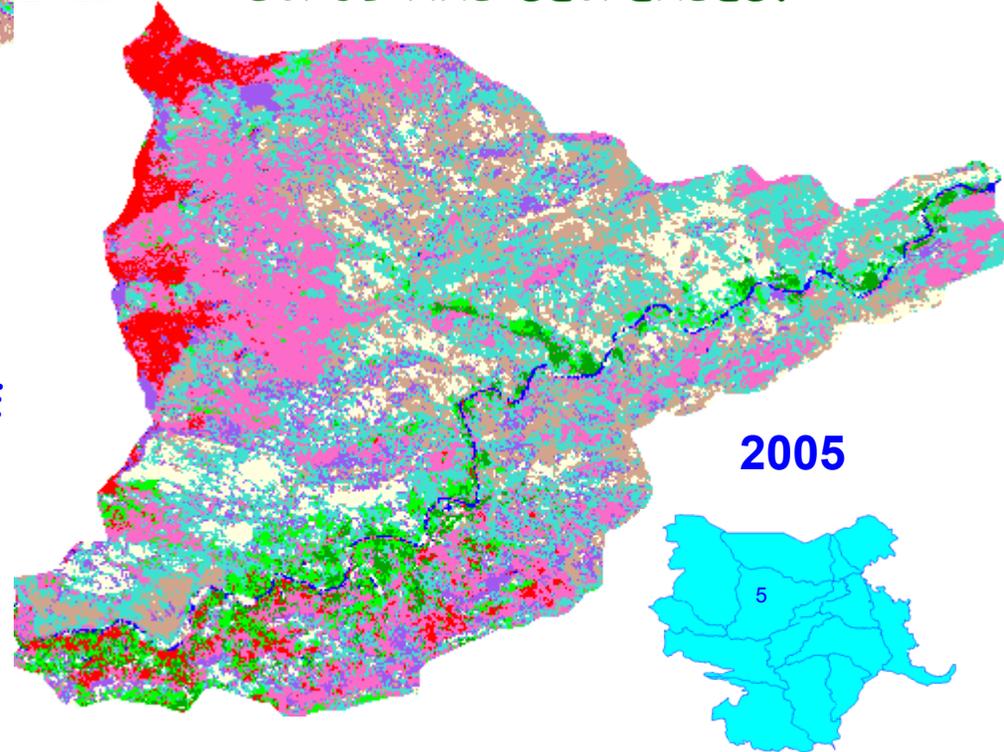


OPEN FORESTED AREA AND SCRUB LAND SHAS ALMOST DOUBLED AND DEGRADED FOREST AND LAND WITHOUT SCRUB HAS DECREASED.

AREA CHANGE

Feature	2001 Area in Sq. Km	2005 Area in Sq. Km	change
Dense Forest	3.19	4.52	+1.33
Open forest	9.67	19.44	+9.77
Degraded Forest	20.02	7.22	-12.80
Agri. Crops	6.84	4	-2.84
Agril. Plantation	3.69	2.63	-1.06
Land with scrub	7.35	23.81	+16.46
Land without scrub	25.86	13.44	-12.42
barrenrocky area	7.88	8.88	+1.00
Water	0.05	0.61	+0.56
	84.55	84.55	

2005

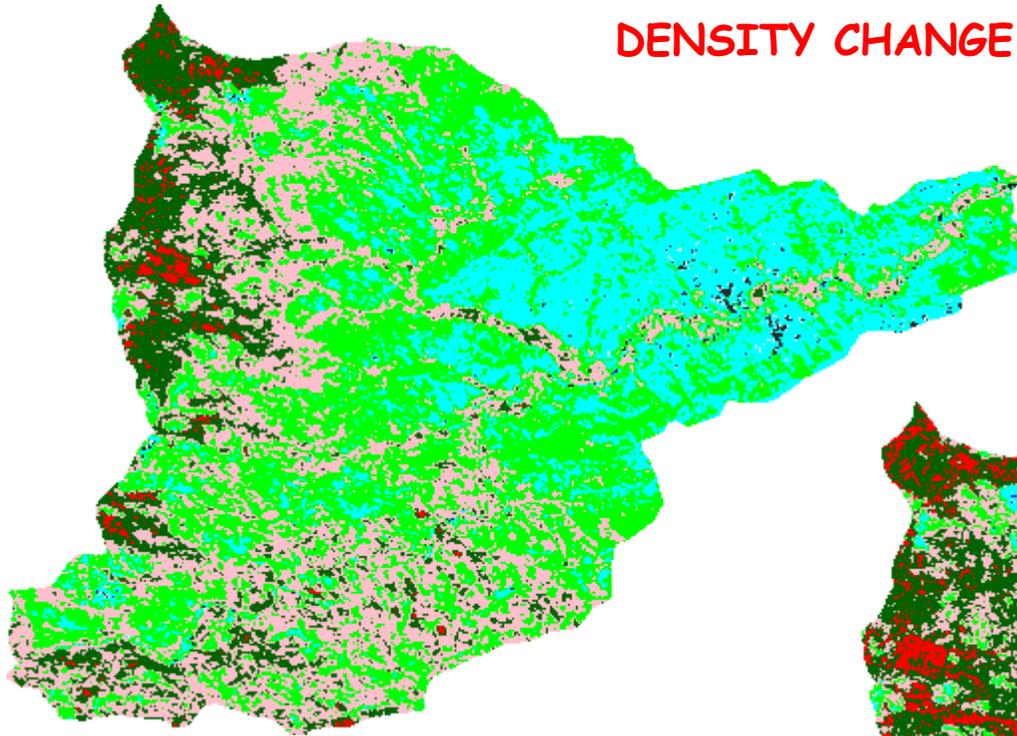


- **DENSE FOREST**; **OPEN FOREST**;
DEGRADED FOREST; **AGRIL. CROPS**;
AGRIL. PLANTATION; **LAND WITH SCRUB**;
LAND WITHOUT SCRUB;
BARREN AREA WITH / WITHOUT ROCKS;
WATER

DEVELOPMENT UNIT-5

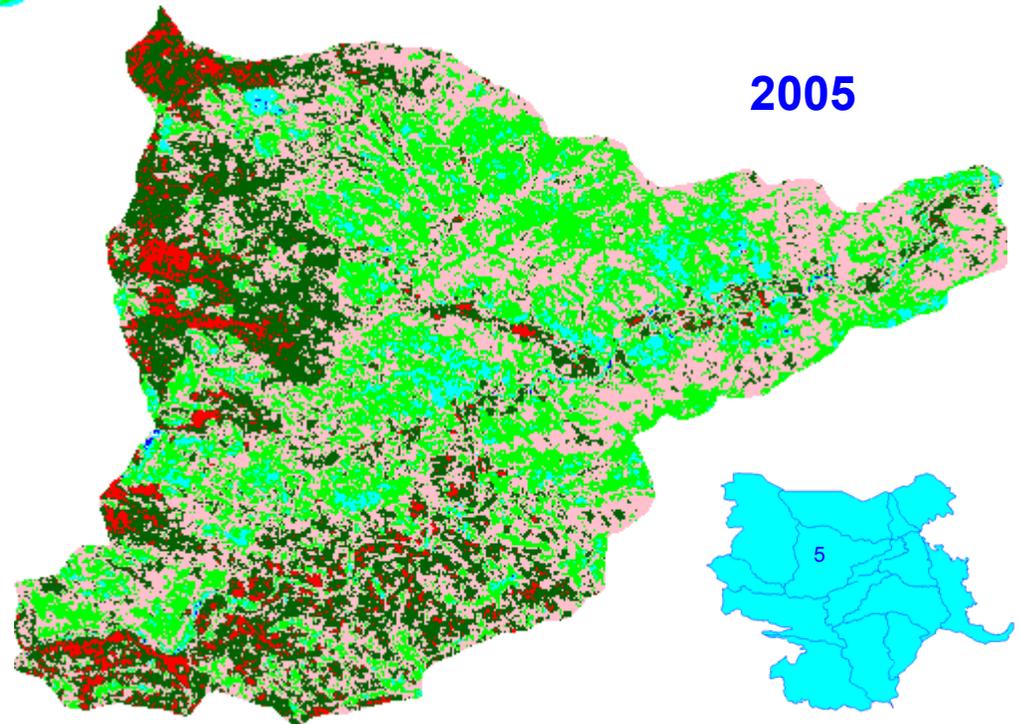
2001

DENSITY CHANGE



LOW DENSED AREA WHICH IS DMINATING IN 2001 HAS CHANGED TO MEDIUM DENSED AND HIGH DENSED AREAS IN 2005. BARREN AREA HAS DEVELOPED TO LOW DENSITY AREA IN 2005.

2005



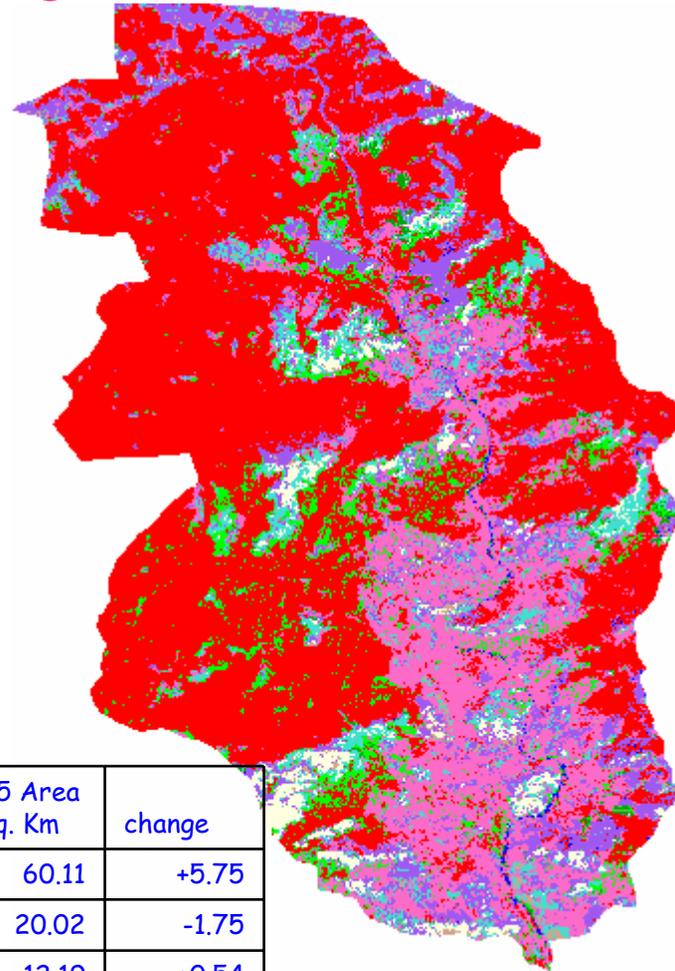
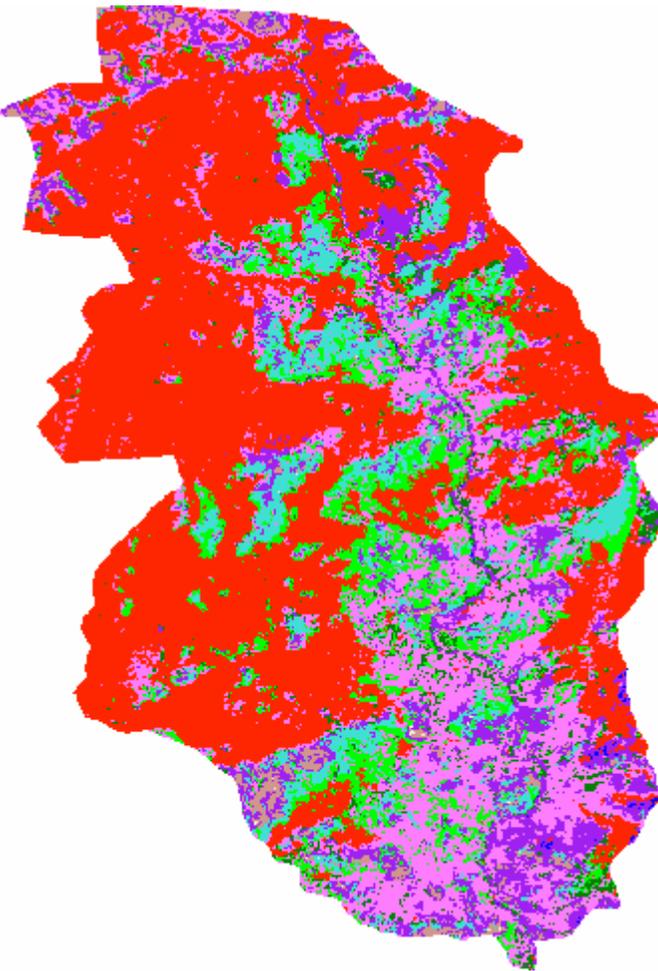
BARREN AREA
LOW DENSITY
MEDIUM DENSITY
HIGH DENSITY
VERY HIGH DENSITY



