4TH MANAGEMENT PLAN OF JALDAPARA NATIONAL PARK

[2018-2019 TO 2027-2028]

Divisional Forest Officer, Jaldapara Wildlife Division, Coochbehar
Wildlife Wing, Government of West Bengal

Government of West Bengal
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No. C-17027/02/2019 **Date. 29.04.2019**

To:

The Divisional Forest Officer
Jaldapara Wildlife Division
West Bengal.

Sub: Management Plan of Jaldapara National Park-revised approval .

Ref: This office memo No.1393/WL/2W-50/2018 dt.06.06.2018 & 4801/WL/2W-68(Pt.II) dt.27.02.2019

In partial modification of this office memo No. 4801/WL/2W-68(Pt.II), the 4th Management Plan of Jaldapara National Park shall be effective for the period from 2018-2019 to 2027-2028.

You are requested to please send printed and suitably bound copies to this office for our office record and also circulate to all concerned offices.

Principal Chief Conservator of Forests, Wildlife
& Chief Wildlife Warden, West Bengal.

No. C-17027/02/2019 **Date. 29.04.2019**

Copy forwarded for information to The Chief Conservator of Forests, Wildlife (North) Circle, West Bengal.

Sd/- R. K. Sinha

Principal Chief Conservator of Forests, Wildlife
& Chief Wildlife Warden, West Bengal.

Ravi Kant Sinha, IFS

सत्यमेव जयते

Principal Chief Conservator of Forests, Wildlife & Chief Wildlife Warden, Government West Bengal

FOREWORD

Conservation of biodiversity has always been in top priority in West Bengal as is evident from the fact that nearly 39.5 % of the recorded forest area of the state have been notified as protected areas (National Parks or Sanctuaries or Tiger reserves). Mere issues of notification cannot sustain the efforts of conservation. A well laid-out management plan, based on field experience and scientific knowledge, is a precondition for management and development of the protected areas.

The current Management Plan of Jaldapara National Park has been prepared by the serving park managers as routine practice of revising Management Plans after fixed intervals of ten (10) years as per existing wildlife management policy of the country, under the guidelines of officers of Wildlife Wing, Department of Forests, Government of West Bengal. The tenure of third management plan for Jaldapara National Park ended during FY 2016-2017 and it was extended upto 30th September 2018.

I am sure this 4th Management Plan of Jaldapara National Park will not only be a readily useable document for all concerned, but also act as guide for preparation of comprehensive management plan for protected and other Forest areas in future.

(Ravi Kant Sinha)

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Ujjal Ghosh, IFS

Chief Conservator of Forests
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PREFACE

Management Plan of a protected area is the most important guide book for working field officers. Management issues for any PA keep changing with time and response of the natural eco systems to management practices are lessons for correcting future course of action. Jaldapara National Park has been scientifically managed in terms of current National policies of wildlife management for three (3) management plan periods starting from 1980-1981 to 2016-2017. Whereas management has achieved its objectives of providing effective protection to the flagship species One Horn Rhino during the stated period, new challenges have come up which need be addressed during times to come.

This present Management Plan of Jaldapara National Park is a result of continuous assessment of past management practices, their outcome, emerging challenges, setting objectives, evaluating constraints in achieving these objectives and developing strategies and for next decade. Use of GIS technology in assessing nature response to different management practices coupled with extensive field visits to assess habitat qualities vis-à-vis habitat use by wildlife has been the basis of decision making in the current exercise.

A multistage consultative approach including the experiences ranging from field level to the highest administrative level of the State has been adopted in formulation of this plan. In the first stage Park managers developed a preliminary management plan report and presented before a team of officers including the Additional Chief Secretary Forests, Chief Wildlife Warden, Chief Conservators of Forest and all Divisional Forest Officers of Wildlife Wing in North West Bengal. A detailed discussion was held on the inception plan for the draft management plan by the field managers at NIC Sukna on 19/04/2018 and final layout for the management plan was drawn up. Draft management plan was drawn up by the field managers on the basis of this layout and this draft was presented before the CWLW and a team of all officers of wildlife wing at Mangrove Interpretation Centre (MIC) Sajnekhali on 20-07-2018.

