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MAPPING THE FOREST COVER AND CALCULATING THE RATE OF DEFORESTATION IN MYSORE DISTRICT USING GEOSPATIAL TOOLS.

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ABSTRACT

Deforestation started from the civilization of man about 3000 BC ago. Forest in India has been severely hampered from the colonial period to the post independence period. Deforestation takes place in India from colonial period to post - independence period. This caused lot of changes in



environment and climate. India's forest started to degrade more after the entrance of British rule, in that pre and post independence period recorded the highest deforestation rate. Through this mapping net loss of forest calculated at three intervals, 1930 – 1960, 1960 – 1990, 1990 – 2010. This study comprised four period of forest

cover mapping, 1930 and 1960 forest cover extracted from 1:250,000 and 1:50000 Toposheets respectively. 1990 forest cover extracted from Landsat TM, 30 M resolution image and 2010 forest cover extracted from IRS – P6, LISS III, 23.5 M resolution image and the layer updated with Google image. Both the satellite images were processed through NDVI (Normalized Difference Vegetative Index) analysis in Remote sensing platform. Forest cover from Toposheets extracted through GIS platform. The result of this mapping disclosed 50 percent of the forest cover degraded from 1930–2010 in Mysore district. Taluk wise, During 1930 Heggadadevankote recorded 73 percent of forest cover and it has reduced as 43 percent at 2010. Hunsur and Periyapatna taluks claiming second place in forest loss, during 1930, both the taluks were recorded 30 percent of forest cover, it was reduced in 2010 as 9 percent. Many causes behind this deforestation, forest land converted into agricultural land, migration, overgrazing, over population, etc,. This study reveals net loss of deforestation of Mysore district between 1930–2010, through GIS and Remote Sensing platform.

KEYWORDS :Deforestation, Forest Cover, GIS, Remote Sensing.

INTRODUCTION:

Mapping of forest and calculating the rate of deforestation is important, while making a study about forest. Through mapping, forest cover and its changes could easily quantifiable. This study comprise four period of forest cover mapping 1930, 1960, 1990 and 2010 respectively. Based on these outputs rate of deforestation was calculated into three intervals. The forest cover of 1930 and 1960 extracted from 1:250000 and 1:50000 Toposheets and 1990 forest cover extracted from Landsat TM 90 Mts resolution image and 2010 forest cover extracted from IRS LISS-III, P6 25.2 Mts resolution image. Both the period of satellite images were processed through NDVI Analysis. This mapping discovered 50 percent of forest cover was degraded from 1930 to 2010 in Mysore district. This result has given interest to study about Mysore district deforestation trend and afforestation measures.

DEFORESTATION STUDIES

Mapping the forest cover with the help of remote sensing begins in the 1990's. Many scholars calculated the rate of deforestation by using Remote Sensing technique. Indrabudi. H and De Gier (1997) conducted a study on calculating deforestation with the help of NDVI (Normalized Difference Vegetative index) and they found that the reason behind the deforestation is population density and over utilization of land. Nami. H. Wikins (1997) derived NDVI from Landsat TM for extract forest cover and identified the reason for deforestation was drought. Tucker C.J and J.R.G.Townshed (2000) used Landsat MSS and TM used for measuring the changes in forest. Cuiyijun (2003) used Landsat ETM+ data for calculating forest cover and classifying the forest. Dr.J.K. Rawat, Forest survey of India (2004) used IRS Pan and LISS –III image for classifying and calculating forest cover. Ranitha Ratnatyaka (2004) used Spot NDVI output for monitoring plantation status, tree harvesting process and wealth of the trees. From this review it is concluded as, the deforestation happened due to increase in population, drought, and landuse changes into agricultural lands.

DEFORESTATION

Deforestation is the conversion of forest to an alternative permanent non-forested landuse, such as, agriculture, grazing or urban development (van Kooten and Bulte, 2000). Deforestation is the conversion of forest to another land use or the long-term reduction of tree canopy cover below the 10 percent threshold (FAO). Land use is a platform for all deforestation agents, this study area is one of victim of land use change, major portion of the forest cover converted into other land uses like, agricultural land, residential area, and others. Before, to make the study regarding causes behind the deforestation, present status of forest and deforestation trend need to map and study.

