Summary

8.0. Summary

Forest has always been a necessary resource to the human civilization because it is directly related to the growth and development of the society. It plays a dominant role in moulding and shaping the life of the citizens. Forests are lost at an unprecedented rate despite of all the above fact. This, in turn, is seriously eroding the capacity of our planet to sustain life on earth. The year 2011 was declared the International Year of Forests by the United Nations to raise awareness and strengthen sustainable management, conservation and development of all types of forests for the benefit of current and future generations. It is also clear that the structural integrity of much of the forest cover that remains has deteriorated and the negative impacts of deforestation are getting noticed internationally. Being the heritage of our children, forest must be managed for the future. As trustees we have to assemble present needs without compromising on the future generation's ability to meet their needs. Keeping this in mind the present study was conducted in the Pavagadh forest area which falls under the Panchmahal District of the Gujarat State.

To achieve the targets of sustainable development within the stipulated time-frame the application of modern geospatial technology has been recognized to provide efficient and effective means towards the planning, preparation & implementation of appropriate sustainable development plans. Utility of this technology for generation of thematic maps of the road network and has proved as an important input for the determination of optimal road link for connecting villages. It has enabled a faster response to the changing ground realities in the development planning, owing to its in-built scientific approach and open-ended design. Thematic maps of road network generated from the different spatial data have shown the difference in length as well as the quality of the roads with change in time. From the

LISS-IV image of the year 2007 & 2012, the total road length of the Halol taluka was found to be approx.147.6 km.and 164.07 km. respectively. All these roads form a linkage between the villages and therefore they are considered to be “life line” in true sense.

Drainage density is the total length of streams of all orders per drainage area whereas stream frequency, which the total number of stream segments of all orders per unit area. It has been observed that the area for both that is density and frequency seem to be approx. same viz., 1.925 sq.km and 1.936 sq.km. respectively. These values exhibit that the area to be falling under moderate density condition which means it has moderately permeable sub soil and fine drainage texture.

Halol taluka has total 123 villages and one town, of which 3villages are unhabited. Total area of the taluka is 49,105.4 hacters out of which 59.9% area is cultivable area. Analysis of population density showed that 31.7 per cent of the total villages of the taluka fall in the population density range of 500 – 999 persons. All the villages avail all kinds of basic amenities.The population density is 378 persons per sq.km. Halol taluka exhibited the highest decadal growth for the year 1991-2001 among all talukas of the Panchmahal district. Highly populated villages of these area are Kanjari, Talavadi, Shivrajpur Sathrota and Champaner with the population of 8031, 4891, 5876, 4377, and 3249 respectively.

Educational infrastructure is another important indicator that demonstrates the development of an area. Almost 100% villages of the Halol taluka have Primary Schools, while only 14.87% have secondary school. Being Industrial Hub, the role of Industrial Training Institute (ITI) has become significant. Halol taluka has only one

I.T.I. at the Champaner. The literacy rate of Halol taluka is 61.1% with 74.9 % males being are literate and 46.1 % females are found to be literate.

Dominant trees species included *Tectona grandis, Butea monosperma, Wrightia tinctoria, Wrightia tomentosa, Capparis sepiara, Morinda tomentosa, Holoptelea integrifolia, Albizia lebback, Carrisa congesta* etc. while under storey was comprised of *Urena lobata, Helictreres isora, Cassia tora, Cassia auriculata, Phyllanthus niruri, Trichodesma indicum, Amorphophallus commutatus*. The occurance of Lantana camera, which is a weed, probably affected the understorey species at many places.

A distinct correlation was seen with respect to species distribution due to variations in the solar energy obtained by the terrain of different aspects.. In the area under study south aspect exhibited the highest number of species.

Slope and aspect are significant factors which contributed greatly in plant dispersal and growth as compared to other factors. Moreover these factors also have significant effect on composition, structure and density of the plant communities. The reason for this can be attributed to the fact that biomass, structure, and composition of the plant communities are greatly influenced by the habitat conditions which are reflected through these features. The present study area reflected a distinct variation in slope and aspect classes. The slope of the entire study area ranged between 2-42% and 5 different classes viz., less than 2%,2-6%,6- 15%,15-42% and lastly greater than 42% were defined.

Understanding of arable land is very important feature for the management of the land cover with respect to the urbanization. In the current study area villages like Mota Handiya, Mandavi, Tajpura, Kakalpur, Bapotia and Champaner exihibited absence of any arable land. Village Talavadi has the highest i.e. 747.20 ha. arable land area, while it was least in the Nana Handiya village, i.e. only 18.70 ha. Bhuva Dungri had the maximum per capita arable land i.e. 4.55 ha. since it had very less population as compare to the arable land of the village.

The soil was generally neutral in pH and low in Electrical conductivity. The Organic carbon was low and Phosphorus content of the soil was high and Potash content was also high. So, overall, the soil fertility indices were good from the agriculture point of view. The soil in the hilly areas is subjected to constant erosion due to lack of vegetation cover.

The air pollution assessment in the form of concentration of gases like SO_2, NO_x and CO showed that all their values were much below the permissible limits of CPCB. Based on their sensitivity classes, major part of the study areawas coming under extremely and very highly SO_2 and NO_x pollutant sensitive category that included major forest cover of the study.

The evaluation of ground water quality of the present study area, in the form of pH, electrical conductivity (EC),and Total dissolved salts (TDS) showed a distinct variation from site to site. It indicated higher concentration of electrical conductivity, and total dissolved solids and thus affected drinking water quality standards of the study area.