The serving field officers namely Sri Kumar Vimal, IFS, Divisional Forest Officer, Jaldapara Wildlife Division, Sri Bimal Debnath, WBFS, AWLW and Sri Manish Kumar Yadav, WBFS, AWLW have put their sincere efforts in drafting this management plan. Consultative approach has ensured evaluation of the approach and providing very useful inputs by large number of experienced officers at several stages resulting in a very good guide book for the PA. All maps used to help the readers to have a better understanding of the contents and their context have been made in ArcGIS Platform supported by Satellite Images taken from Sentinel-2, DEM Data from SRTM and Radar Image from Sentinel-3 by Sri Dolon Sarkar, Technical Assistant (Computer) to the Office of the AWLW, Jaldapara National Park.

(Ujjal Ghosh)

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CHAPTER-1

CHAPTER-1
INTRODUCTION TO THE AREA

1.1 NAME, LOCATION, CONSTITUTION AND EXTENT

Jaldapara National Park (erstwhile Jaldapara Wildlife Sanctuary) is situated at the foothills of Eastern Himalayas in the Alipurduar District of West Bengal, between coordinates 26°50'43.20"N 89°13'36.76"E to 26°31'23.02"N 89°25'54.52"E in the biogeographic zone 7B (lower gangetic plain).

It had been placed on the wildlife map of India because of the presence of the Great Indian One Horned Rhinoceros (Rhinoceros unicornis). The National Park is famous for its rich bio-diversity and Eco-Tourism. Major part of the National Park is in the flood plains of the river Torsa and other small rivers & rivulets, which have created large tracts of grasslands sustaining a population of Great Indian One Horned Rhinoceros with other animal like Elephant, Guar, Sambar etc. The areas such as Titi Forest block, Bania Forest block, Mendabari Forest block are very rich in flora and fauna.

Forests of the region, which were earlier a part of the Buxa Forest Division, were being managed for commercial purposes till 1929. But due to the presence of pre-historic Rhinoceros, the Bengal Rhinoceros Preservation Act came into force in 1932 providing protection to the one-horned Rhinoceros in this area. The area was first declared as a "Game Sanctuary" in the year 1941 vide Govt. of Bengal Notification No. 10549-For, dated 13th November, 1941 (Annexure-1) read with amendment Notification No.5238-For, dated 3rdApril 1943. In the Year 1951, the area was transferred to the newly created Cooch-Behar Forest Division with Head Quarter at Nilkuthi CoochBehar. An area of 99.51sqkm was being managed under Sanctuary Working Circle in the two subsequent Working Plans (1962-63 to 1971-72 and 1972-73 to 1981-82) of Cooch Behar Division. The Game Sanctuary was re-notified as Jaldapara Wildlife Sanctuary in 1976 vide Govt. notification No. 5404-For Dated 24.6.1976 (Annexure-2) issued under section 18 of the Wildlife (Protection) Act, 1972 and its area was increased to 115.53 sqkm. The then sanctuary was transferred to the administrative control of the Wildlife Division-II on 10.2.1982 with Head Quarter at Jalpaiguri. Another 100.98 sqkm area more was added to the then Sanctuary from Cooch Behar Forest Division vide Govt. Notification No. 7245-For Dated 31.8.1990 (Annexure-3) making total area of the Sanctuary as 216.34 sqkm comprising of 12 blocks and 45 compartments. However, management of the extended area (100.98 sqkm) was under the control of Cooch Behar Forest Division till November 1995, when the entire Sanctuary came under unified control of Cooch Behar Forest Division with Head quarters at Cooch Behar, vide Govt. Notification No. 4983- for dated, Calcutta, the 25th September 1995 (Annexure-4).

In 2012 the then Jaldapara Wildlife Sanctuary was legally notified as Jaldapara National Park vide government notification no: 973-For/FR/O/IIM-44/11 Dated: 27/04/2012 under section 35 of Wildlife (Protection) Act,1972 (Annexure-5). Area statement of the National Park is stated in Annexure-6. At present the National Park consists of Eight (8) Territorial Ranges, one Eco-Tourism Range, one Elephant Squad Range, one Caretaker-Tourist Lodge, Twenty-four (24) Beats, Five (5) Camps and Twenty-one (21) Watch Tower. Detailed list of Range, Beat, Camp & Protection watch Tower given in Annexure-7. The History map of Jaldapara National Park is given in Figure-1.

