IMPACT OF HUMAN ELEPHANT CONFLICT ON PEOPLE'S WELLBEING IN WEST BENGAL

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BY

AKASH DATTUSALIA

SUPERVISOR

DR. L.T. SASANG GUITE

DEPARTMENT OF GEOGRAPHY & GEOLOGY

School of Environment & Earth Sciences

Central University of Punjab, Bathinda

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DECLARATION

I declare that the dissertation entitled **"Impact of Human Elephant Conflict on People's Wellbeing in West Bengal"** has been prepared by me under the guidance of Dr. L.T. Sasang Guite, Assistant Professor, Department of Geography and Geology, School of Environment & Earth sciences, Central University of Punjab, Bathinda. No part of this thesis/dissertation has formed the basis for the award of any degree or fellowship previously.

Akash Dattusalia
Reg.No. – 16mageog04
Department of Geography and Geology
School of Environment and Earth Sciences
Central University of Punjab, Bathinda – 151001.
Date:

CERTIFICATE

I certify that Akash Dattusalia has prepared his project entitled **"Impact of Human Elephant Conflict on People's Wellbeing in West Bengal"** for the award of Master of Arts degree of the Central University of Punjab, under my guidance. He has carried out this work at the Department of Geography and Geology, School of Environment and Earth sciences, Central University of Punjab.

Dr. L.T. Sasang Guite
Assistant Professor,
Department of Geography and Geology
School of Environment and Earth Sciences
Central University of Punjab, Bathinda - 151001.
Date:

ABSTRACT

Impact of Human Elephant Conflict on People's Wellbeing in West Bengal

Name of student : Akash Dattusalia

Registration number : 16mageog04

Degree for which submitted : Master of Arts

Name of supervisor : Dr. L.T. Sasang Guite

Name of Department : Department of Geography & Geology

Name of School : School of Environment & Earth Sciences

Keywords: Wildlife Management, Human Elephant Conflict, Environmental Impact Assessment, Inter-state elephant corridors and Inter-country elephant corridors

One of the major issues in wildlife management is Human-Wildlife conflict. Over the last two decades, the problem has only increased because of growing population, economic activities, both in privately and publicly run. Often these activities lack inter-departmental co-ordination or advanced planning. Environmental Impact Assessment are either not carried out or executed effectively. West Bengal, has to its strategic geographical location in the terms of biodiversity, it acts as inter-state and inter-country elephant corridors at several places, both at south Bengal and at North Bengal.

The current study focus upon Human-Elephant Conflict in North and South West Bengal (mainly on Doors-Terai and Purulia, Bankura and West Midnapore) which are being experienced with increased intensity because of several development activities which are being executed with little attention for the region's legacy as a richly biodiverse zone. The study looks into factors which cause harm to peoples and Elephants life. The migration of herds from Dalma Wildlife Sanctuary, situated in the State of Jharkhand started migrating to Jhargram Division in the state of West Bengal; chequered pattern of land distribution in the region where tea gardens, human settlements and forests are knitted with each other.

Akash Dattusalia — Dr. L.T. Sasang Guite

Assistant Professor

(Signature of Student) (Signature of Supervisor)

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Akash Dattusalia

(Signature of the student)

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Chapter 1

Introduction

1.1 Introduction: Human and wild animals both are integral components of forest ecosystem. Both exist in harmony unless their interests come to conflicts and their activities start harming each other. Here animals denotes wild animals that can potentially harm human-beings livestock, crops and other property. Man-animal conflicts are reciprocate whereby injury and loss falls on both sides; but being an anthropocentric characteristics human thus, find solutions to the problem for prevention of conflicts. Villagers living in and around such jungle areas where wild animals also have their habitat are most affected in such conflicts. The cattle reared by man are killed or injured by wild animals in and around these jungle areas and his crops are also damaged by many herbivores like deer, wild boar, blue bull, bison, monkeys and elephants. Conflicts between wildlife and humans cost many lives, both human and wildlife, threaten livelihoods, and jeopardize long-term conservation goals such as securing protected areas and building constituencies in support of biodiversity conservation.(Barua,2010)

Human-wildlife conflict is fast becoming a critical threat to the survival of many endangered species, like wild buffalo, elephants, tiger, lion, leopard etc. such conflicts affect not only its population but also has broadened environmental impacts on ecosystem equilibrium and biodiversity conservation. Laws are man-made, hence there is likelihood of anthropocentric bias towards man, and rights of wild animals often tend to be of secondary importance. But in the universe man and animal are equally placed, but human rights approach to environmental protection in case of conflict, is often based on anthropocentricity. Wildlife-human conflicts are a serious obstacle to wildlife conservation and the livelihoods of people worldwide and are becoming more prevalent as human population increases, development expands, and global climate changes and other human and environmental factors put people and wildlife in greater direct competition for a shrinking resource base. Conflicts between wildlife and humans cost many lives, both human and wildlife, threaten livelihoods, and jeopardize long-term conservation goals such as securing protected areas and

building constituencies in support of biodiversity conservation. Human-Wildlife Conflict is any interaction between wildlife and humans which causes harm, whether it is to the human, the wild animal, or property. (Property includes buildings, equipment, livestock and pets, crops fields or fences.) (Barua, Bhagwat & Jadhav, 2013) Some examples of human-wildlife conflict include: Predation on livestock or domestic animals by wildlife, Ungulate damage crops and fences, Flooding caused by beavers, Wildlife strewing about residential garbage, Squirrels or bats in home attics, Birds nesting in undesirable residential locations, Vehicle/wildlife collisions. (Barua,2010)

In many parts of the world, people and animals are increasingly coming into conflict over living space and food. This is mainly due to expanding human populations and the continued loss of natural habitats. The impacts are often huge. People lose their crops, livestock, property, and sometimes their lives. The animals, many of which are already threatened or endangered, are often killed in retaliation or to 'prevent' future conflicts. Human-animal conflict is a universal problem. From tigers killing cattle in Malaysia and elephants trampling fields in Kenya to sun bears destroying corn crops in Colombia and wolves attacking sheep in Italy …it happens around the world, affects rich and poor, and is bad news for all concerned. There can also be a knock-on effect. If solutions to these conflicts are not adequate, local support for conservation of the species also declines. (Palita & Purohit 2008)