MAPPING OF DEFORESTATION IN MYSORE DISTRICT

Mapping the different period of forest cover is essential for calculating the deforestation rate. For extracting 1930 and 1960 forest cover 1:250000 and 1:50000 Toposheets was used and processed on GIS platform. Forest cover of 1990 extracted from Landsat TM 30 Mts image and 2010 forest cover was extracted from IRS P6 LISS-III 23.5 Mts image and it was further purified with Google image. Satellite images are processed through NDVI analysis on remote sensing platform. Four period of forest cover obtained from layers and tabulated for estimating the forest loss.

NDVI

Vegetation is the most important component of earth surface. Biomass weight, Carbon stock can be calculated based on available volume of vegetative cover on the earth surface. Vegetation

determines the micro and macro climate of the particular region, and great indicator of aquifers. Forest is a combination of vegetation in broader sense, NDVI was first used in 1973 by Rouse from the remote sensing center of Texas University. Many remote sensing analyses stated regarding the usage of NDVI, the NDVI has provided a method of estimating net primary production over varying biome (Domey, 1996). Identifying eco regions (Ramsey, 1995), monitoring phenological pattern of earth's vegetative surface and of assessing the length of the growing season and dry down periods (Hulme and Diu, 1994). NDVI can be calculated from red and infrared bands. Various multispectral images can be used for this analysis.

The following formula executes the NDVI analysis,

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

The NDVI outputs contain -1 to +1 value in raster attributes. In real case -1 represents water bodies and low vegetative cover, zero represents soil and moderate vegetative cover and +1 represents dense vegetative cover. Mysore district vegetation index calculated for the year of 1990 and 2010. Landsat TM and IRS P6 LISS III images were used, the NDVI output of 1990 possesses dense vegetative cover over southern and western portion of the district (Fig: 2&3). Less forest cover recorded near forest fringe areas, stream paths recorded dense vegetative cover due to availability of water. Near Hunsur an Iso forest cover converted from dense to less vegetative cover. The image showing less vegetative cover, major portion of land was under cultivable and cultural land.

The NDVI output of 2010 showing further decline of vegetative cover in forest and forest fringe areas. The degraded Iso forest near Hunsur gained vegetation and again stream paths retained with dense vegetative cover. Finally both the images put under change detection analysis, the raster converted into vector and area was calculated for the both period of NDVI (Fig: 3.4), there was notable decrease of vegetative cover. The result shows few places increase the vegetation rest of the places again recorded deforestation.

DEFORESTATION IN MYSORE DISTRICT

Presently Mysore district having 628.51 sq km (62851 ha) of forest cover as per Karnataka forest department report, but canopy cover extracted from satellite image showing 882 sq km (88200 ha) of forest, this is 14 percent of forest cover from the total geographical area. During 1930, Mysore district had 1865 sq km (186500 ha) of forest, it was almost 30 percent of forest cover from the total geographical area. From 1930-2010 about 46 percent (Table: 1) of forest was deforested. Loss of forest cover calculated into three phases 1930-1960, 1960-1990, 1990-2010 respectively. The first phase of mapping 1930-1960 found about 850 sq km (85000 ha) of forest was deforested (Fig: 4). the second phase 1960-1990, about 50 sq km (5000 ha) of forest cover and 1990-2010, about 85 sq km (8550 ha) of forest cover was cleared. Last two phases deforestation was recorded at the rate of one percent, severe deforestation happened in first phase about 50 percent of forest cover was cleared. From 1930-2010 about 983 sq km (98300 ha) of forest was deforested (Fig: 5). Second phase deforestation was slightly controlled but again it was triggered in third phase. Reason behind the deforestation is expansion of agricultural land and migration for seeking land and resources. Taluk wise deforestation trend obtained to identify which area highly affected by deforestation.