1.2 APPROACH AND ACCESS

The National Park is located near Madarihat town, by the side of National Highway-31C that runs between Siliguri and Alipurduar. Bagdogra Air Port, which is close to Siliguri, can be reached by air from Kolkata, Delhi, Bengaluru, Chennai and Guwahati. From Siliguri, Madarihat can be approached by rail as well as by road, distance being about 130 km. The National Park can also be approached by road from Hasimara, Falakata and Alipurduar and the respective distances are 5.00 km, 22.00 km and 40.00 km. The Divisional Head Quarter of the National Park is in Cooch Behar which is linked by train with Delhi, Kolkata, Bengaluru, Chennai and Guwahati and by air with Kolkata. Nearby Broad Gauge railway stations are Hasimara & Falakata which are 5 km and 22 km away respectively from Jaldapara National Park. Location map of Jaldapara National Park is given in Figure-2.

1.3 SIGNIFICANCE

1.3.1 General Significance

Jaldapara National Park has great ecological significance as it forms gene pool reserve for the Great Indian One-Horned Rhinoceros outside Nepal and Assam and safeguards against any possible extinction of wild Rhinoceros population elsewhere due to unforeseen events. Existing population of Rhinoceros in Jaldapara National Park is 237 (2019 estimation) which is about 7 % of the global population of the species, but there is a fair chance of increasing the population through proper management and sustaining existing protection measures.

Rhinoceros population in Jaldapara National Park is a remnant of the erstwhile population inhabiting Indo-Gangetic plains, which got geographically isolated due to fragmentation of habitat. Jaldapara National Park contains one of the largest tracts of Savannah grassland now left in West Bengal although large parts of said grassland have been lost due to extension of agriculture or other development activities. Savannah grassland of Jaldapara harbours some other important grassland fauna such as Hog deer (Axis porcinus), Hispid hare (Caprolagus hispidus), Bengal florican (Eupodotis bengalensis). The Swamp deer (Cervus duvauceli) & Wild buffalo (Bubalus bubalis) were found in the National Park till the last century, but now they have become locally extinct.

1.3.2 Ecological Significance

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1.3.3 National Level Significance

Jaldapara National Park lies in the biogeographical zone 7B (Lower gangetic plain) as recognized by Rodgers and Panwar, 1988 (Wildlife Institute of India, Dehra Dun). Significance of Jaldapara National Park in the national context lies in presence of the following species which are included in Schedule-I of the Wildlife (Protection) Act, 1972 and have been provided highest protection at national level.

Animal of national significance

SL No	Name	WL(P) Act. 1972 Status
1	Rhinoceros (*Rhinoceros unicornis*)	Sch I (Part I)
2	Gaur (*Bos gaurus*)	Sch I (Part I)
3	Elephant (*Elephas maximus*)	Sch I (Part I)
4	Sloth Bear (*Melursus ursinus*)	Sch I (Part I)
5	Tiger (*Panthera tigris*)	Sch I (Part I)
6	Leopard (*Panthera pardus*)	Sch I (Part I)
7	Hog badger (*Arctonyx collaris*)	Sch I (Part I)
8	Hispid hare (*Caprolagus hispidus*)	Sch I (Part I)
9	Leopard Cat *(*Prionailurus bengalensis*)*	Sch I (Part I)
10	Fishing Cat *(Felis viverrina)*	Sch I (Part I)
11	Indian Pangolin (*Manis crassicaudata*)	Sch I (Part I)
12	Chiness Pangolin *(Manis pentadactyla)*	Sch I (Part I)
13	Great Indian Horn Bill *(Busrceros bicornis)*	Sch I (Part III)
14	Indian Pied Horn Bill *(Anthracoceros malabaricus)*	Sch I (Part III)
15	Pea Fowl *(Pavocris cristatus)*	Sch I (Part III)
16	Ospery (*Pandion Haliatetus)*	Sch I (Part III)
17	Bazas *(Aviceda geordone)*	Sch I (Part III)
18	Bengal florican (Eupodotis bengalensis)	Sch I (Part III)
19	Hill Myna (G*racula religiosa)*	Sch I (Part III)
20	Kaliz Pheasant (*Laphurs leucomelana)*	Sch I (Part III)
21	Python (*Python reticulatus*)	Sch I (Part II)
22	Indian Shoft-shelled Turtle *(Lissemys punctata punctata)*	Sch I (Part II)
23	Large Bengal Monitor Lizard (*Varanus bengalensis)*	Sch I (Part II)

1.3.4 Significance at International Level

Significance of Jaldapara National Park in the International Context lies in the fact that it provides shelter and protection to various species of wildlife included in Red Data Book (RDB) of IUCN and Appendices of CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora).