In both Africa and Asia, elephant habitat is being replaced by agriculture both small-scale subsistence agriculture and international agribusiness such as palm oil. The animals are being squeezed into smaller and smaller areas of remaining natural habitat, which are surrounded by crops that elephants like to eat. As a result, elephants frequently raid and destroy the fields. Small farmers often desperately poor and economically vulnerable, and sometimes forced by circumstances to encroach into elephant habitat can lose their entire livelihood overnight to an elephant raid. Big business suffers too: for example, in Riau, Indonesia, the cost of elephant damage to oil palm plantations and timber estates is estimated at around US$105 million per year. There are also deaths and injuries on both sides. In Kenya alone, over 200 people have been killed by elephants in the last seven years, and wildlife authorities shoot between 50 and 120 elephants each year. With elephant populations declining

dramatically over the past 100 years, habitat loss, poaching, and conflict with people are now the biggest threats to their continued survival. (Desai, Riddle 2015)

1.2 Factors Causing Human Elephant Conflict

Elephants have increased contact with humans because of changes in landuse (i.e., fragmentation of habitats because land is rehabilitated for crop cultivation, settlement, and livestock grazing). The human site has extended into areas that were previously for wildlife for several reasons. In some areas, state sponsored and professional settlement programs were endorsed to reassure pastoralists to take permanent residence in areas that were not being used by human populations. Since these areas are often environmentally marginal, agriculture has been rather less productive. Farms have become more scattered in these areas as localized soil degradation has forced farmers to plant in scattered miscellanies farther from. As a result, the human elephant interface increases and creates a land use pattern conducive to elephant hunting. There have also been human migration as rural residents move to more urban areas in search of jobs. When they leave their fields, they leave a formation of farmland distributed with early successional forests that attract elephants. Other rural areas also have had greater interaction with elephants as they have changed the environment i.e. artificially maintained water sources attract elephants, and logging fetches elephants in closer proximity to humans as elephants feed on the secondary vegetation that moves in after the disturbance. Additionally, cattle fences and agriculture land have blocked regular migration routes, and humans have settled along the boundaries of protected areas. Though the area of interface is increasing, contemporary socioeconomic conditions have reduced human tolerance to elephant presence.

Since natural wildlife habitat have been lost, measures have been taken to create protected areas, but local people sometimes have overlooked this decision favourably. National parks created under colonial governments were established to remove local people and protect the areas as wildlife sanctuaries. As a result, these areas remained same with time. This prohibiting led to local people feel bitter about wildlife, especially dominant wild species like elephants, because innate people

thought animals enjoyed economic, land use, and political advantages that were absent to them. This has donated to determinedly hostile attitudes for elephants. (Li, Ning 2003) (Zhang, Wang, 2003, Hoare 1999, Simon et al 2005)

1.3 Statement of Problem

People's wellbeing is gravely affected by the conflicts between humans and elephant. These conflicts possess a great threat to the life and economy of the people of the area. The ranging behaviour of elephant cause damage to the crop. Elephants plays a crucial role in the ecology of the region. The conflicts led to the degradation of the habitat of the elephant and damage the environment of the region of study. The conflicts force the elephant to remain in a single fragmented habitat resulting in increase population density of elephants in that region, which puts enormous pressure on the resources of the region. The increasing incidents of HEC in the state of West Bengal has led to bitter relationship between humans and elephants. Economy of people as well as the ecosystem is getting effected by this interaction as if elephants plays a crucial role in the ecosystem of the region.

1.4 Objective

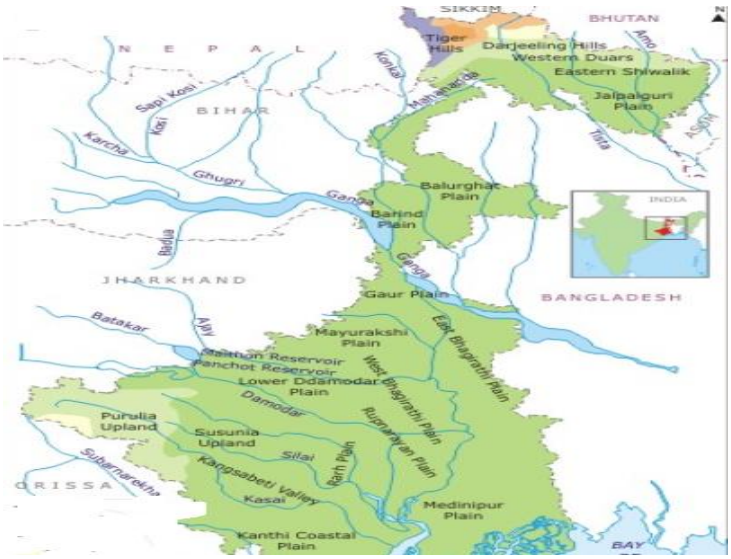
(1) To identify the place of human elephant conflict in state of West Bengal.
(2) Impact of Human Elephant conflict on well being of people of West Bengal

1.5 Study Area

The state of West Bengal stretches from the Himalayas in the North to Bay of Bengal in the south covering an area of 88752 square km. Out of its total geographical area, 13.38% includes the recorded forest category which is far less than the national figure of 23.38%. Of the total forest area of West Bengal, 59.38%, 31.75% and 8.87% are included under reserved, protected and un-classed forests respectively. Furthermore, protected areas comprise 3.26% of its total geographic area consisting of 15 Wildlife Sanctuaries and 6 National Parks, 2 Tiger reserves and 2 Elephant reserves. Habitat degradation, Encroachment of forests, habitat losses, and developmental activities like construction of roads and railway lines and increasing population of both human beings and wild animals, are bringing human and wildlife in close proximity resulting in many human-wildlife conflicts (HWC) in the state. This scenario is most prominent

in Terai and Dooars region of Northern Bengal, as it houses most of the protected areas of West Bengal. (Choudhury 2004).