| YEARS | Forest Cover 1930 | | Forest Cover 1960 | | Forest Cover 1990 | | Forest Cover 2010 | |
|------------------|----------------------|-----------|----------------------|-----------|----------------------|-----------|----------------------|-----------|
| TALUKS | in Sq Km | in % | in Sq Km | in % | in Sq Km | in % | in Sq Km | in % |
| Heggadadevankote | 1188 | 74 | 739 | 46 | 726 | 45 | 699 | 43 |
| Hunsur | 289 | 32 | 100 | 11 | 81 | 9 | 80 | 9 |
| Mysore | 23 | 3 | 18 | 2 | 10 | 1 | 7 | 1 |
| Nanjangud | 116 | 12 | 50 | 5 | 36 | 4 | 24 | 2 |
| Periyapatna | 248 | 31 | 106 | 13 | 113 | 14 | 71 | 9 |
| T.Narasipura | 0 | 0 | 2.6 | 0 | 1.5 | 0 | 1 | 0 |
| K.R.Nagara | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | 1865 | 30 | 1015.6 | 16 | 967.5 | 15 | 882 | 14 |

Table 1: Forest Cover in Mysore District

DEFORESTATION IN H.D.KOTE TALUK

H.D.Kote taluk is having more forest cover, claims rank first compare to other taluks. At present the taluks having 330 sq km (33031 ha) of forest cover as per the district statistical report. But canopy cover extracted from satellite image stating 699 sq km (69900) ha of forest cover. The district authorities is not consider reserved forest and national park areas, because of that, the variation existing regarding forest area. The present forest cover is 45 percent from the total geographical area, during 1930 about 1188 sq km (118800 ha) of forest was exists and it was 73 percent of forest cover from the total geographical area. The first phase of mapping 1930-1960 found, 449sq km (44900 ha) of forest loss (Fig: 5) and second phase of mapping 1960-1990 found 13 sq km (1300 ha) of forest loss and third phase, 1990-2010 found 27 sq km (2700 ha) forest loss. The trend of deforestation resembles the district. First phase recorded severe deforestation, second phase recorded less and third phase again deforestation was triggered. From 1930-2010 about 489 sq km (48900 ha) of forest was deforested and it is 30 percent (Fig: 1) of forest loss from the actual forest cover.

DEFORESTATION IN HUNSUR TALUK

Hunsur taluk is having second largest forest cover in Mysore district. The statistical report stating at present 77 sq km (7786 ha) of forest existing in this taluk but actual canopy cover extracted from satellite image is 80 sq km (8000 ha), it is 9 percent of forest cover from the total geographical area. During 1930 about 32 percent of geographical area covered by forest (Fig: 4), it was 289 sq km (28900 ha) of forest cover. The first phase of mapping 1930-1960 found 189 sq km (18900 ha) of forest loss and second phase 1960-1990 found 19 sq km (1900 ha) of forest loss and third phase 1990-2010 found 10 sq km (100 ha) of forest loss. From 1930-2010 about 210 sq km (21000 ha) of forest was deforested(Fig: 7), nearly 28 percent of forest was cleared from the actual forest cover. The trend of deforestation is decreasing from first phase to finale phase.

DEFORESTATION IN PERIYAPATNA TALUK

Periyapatna taluk is having third largest forest cover in Mysore district. The district statistical report is stating 148 sq km (14810 ha) of forest cover existing in this taluk, but canopy cover extracted from satellite image is 71 sq km (7100 ha), it is 9 percent of forest cover from the total geographical area. During 1930 this taluk had 248 sq km (24800 ha) of forest cover and it was 30 percent of forest cover from the total geographical area. The first phase of mapping 1930-1960 found about 142 sq km

(14200 ha), of forest cover loss, the second phase 1960-1990 found 7 sq km (700 ha) of forest cover increase and again third phase 1990-2010 deforestation rate was increase as 32 sq km (3200 ha). From 1930-2010, nearly 21 percent of forest cover was deforested, it was 177 sq km (17700 ha) of forest cover loss, first and third phase recorded deforestation, in contrast second phase recorded forest gain in Periyapatna taluk.

