CHAPTER 2

2.1 Study Area

The state of Karnataka has three major types of relief features such as costal, Malnad and Maidan regions. Being located in subtropical location possess five major types of forests such as evergreen forest, Semi evergreen forest, deciduous forest, semi deciduous, shrubs and bushes. Except shrubs and bushes other four types of forests are found in the foot hills of eastern parts of western Ghats and plateau region of southern Karnataka. The increasing population and the pressure on agriculture resulted into deforestation. Dry deciduous and monsoon forests are the major forest covered which has been deforested. The illegal encroachment of forest land for agricultural use has taken place along the forest boundary. The deforested parts of semi evergreen forest have been replaced by the cultivation of coffee, Areca nut, rubber, tea, ginger, cardamom. In case of deciduous forest, wet and dry crops have been replaced and in dry deciduous forest dry crops have been replaced.
Figure no: 2.1 Study area
2.2 Nagarahole Reserve Forest

The forest land which stretches from river Cauvery to river kabini falls under Madikeri, Hunsur and Mysore forest range. Locally this forest range is called as Nagarahole forest, on 13th May 1992 in commemoration of the 1st death anniversary of Late Prime Minister of India, Nagarahole forest was renamed as ‘Rajiv Gandhi National Park’, but even today popularly known as Nagarhole National Park.

The Nagarhole reserve forest is situated at south west, 94 kms away from Mysore City and covers 1250 square kms of area. It stretches towards south east as Bandipur National forest, further stretches as Madhumalai reserve forest in Tamil nadu and towards south west in Kerala as wynad forest. It comprises of evergreen, semi evergreen, moist deciduous and dry deciduous vegetation which is also identified as one of the biodiversity hot spots of India.

Human-Elephant-Conflict is seen especially in the margins of evergreen forest and semi evergreen forest cover. Nagarahole National forest is a habitat of elephants and other wild animals, the villages located along the periphery of this forest have become the hot spots of conflicts. Nagarahole National Park is bestowed with evergreen and semi evergreen vegetation which is most supportive for the increase of elephant population, it is estimated that nearly 1500-2000 elephants have taken shelter in this forest area. The increase in the number of elephants and Human encroachment of the forest margins have resulted into Human- Elephant-Conflict in this region. On the basis of field study and the forest department records, Human-Elephant-Conflicts are confined to certain points and forest cover.
Map no: 2.2 Study Area
The entry point of elephants into agricultural lands are again a matter of ambiguity, because the entire forest boundary is adjoined by agricultural land, but the place of entry is confined to certain places only, from this point of view; identifying and marking the exact points of the elephant trespass into agricultural land and villages is one of the objectives and to know the factors affecting on their entry.

2.3 Drainage:

The study area is well drained by river Cauvery and its tributaries such as Kabini Lakshmanatheertha and Taraka, which are seasonal in nature. A dam has been constructed across river Cauvery is called Krishnarajasagara reservoir (K R S) which is one of the important irrigational project in Karnataka state, the river Lakshmanatheertha joins river Cauvery near KRS and it also discharges the water into KRS reservoir. The dams also have been constructed across river Kabini and Taraka.

2.4 Climate:

The study area shows a striking diversity of climate due to the varied topography. The minimum and maximum temperature ranges from 15\(^{0}\) Celsius during December and January, to 35\(^{0}\) Celsius during April and May. The region receives most of its rainfall during south west monsoon season; however on the basis of rainfall pattern, three seasons can be identified.

1) **Dry weather season (January-May):** This period is characterized by negligible amount of rainfall. During March and April region receives meager amount of convectional rainfall. This is the season in which ponds and lakes become almost dry and low flow in streams, thus it is a period of a hydrological drought.

2) **First spell of rainy season (June-August):** The commencement of monsoons brings a quantitative change in the water availability, rainfall attains peak in August and the amount of rainfall is generally high towards the northern parts of the study area.

3) **Second spell of rainy season (October-December):** After the end of the southwest monsoons there is slight increase in rainfall over the southern part
of the study area, with peak in October or sometimes November. Although rainfall from the northeast monsoon is irregular during November and December, sufficient water is available in the streams and lakes.

2.5 The organization of the thesis:

The thesis entitled “Environmental and agricultural implications on Human Elephant Conflict in Nagarahole forest buffer zone” the first of its kind, the study is completely based on primary facts and figures. To pursue the research work on this topic and to bring it on documentation form as a thesis, the entire work has been classified into eight chapters.