Although in most of the cases the conflicts and casualties are projected in an animo-centric orientation, emphasizing the deaths and depletions of wildlife, however, in recent years, there have been a huge life and property loss in part of human beings as well. Hence, the aim of this study is to highlight some anthropo-centric angles of Human- Wildlife Conflict (HWC) in the northern districts of West Bengal, projecting the extent of human casualties in last few years in the region and also suggest some remedies.



Map of West Bengal

Source: Maps of India

1.6 METHODOLOGY

Secondary Data: The present study is based on the secondary data derived from government website, data base websites. Data relating the ecological aspect of the study have been derived from the website of Ministry of Environment Forest and Climate Change. The study is conducted by discussing various articles and reports of various conservation schemes and surveys done by various NGOs and Government agencies. Secondary Data which is collected on these parameters: Compensation given by the government, Cases of casualty caused by elephants, Economic damage done by the elephants.

Chapter 2

Literature Review

Ogra (2011) proposed that elephant-human clash represents a grave risk to their proceeded with presence. Concentrates on strife amongst elephants and people in West Bengal and in Africa have recognized harvest assaulting as the fundamental type of contention. Elephant-human clash is an aftereffect of living space misfortune and discontinuity. Whenever elephants and people interface, there is strife from edit assaulting, wounds and passing's to people caused by elephants, and elephants being slaughtered by people for reasons other than ivory and living space corruption. Elephants cause harm producing from a couple of thousand dollars to a huge number of dollars. Consistently, 100 people (in a few years it might be 300 individuals) and 40-50 elephants are murdered amid edit striking in India.

Choudhary (2011) proposed Human population increments and improvement in Northeast India have lessened and divided untamed life environment, which has brought about human– natural life clashes. In spite of the fact that species, for example, tigers (*Panthera tigris*) and (*Rhinoceros unicornis*) cause struggle, elephants (*Elephas maximus*) have turned into the point of convergence for strife and preservation issues. This article exhibits a few contextual analyses to show the various idea of human– elephant clashes. In the vicinity of 1980 and 2003, in excess of 1,150 people and 370 elephants have passed on because of these contentions. In spite of the fact that general society and government have made strides, human population development must be tended to before any lasting answers for this contention can be come to.

Sukumar (2016) reported that assam lost 65 per cent of its lowland semi-evergreen forests since 1972. In the adjacent state of Meghalaya, forest cover declined from 33.1 per cent in 1980-1982 to 18 per cent in 1995. All included, the northeastern states lost 1,802 sq. km. of elephant range habitat between 1991 and 1999. Other parts of the elephant's range are no exception. In northern Karnataka, Orissa and Jharkhand, elephants have lost large chunks of habitat to mining and encroachments. Just as in Assam, pachyderms in these states have dramatically expanded their

range into neighbouring areas which had no history of elephant presence for several decades or even, centuries. Extreme weather events like El Niño can also have a similar dramatic impact on elephants. During the drought of 1983, several herds moved from Hosur (Tamil Nadu) into Andhra Pradesh where people had not seen elephants for over a century. Unlike tigers, the bulk of whose range falls within Protected Areas, only 22 per cent of elephant habitat is enclosed in sanctuaries and national parks. Since the rest of their range lies in areas of increasing human density where there is intense competition for the same resources, conflict is inevitable.

While it is largely reported that elephants compensate for habitat loss by eating crops, bulls in particular may take advantage of the easy availability of crops and stored grain. Additionally, eating crops may also be a learned behaviour. Calves may learn to crop raid from the adults in the herd or young dispersing bulls may learn by associating with bulls that do. This may not only explain the widespread nature of the phenomenon but also the behavioural difference between herds in the same region.

Mehta et.al. (2017) purposed that the number of elephant attacks in India is on the rise, especially in the country's northeast and south, where the majority of wild elephants live. In 2008, an elephant killed three people at a temple ceremony in Kerala, and in December 2010 a herd of 70 elephants – intoxicated after drinking from barrels of rice beer – went on a drunken rampage through a village, killing four people and destroying 60 homes. This violent behaviour by elephants, often seen as gentle giants isn't unprovoked. India's numerous development projects, such as building new roads and houses, and an intensification in agriculture have encroached upon and fragmented elephant habitats, notably forests.

Jyoti (2012) Human-elephant struggle can inflict significant damage both on human lives and property and in addition elephant populations. Methods for diminishing or settling such clashes are indispensable for the practical protection of West Bengal elephants. Elephants crosswise over Assam live in an assortment of natural surroundings and scenes. These incorporate extensive adjoining territories encompassed by trim fields, or in very corrupted regions with other horticultural infringements and they are additionally found in divided scenes with a mosaic of

product fields, ranches and fixes of woods. The example of harvest assaulting and the quick reasons that instigate elephants to attack crops change. Elephants may lean toward encouraging on crops when contrasted with wild rummage in light of their higher nutritive substance and acceptability.

Senthilkumar et.al. (2016) The problem is that home ranges are imprinted in the mind of an elephant and that won't change even if the forest is reduced or a farmer cultivates there. This increasing interaction between humans and elephants leads to more and more aggressiveness on their part, who was also one of the contributors of the Elephant Task Force report submitted to the Ministry of Environment and Forests in 2010.The two elephants that went on a rampage in Mysore were separated from their herd after farmers threw stones at them as they entered a field on the outskirts of the city. Only 28% of India's elephants remain within protected areas. Ideally, a population of 100 elephants needs 5,000 square kilometres of protected area for normal development.

Kausik et.al. (2016) West Bengal elephants living in touching reduced territories demonstrate that not all elephants in a population attack crops. Be that as it may, in profoundly divided scenes, the whole population might be engaged with elephant-human clash. Notwithstanding these immediate clashes amongst people and elephants, elephants additionally endure roundabout costs like corruption of living space and loss of nourishment plants. As India pushes forward with development, elephant habitats will come under further threat. Perhaps the Elephant Task Force could take a leaf from the Tiger Task Force, which brought the issue of tiger endangerment to the spotlight, ultimately leading to an increase in the tiger population. According to the latest census, the number of tigers in India has risen to 1,706 from 1,411 in 2006.