2001

DEVELOPMENT UNIT-6

2005



- DENSE FOREST;
- OPEN FOREST;
- DEGRADED FOREST;
- AGRIL. CROPS;
- AGRIL. PLANTATION;
- LAND WITH SCRUB;
- LAND WITHOUT SCRUB;
- BARREN AREA WITH / WITHOUT ROCKS;
- WATER

AREA CHANGE

Feature	2001 Area in Sq. Km	2005 Area in Sq. Km	change
Dense Forest	54.36	60.11	+5.75
Open forest	21.77	20.02	-1.75
Degraded Forest	11.65	12.19	+0.54
Agri. Crops	10.24	5.98	-4.26
Agril. Plantation	3.78	0.98	-2.80
Land with scrub	6.97	7.11	+0.14
Land without scrub	1.92	0.84	-1.08
barrenrocky area	0.05	3.34	+3.29
Water	0.09	0.26	+0.17

OPEN AND DEGRADED FOREST AREA HAS DECREASED AND DENSE FOREST AREA HAS INCREASED. LAND WITHOUT SCRUB DECREASED WHILE SCRUBBED AREA HAS INCREASED.

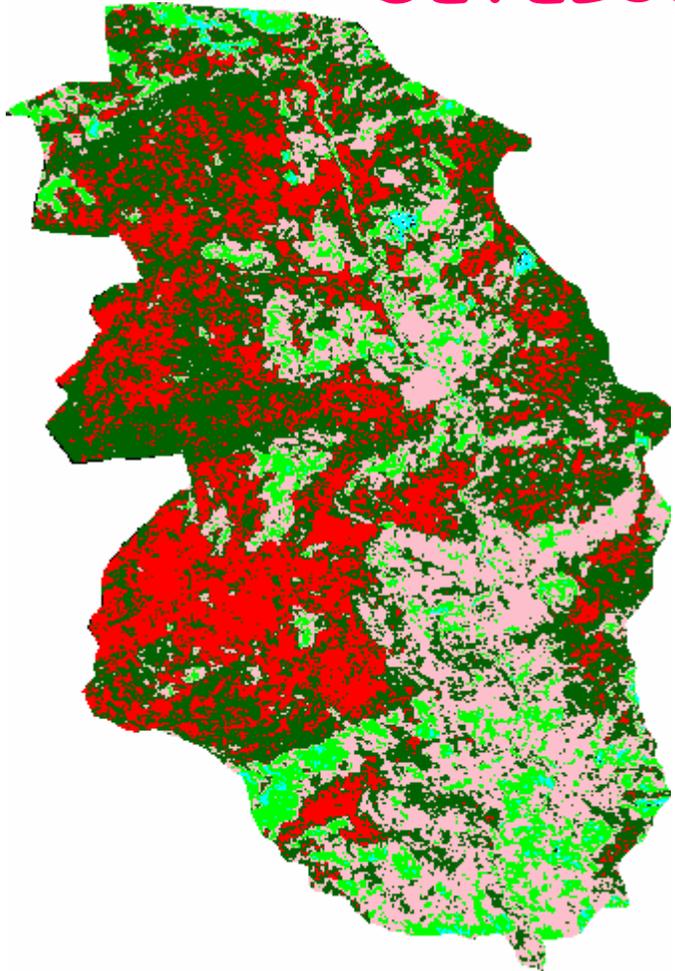
110.83

110.83



2001

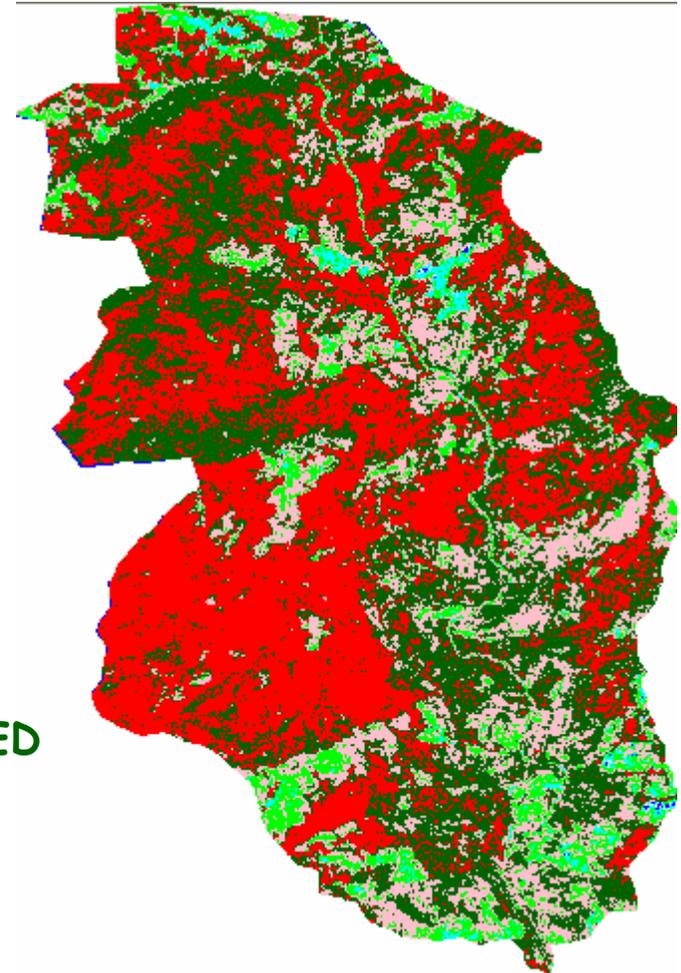
DEVELOPMENT UNIT-6



DENSITY CHANGE

2005

BARREN AREA;
LOW DENSITY;
MEDIUM DENSITY;
HIGH DENSITY;
VERY HIGH DENSITY

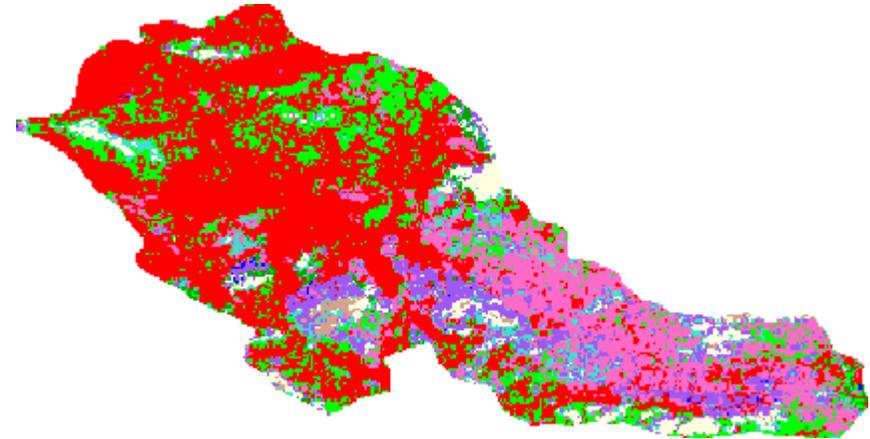
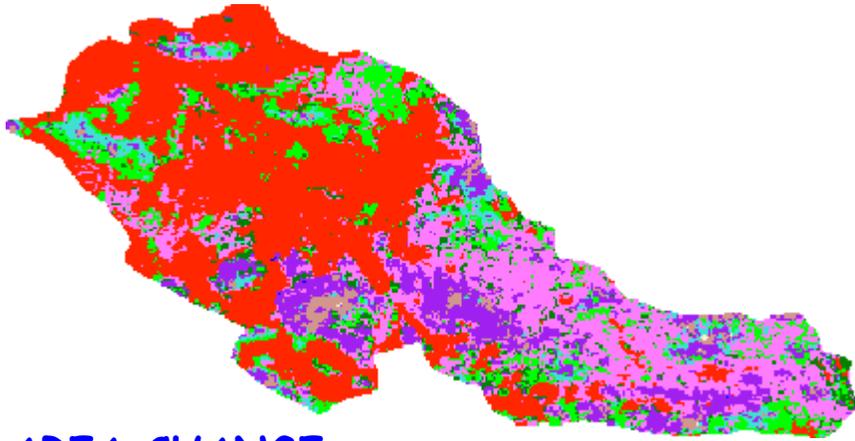


VERY HIGH DENSED AREAS HAS INCREASED
AND MEDIUM DENSITY HAS CHANGED TO
HIGH DENSITY.

2001

DEVELOPMENT UNIT-7

2005



AREA CHANGE

Feature	2001 Area in Sq. Km	2005 Area in Sq. Km	change
Dense Forest	11.72	12.81	+1.09
Open forest	6.57	4.85	-1.72
Degraded Forest	3.19	2.45	-0.74
Agri. Crops	3.25	4.18	+0.93
Agri. Plantation	1.35	0.46	-0.89
Land with scrub	1.02	1.31	+0.29
Land without scrub	0.60	0.30	-0.30
barren rocky area	0.04	1.34	+1.30
Water	0.00	0.04	+0.04
	27.74	27.74	

AGRICULTURAL AREA HAS INCREASED AND FOREST AREA ALSO INCREASED. OPEN FOREST DECREASED.