DEFORESTATION IN NANJANGUD TALUK

Nanjangud taluk is occupied by more non forest land use like agriculture, industrial, commercial. The taluk having very less forest cover in southwestern part, as per the statistics 36 sq km (3688 ha) of forest cover recorded, but canopy cover extracted from satellite image is 24 sq km (2400 ha), it is 2.5 percent forest cover from the total geographical area. During 1930, the forest cover was 116 sq km (11600 ha), and it was 12 percent of forest cover from the total geographical area. The first phase of mapping 1930-1960, found about 66 sq km (6600 ha) of forest loss, the second phase 1960-1990 found about 14 sq km (1400 ha) of forest loss and third phase 1990-2010 found 12 sq km (1200 ha) of forest loss. From 1930-2010 about 92 sq km (9200 ha), of forest was deforested, it is 10 percent of forest loss from the total geographical area. In this taluk deforestation trend increased from first phase to finale phase, rate of deforestation was equal in second and third phase.

DEFORESTATION IN MYSORE TALUK

Major portion of land area occupied by urbanites, Mysore city demanding more land to expand, so the city growing towards taluk boundaries. Present Mysore taluk having 7 sq km (700 ha) of forest cover this is less than 1 percent of forest from the total geographical area. During 1930 about 23 sq km (2300 ha) of forest was exist and it was 3 percent of forest cover from the total geographical area. The first phase of mapping 1930-1960 found 5 sq km (500 ha) of forest loss and second phase of mapping 1960-1990 found 8 sq km (800 ha) of forest loss and final phase 1990-2010 recorded 3 sq km (300 ha) of forest loss. From 1930-2010 nearly 16 sq km (1600 ha) of forest cover was removed, it is 30 percent of forest loss from the actual forest cover.

DEFORESTATION IN K.R.NAGARA AND T.NARASIPURA TALUK

T.Narasipura and K.R.Nagara taluks are located in Cauvery river basin and most of the area occupied by irrigated agricultural land. During 1930 T.Narasipur had not any forest cover, except wasteland near river side. During 1960 forest cover recorded about 2 sq km (260 ha) in wasteland. In 1990 the new forest cover was decreased as 1.5 sq km (150 ha), and further it was decreased as 1 sq km (100 ha) in 2010. T. Narasipura taluk at present having less than one percent of forest cover from the total geographical area. K.R.Nagara taluk not having any forest cover at present. The district statistics report stating about 1.5 sq km (166 ha) of forest existing in this taluk during 1930 about 1 sq km (100 ha) of forest was exist in 1960 mapping resulted the forest cover fully vanished and present the taluk don't have any forest cover. These two taluk irrigated by Cauvery river, people highly concentrating on agriculture and other allied activities.

CONCLUSION

Mysore district forest cover mapped for four periods and area calculated from these outputs for finding rate of deforestation. Mapping conducted into four periods 1930, 1960, 1990 and 2010 respectively. This observation is made for forest cover changes in taluk level. The entire district lost about 46 percent of forest cover from 1930-2010. H.D.Kote and Hunsur taluks are addicted for severe

deforestation. From 1930-2010 about 489 sq km (48900 ha) of forest was deforested in H.D.Kote and about 210 sq km (21000 ha) of forest was deforested in hunsur, these two taluks addicted for sever deforestation. K.R.Nagara and T.Narasipura taluk remaining less forest cover, new forest cover emerged in these two taluks but again those addicted for deforestation. The trend of deforestation in district level is reflecting the same of taluk level. The result of this mapping is discovered huge area of forest cover was deforested and still deforestation continuous in inside the forest. Government and forest department data's portraying, only area of the forest not about the canopy cover. The reason behind the deforestation is enormous like land use changes, illegal tree felling, overgrazing, migration, fuel wood collection, infrastructure development, political pressure, corruption and forest fire etc.