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Chapter 3

Human - Elephants Conflict in West Bengal

3.1 Areas of Human Elephant Conflict in West Bengal

Human-elephant conflict has been a key issue for handling wild elephant population. Over last two to three decades the problem has increased due to growing population and economic activities. West Bengal serves as inter-state and inter country elephant corridors at several points, in both at South Bengal and at North Bengal.

3.1 Areas of conflict In North West Bengal

For the elephants in northern districts of West Bengal region a suitable environment ranging from the Sankosh river in the east to Mechi river in the west. North Bengal provides a great accumulation of biological resources in the protected and reserved forests lying at the foothills of Himalia. The forests in North Bengal and touching territory in Eastern Nepal, Western, Sikkim, Bhutan and Assam show a rich biodiversity in its miscellaneous ecosystems. This has been possible due to this region's location at the confluence of several bio-geographic realms, e.g. Mediterranean, Ethiopian, Indo- Malayan, Sino- Japanese, Palaearctic and Oriental. Presence of animals likes Tiger, Elephants, One-horned Rhino etc. and existence of trans- boundary corridors for gene flow have enhanced the global significance of this tract for conservation (Das 2015).

However, human population and the growing demands for land and natural resources changed this landscape to a major extent. Fragmentation of habitat has mainly occurred as a result of development of infrastructure, widening of road, conversion of railway line to broad gauge with heavy traffic, river training works through large scale construction of embankments, deposition of dolomite in rivers in the foothills bordering Bhutan and particle containing dolomite in the flowing river coming from Bhutan hills. Tea plantations have taken heavy toll on adjoining grasslands and also the industry has produced huge amount of unplanned human settlements. All these factors led to an increased level of human-animal conflict. (Mallick 2012)

Elephant range in north West Bengal falls in two civil districts –(i) Darjeeling (3 Civil blocks out of 12 Civil blocks) and (ii) Jalpaiguri (11Civil blocks out of 13 Civil blocks). Both these districts together encompass a geographical area of 9376 sq. km. However, elephant range is confined to 1/3rd of this 9376 sq.km. The area is bounded by international boundaries i.e. with Bhutan in the northeast, and on west with Nepal. The eastern and southern boundaries are bordered by the State of Assam and CoochBehar district in West Bengal respectively. Northern West Bengal (JPG+DRJ) has a forest area of 2994 km^2 or about 25% of the total geographical area of forests of the state. However, the elephant habitat is confined only to about 2200 km2 in three distinct zones viz

(a) The Terai stretch between the Mechi River and the Teesta River comprising the forest areas under Kurseong Division, Wildlife Division I (Mahananda WLS)

(b) The Western Doors stretch between the Teesta river and the Torsa river comprising Apalchand Range of Baikunthapur Division; Jalpaiguri Division, Wildlife Division II (including Garumara N.P & Chapramari WLS); Kalimpong Division & Wildlife Division III (including Western Part of Jaldapara WLS).

(c) The Eastern Doors stretches between the Torsa & the Sankosh River bordering Assam & Bhutan and the forests of Wildlife Division III (Eastern part of Jaldapara WLS and Buxa Tiger Reserve).

Affected areas fall under civil Blocks Kumargram. Alipurduar1. Kalchini, Madarihat Birpara, Falakata, Dhupguri, Mainaguri, Nagrakata, Mal, Meteli & Rajganj(Jalpaiguri), Naxalbari, Mirik & Garubathan (Darjeeling). The elephant range constitutes flat, slightly undulating to hilly areas to an elevation 1,750 m, with numerous rivers and hill streams running from North to South. The average annual rainfall is 3,498 mm with temperature between minimum 8ºC and maximum 32ºC. Out of an estimated elephant range of 2,687 km2 in Northern West Bangal, 34 % area constitutes forests, 22% area as tea garden, 17% area is agriculture land and the balance comprise area of human habitation, Water and sands. According to the 2011 census, average human density is 611 persons/km^2 in Doors & Terai region. There are 6 Protected Areas, 5 of them fall in Jalpaiguri District alone. All of these are small and constitute

roughly 28% of the elephant range. Range expansions of elephant during two crop seasons (Paddy and Maize) are the major reasons of conflict (HEC) due to their movements through tea gardens and crop fields. (Menon 2005)

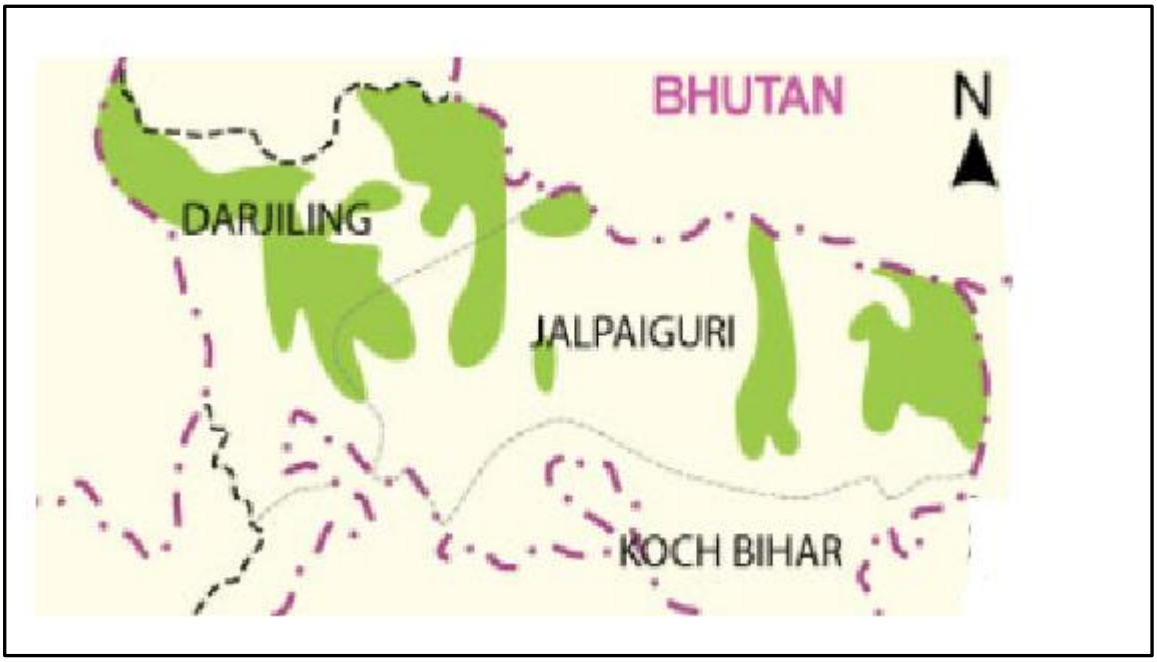
The northern elephant range in West Bengal extends from Mechi river along Indo-Nepal border in the west to the Sankosh river in the east bordering the State of Assam. Elephants residing in this stretch of land represent western most entity of the discontinuously distributed north-eastern elephant population - the one among the five identified in India (Choudhury, 1980). This elephant range is surrounded by three international boundaries, as mentioned earlier - Nepal on the west, Bhutan on the north, and Bangladesh in the south. Landscape contiguity through forest cover exists between Nepal, Bhutan and India. Besides this, two other Indian States - Sikkim and Assam bound this elephant range on the north and eastern sides respectively. Regular elephant movement in this region have been recorded at an altitude of 3000 feet. Annual Report of Forest Department 1940-41 reports movement of elephant to Rechila, at an altitude of 10,000 feet, and further into Bhutan.