- **DENSE FOREST**; **OPEN FOREST**;
DEGRADED FOREST; **AGRIL. CROPS**;
AGRIL. PLANTATION;
LAND WITH SCRUB; **LAND WITHOUT SCRUB**;
BARREN AREA WITH / WITHOUT ROCKS;
WATER

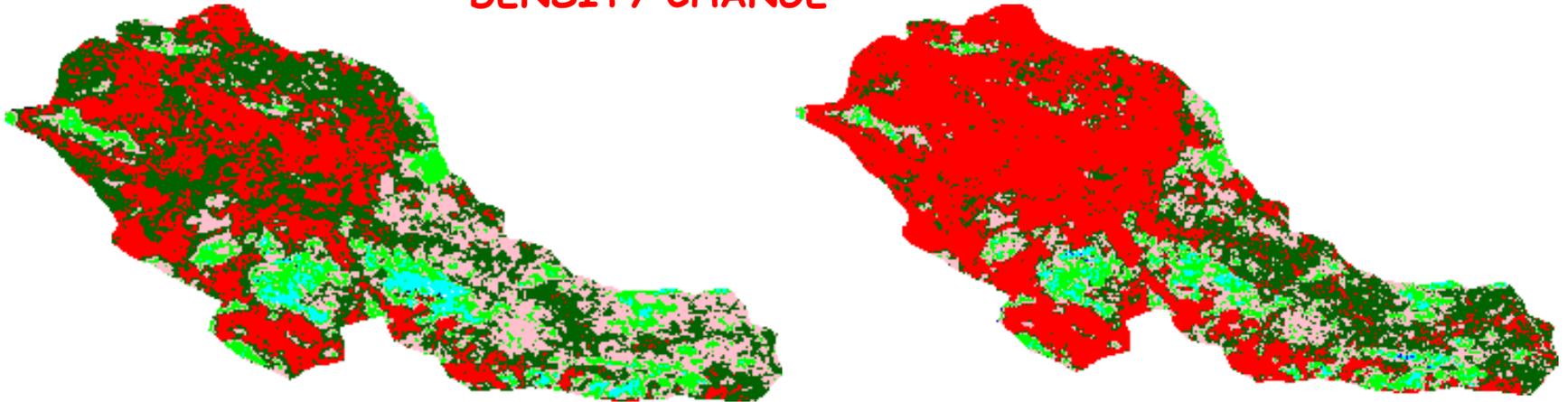


DEVELOPMENT UNIT-7

2001

2005

DENSITY CHANGE



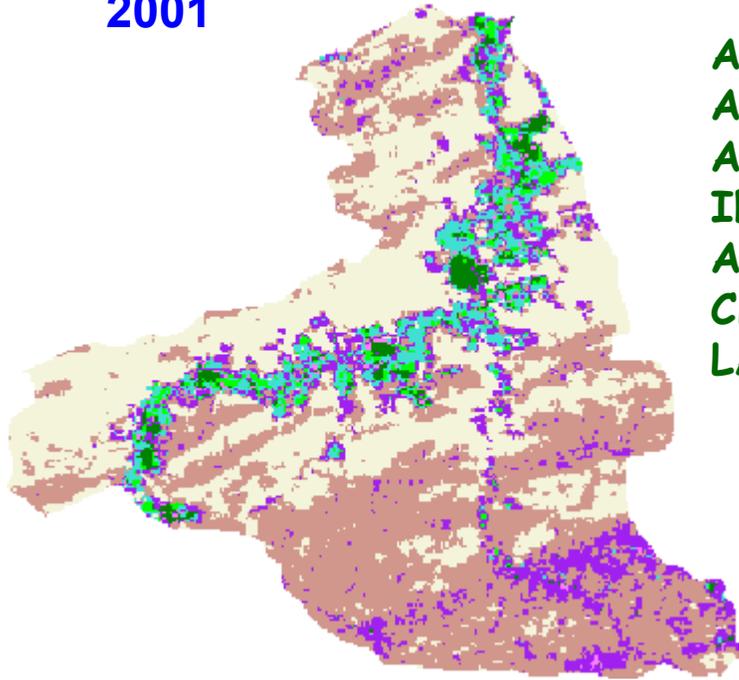
BARREN AREA
LOW DENSITY
MEDIUM DENSITY
HIGH DENSITY
VERY HIGH DENSITY

VERY HIGH DENSED AREAS HAS INCREASED WHEN COMPARED TO 2001 IN 2005 AND MEDIUM DENSITY HAS CHANGED TO HIGH DENSITY AREA.

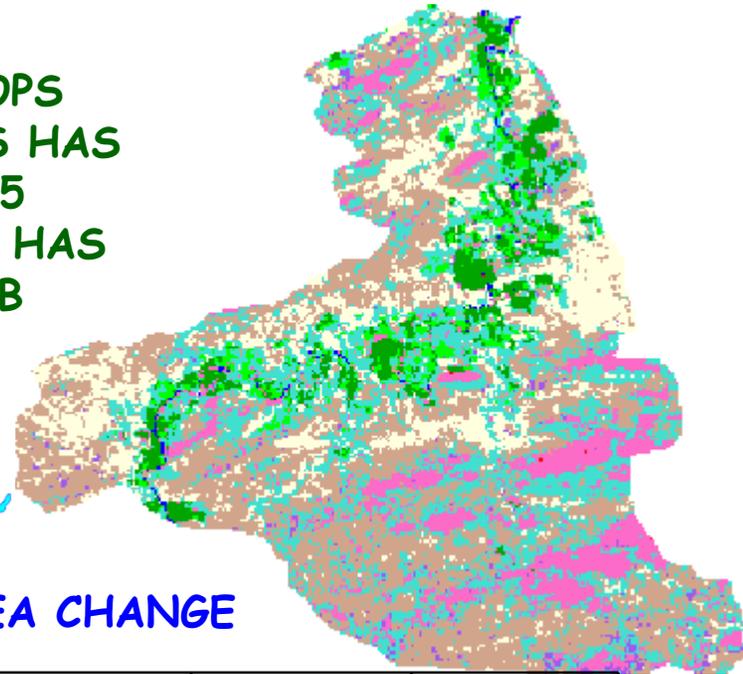


DEVELOPMENT UNIT-8

2001



2005



AREA UNDER AGRICULTURAL CROPS AND PLANTATIONS HAS INCREASED IN 2005 AND BARREN AREA HAS CHANGED TO SCRUB LAND



AREA CHANGE

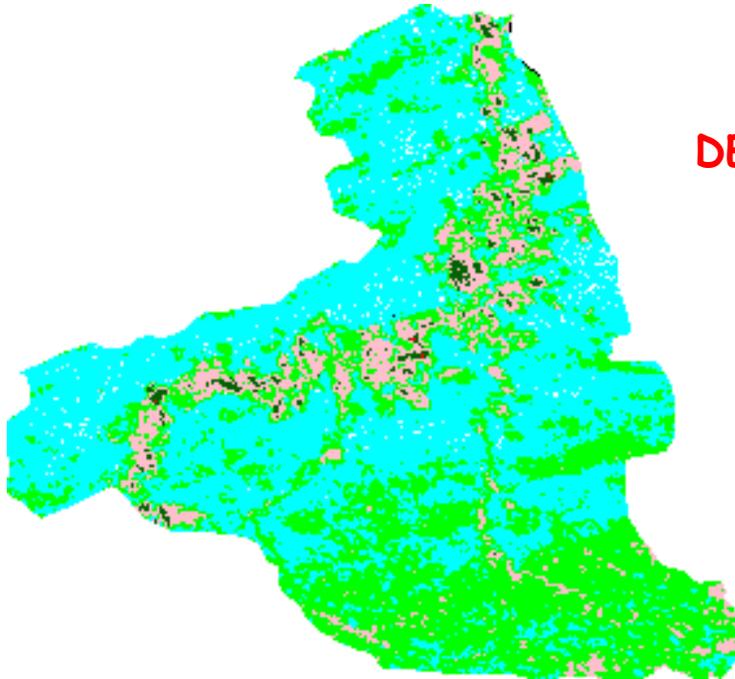
- DENSE FOREST
- OPEN FOREST
- DEGRADED FOREST
- AGRIL. CROPS
- AGRIL. PLANTATION
- LAND WITH SCRUB
- LAND WITHOUT SCRUB
- BARREN AREA WITH / WITHOUT ROCKS
- WATER

Feature	2001 Area in Sq. Km	2005 Area in Sq. Km	change
Dense Forest	0.00	0.00	+0.00
Open forest	0.18	3.39	+3.21
Degraded Forest	3.76	0.51	-3.26
Agri. Crops	0.65	1.05	+0.40
Agri. Plantation	0.60	1.78	+1.18
Land with scrub	1.66	8.46	+6.80
Land without scrub	13.19	11.40	-1.79
barren rocky area	12.24	5.58	-6.66
Water	0.00	0.11	+0.11
	32.28	32.28	

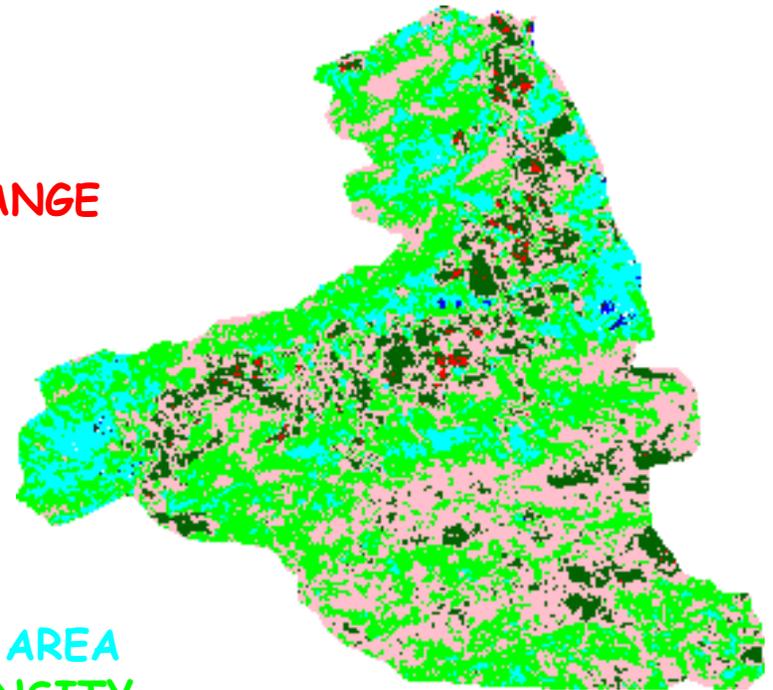
DEVELOPMENT UNIT-8

2001

2005



DENSITY CHANGE



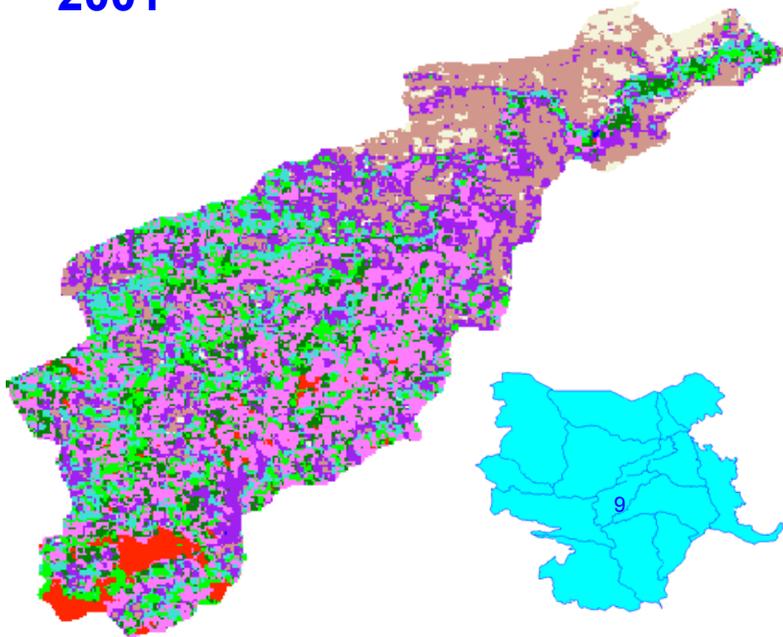
BARREN AREA
LOW DENSITY
MEDIUM DENSITY
HIGH DENSITY
VERY HIGH DENSITY

BARREN AREAS AND LOW DENSITY AREAS
IN 2001 HAS CHANGED TO LOW AND
MEDIUM DENSITY AREAS.HIGH DENSED
AREAS HAS ALSO INCLUDED IN 2005.