The study on Human Elephant Conflict related to environmental and agricultural impacts begins with the introduction about the seriousness of the Human Animal conflict and then focused on Human Elephant Conflict, giving at most importance to state the necessity of the topic as a PhD research. This unit is also covers the review of literature, objectives and methodology. The six objectives framed are most opting and each one of the objective focuses on the minute aspects of the Human Elephant Conflict. The first objective covers the demarcation of the study area, which is very much essential for the study to be carried on. The second objective deals with the concentration of elephant entry points. The third objective focuses with the intensity of the Human Elephant Conflict, The fourth objective emphasized on the cropping pattern and causes of Human Elephant Conflict. The fifth objective stress on the challenges that are faced in the fringe villages. The sixth objective deals with the preventive measures and strategies to avoid Human Elephant Conflict.

The methodology clearly states the manner in which the entire research work has been carried out for four years at a phased manner beginning with the pilot study to GPS survey to mark entry points; these are the main aspects which are covered in the first unit to make reader understand thoroughly and clearly.

The second unit introduces with the deforestation in Karnataka, and particularly focuses on the Nagarahole region. The geographical settings of the study area and the background of the entire demarked villages are covered. This unit is also covers the review of literature, the references and citations quoted all through the thesis wherever it is required.
The third unit covers the demarcation of the boundary of the forest fringe villages. In this chapter the GPS survey boundary map along with identification of the intensive conflict points have been discussed. Based on buffer zones 1 km, 3 kms and 5 kms buffer villages have been identified, thus this unit entirely discusses on the intensity of Human Elephant conflict.

Fourth chapter is framed to provide the background of demarcation of the study area. This chapter is devoted with the general trend of population structure, cropping pattern and damage caused by the elephants in the demarcated buffer villages; cropping pattern is one of the key factors which impacts on Human-Elephant-conflicts. With this study the fourth objective i.e. relationship between cropping pattern and Human Elephant Conflict is fulfilled.

Understanding the cropping pattern and its relationship with Human elephant conflict is the main objective of the fifth chapter. The behavior of elephant raids on crops and its attacking nature on human being is studied thoroughly. The month wise and crop wise analysis of elephant raids have made. Besides, the analysis of human and elephant deaths due to conflict from 2009 to 2015 has done.

The sixth chapter is framed on the challenges faced by the fringe villages. The forest fringe villages are facing different kind of issues and problems compared with the other villages. To understand the issues and problems of fringe villages it is necessary to take up a case study of a typical village located in forest fringe, so the case study of Metikuppe has made to understand and analyze the different issues and challenges of these villages

Seventh chapter fulfilled the objective ‘causes of Human Elephant Conflict and measures’. In this chapter Different causes are identified such as the dry forest condition, water problem, cropping pattern, encroachment of elephant corridor and many more issues. In order to overcome all these issues, preventive measures have been discussed in this unit.

The Eighth chapter consists the findings which I have obtained from the field survey, research analysis and suggestions, conclusion.
2.6 REVIEW OF LITRATURE:

Review of literature has been conducted on the basis of five categories

- Past to recent
- Human animal conflict in General
- Human elephant conflict in particular, with reference to national and international studies.
- Studies about Mitigation methods at national and international
- Case studies of India and Nagarahole

Better Management Practices for the Mitigation and Management of Human-Elephant –Conflict in and Around oil palm Plantations in Indonesia and Malaysia.

In this Paper the elephant species are classified into two the African elephant, loxadonta Africana and the Asian elephant Elephus Maximus, the two sub species of African elephant recognized by the IUCN are the savannah or bush elephant (Africana) and the forest elephant (Cyclotis), There are four sub species of Asian elephants, Sri Lankan (E M Maximus) Indian (E M Indians) Sumatran (E M Sumatranus) and the elephants in Borneo. They have studied the mitigations method. How mitigation methods are mitigating the elephant entry into agricultural land and land use changes, Buffer and suggested the trench, solar fencing and chilly crops are the best mitigation methods.


From conflict to coexistence in sustainable landscapes. The main intension of their study is to understand the dynamics of wildlife-human interactions in India and Norway and develop mechanisms of coexistence suitable to the countries. They have observed that not all biodiversity is associated with human wellbeing and many species can create direct and severe conflicts with human interest. As such wildlife-human conflicts are recognized as a serious impediment to the implementation of conservation plans for species recovery and the establishment or management of protected areas in developing countries like India and even in parts of Norway.
2.6.3. Vidya Athreya and aniruddha belsore:( 2007) “human leopard conflict management guidelines” kaati trust pune, India. In this paper they have suggested that effective management of conflict is needed to strike a balance between minimizing serious conflict (attack on people) and the long term conservation of the leopard species.


