CHAPTER-V

5. Summary & Conclusions

The world’s forests are in a direct or indirect way interrelated to the livelihood of all human beings and to all life on earth, and therefore it is crucial to preserve these ecosystems. As per the Millennium Assessment Goals report, around 13 m ha of forest loss worldwide each year between 2000 and 2010, either through devastation by natural causes or because the land was converted to other land use purposes. Only half of this area is compensated by new forests or forest growth. In addition to directly human-induced deforestation, the growing forests have also been affected by climate change, increasing risks of storms, and diseases. Urbanization and the expansion of large-scale commercial agriculture are the main causes of deforestation at the global level.

The forest and tree cover area in India is 23.64 % of the country’s geographical area. This is against the 33 % of the geographical area as envisaged in the first National Forest Policy (1988). This meager amount of forest constitutes about 1.8 % of the global forest, which support 17 % of human population and 18 % of bovine population. In view of this, Government of India has initiated various activities not only to ameliorate the health of the forest but also to bring more areas under forest cover.

Regular data on encroachment of forest lands are generally not available. The Central Empowerment Committee constituted by Supreme Court opined that the encroached lands are much more than the government statistics and further stressed the need for survey/mapping of forests using satellite data. Space borne Remote Sensing technology has proved to be an important tool in the rapid assessment and mapping of natural resources over a large area with reasonable accuracy. Application of satellite data for the assessment of forest cover in India was first demonstrated by the National Remote Sensing Center (NRSC), Hyderabad.
The five districts namely Mangalore, Kodagu, Hassan, Mysore and Chamarajanagar of south interior region of Karnataka are in Western Ghats region and represent 14.3% of the total geographical area of Karnataka state. Various forest types are distributed in accordance with bioclimatic parameters such as precipitation, length of dry season, topography etc. There is a west-east gradation of forest types: evergreen forests (low/medium/high elevation forests differ from one another by their floristic composition and structure), to moist deciduous, dry deciduous and scrub forests. The climatic evergreen forests, characterized by their richness and diversity contain a large number of endemic species, and contribute to a high level of biodiversity of the Western Ghats to elevate it to the level of one of the biodiversity hotspots of the planet. In addition to the above main type of forests, many other subsidiary types of local occurrences exist, which owe their existence to micro-climatic influences or local edaphic changes and or biotic influences.

Among fifteen different vegetation land cover types observed in five districts, dry deciduous forest type is the major type followed by moist deciduous, evergreen and scrub forest type. Among fifteen vegetation land use types seven categories belong to different plantation types. Teak plantation dominates the region followed by *Eucalyptus, Acacia* and Rubber plantations. Among the forest types observed scrub and dry deciduous forests are more encroached than the other forest types. The change in forest cover exhibited a great deal of variation in both spatial and temporal context maybe, a result of different strategies and efforts by the forest department and due to the change in climatic conditions and socio-economic factors.

The five districts selected for the study together support around 30% of forest cover of the state. Our study revealed that 1.7% of reserve forests are encroached by farmers by 2010. Among the five districts more encroachments is seen in Mysore district followed by Hassan and Chamarajanagar. It is least in Mangalore district. Decadal forest encroachment Zonation analysis (low, medium & high) revealed that low
(below 5 ha) encroachments pockets to be begin with, have gradually accelerated to medium (5 to 10 ha) and later turned to higher (more than 10 ha) encroachment pockets. Higher encroachments were observed in the north interior districts of Karnataka harboring scattered dry and scrub forests, wherein population density is also higher. Study reveals the major cause for encroachment as agriculture expansion, which is more prevalent in scrub and dry forests.

A total of 0.5% reserve forests in Mangalore district were encroached as per 2010 satellite data. The forest encroachment has considerably increased from 0.09% to 0.44% from 1975 to 2010 and the majority of encroachment occurred between 1990 and 2000. Unauthorized cultivation is noticed in many of the forests which have been notified under Section 4 of the Karnataka Forest Act, 1963. The encroachment is majorly found in Puttur, Sullia and Belthangady taluks in 2010. The forest type encroached is mainly moist deciduous, thorny scrub and traces of semi-evergreen forest with plantations such as Eucalyptus, Acacia, etc.

The area of reserved forest in the Kodagu district is 287663.4 ha. The extent of forest encroachment is identified as 1674.9 ha, 1644.8 ha, 773.7 ha and 372.7 ha for 2010, 2000, 1990 and 1975 respectively. It was observed that these forest encroachments vary from 0.86 %, 0.85%, 0.39% and 0.19% respectively. Highest percentage of encroachment is found in Somavarpet and Virajpet taluk inhabiting semi evergreen forest, moist and dry deciduous forest types along with other forest plantations. The encroachment pattern is quite different from other regions of the study, it can be said that the traditional tenurial system is the major factor for encroachment.

In Hassan district encroachment is estimated at 4438.7, 4163.31, 2137.65 and 793.08 ha for 2010, 2000, 1990 and 1975 respectively. It varied from 1.61 to 9 % from 1975 to 2010 and majority of encroachment was observed between 1990 and 2000. Highest encroachment is found in the areas with mixed plantation and major part being scrub land whose weighted average for
Arsikere taluk is 41.94% over the years. Field observations indicate that the encroachment is mainly at places nearer villages and towns. Higher encroachments were observed in the dry deciduous and scrub forest areas of Garudangiri State Forest near Battihalli, Kallusadarahalli, Yarehalli, Sasila, and Rampura villages. Here major encroachment pockets are located in plain regions, wherein reserve forests are not contiguous. Also the villages are situated close to reserve forest boundaries.