DEVELOPMENT UNIT-9

2001

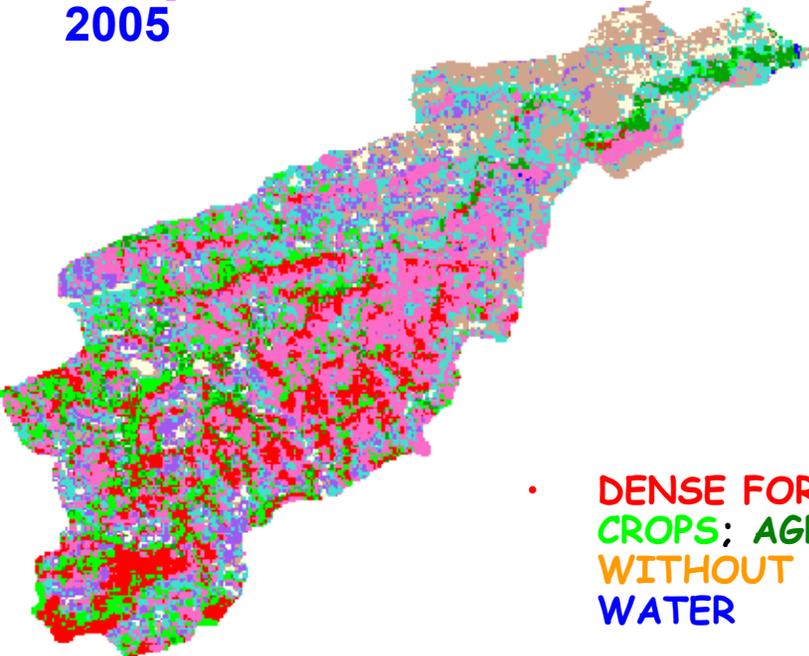


THE AREAS UNDER AGRICULTURE ,OPEN FOREST AND SCRUB LAND HAS INCREASED AND DENSE FOREST ALSO INCREASED. LAND WITHOUT SCRUB HAS DECREASED.

AREA CHANGE

Feature	2001 Area in Sq. Km	2005 Area in Sq. Km	change
Dense Forest	0.80	3.50	+2.70
Open forest	7.28	7.87	+0.59
Degraded Forest	5.57	2.45	-3.12
Agri. Crops	3.09	3.22	+0.13
Agri. Plantation	2.60	1.15	-1.45
Land with scrub	2.87	5.08	+2.21
Land without scrub	4.63	3.32	-1.31
barrenrocky area	1.06	1.31	+0.25
Water	0.01	0.01	+0.01
	27.91	27.91	

2005



- **DENSE FOREST**; **OPEN FOREST**; **DEGRADED FOREST**; **AGRIL. CROPS**; **AGRIL. PLANTATION**; **LAND WITH SCRUB**; **LAND WITHOUT SCRUB**; **BARREN AREA WITH / WITHOUT ROCKS**; **WATER**

DEVELOPMENT UNIT-9

2001

DENSITY CHANGE

2005

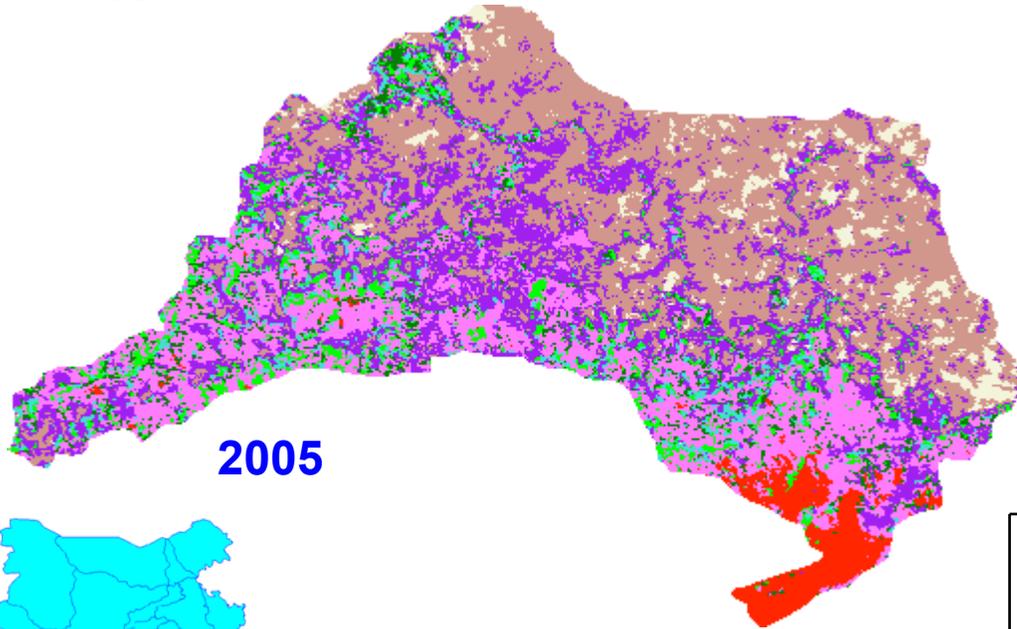
BARREN AREA
LOW DENSITY
MEDIUM DENSITY
HIGH DENSITY
VERY HIGH DENSITY

THE AREAS IN 2001 ARE UNDER LOW AND MEDIUM DENSITY WHILE IN 2005 MAJOR AREA IS UNDER HIGH AND VERY HIGH DENSITY.

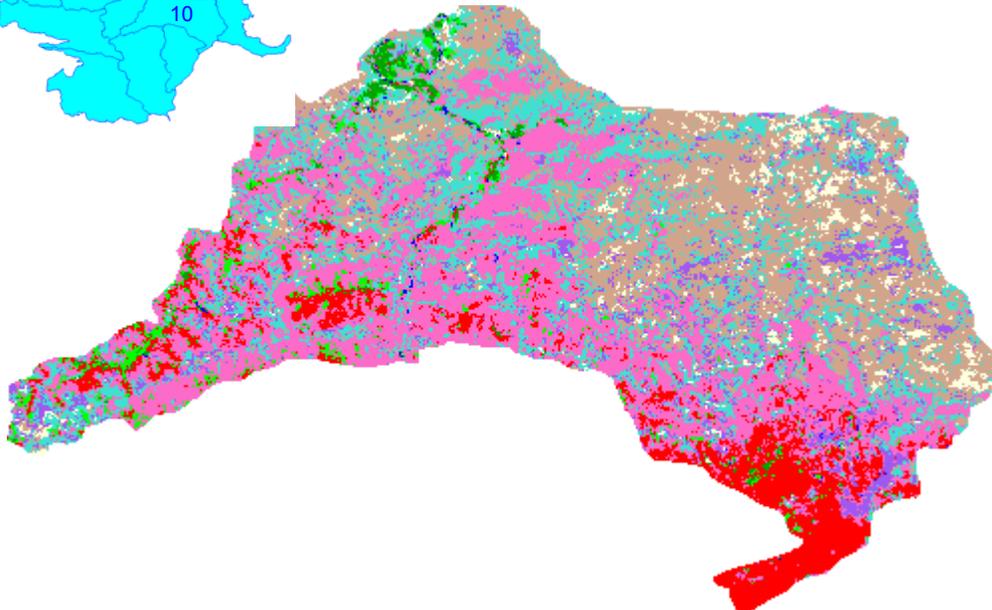


DEVELOPMENT UNIT-10

2001



2005



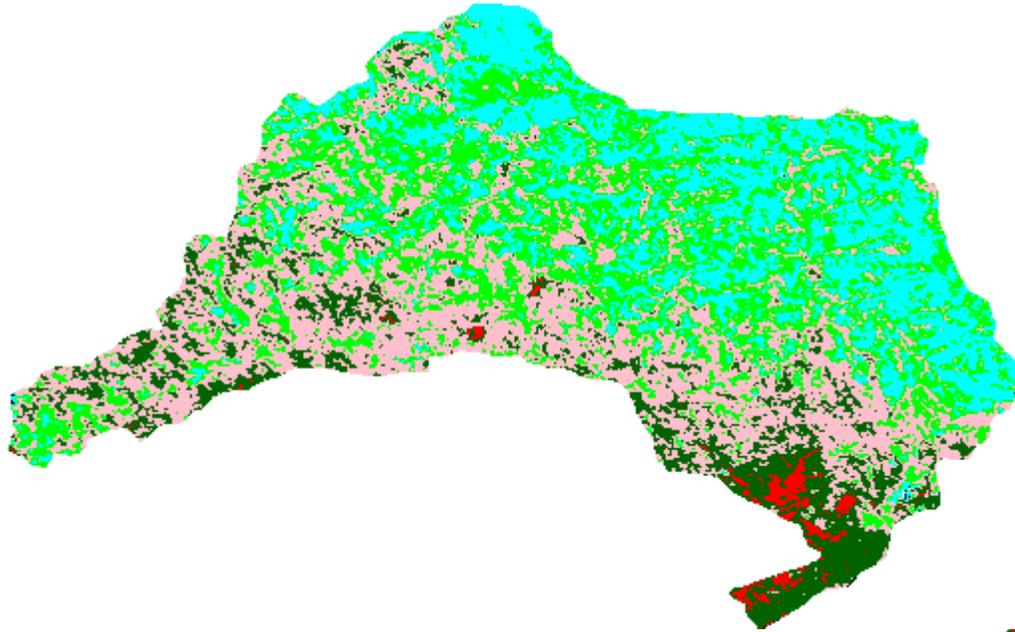
DENSE AND OPEN FOREST AREAS HAS INCREASED AND AGRICULTURAL AREA DECREASED. LAND WITHOUT SCRUB DECREASED WHILE SCRUB LAND HAS INCREASED.