The thematic maps of the forest area have been generated using two different attribute data through which the changes that have occurred in this forest area during different time series have been analysed. The first thematic map generated from the SoI toposheets showed Pavagadh area during 1970s having 8960 ha. of thick forest cover which was protected mainly under Reserve Forest category. This

Reserve Forest was comprised of different forest categories viz. open forest, open jungle, open scrub, eucalyptus plantation, Fairly dense mixed jungle mainly teak, dense mixed jungle mainly teak, etc. The second thematic map was generated from the data available in Census of the year 2001. According to it, Halol taluka had 9145.5 ha of land area under different categories of forest.

The phytosociological analysis revealed that, *Prosopis chilensis* (Molina) Stuntze in tree layer , and *Cassia tora* in Understorey layer exihibited the maximum IVI value and these are considered as leading dominants in the study area. For Tree layer, maximum Shannon-Wiener Index has been found to be 1.26 at the site no.26, while the minimum was 0.30. Majority study sites showed evenness values between 0.9 to 1,and Species richness values ranged from 0.33 -1.68. Study showed that though there are many species of trees growing in this forest of study area, *Tectona grandis* is the dominant one.

The land use classification was performed using images of different years for understanding the landuse changes occurring in the Pavagadh forest area. The supervised classification for the LISS-IV image of the year 2007 showed different land use classes, namely, Built up/settlement, Waterbodies, Agriculture, Wasteland, Scrub and forest.It was distinct from the classified output that forest occupied equal proportion of land along with wasteland. i.e. 121.55 and 113.56 sq km respectively. The supervised classification of the LISS-IV image of year 2012 highlighted the overall scenario of all land use classes. The builtup occupied the majority land area by 112.84 sq km, whereas minimum land area recorded for the waterbodies was only 13.72 sq km. Comparison of classified images of the year 2007 & 2012 has highlighted the areas which had a distinct change**.** Among all the land use classes, there is a decrease in forest, scrub and wasteland whereas the classes like built-up and agriculture showed increase in area and the water bodies indicated very negligible change. The maximum change was observed in case of forest area. This decrease was of about 33.08 sq km area from 2007 to 2012 with a per year change of 6.616 sq km was found. There was a decrease of 21.57 sq km area in scrub, 15.06 sq km in wasteland and 1.51 sq km in waterbodies from 2007 to 2012. On the other hand, area of land use classes like built up and agriculture have been increased by 4% during the year 2012 which constituted 4.486 and 3.546 sq km respectively. The forest cover density assessment of 2007 showed that 35.65 sq km of the area was under moderately dense category and 85.90 sq km under open category**.** Forest cover density assessment of 2012 estimated 31.36 sq km of the area was under moderately dense category and 88.47 sq km was under open category

The generation of ESA was mainly based on the process of designing an optimal mix of different land use based on their suitability class. It was also significant to understand the existing and future potential landuse of these areas for developing these areas sustainably. The utility of RS–GIS with a modelling approach was mainly to integrate spatially complex and different land attributes. The present study has made use of the output of land use/ land cover classification along with all the significant factors related to it in the form of thematic maps and thus retained their present spatial location during the process of suitability analysis. The use of GIS mode was specifically done to assign values to alternatives that are evaluated along Multi criteria decision analysis. The current analysis revealed that, approx. 45% of the area is suitable with 15.30 sq km, 99.45 sq km & 31.30 sq km under highly suitable, moderately suitable & marginally suitable respectively. The rest 55% of the study area is not suitable. Out of which approx. 96.54 sq.km area covered under N1 category indicating that if proper planning is done, this area can be utilized further for the forest development.

It was observed that forest cover loss in this area has not only diminished the prospects of rural in this area but also have limited the scope of biodiversity and genetic conservation. It was therefore essential that areas should be identified which were specifically in the forest area along with the other land use categories where restoration attempts can be made. Serious efforts in this direction will definitely aid to reach that land to any one stage of ecological integrity.

Sensitivity status of 13 sites selected under each suitability categories is clearly Indicates that out of 65 selected sites, the majority sites were showing Less sensitive areas, whereas highly sensitive areas have been represented by only 19 sites. Total 21 sites were falling under the moderately sensitive areas. The reason for their identification was the severe degradation and fragmentation of environmentally, economically, and aesthetically important landscape.

Understanding these areas what proper strategies can be designed for them and what are the prospects available for their sustainability, factors related sustainability of each area were required to be identified. Thus, to check sustainability few more criteria were needed to be integrated in the existing model of suitability requiring a voluminous data difficult to be procured easily. At this point a sample village from this area named Champaner was selected as pilot village for generating ESD. The ESA of this village falling under different landuse themes were integrated with the essential criteria and indicators formulated under Bhopal India Process along with few other criteria which were thought to be relevant.

Total nineteen areas were thus identified and designated as Plots, out of which five were sustainable, eight were moderately sustainable, while rest six were categorized as less sustainable areas.

Sustainable land management is basically "the adoption of land use systems that, through appropriate management practices, enables land users to maximize the economic and social benefits from the land while maintaining or enhancing the ecological support functions of the land resources". It is crucial in minimizing land degradation, rehabilitating degraded areas and ensuring the optimal use of land resources for the benefit of present and future generations The Plan generated for Champaner has been designed in such a manner that it fulfils the above requirements.

ESD plans are based on a holistic approach to achieve productive and healthy ecosystems by integrating social, economic, physical and biological needs and values. As it contributes to sustainable and rural development it should be given greater attention both at national and community level programmes.