In Mysore district the extent of forest encroachment is identified as 7098, 6803, 1455.06 and 3472.38 ha for 2010, 2000, 1990 and 1975 respectively. The encroachment analyses indicate that, it is high during transition period from 1975 to 1990, accounting to 962.68 ha. For 1990 to 2000 period, the extent of encroachment is 5347.94 ha, which further remained almost unchanged as on 2010. Highest encroachment is in HD Kote taluk inhabiting moist, dry deciduous and scrub forest types along with and forest plantations.

In Chamarajanagar district the forest area encroached is 2232.3, 2169.34, 1020.67 and 519.06 ha for 2010, 2000, 1990 and 1975 respectively, with more Encroachment in 2000. The highest encroachment is in Kollegala and Gundlupet taluks supporting moist and dry deciduous forest types along with scrub and other forest plantations. Here encroached pockets are comparatively less than the other regions of the study. This is because of the existence of protected areas (Cauvery wildlife sanctuary and Bandipura National Park) coming in this region.

A total of 13.72 lakhs tons of biomass has been lost from 17129 ha forest encroached as on 2010. The biomass lost ranged from 35 to 125 t/ha in the five district studied (average is 80 t/ha). Mangalore and Kodagu districts account for more biomass loss per hectare, because the encroachment pockets fall in evergreen and semi-evergreen forest types. However, the extent of encroachment in these two districts is less than other three districts studied.
Normally around 50 % of dry weight of plant constitutes carbon, which will be released into atmosphere when forests are cleared. The present study illustrate total of 13.72 lakhs tons of biomass loss from 17129 ha of forest encroachment as on 2010. The recent literature suggests that the ongoing deforestation is enough to raise atmospheric concentrations to well over 1000 ppm with potential catastrophic rise in temperature up to 5-6 C°.

**Recommendations**

The encroachment data collected through conventional method has been questioned in various courts in country over the years, which also lead to legal dispute between community and government. In this context present study was undertaken to assess the encroachment pockets using satellite data, which was recommended by judicial authorities and forest department. It is important to evolve a strategy and action plan in consultation with farmers and revenue department officers to work out long term solution to the problem. In this context the following recommendations are proposed based on our field observations and consultations with the forest department.

- Keeping the boundary of the forests intact with full accessible data is the most distinct cause encouraging encroachment. Therefore to contain the problem it is necessary to inspect the boundary of the forest regularly and establish permanent pillars or trenches or solar fence to check the encroachment.

- Encroachments in reserve forest are punishable with an imprisonment for a term which may extend to six months or a fine which may extend to five hundred rupees or both, according to Indian Forest Act. This must be sufficiently enhanced by amending the act and, the accumulated amount must be deposited separately and, should be used to rehabilitate the socially underprivileged encroachers of the region.
• Forceful but planned eviction of encroachers is the simplest approach that would yield rapid results. It will enable National forestry authority to take over community forest rights and start rehabilitation activities immediately. The legal provisions in the Forest Act should be strictly implemented. It involves issuance of eviction notice with a deadline and, if there is no compliance forceful eviction must be done with the help of security or Court brokers could be enacted.

• Increasing employment opportunities to villagers residing in the areas adjacent to forest would supplement their income and diverts their attention. Thus increasing employment opportunities in areas outside the forest exercises a great check on encroachment. People residing at forest fringes can be engaged in afforestation work, ecotourism, forest based industries and other eco-development works carried out in the area.

• As per section 64A of Karnataka Forest Act, 1963, any person unauthorizedly occupying any land in reserve forest may, without prejudice to any other action may be taken against him under any other provision of this act or any other law for the time being in force, be summarily evicted, by a forest officer not below the rank of an Assistant Conservator of Forests and any forest including trees raised in the land and any building or other construction erected thereon shall, if not removed by him within such time as the forest officer may fix, be liable to forfeiture. There is need to implement this section with utmost care and sincerity.

• Tenurial right systems operating in Kodagu, Mysore and Mangalore part of Western Ghats are confusing. In these districts, tenure system was established by the princely rulers and during British regime wherein the farmers have given the privilege of using natural forest as green manure, fuel-wood and grazing purpose. On the other hand the farmers have converted many of these areas into agricultural lands.
Hence it is important to clear the confusion on tenurial rights systems using spatial data and records of revenue and forest departments.

- The tribal and other forest dwellers are poorly educated. Hence it is important to educate them with a focus on the role of forests and wildlife conservation. In this direction it is also important to create awareness on forest law and forest conservation.

- Forest Department has planted exotic trees species such as *Acacia, Eucalyptus* and *Casuarina* on evicted land. It is very important that forest department should stop planting these exotic plantations and should promote native species, which can help to sustain both tribal's and wildlife of the region.

- Every beat guard should be appraised with government rules, provisions, notifications issued from time to time; data on encroachment by individual farmer with survey number etc. this work worth to the advantage of Forest Department.

- The Range Forest officer and Forester should be trained an spatial data analysis and mapping of encroachment pockets by using GPS & DGPS technology.