AREA CHANGE

Feature	2001 Area in Sq. Km	2005 Area in Sq. Km	change
Dense Forest	2.48	5.58	+3.10
Open forest	11.81	18.80	+6.99
Degraded Forest	14.13	3.54	-10.59
Agri. Crops	3.16	1.49	-1.67
Agri. Plantation	2.57	0.82	-1.75
Land with scrub	2.26	12.05	+9.79
Land without scrub	20.48	15.00	-5.48
Barren rocky area	2.57	2.07	-0.50
Water	0.00	0.11	+0.11
	59.46	59.46	

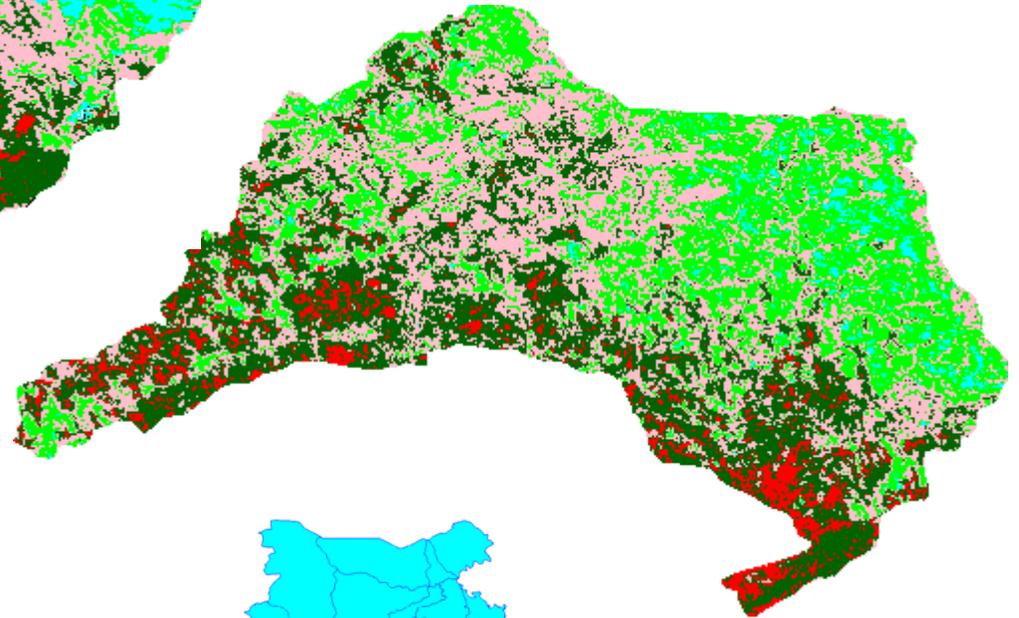
DEVELOPMENT UNIT-10

2001



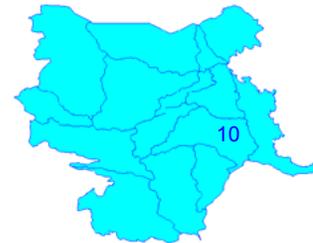
DENSITY CHANGE

2005



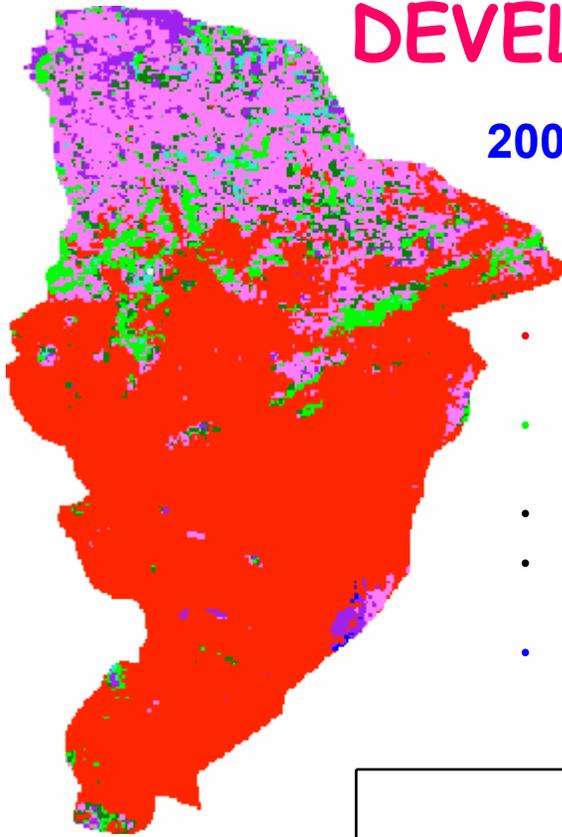
MOST OF THE AREAS ARE UNDER LOW AND MEDIUM DENSITY IN 2001 AND IN 2005 THEY ARE CHANGED TO MEDIUM AND HIGH DENSITY AREAS CONSEQUENTLY.

BARREN AREA
LOW DENSITY
MEDIUM DENSITY
HIGH DENSITY
VERY HIGH DENSITY



DEVELOPMENT UNIT-11

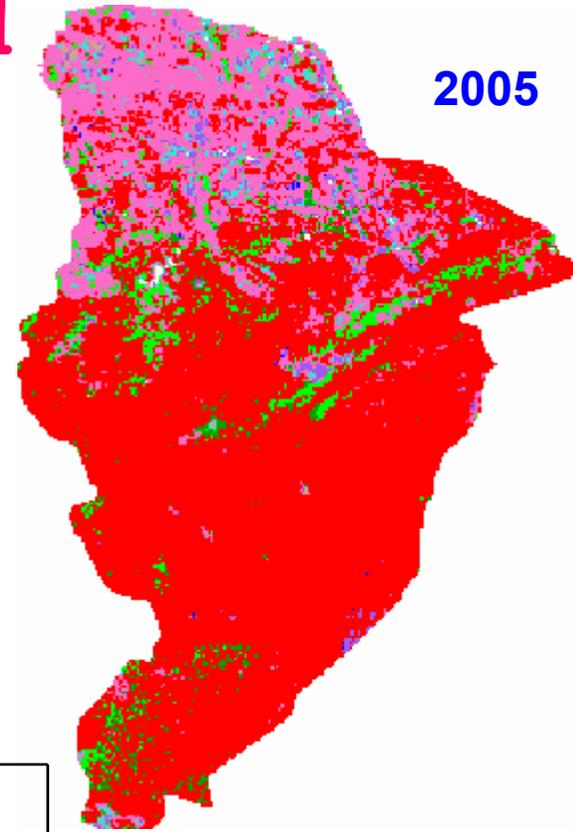
2001



AREA CHANGE

- DENSE FOREST OPEN FOREST
DEGRADED FOREST
- AGRIL. CROPS AGRIL.
PLANTATION LAND WITH SCRUB
- LAND WITHOUT SCRUB
- BARREN AREA WITH / WITHOUT
ROCKS
- WATER

2005



Feature	2001 Area in Sq. Km	2005 Area in Sq. Km	change
Dense Forest	21	22.9	+1.90
Open forest	7.27	6.5	-0.77
Degraded Forest	1.14	0.665	-0.48
Agri. Crops	1.89	1.58	-0.31
Agril. Plantation	1.27	0.63	-0.64
Land with scrub	0.4	0.59	+0.19
Land without scrub	0.01	0.08	+0.07
barrenrocky area	0.045	0.07	+0.03
Water	0.02	0.03	+0.01
	33.045	33.045	



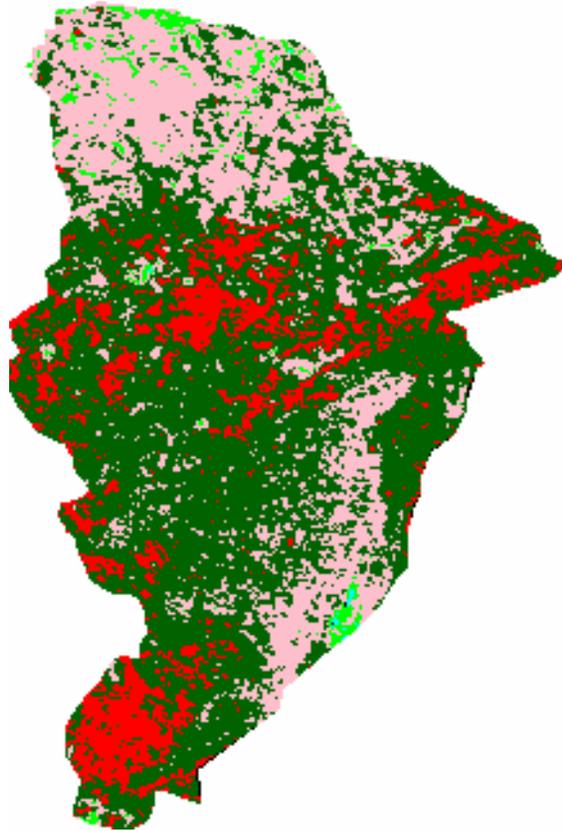
OPEN AND DEGRADED FOREST AREA HAS DECREASED AND DENSE FOREST INCREASED SLIGHTLY. AGRICULTURAL AREA DECREASED AND SCRUB LAND INCREASED BY A SMALL AMOUNT. NOT MUCH CHANGE HAS OBSERVED COMPARATIVELY.