From the biogeographical stand point, the entire northern elephant range comprises of two major biotic provinces - the Siwalik/ Bhabar and lower Gangetic plains. According to (Mani 1974), at a short distance of 80 km, opposite the basins of the river Teesta and river Raidak, the Siwalik range lies with remarkable uniformity in front of Himalaya throughout its length. The lower-Gangetic plain in north West Bengal, that separates the Peninsula from Himalayas through a belt of Siwaliks in between, is referred as sub montane Terai or Doors (Mani, 1974). Infact, the name Doors is derived from the passes leading into the lesser Himalayas.

The first systematic survey was undertaken in the year 1975 to record status, distribution, movement and conflicts of elephants in northern range of West Bengal. This work was initiated after formation of North-East India Task Force under the aegis of Asian Elephant Specialist Group. The State wise report (Das 2015) indicated presence of three separate elephant populations in North Bengal: (a) West of Torsa (b) East of Torsa and, (c) One seasonally transient from Assam. The 1978 estimates for these three populations of elephant were recorded as: 80, 60, & 10 respectively,

totalling 150 elephants in North Bengal (Das 2015). He further accounted that the west of Torsa population as most seriously threatened because of its habitat fragmentation and pocketed populations.

Elephants being animals with wide range of movement have biological requirement of migration from one forest to another. This process has been carried out for hundreds of years through tracks passed down the generations through hereditary system or through socialisation. However, fragmentation of these time-tested corridors took place after establishment of Tea Estates, Forest villages, and other human settlements, commercial harvesting of wood by East India Company during mid 1800's to 1918's and when post-independence, large scale human settlements took place due to heavy inflow of Refugees form adjacent countries. (Das 2015)



Source: Maps of India

Main Elephant Corridors in North Bengal are, Mahananda – Kolabari (Wildlife -I and Kurseong Divisions), Apalchand – Mahananda (Baikunthapur and Wildlife-I Divisions)

a) Apalchand – Garumara-Lower Tondu (Baikunthapur and Wildlife-II Divisions)
b) (d) Apalchand – Kalimpong Via Targhera, Damdim/ Sylee (Baikunthapur and Kalimpong Divisions)

c) (e) Apalchand – Bhuttabari via Meenglass TE (Baikunthapur and Kalimpong Divisions)
d) Chapramari – Bhuttabari (Wildlife-II and Kalimpong Divisions)
e) Rethi – Central Diana (Within Jalpaiguri Division)
f) Rethi – Moraghat (via Banarhat) (Within Jalpaiguri Division)
g) Dumchi – Rethi (Wildlife-III and Jalpaiguri Divisions)
h) Titi – Dumchi (Within Wildlife-III Division)
i) Buxa – Titi via Torsa/Rangamati (BTR and Wildlife –III Divisions)
j) Buxa – Titi via Beech/Barnabari TE (BTR and Wildlife –III Divisions)
k) Nimati – Chilapata (BTR and Wildlife –III Divisions)
l) Buxa – Ripu via Sankosh (Bengal and Assam)

3.2 Areas of Conflict in Southern West Bengal

In recent years the increased man-elephant conflict in the districts of Purulia, Bankura and West Midnapore has become a serious challenge for the Forest Staff of these areas. These three districts of SW Bengal are severely affected due to elephant depredation. Presence of elephants in South West Bengal is historic. They were abundant in the dense sal forests of the erstwhile Midnapore District as early as 1900 as per older reports. The population dwindled and became very small till mid 1980s due to loss of forest cover and depletion of food. During the period human-elephant conflict was reported only from West Midnapore, west of Kangsabati River bordering Bihar and West Bengal. (Chowdhury et.al. 2002). The districts of Purulia, Bankura and West Midnapore are situated in the south western part of the state of West Bengal, bounded by the state of Jharkhand on the Northern and Western side, Burdwan, Hoogly, Howrah and East Midnapore districts of West Bengal on the Eastern side, and the state of Orissa on the southern side (Daniel, 1999). The western part of the region is hilly and undulating being an extension of Chotanagpur plateau while the eastern part consists of flat Gangetic plains. The general topography varies from 200m to 670m.The soil is red, sandy, lateritic and alluvial type with red and black soils in a few pockets.

The main regions of conflicts in southern West Bengal are:

Bankura District: Bankura north Division and Bankura South Division

Purulia District: Purulia Division, Kangsabati North Division and Kangaasabati south Division.

West Midnapore Division: Midnapore Division, Rupmnarayan Division, Jharghram Division and Kharagpur Division.

All the above-mentioned Forest Divisions are affected due to elephant movement through their jurisdiction.

Source: Maps of India

The elephants emerge from the Dalma range of Jharkhand and gradually migrate into Bankura, West Midnapur and the Purulia districts of West Bengal. The influencing push factors causing migration of elephants are - lack of food, water, and destruction of habitats, encroachment of forest and the reduction of the dwelling place of the elephants. Not only the push factors but also the pull factors, (Santra et.al. 2008) are considered as key causes for migration of the elephants to the study area.