Animal of International significance

SL No	Name	RDB Status	CITES Status
1	Rhinoceros (*Rhinoceros unicornis*)	EN	I
2	Gaur (*Bos gaurus*)	VU	I
3	Elephant (*Elephas maximus*)	EN	I
4	Sloth Bear (*Melursus ursinus*)	VU	II
5	Tiger (*Panthera tigris*)	EN	I
6	Leopard (*Panthera pardus*)	NT	I
7	Hog badger (*Arctonyx collaris*)	NT	
8	Hispid hare (*Caprolagus hispidus*)	EN	I
9	Hog Deer *(Axis porcinus)*	EN	I
10	Leopard Cat *(*Prionailurus bengalensis*)*	LC	I
11	Sambar *(Cervus unicolor)*	VU	
12	Fishing Cat *(Felis viverrina)*	EN	II
13	Jungle Cat *(Felis chaus)*	LC	II
14	Indian Pangolin (*Manis crassicaudata*)	NT	II
15	Chinese Pangolin *(Manis pentadactyla)*	EN	II
16	Indian Pied Horn Bill *(Anthracoceros malabaricus)*	NT	
17	Bengal florican (Eupodotis bengalensis)	CE	
18	Giant Squirrels (*Ratufa bicolor)*	NT	

1.3.5 Significance at local level

Jaldapara National Park has gained more significance in view of the serious depredation caused by the elephants in North Bengal and it consequent need to setup Managed Elephant Ranges (MERs) as envisaged in the Asian Elephant Action Plan of the IUCN. Some of the forest blocks of the National Park such as Bania, Mendabari, Titi, Hasimara and Torsa provide excellent Elephant habitat. Asian Elephant can stay inside the forests for longer duration if sufficient food, water and cover are provided and biotic pressure is reduced. This, in turn, will automatically reduce Elephant depredation incidences. During last few years, wild elephants are reported to be staying for much longer duration in Jaldapara National Park, which is quite unlike previous years when Elephant herds seldom stayed inside the National Park. The national level Action Plan on Project Elephant has identified Jaldapara National Park as part of the extended Elephant Reserve of Buxa-Manas Protected areas and subsequently declared as a part of Eastern Duars Elephant Reserve.

Though Jaldapara National Park is famous for Great Indian One Horned Rhinoceros (GIOHR), yet it provides excellent habitat for the Bengal Tiger (Panthera tigris). Both food and cover are adequately available for the large carnivores and it acts as integral ecological part of Buxa Tiger Reserve landscape.

1.3.6 Scientific significance

Jaldapara National Park provides excellent habitat of Rhinoceros, which generates government revenue and provides opportunity to study the ecology, territorial & social behavior, habitat requirement, food habit, genetics and reproductive biology of Rhinoceros. Moreover, Jaldapara National Park offers great scope for study of Asian Elephant, Gaur (Bos gaurus) and Leopard (Panthera pardus). It is also very rich in wild flora. It contains a total of 585 identified species of flowering plants which belongs to 429 genera and 111 families. Out of which, 71 are grass species, 19 orchid species and 47 endangered plant species (29 genera) having conservation importance. Moreover, it contains many Pteridophytes, Bryophytes, Algae, Fungi and Lichens. Detailed list given in Annexure-8.

This National Park has 33 species of carnivores & herbivores, approximately 246 species of birds, 29 species of reptiles, 8 species of turtles, 88 species of fishes and a host of other micro fauna. Detailed list of fauna in Jaldapara National Park given in Annexure- 9.

1.3.4 Significance at International Level

Due to eco-tourism activities in Jaldapara National Park local people are being benefited economically. Moreover, for conservation of Rhinoceros (Rhinoceros unicornis) and the National Park, funds flow from various sources and a lot of development activities are going on inside as well as in the fringes of the National Park, which generate employment opportunities and economic development for the local people. The Eco Development Committee (EDC) members get 40% share from the revenue generated from Eco tourism. The share money is utilized by the villagers for community development works and human-wildlife conflict mitigation.