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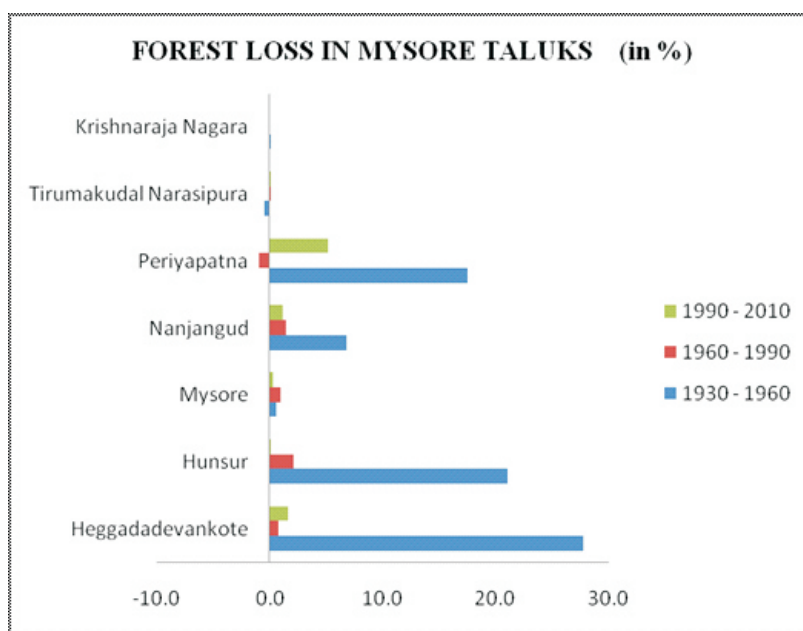