Availability of crops like paddy, wheat, etc. in the cropping fields, which are located adjacent to the forest of the study area. Presence of a variety of seasonal vegetables such as potatoes, tomatoes, cabbage, cauliflower, pumpkins, and gourds are

available in most patches of the forest area or in the vegetable gardens of the locals throughout the year. Variety of fruit crops such as jackfruits, banana, watermelon and sugarcane are available in the farmers' gardens. Adequate water, which is available in the D.V.C (Damoear Valley Corporation) canal helps in drinking and bathing of the elephant herds. Deep Sal (Shorea Robusta) forest are used as dwelling place through which the herds can travel freely.

3.3 Causes of the Conflict in Both North and South West Bengal

In North West Bengal (primarily Doors-Terai) which is being experienced with increased intensity due to several development activities which are being implemented with little consideration for the region's legacy as a richly bio-diverse zone. The conflict is most starkly manifest in the accidental death of 54 elephants upon collision with trains since 2010. The situation is grim as of now since over the years, the pathetic deaths of so many elephants have brought forward a newer and more severe dimension of man-elephant conflict. The severity transcends the nature of mere Man-elephant conflict, the conflict is between technology/development (which multiplies the potential of man as destroyer of natural order manifold) and elephants in more immediate sense.

Indiscreet dolomite extraction for cement manufacturing at the border between West Bengal and Bhutan i.e. at the foothills of Bhutan; chequered pattern of land distribution in the region where tea gardens, human settlements and forests are intermeshed with each other. The Doors Tea Gardens often lead to unorganised settlement of unregistered labourers due to lack of management and also these labourers are often heavily dependent upon the forests and other natural resources since they are often meagrely paid. Also, since 2005, the Doors Tea Industry have faced severe crisis whereby some Tea Gardens were abandoned or locked up almost overnight. The surrounding Natural habitat has only faced increased human pressure owing to the mismanagement of these gardens.

Out of an estimated elephant range of 2,687 km^2 in Northern West Bangal, 34 % area constitutes forests, 22% area as tea garden, 17% area is agriculture land and the balance comprises area of human habitation, Water and sands. According to the

2011 census, average human density is 611 persons/km^2 in Doors & Terai region. There are 6 Protected Areas, 5 of them fall in Jalpaiguri District alone. All of these are small and constitute roughly 28% of the elephant range. Range expansions of elephant during two crop season (Paddy and Maize) are the major reasons of conflict (HEC) due to their movements through tea gardens and crop fields.

The next major land use in North Bengal is Tea cultivation which occupies 12.68% and around 18% of total land areas in Jalpaiguri and Darjeeling districts, respectively. Major elephant movements take place through the tea gardens. Almost 90% Tea gardens of Jalpaiguri & 30% of Darjeeling are within the zone of conflict. The tree stands in tea garden provides cover and some amount of fodders to the elephants. Haphazard labour line distribution and their activities for crop cultivation and brewing rice alcohol are the major problems for man-elephant conflict in North Bengal.

There have been several incidents of elephants getting injured or killed in Nepal. The elephants often use the Mechi river corridor to enter Nepal (Jhapa District) thought Kolabari-Tukriajhaer in search of food. To prevent the animals from foraging for food in their paddy fields, Nepal villagers often attack the elephants. These elephants return injured and carry out rampages in India. Affected areas are Lohagar, Kolabari, Naxalbari under Panighata Range (Civil block- Mirik), Tukriajhar Range (Civil block Naxalbari). A herd of 130-140 elephants devided into smaller groups and use to roam the areas. (Singh et.al.2016)

The physical presence of the roads & rails and their widening/conversion in the habitat creates habitat edges, alters the hydrological dynamics and create a barrier to the movement of elephants & other animals leads to habitat fragmentation and loss, apart from death due to collision with speeding train & vehicle.

Siliguri is connected by railways to Alipurduar by two separate lines, one of which (Siliguri Jn. to Alipurduar Jn.) stretches over 168 km and traverses forest over 74 k.m. i.e. about 44% of the length. The rail line passes through 3 PAs and buffer of BTR including 9 sensitive established elephant movement routes and reserved forests. (This BG line was inaugurated on 20th Nov. of 2003.) 13 Predominant among which are;

1) Mahananda Wildlife Sanctuary,

2) forests of Kalimpong Forest Division,

3) forest tracts of Tondu (Chalsa) between Chapramari Wildlife Sanctuary and Gorumara National Park,

4) Diana reserve forest under Jalpaiguri Division including Moraghat and Bannarhat area (Rethi –Moraghat corridor)

5) Jaldapara Wildlife and

6) Buxa Tiger Reserve.

The two separate sectors are (1) through the forest and (2) other track passing outside the forest area through Falakata

Here, in N.B., Rail alone has caused the death of 71 elephants despite its status as an endangered species under the provision of schedule I of Wildlife (Protection) Act, 1972 (As per record available form 1974) (Das2015). One of the most important direct losses of Jalpaiguri's rich forest is caused by the unscientific and illegal mining activities in the Sub-Himalayan areas of this region, West Bengal and adjacent Bhutan. Good forest lands have been greatly destroyed either by bank failure or by shifting river courses or due to elevation of river beds. An excessively high amount of dolomitic dust {Dolomite is a carbonate mineral of calcium magnesium carbonate $CaMg(CO3)2$} transported by air and river water accumulates on the forest floor and leads to a rise in the pH value of the soil. Alkalinity of the soil hinders the availability of phosphate to the plants. Non-availability of phosphate along with alkalinity is found to be responsible for dying of valuable plant species. A study by (Sarkar 2012) showed that 850 ha. of good forest land was destroyed between 1993-99 as a result of which wild habitat including vegetation, soil, natural licks at the foothills is diminishing and river water is getting polluted. These factors are compelling the elephants to move farther down south, leading to highly frequent HEC.