1.3.8 Anthropological & Cultural Significance

The ethnic Toto tribe has their home in Totopara- a village that lies in the extreme north boundary of the National Park adjoining Bhutan border. Their custom and culture have been a subject matter of great anthropological interest. Currently, this remote village has a small remnant population of 1,597or so. Totos, who have preserved their distinct identity till now though gradually are being swamped by the mainstream of development.

Bania ruins, the remains of historical place and a big pond in Bania block, indicate the existence of an ancient settlement and culture in this region. Local folks believe that the 'Nala Raja' of the epics lived here. Other sources indicate that the "Bania Ruins" or "Nalrajar Garh (Fort)" as it is called, was the place where soldiers of the Maharajahs of Coochbehar stayed and the river transport system over Bania River was carried out to materialize anti-invasion techniques to guard the palace from King of Bhutan.

Dayamara Caves, a beautiful stalactite stalagmite cave exists on the right flank of Dayamara river in Titi- 1 Compartment within Lankapara Range. It is a part of Shiwalik Himalaya and formed of calcium deposits. The local mythology is very much vocal about the cave. According to the mythology two primitive tribes namely the Toto & the Daya were living in the area (Toto still live in the area). These two tribes very often tried to establish their dominance over each other until the decisive war beside the cave when the Dayas lost the battle and fled away to Bhutan. From that day the river and cave are known as Dayamara. Now every year during 'Holi' the local tribal people worship the cave.

CHAPTER-2
BACKGROUND INFORMATION AND ATTRIBUTES

2.1 BOUNDARIES

2.1.1 Legal Boundaries

The National Park is demarcated on the north by international boundary with Bhutan and Totopara Village (6.76 km). Detailed list of list of International Pillars is given in Annexure-10. It is rather difficult to categorically demarcate the southern boundary of the National Park since it is in the shape of a trouser and the two legs of the trousers point towards the southern side.

However, southern boundary of the National Park may be taken as northern boundary of Patlakhowa Mouja (JL No. 18), Purba Kathal bari (JL No. 17), eastern and western boundary of Sirubari (JL No. 16) Suripara (JL No. 14), eastern boundary of Sidhabari (JL No. 13), Munsipara (JL No. 8), eastern & northern boundary Nutunpara (JL No. 11), western boundary of Jaldapara (JL No. 10), Pradhan para (JL No. 9), Salkumarhat (JL No. 7), East and West boundary of Kalabaria (JL No. 6) Jogendranagar(JL No. 5), North Western boundary of Mejbill (JL No. 3), Northern boundary of Bangsidharpur (JL No. 62) and Kadambini TG (JL No. 61).

Eastern side of the boundary is formed by Jaigaon(JL No. 27), Mechiya Basti (JL No. 25), Dalsingpara Tea Estate (TE) (JL No. 23), Beech TE (JL No. 21), Malangi TE (JL No. 20), Par-Malangi (JL No. 20), Subhasini TE (JL No. 02) and forests of Barodabri 1A,3, 6A, western & southern boundary of Barodabri 7A, southern boundary of Barodabri 8, Mendabari - 1 & 2 compartments, western boundary of Uttar Mendabari (JL No. 9) & Dakshin Mendabari (JL No. 10), northern boundary of Bania 5, 6, 7, northern & western boundary of Bania 8A, western boundary of Chilapata 3A and 4A forest compartments.

Western side boundary of the National Park is the eastern boundary of Kunjanagar (JL No. 58), Lachmandabri (JL No. 57), Shibnathpur (JL No. 56) Khowchandpara (JL No. 54), Purba Madarihat (JL No. 50), Umacharanpur (JL No: 53), Purba Madarihat (JL No. 50), Madhya Madarihat (JL No. 47), Uttar Madarihat (JL No. 46), Purba Khairbari (JL No. 36), Uttarkhairbari (JL No. 37) and Hantapara resume land, Garganda resume land, Titi extension and Lankapara resume land forest compartments.

2.1.2 External Boundaries

External boundary of Jaldapara National Park is same as Legal boundary as mentioned in para 2.1.1.

The Administrative jurisdiction of the whole National Park lies within Alipurduar District, extended over four Civil Blocks, viz. Alipurduar I, Kalchini, Madarihat-Birpara and Falakata. Demarcation of the external boundary of the National Park is of immense importance to avoid the encroachment problem and the National Park is not engulfed by densely populated human habitation in the surroundings. In field practice, normally the boundary demarcation is done by some natural features which are generally coherent with geographical features like riverbed, mountain ridges. which ultimately creates administrative problem in the long run. The external boundary of the National Park are clearly demarcated with Boundary Pillars made up of stone-based pyramid like conical structure called CAIRN or with the RCC pillars which have a permanent impression of the boundary details.