DEVELOPMENT UNIT-11

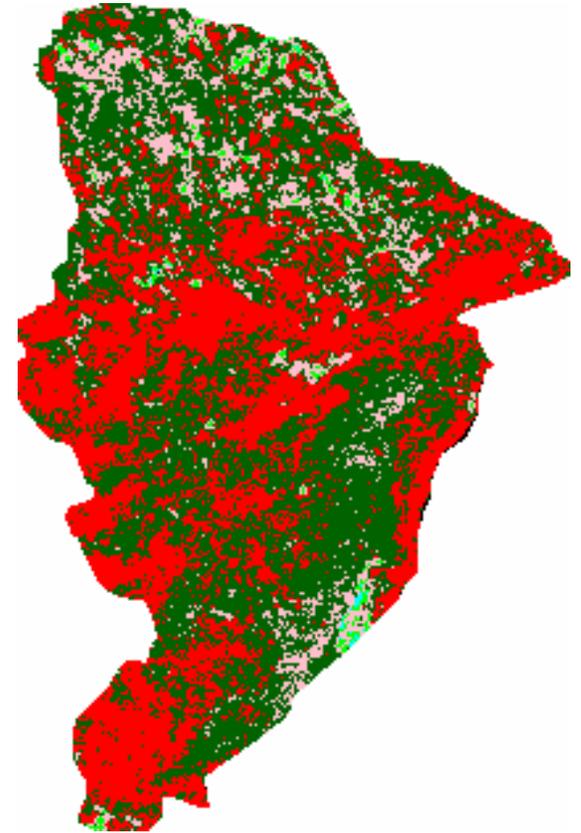
2001

2005

DENSITY CHANGE



BARREN AREA
LOW DENSITY
MEDIUM DENSITY
HIGH DENSITY
VERY HIGH DENSITY



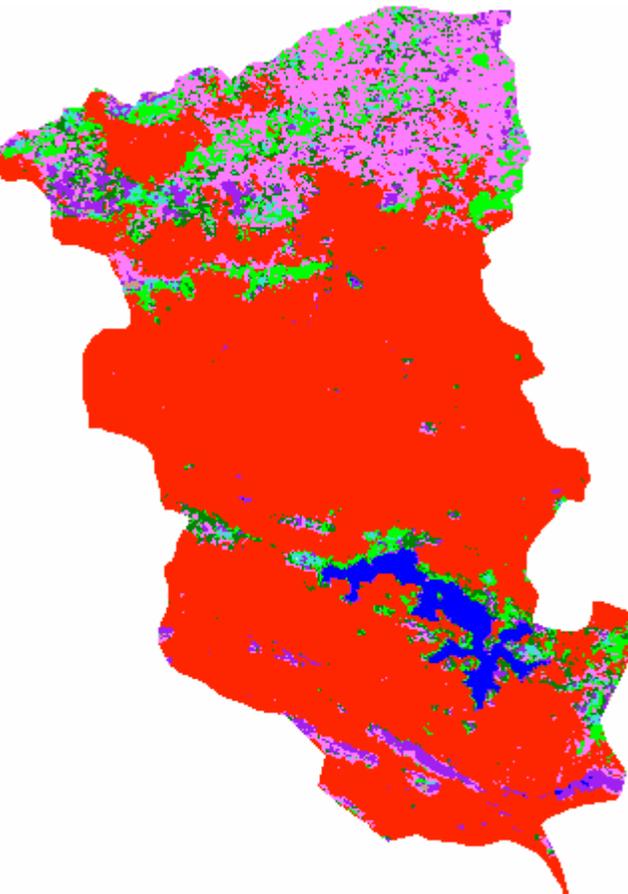
IN 2001 MEDIUM AND HIGH DENSITY OF VEGETATION IS DOMINATING WHILE COMING TO 2005 VERY HIGH AND HIGH DENSITY HAS OBSERVED.



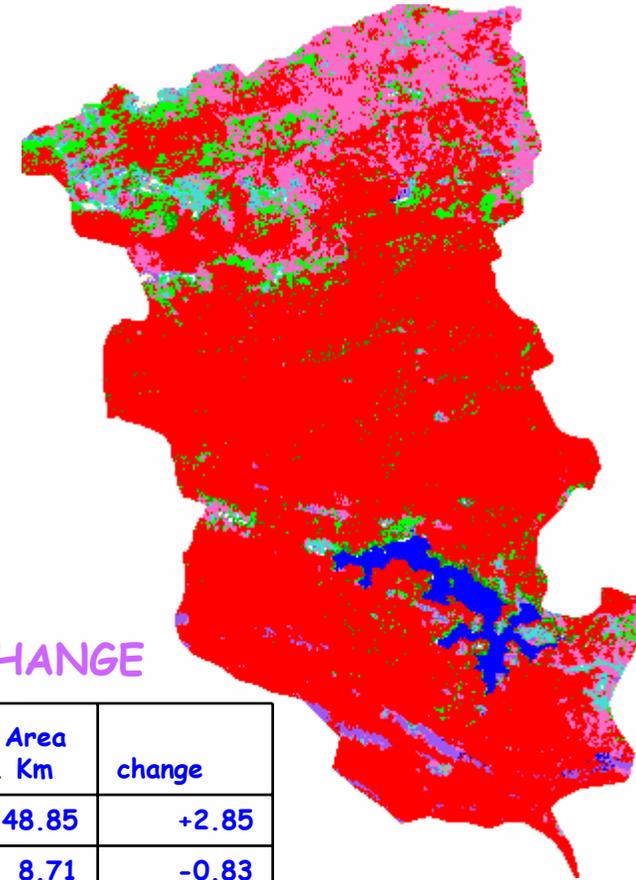
2001

DEVELOPMENT UNIT-12

2005



- DENSE FOREST
- OPEN FOREST
- DEGRADED FOREST
- AGRIL. CROPS
- AGRIL. PLANTATION
- LAND WITH SCRUB
- LAND WITHOUT SCRUB
- BARREN AREA WITH / WITHOUT ROCKS
- WATER



AREA CHANGE

Feature	2001 Area in Sq. Km	2005 Area in Sq. Km	change
Dense Forest	46	48.85	+2.85
Open forest	9.54	8.71	-0.83
Degraded Forest	2.35	1.13	-1.22
Agri. Crops	3.87	3.71	-0.16
Agri. Plantation	2.93	1.2386	-1.69
Land with scrub	0.8	1.56	+0.76
Land without scrub	0.102	0.145	+0.04
barrenrocky area	0.0016	0.17	+0.17
Water	1.56	1.64	+0.08
	67.1536	67.1536	

OPEN AND DEGRADED FOREST AREA HAS DECREASED AND DENSE FOREST AND SCRUB LAND HAS INCREASED WHILE OTHERS REMAINED MORE OR LESS SIMILAR.

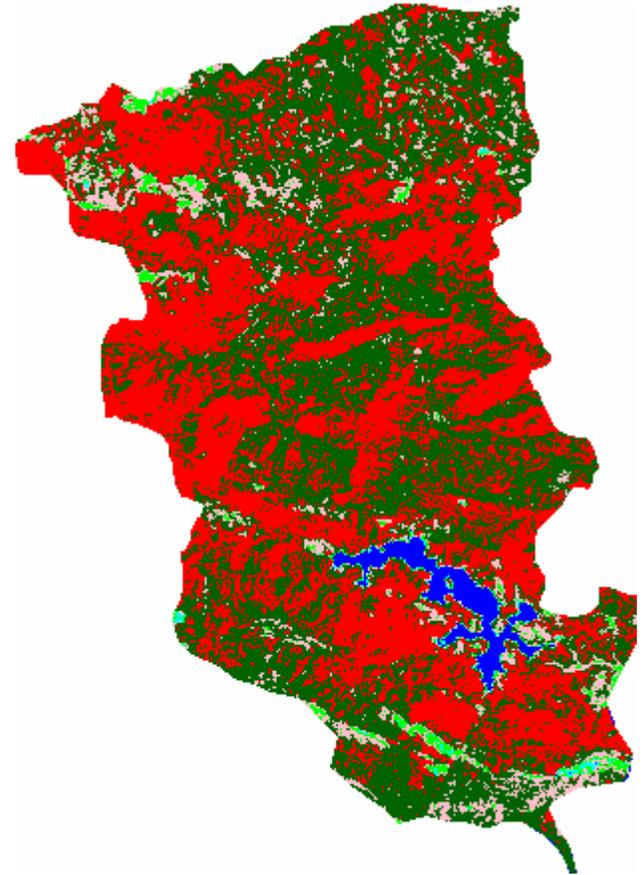
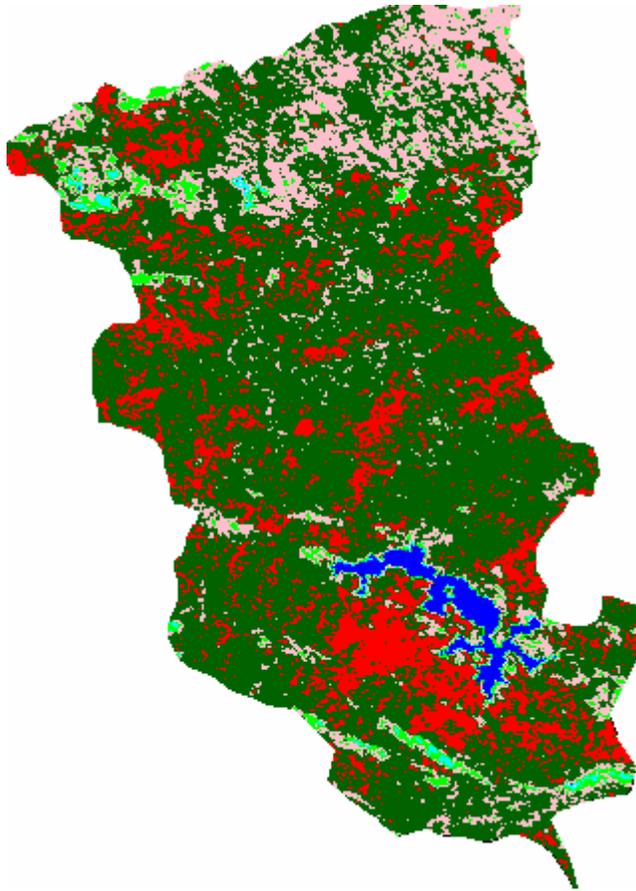


2001

DEVELOPMENT UNIT-12

DENSITY CHANGE

BARREN AREA;
LOW DENSITY;
MEDIUM DENSITY;
HIGH DENSITY;
VERY HIGH DENSITY



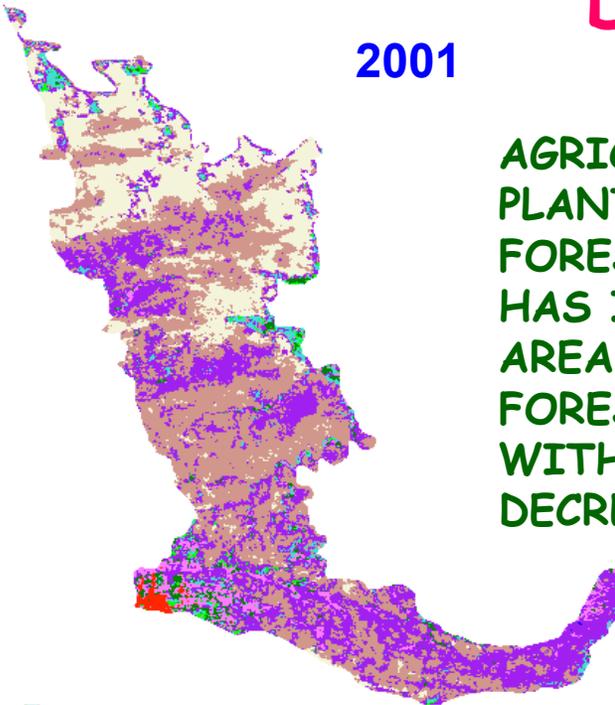
A VERY HIGH DENSITY AND HIGH DENSITY OF VEGETATION HAS OBSERVED IN 2005 WHEN COMPARED TO 2001 IMAGE.