Fig 1: Forest Loss in Mysore Taluks

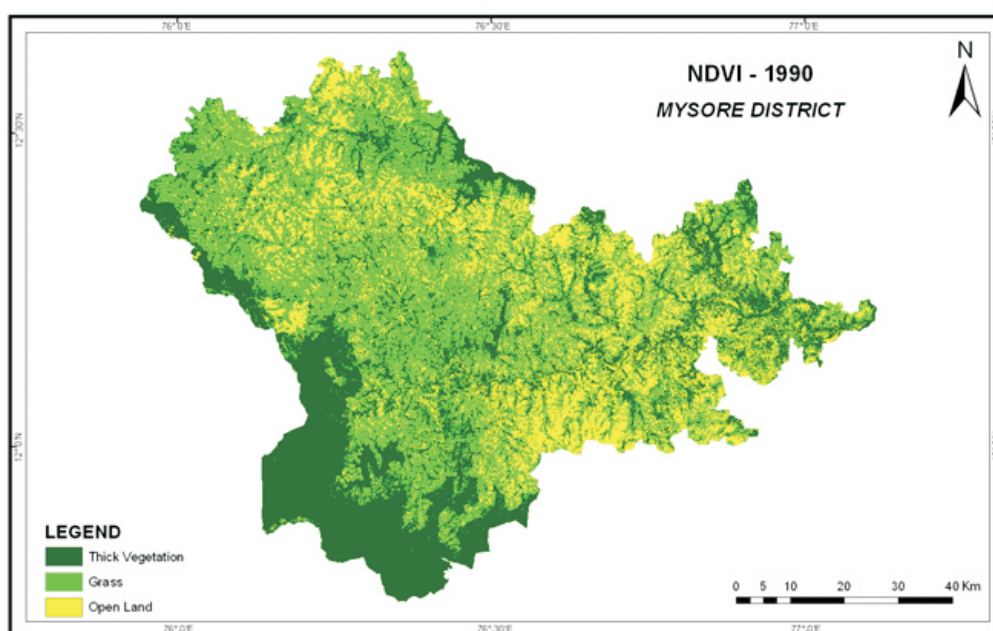


Fig 2: NDVI 1990

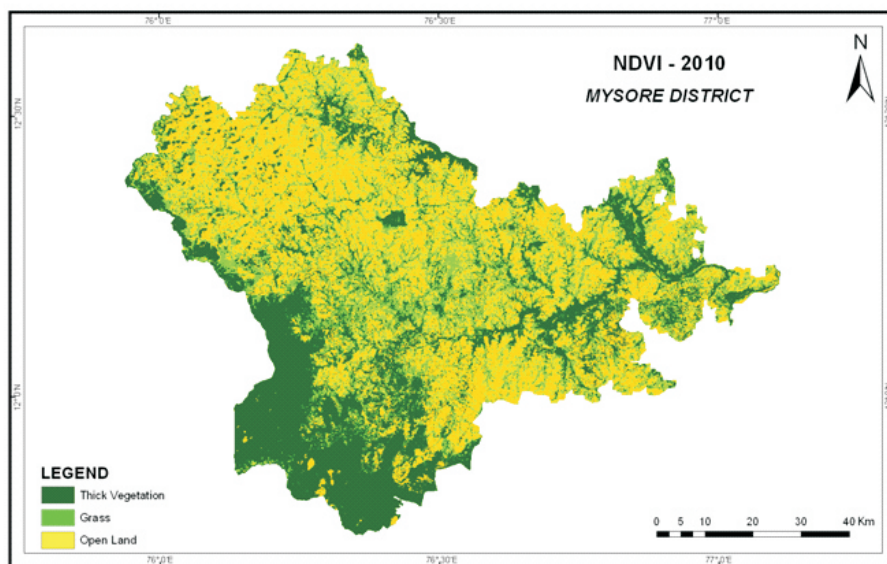


Fig 3: NDVI 2010

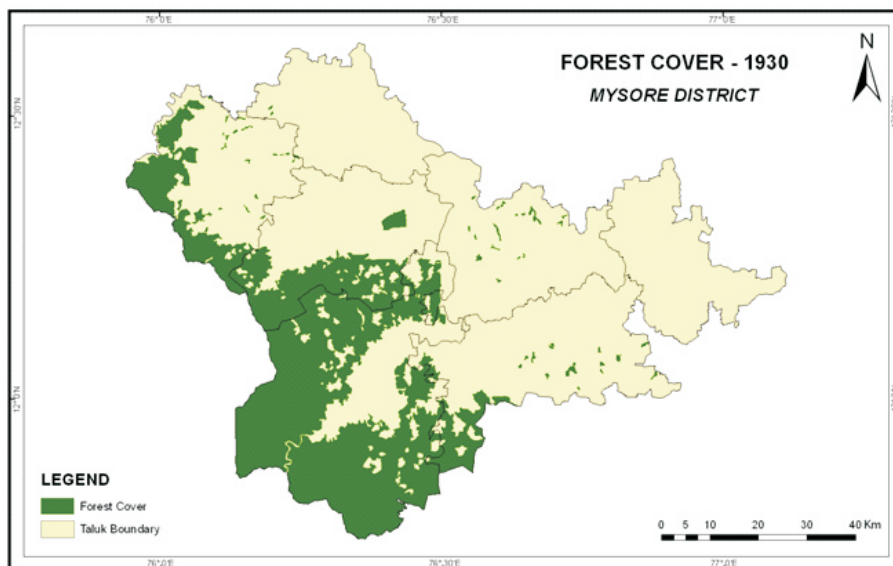


Fig 4: 1930 - Forest Cover in Mysore District

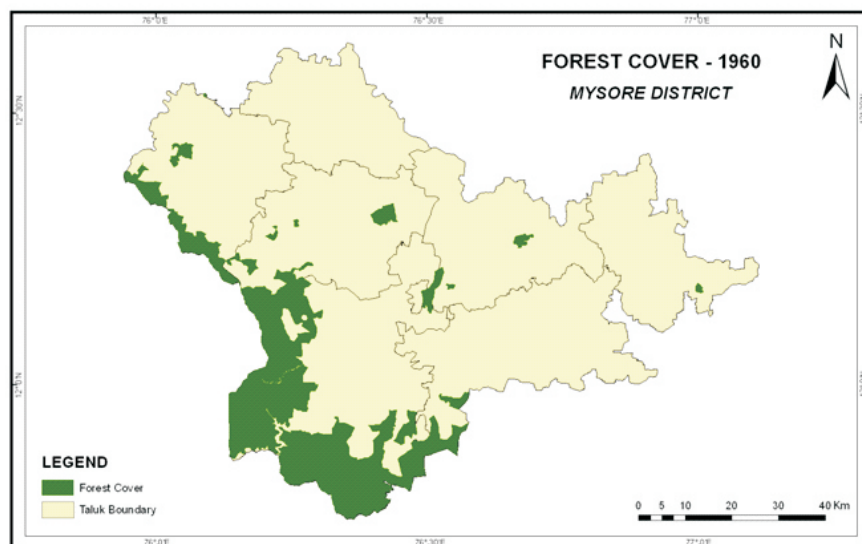