In this report, they have studied the south African ecosystems that contain elephants and people that live adjacent to elephant populations are perceived to be coming under increasing threat and asses the south Africa elephant management focuses on the interactions between elephants humans and the ecosystems in which they occur, address more or less wild elephants of the species Loxodanta Africa in south Africa, and they have observed some of the elephant population are shared with neighboring countries, special features of elephants, feeding behavior, ecological process influenced by elephants, effects of elephants on biodiversity, constraints to identifying elephant effects, interactions between elephant and people, societal values and attitudes to elephants section of elephant for translocations, genetic management in the long run, reproductive control of elephant, aspects of reproduction of male and female elephants including the role of musth on breeding that relate to reproductive control surgical sterilization in elephants lethal management of elephant, ethical considerations in elephant management, the economic value of elephant national and international law


In this journal, author has discussed a specific conflict situation in bwindi impenetrable forest national park in Uganda, and the author himself shared his own experience. Author focused on the problem of increasing losses suffered by local people due to gorillas that were deliberately habituated to human presence for tourism purposes day after day losing their fear of humans he also discussed some of the roles that law and policy have played in contributing to human-wildlife conflict in many places around the world.

In this study, the scholar has assessed the attitude of the Nishis, an ethnic group dominant in Arunachal Pradesh towards wildlife, which was extremely negative. She tried to disseminating wildlife awareness to reduce human wildlife conflict. The scholar adopted the method of forest trails and village survey. She has opinioned the conservation education is totally lacking in that region and there is a need for carrying out intensive awareness program. Finally this paper suggests that communicating with the local people about wildlife is a vital part of wildlife conservation. A combination of innovative approaches to wildlife education and the involvement of local people can have a large and positive impact.

2.6.7. Elisa Distafana: (2010) “human-wild life conflict worldwide collection of case studies, analysis of management strategies and good practices” In this study she has noticed that human wildlife conflict is fast becoming a serious threat to the survival of many endangered species in the world. According to this study HWC (human-wildlife conflict) is a growing as a global problem, which is not restricted to particular geographical regions or climatic conditions, but is common to all areas where wildlife and human population coexist and share limited resources. Conflict become more intense where livestock holding s and agriculture are an important part of rural communities and wild animals over natural resources is more intense in developing countries, where local human populations tend to suffer higher costs.

2.6.8. Yuvaraj patil (2010) “conflict between human animal in India” The case of endangered species. In this research study, the scholar has made critical analysis of wildlife protection act to solve the problem of conflict between human and animal specifically leopard. The scholar have made the attempt to explore the conflict between human and animal in wildlife protection act and he has adopted doctrinal and non-doctrinal method as well as sampling method for collecting data from forest officers and small group of population of effected villages.

In this study they have estimated the elephant population using various methods in the past, total count method was used extensively by forest department from the 1970 until 0980, Ratio based method based on individually identified elephants was used, in addition line transect indirect method was tested, the tamilnadu forest department has been using the line transect method to estimate the population of larger mammals since 1995, however these efforts have been hampered by lack equipment and trained personnel needed to ensure precision of measurements.

The results of these studies have varied widely and it is difficult for the managers to make realistic use of these widely varying figures, additionally focusing largely on estimating the elephant densities alone and made an elephant demography ,age structure, sex ratio, compared the past and present population density or the age structure, mortality and reproductive status of the population.


In this study they have identified the elephant population in the Bannergatta national park and understand the Eastern Ghats and Western Ghats influence on elephant population and Human habitation, habitat disturbance and elephant conservation measures.


In this report they have estimated the protected area and give an ecological dimension for conflict, and studied the psychology of elephants, diet of elephants and impact of human actions on elephant human conflict, habitat transformation, competition with human for forest resources, crop raiding, adverse habitat factors and asses the conflict mitigation measures and decision making.

2.6.12. Rahim Ali Ahmed (2012) prevailing human carnivore conflict in Konha-Achanakmar corridor central India. In this study he has discussed human wildlife conflict is a common phenomenon from the past and become a significant problem throughout the world and in country like India ecological research in areas of high conservation value is often focused in protected areas, where human impact is
minimal in unprotected area. The rapid growth of population is reducing and fragmenting the available habitat for the wildlife.

The dependency on forest product forced the wild animal land human to share the same place for their basic needs and it became very crucial in unprotected areas.


In this paper authors have suggested chilly is the best crop to prevent the elephant entry into the farm land, compare and asses the chilly crop land and other crops land Human elephant conflict incidences ,raids and crop protection methods.


In this report they studied the patterns of Human Elephant Conflict, Causes for HEC, and responses. And they have observed& suggested the monthly wise Human elephant conflict, to strength the physical barriers and to provide the compensation for the loss due to damage by elephants.


In this paper, Scholar has studied the compensation for human death and injuries, crop lasses and correlates between conflict incidences and other variables, temporal distribution of conflict and spatial distribution of conflict. Correlation of human- elephant- conflict and distance of farm land