In the Sothern West Bengal, Earlier, before the year 2000, the elephant herds used to enter into the paddy fields and rarely raided crops from the households' storage, but

in recent times, the same incidents have been occurring throughout the year. The higher frequency of HEC incidents during the rainy season probably stems from the maturation of crops (paddy, corn, beans, sugarcane) (Barua 2010). When the foods are available in the forest, the herds do not invade anywhere although the paddy fields are full of their favourite foods when the herds have faced much food crises in the forest, then the herds raid the paddy from the fields to fulfil their huge calorific demand. Sometimes, when the foods are not sufficient in the forest and agricultural fields, then the herds enter into the villages and raid foods from the households' storage. During the times of searching and raiding foods, the herds sometimes break the walls of the houses, mud houses, paddy, farm storage, etc. In the autumn and the winter seasons, damage, caused by the herds, are greater than the other seasons. Because in these two seasons, there are more amounts of agricultural products available in the farmers' fields. In these seasons, both the local and migratory elephants invade the fields.

In the winter seasons, the horticultural crop practices take centre stage. There are different types of vegetables like potatoes; the farmers cultivate brinjals, cabbages, cauliflowers, etc. As the vegetables are short-term profitable products so, when the herds eat the vegetables and destroy the fields, the farmers face trouble because they cannot replant the vegetables as the seeds become unavailable and the climatic conditions unsuitable for those particular vegetables. The farmers face multiple losses like damage of production, loss of time, seeds, amount investments, and even their hard work. In the rest of the seasons, the fields are affected by the local elephants; those that come from the adjoining Ajodhya hills, and from Jhargram area of Paschim Midnapur. In the intervening cropping periods, the herds attack commercial cash crops like jackfruits, sugarcane, and bananas, etc.

The agricultural loss is greater not for eating but for roaming of the elephants in the fields when the farmers apply unscientific practices for driving out the herds. During the day, evening or night when the herds come from the nearby forests and enter into the cropping fields, the farmers are often confused to see the massive gathering of the elephant herds.

Reasons for conflicts between Human and Elephant:

1. Forests here are mostly in patches, intercepted with habitation and agriculture field.

2. Elephant migratory route are gradually encroached by construction resulting in invention of new route for the elephant causing extensive damages.

3. Plantation forests are mainly under monocrop i.e. under eucalyptus / which are not suitable as food for elephant.

4. In some of the forest patches ground floras are not available to be used as food for elephant.

5. Composition of agricultural crops are such that they are very much palatable and easily available for elephant and for that reason elephant frequently raided the crop field.

6. They found suitable habitat here causing extensive damages throughout the year.

Chapter 4

Impact of the Human Elephant Conflict on People's Wellbeing in West Bengal

4.1 The economic impact of HEC affects agricultural communities who live near or in elephant areas; it also affects government agencies tasked with the responsibility for wildlife and the forest environment, as well as those agencies responsible for rural communities. This impact includes visible costs due to damage to crops, damage to structures such as houses or storage buildings, to fences and other equipment, as well as costs of compensation – which may be paid not only for loss of crops but also for injuries and/or loss of human life. India spends about 25 cr. per year on compensation for HEC (AsERSM, 2017). That amount may continue to rise across West Bengal elephant range countries as development and prosperity have moved people away from subsistence farming and more towards commercial farming where a higher value is put on agricultural losses. There are also hidden costs of HEC that are often overlooked; the daily stressors due to a constant fear of conflict with elephants can lead to diminished productivity and to health conditions. Costs to the farmers of resulting health care are often not considered. Additionally, the day-to-day costs of crop protection (torches, batteries, fuel, fire crackers, etc.) further cut into resources that could have been better used for improving the quality of life of the farmers. The implications of these losses on the quality of life are generally not measured when economic costs of crop protection are being considered.

Not only in terms of life loss and injuries, these conflicts do cause a huge economical loss. Each year Central and State government must pay a huge amount of money to pay ex-gratia relief to the affected for wildlife depredation. In the latest State forest reported it was reported that Buxa Reserve division paid the highest compensation (Rs. 4502897), followed by Baikunthapur (Rs 4165646) while, Coochbehar wildlife division (Rs 23670) paid the least. Human casualties due to human animal conflict have been ever increasing since last few years. Among different interactions, highest casualties have taken place in conflicts between human and elephant. The extent of human casualties in last five years (2011-2016) in West Bengal is depicted. (Chakraborty 2017)

State Government to provide assistance and to compensate for the losses, the number of which are increasing day by day, had issued G.Os, latest rate of which is given in Table No.1

Table 4.1 PRESENT RATE OF COMPENSATION AND EX-GRATIA

Category	**COMPENSATION / EX-GRATIA**
Person Killed by Wild Animal	Rs.1,00,000.00
Person injured by Wild Animal	Free medical treatment in Govt. Hospital
Person against permanent disability	Rs. 50,000
Person against loss of single limb	Rs. 7,500/- + free medical treatment in Govt. Hospital
Damage to crops by wild animals	Rs 7500/- per ha
Damage to live- stock by wild animals	Rs.100/-to Rs.700/- Subject to actual quantum of loss
Damage to huts / Bldg. caused by wild animals	Total damage for kuchha house=3,000/- Partial damage for kuchha house=1,500
Damage of semi-permanent house (G.I. sheet or Tali roof)	Upto Rs. 5,000/-
Damage of permanent house with RCC roof	Upto Rs. 10,000/-

Source: Government of West Bengal Finance Department Audit Branch

Compensation Paid in Northern West Bengal

A study of human deaths in S W Bengal by wild elephants during the last 5 years and ex-gratia relief / compensation paid (Table 2) during the last three years clearly points to the fact that during 2010 – 2011 the number of elephants had suddenly increased to a considerable extent leading to increase in conflict, rise in human death and damage of crop and property and consequent rise in ex-gratia/compensation amount.