Fig 5: 1960 - Forest Cover in Mysore District

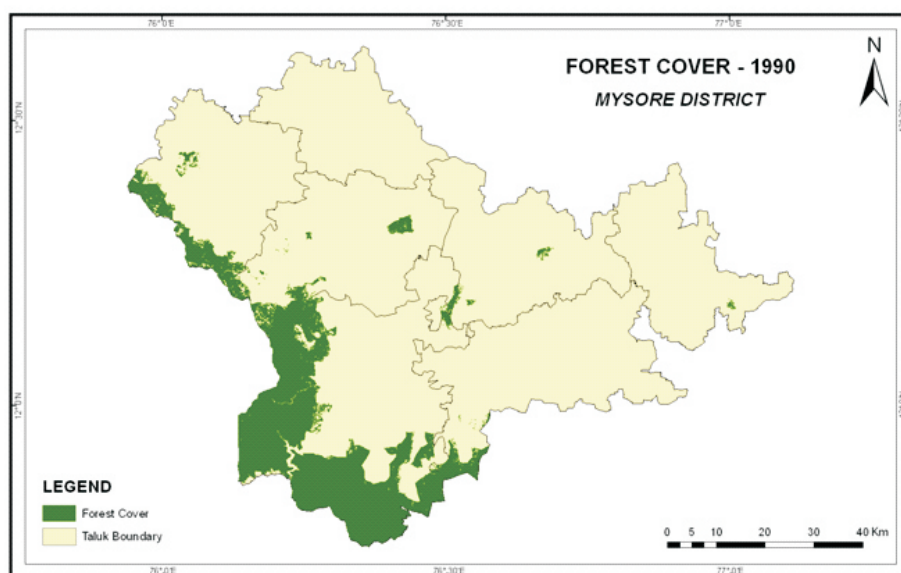


Fig 6: 1990 - Forest Cover in Mysore District

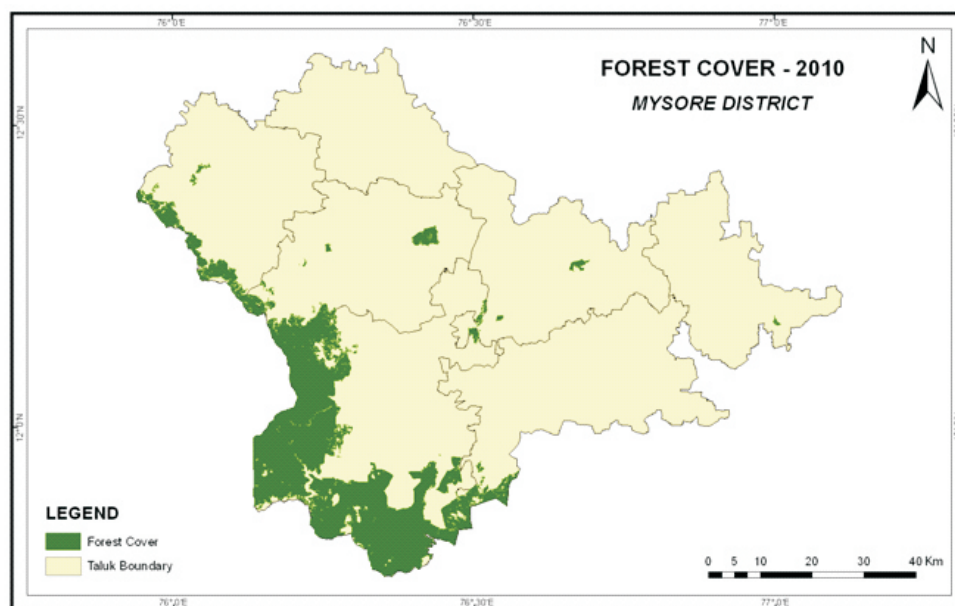


Fig 7: 2010 - Forest Cover in Mysore District

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