DEVELOPMENT UNIT-13

2001

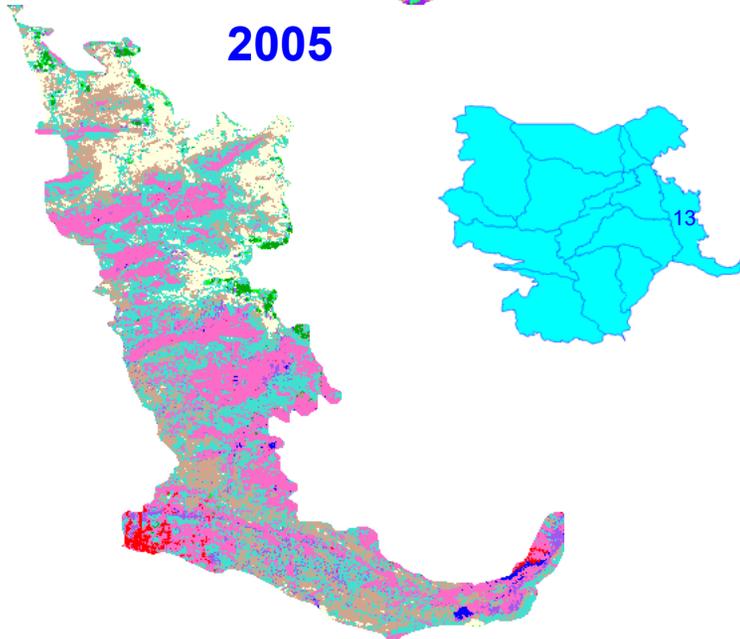
AGRICULTURAL PLANTATION, OPEN FOREST AND SCRUB LAND HAS INCREASED IN AREA. AND DEGRADED FOREST AND LAND WITHOUT SCRUB HAS DECREASED.



- DENSE FOREST
- OPEN FOREST
- DEGRADED FOREST
- AGRIL. CROPS
- AGRIL. PLANTATION
- LAND WITH SCRUB
- LAND WITHOUT SCRUB
- BARREN AREA WITH / WITHOUT ROCKS
- WATER

AREA CHANGE.

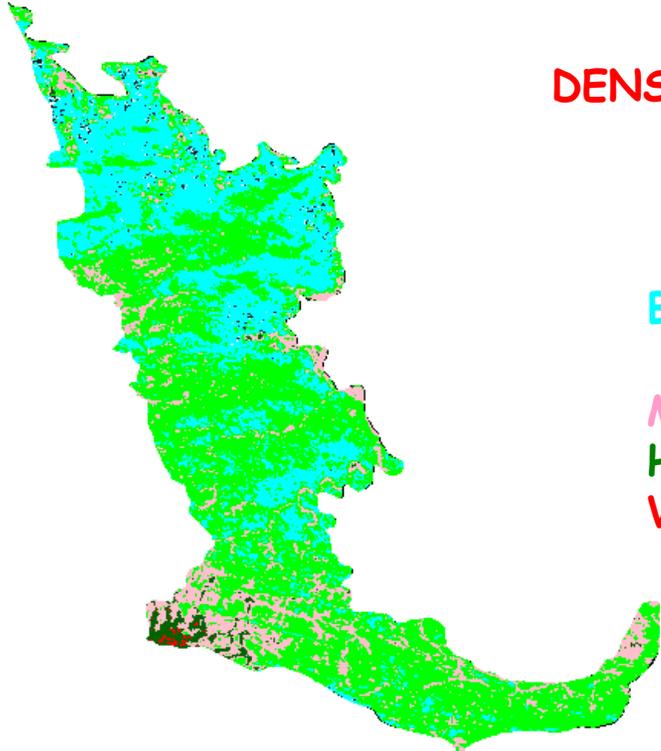
2005



Feature	2001 Area in Sq. Km	2005 Area in Sq. Km	change
Dense Forest	0.31	0.59	+0.28
Open forest	1.88	16.07	+14.19
Degraded Forest	15.73	1.71	-14.02
Agri. Crops	0.50	0.26	-0.24
Agril. Plantation	0.10	0.67	+0.57
Land with scrub	1.57	16.75	+15.18
Land without scrub	22.64	10.57	-12.07
barrenrocky area	10.14	7.02	-3.12
Water	0.00	0.24	+0.24
	52.88	53.88	

DEVELOPMENT UNIT-13

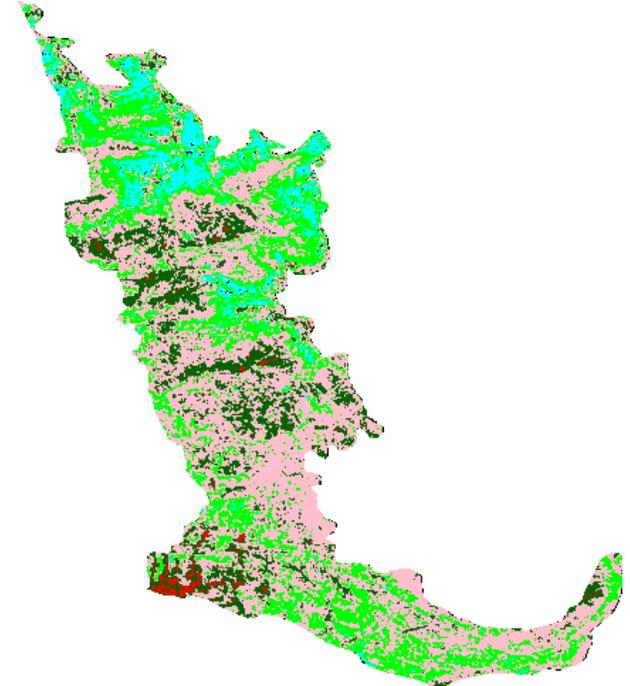
2001



DENSITY CHANGE

BARREN AREA
LOW DENSITY
MEDIUM DENSITY
HIGH DENSITY
VERY HIGH DENSITY

2005



IN 2001 MOST OF THE LAND IS UNDER LOW DENSITY VEGETATION AND IN 2005 THIS HAS CHANGED TO MEDIUM AND HIGH DENSITY OF VEGETATION.



2001

DEVELOPMENT UNIT-14

DENSE FOREST AND AGRICULTURAL AREA HAS INCREASED AND OPEN AND DEGRADED FOREST AREA HAS DECREASED.

2005

AREA CHANGE

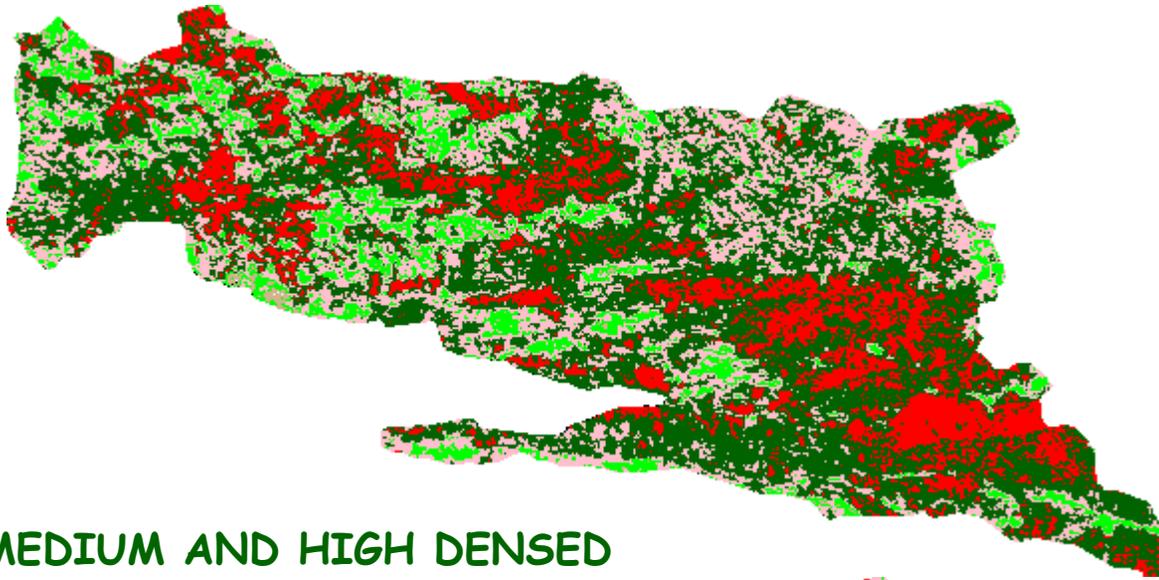
Feature	2001 Area in Sq. Km	2005 Area in Sq. Km	change
Dense Forest	18.62	22.68	+4.06
Open forest	10.98	7.49	-3.49
Degraded Forest	5.51	3.72	-1.79
Agri. Crops	20.41	21.33	+0.92
Agril. Plantation	6.94	2.79	-4.15
Land with scrub	5.92	6.45	+0.53
Land without scrub	1.15	0.63	-0.52
barrenrocky area	0.3	4.64	+4.34
Water	0.03	0.13	+0.10
	69.86	69.86	

- DENSE FOREST; OPEN FOREST; DEGRADED FOREST; AGRIL. CROPS; PLANTATION; LAND WITH SCRUB; LAND WITHOUT SCRUB; BARREN / WITHOUT ROCKS; WATER



DEVELOPMENT UNIT-14

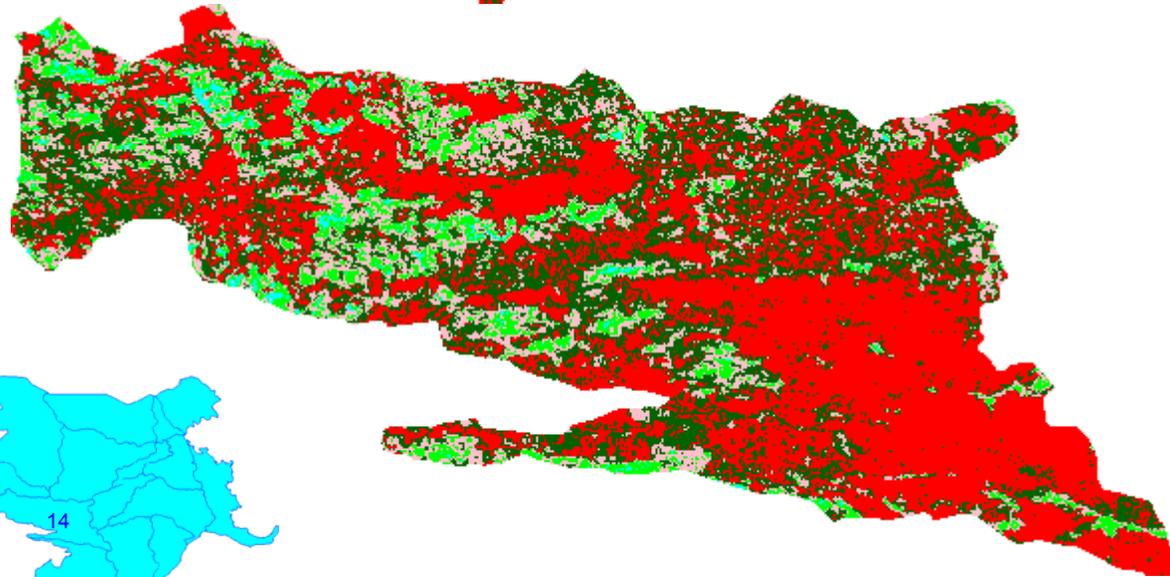
2001



DENSITY CHANGE

2005

MEDIUM AND HIGH DENSED AREAS IN 2001 HAS CHANGED TO HIGH AND VERY HIGH DENSED AREAS IN 2005.