2.2 GEOLOGY, ROCK AND SOIL

The Geological formations normally encountered in this tract are one of sub-recent to recent origin and comprise of the following: -

A. Alluvial Formation – It is mainly represented by silt and clay without much gravel or boulder and constitutes the flat plains to the south, under extensive cultivation, outside the National Park.

B. Terai Formation – The formation is transitional in character between the Alluvial formation in south and Bhabar formation the north. It is better stratified and has more clay than in the Bhabar formation.

C. Bhabar Formation – This formation is represented by loose gravels, boulders and river deposits that are highly variable in composition and texture. This is also known as older alluvium. Sub-surface data indicate that clay is mixed in varying proportion and demarcation of distinct clay bed cannot be made. Except during monsoon, the formation is apparently devoid of water and the streams carrying volume of water disappear in the porous structure of the formation and reappear towards south in the form of springs.
There is one cave present at Titi-2b compartment called Dayamara Cave; it is recent formation of stalagmite and stalactite.

D. Ground Water Resources – Since most of the area is covered with loose sand and gravel, there is immense potentiality for the development of ground water in the region. Ground Water occurs both under water table conditions as well as in deep aquifers. Slope of water table generally coincides with the surface slope, which is a south ward. At places, the water table slope intercepts the ground surface forming springs. Gradient of the water table is 'very steep in the Bhabar Zone (5.6 meters per km.), while it is quite gentle' in the alluvial plains further southwards (0.4 meters per km.) Lithological logs of bore holes drilled both in the Bhabar as well as the alluvial zones indicated the presence of good aquifers consisting of gravels, boulders and coarse sand up to a depth of 75 meters in the Bhabar Zone. In the zone depth of water is from 7.0 meters to 10.5 meters, while in the Terai and alluvial country further south, it varies from 2.5 to 5.5 meters. Chemically, water from shallow zones is suitable both for drinking and irrigation purposes. In Bhabar Zone, however, dug wells dry up during dry seasons due to considerable depression of water table. The northern part of the tract has a geological formation known as Bhabar formation, which is superficially devoid of water, except during the monsoon seasons. Water carried by streams sinks into porous Bhabar tract and reappear further southwards in form of springs. The Perennial streams and wells form the main sources of water supply for labour and plantations. Water table of locality has been furnished in Annexure-11.

2.3 TERRAIN

Configuration of the National Park is undulating, and elevation varies between 46 m to 1001 m. Titi Forest Block which being in hilly terrain is steep and precipitous, having elevation ranging from 116 m to 1001m above mean-sea-level. Direction of flow of water is from north to south.

2.4 CLIMATE

2.4.1 Rainfall Pattern And Distribution

South West monsoon is the main source of rainfall. Maximum rainfall occurs from mid June to September, July and August are wettest months. March receives maximum of winter rain. December is the driest month with minimum rainfall. Pre-monsoon showers or thundershowers accompanied by hail occur in the months of April and May. Average annual rainfall is about 371.4 cm. for last 9 years, increasing a little towards the north and decreasing towards the south. In recent years monsoons have been some what irregular.

In July 1993, heavy flood occurred which damaged lots of vegetation and caused other major physical damages. In the year 1994 Jalpaiguri district received much less rainfall. Again, in July 1996, Jaldapara National Park was partly flooded by overflowing rivers like Hollong, Chirakhawa, Torsa and some other rivers streams flowing through the National Park. During August 2014 western stream of River Torsa started flowing through Sisamara river and to again join Torsa River down south near park boundaries and cutting off Malangi-1,2,3 and CP-2 compartments from the main land of the Park. In August 2015 flood, embankment constructed in the western bank of Torsa river near Siltorsa Watch Tower was washed away along with the then Siltorsa Watch Tower. Through this junction, the National Park receives plenty of flood water which inundates areas of Jaldapara-2, 3 and Malangi – 1. Rainfall data for last 10 years is given in Annexure-12.