Table 4.2 COMPENSATION PAID FOR ANIMAL DEPREDATION IN NORTHERN WEST BENGAL

Year	Person killed (No.)	Person injured (No.)	Comp paid for human life & injury. (Rs)	Livestock killed/ injured (No.)	Comp paid for livestock killed (Rs)	Hut damage (No.)	Comp paid for hut damage (Rs)	Crop damage (Ha.)	Comp paid for crop damage (Rs)	Total Comp (Rs)
2011-12	19	57	1677257.82	10	7000	1574	1809154.00	1995.98	6306987.38	9800399.20
2012-13	25	52	3557933.91	35	24490	1995	1898710.00	2551.26	11989891.35	17471025.30
2013-14	22	60	2622092.18	21	14600.00	1385	1899872.00	2212.88	11138445.00	15675009.20
2014-15	38	51	4029033.00	4	6000.00	1401	1699568.00	3388.36	17573781.00	23308382
2015-16	26	44	3000,531.00	18	900	1698	18,10,208.0	3094.60	1,70,88,754.00	21900393

Source: State Finances Government of West Bengal annual report (2011-2016)

Compensation Paid in Sothern West Bengal

The records show that during the year 2011–2012 there have been increased incidences of crop and hut damage, injury and human death. It was learnt that during this year there had been good rainfall and consequently a good crop. This led the elephants to stay back for a longer period leading to more interaction with humans and more overall depredation. This trend can also continue in the future and if such damage and loss of life continues the forest staff would be under tremendous pressure with risk of assault. It will also be difficult to save the elephants from the mob fury.

Table 4.3 Payment of Ex-gratia Relief for elephant depredation in South West Bengal during the last 5 years.

Year	Person killed (No.)	Person injured (No.)	Comp paid for human life & injury. (Rs)	Livestoc k killed/ injured (No.)	Comp paid for livestock killed (Rs)	Hut damage (No.)	Comp paid for hut damage (Rs)	Crop damage (Ha.)	Comp paid for crop damage (Rs)	Total Comp (Rs)
2011-12	15	45	1487256.82	0	0.00	1194	1629154	1935.98	6046939.38	9163350.2
2012-13	22	50	3568933.91	37	24500	2041	1941710	2453.26	11589771.35	17124915.26
2013-14	24	63	2613092.18	22	14600	1399	1805872	2332.88	12138446.00	16572010.18
2014-15	40	55	4030033.00	3	6000	1359	1716568	3488.36	18573501.00	24326102
2015-16	23	48	23,94,531.00	16	900	1735	1777208	2994.60	1,60,88,851	20658876

Source: State Finances Government of West Bengal annual report (2011-2016)

Impact on quality life of people

HEC negatively impacts human well-being. While the immediate and most visible impacts are loss of crops, property damage, physical injury or loss of life to people sharing space with elephants, there is little information about the less visible impacts of HEC, particularly on the psycho-social well-being of rural, agricultural communities (Jadhav & Barua, 2012). In India, approximately 500,000 families across the country are affected by HEC (Rangarajan 2010) and 10,000 – 15,000 houses are damaged annually by elephants (Bist, 2006). These affected families mainly rely on agriculture; as a result of HEC they suffer not only loss of crops but also the loss of already harvested crops when storage granaries or houses are damaged by elephants. The loss of income or food is compounded by a loss of health, both psychological and physical, brought on by the stressors of guarding fields and homes. Elephants generally raid at night, leading the farmers who are guarding their crops to suffer from a significant lack of sleep. The ensuing fatigue often means less productivity during the day. (Jadhav and Barua 2010) study illustrates how the psycho-social consequences of HEC significantly impact people's well-being. These consequences

are not straightforward outcomes of human–elephant encounters; conflicts aggravate pre-existing problems in local communities such as poverty and mental health, while fatalities from elephant attacks during HEC result in domino effects that multiply problems. The authors argue that further studies into the less visible impacts of HEC on human physical and psychological health and well-being are needed to better connect ecology, culture, and clinic.

CHAPTER 5

Conclusion

From east to West there are 6 protected areas, while 5 of them fall in Jalpaiguri district and only one on Western side fall in Darjeeling District. On the extreme eastern side Buxa Tiger Reserve is the largest protected area and specially created for the conservation of tiger and its ecosystem. This protected area has an area of 117 sq.km as National Park and around 250 sq.km as Wildlife Sanctuary. Further, an area of 390 sq.km act as buffer for controlled forestry and human activities. Towards West of Buxa located is Jaldapara with an area of 216 sq.km. The focal animal for conservation here is the Rhinoceros. Further west located are three protected areas: the Gorumara, Chapramari and Neora Valley Complex which have their area contiguous with each other. Gorumara and Neora Valley are having status of National Park with an area of 80 sq.km and 88 sq. km respectively. Chapramari is a small Wildlife Sanctuary with an area of 10 sq. km linking Gorumara and Neora Valley in between. Elephants only utilizes the lower reaches of Neora Valley National Park. The Western most protected area is the Mahananda Wildlife Sanctuary falling in Darjeeling district with an area of roughly 130sq.km. Therefore, in all 1281 sq.km area falls under Protected Area coverage for elephants in North Bengal. Balance area falls under entire Jalpaiguri & Baikunthapur Divisions, part of Kalimgpong & Kurseong Divisions where conflicts are more severe.

There has been constant migration of elephants from Jharkhand region to south of Bengal due to which conflicts between man and elephants have increased. To encounter this problem state govt. has decided to form elephant rehabilitation centre in both north and south Bengal where elephants will be given natural environment and return of migratory elephants back to Jharkhand will be ensured.

Conflict is inevitable, so we must minimize through adaptation for co-existence. Keeping in mind the current status of protected areas, the following strategies may be adopted in order to better harness the potential for conservation activities and most importantly to mitigate conflict to an extent:-

- Requirement of elephant squad or Quick action force with vehicles and modern equipments involving JFMCs and better veterinary facilities with mobile unit.
- Electric fencing in proper working condition to avoid human elephnats conflicts.
- Agriculturally the eastern bank of Kangsabati River is very fertile and most of the land is under crop throughout the year providing food to the elephants throughout the year. So, farmers can go for alternative crop cultivation and public awareness camps by government will be helpful to minimise the conflicts.
- Actions to avoid collision with Rail Construction of underpass in highly vulnerable areas, watch towers and removal of cultivation near railway tracks should be incorporated.
- Formation of Elephant Movement Coordination Committee (EMCC), which was not there earlier which will monitor elephant's movement in both north and south Bengal.

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