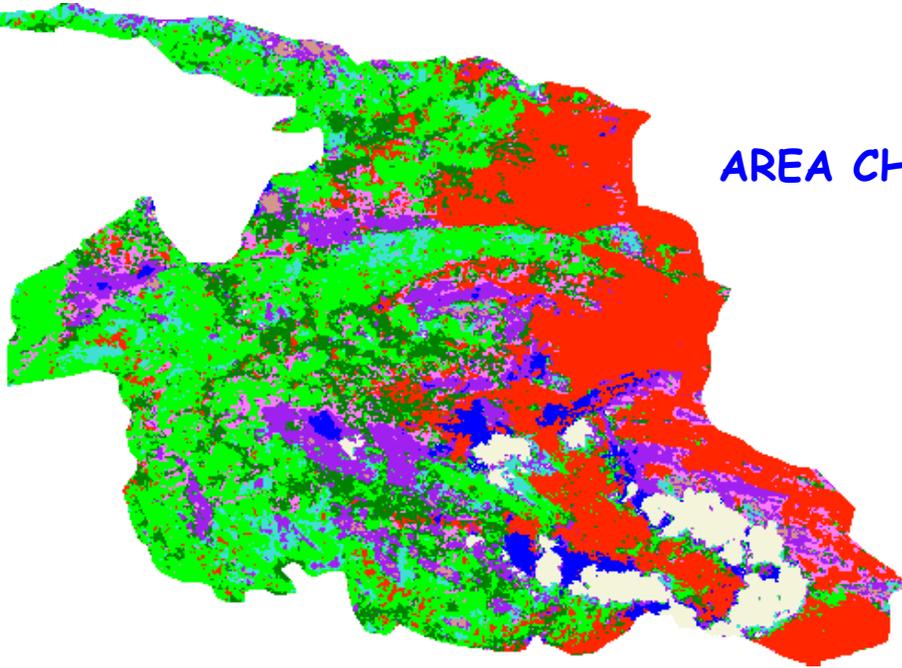


BARREN AREA
LOW DENSITY
MEDIUM DENSITY
HIGH DENSITY
VERY HIGH DENSITY

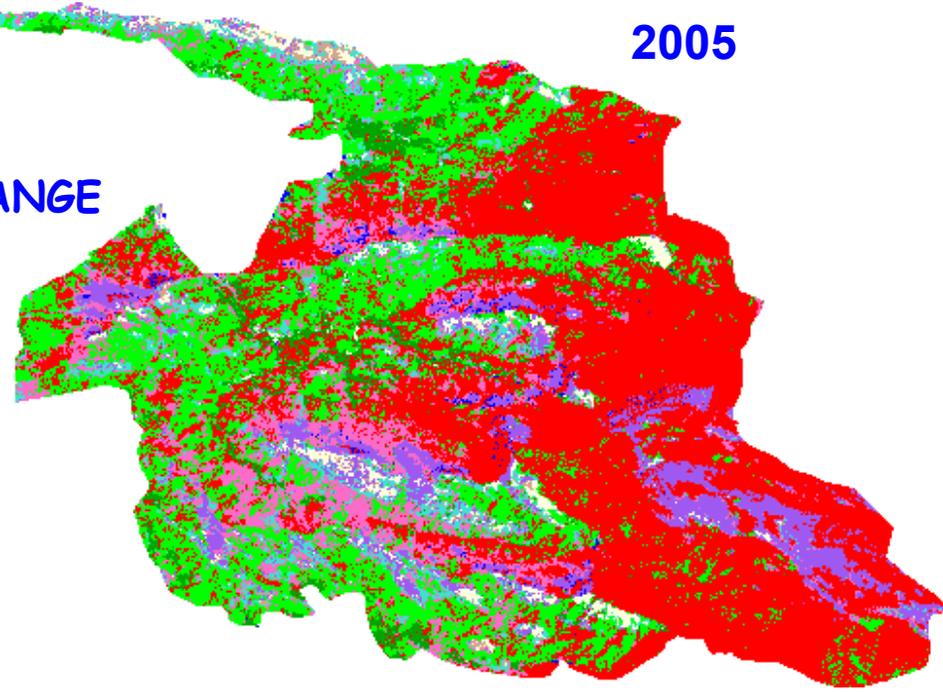


DEVELOPMENT UNIT-15

2001



2005



AREA CHANGE

Feature	2001 Area in Sq. Km	2005 Area in Sq. Km	change
Dense Forest	22.33	37.58	+15.25
Open forest	5.35	8.98	+3.63
Degraded Forest	9.22	6.48	-2.74
Agri. Crops	25.15	20.4	-4.75
Agril. Plantation	10.91	3.98	-6.93
Land with scrub	4.54	3.98	-0.56
Land without scrub	0.8	0.64	-0.16
barrenrocky area	4.04	2.11	-1.93
Water	2.21	0.4	-1.81
	84.55	84.55	

THE AREAS UNDER AGRICULTURE ARE DOMINATING IN 2001. DENSE FOREST AREA IS ALSO GOOD. THE WHITE AND THE BLUE PATCHES IN 2001 IMAGE ARE CLOUD AND ITS SHADE. DENSE FOREST AND OPEN FOREST AREA IS DOMINATING IN 2005 AND DEGRADED FOREST AND SCRUB LAND HAS DECREASED.

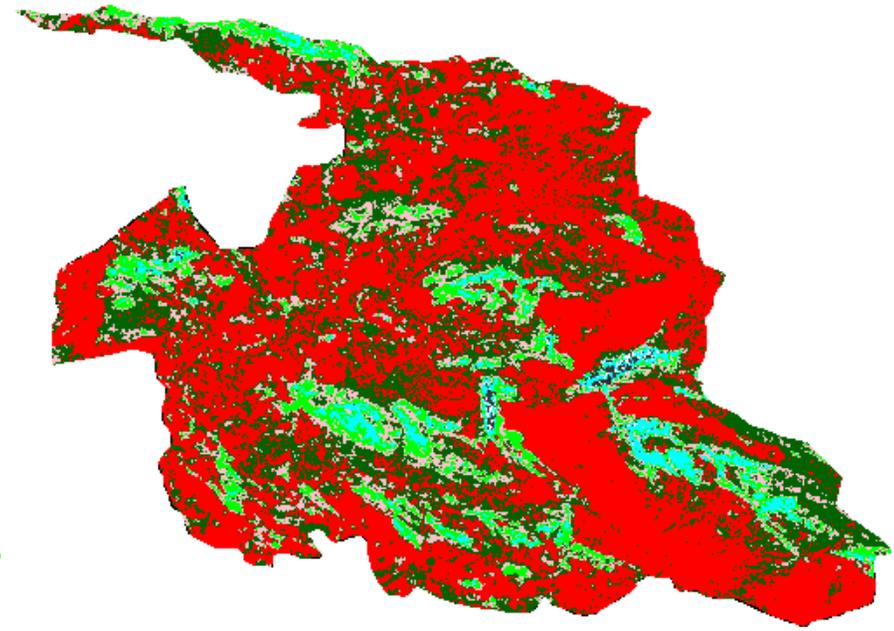
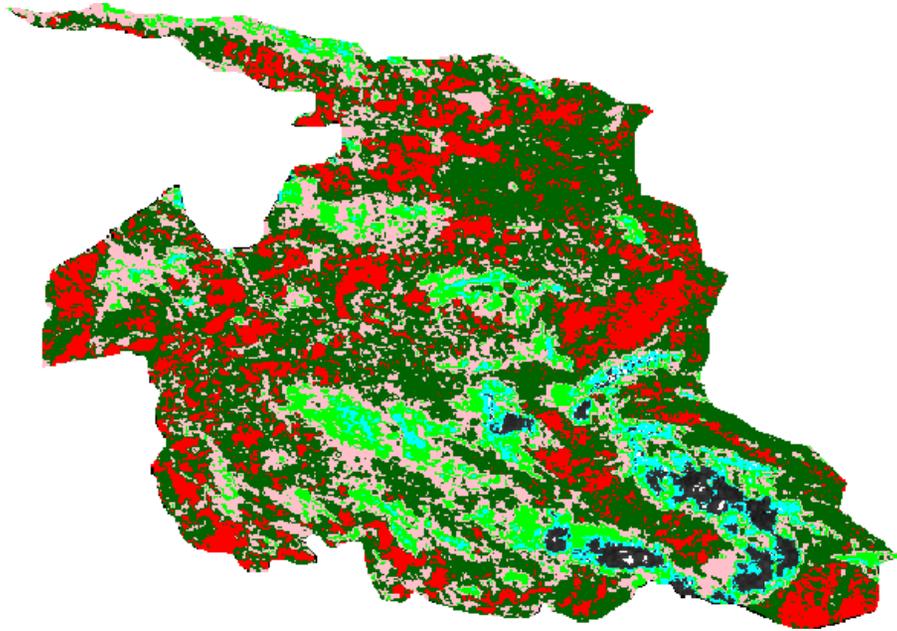


DEVELOPMENT UNIT-15

2001

2005

DENSITY CHANGE



MEDIUM AND HIGH DENSED AREAS ARE DOMINATING IN 2001. THE BLACK PATCHES ARE CLOUD AND ITS SHADE. A VERY HIGH DENSITY OF VEGETATION HAS OBSERVED WITH PATCHES OF LOW DENSITY AREAS IN 2005 IMAGE.

BARREN AREA
LOW DENSITY
MEDIUM DENSITY
HIGH DENSITY
VERY HIGH DENSITY



CONCLUDING REMARKS

1. VEGETATION COVER HAS CHANGED POSITIVELY FROM 2001 TO 2005.
2. **DENSE, OPEN AND LAND WITH SCRUB** HAVE INCREASED CONSIDERABLY DURING 2001-2005.
3. **DEGRADED FOREST AREA** HAS DECREASED
4. AREA UNDER AGRICULTURAL CROPS AND AGRICULTURAL PLANTATIONS DECREASED
5. DUE TO THE DEVELOPMENT OF SCRUB TYPE VEGETATION, BARREN AREA HAS DECREASED
6. COMPARATIVELY, MORE VEGETATION IS SEEN IN 2005 PERHAPS, DUE TO AFFORESTATION PROGRAMMES.

POLICY SUPPORT

INCENTIVES FOR USING SPACE BASED MONITORING TOOLS

PREFERENCE IN LARGE UPSCALE PROJECTS

MULTIPLE FUNDING

COMMON DATA CENTRE

WEBGIS FOR MONITORING

E-GOVERNANCE

ROAD AHEAD

GIS CENTRES ACROSS THE COUNTRY

HRD PLANNING & INCENTIVES

POLICY SUPPORT

NETWORKING AMONG ORGANISATIONS

PUBLIC PRIVATE PARTNERSHIP (PPP)

MOBILE GIS

WEBGIS

COMMON DATA STANDARDS & FORMATS

Thank You