2.4.2 Temperature-Monthly Data and a Summary of Pattern

The tract lies in the moist tropical zone. Its minimum temperature varies from 14oc to 26oc in the month of November and March respectively and maximum temperature varies from 27oC to 34oC in the month of April and October respectively.

In Dooars, there is an appreciable variation between day and night temperatures throughout the year and sometimes winter nights are severe. During the months from June to September, sultry heat prevails during day time and early part of evening, but the nights are usually cooler. Temperature data for last 10 Years is given in Annexure-13.

2.4.3 Humidity

Since the National Park is in the foothills of the outer Himalaya, it remains adequately humid throughout the year. Maximum relative humidity varies between 80% to 95%, during June to September and is seldom below 75% (during December to February).

2.4.4 Frost, Dew And Fog

From November to February nights are very cold with much frost and dew and in low lying areas a dense fog lingers often till after 9.00 A.M. From March to the onset of monsoon, fog and frost are absent but dew is deposited until April.

2.4.5 Wind Speed

From September to October wind blows pleasantly over foothills. During hot months from April to June, hot wind blows up to the foothills from 11 A.M. to 9 P.M. and air becomes dry with dust which is frequently interrupted by thunderstorms.
Severe storms sometimes accompanied by hail occur almost every year, especially in the months of April and May and sometimes in September and October. In 1942-1943 a cyclone of severe nature was recorded. During April almost every year, cyclones damage and uproot many trees in Torsa, Jaldapara, Hasimara and Barodabri blocks.

2.4.6 Wind Speed

There is no record of severe drought in Jaldapara National Park.

Jaldapara Watch Tower at JP-3 Compartment

2.5 WATER SOURCES

2.5.1 Nature and Distributions of Sources of Water

A. River System – The main river that flows through the National Park area is Torsa, rising and falling with great rapidity and changing its courses frequently. It becomes shallow and tame during dry season and remains full and fierce during monsoon. The beds of the river are rising continuously because of carrying down a large quantity of silt and detritus materials from hills and depositing the same in plains. Torsa originates in Chumbi valley of Tibet where it is known as "Machu". Then it flows through Bhutan and enters Indian Territory in Jaigaon, ultimately draining into river Brahmaputra. It is highly unpredictable in nature and has occupied various positions over a tract of about 15 km wide from West to East, by shifting its courses time and again in the last one and a half century. As a result, literally, the whole tract comprises of a network of dead streams with abandoned river beds and all these are designated alike after the name Torsa viz. "Mara" (dead), "Buri" (old), "Char"(deserted). Torsa has a perennial flow throughout the year. Malangi was used to be a small river but had a strong current and tended to shift eastwards during floods, but now it has merged with Torsa.

In 2014 floods, western most stream of Torsa river merged with earlier Sisamara Jhora and it became a distributary of River Torsa.

B. Other Rivers / Streams

I. Perennial water sources

Name of River / Jhora	Description
Hollong	Originates in Titi block (near Ballalguri village) and entering through Hasimara-1 it merges with Char-Torsa in Torsa block. Compartment-2. Its upper part gets dried up from January till May. This jhorsa use to be very good till 1990. But due to mining operation and illicit felling in upper catchment area, the tributary like Howri, Bangri, Titi become silted up and became shallow and wide and carrying dolomite to the Hollong River.
Bania	It enters the National Park and passes through Mendabari and Bania forest blocks and harbours very rich flora and faunal biodiversity.
Chirakhawa	It passes through Hasimara 1 & 2 Jaldapara 1, 4 & 5 and Torsa-1 (T-1) Compartments and ultimately falls into Buri Torsa at Torsa-1.
Bhaluka	It is a small water source and passes through Chiilapata-4 (CP-4). Compartment of Dhaidhaighat Beat and ultimately falls in to river Torsa.
Sanjoy	Mainly confined to Salkumar Block.
Kalijhora	Originates in Jaldapara-2 and falls into Torsa at Malangi-1 Compartment. It passes through the Jaldapara (JP-3) Compartment.
Nasika	Originates in JP-4. Passes through JP-5 and falls into Hollong at Torsa-1 Compartment.
Lodge	Originates in JP-5 and falls into Nasika Jhora in JP-5 Compartment

Name of River / Jhora	Description
Sukti	It is a small Jhora and passes through T-2 & T-3 Compartment and falls into Buri Torsa.
Buribasra	Another perennial water source passes through, Bania-4 and falls into Kaljani river.
Thandi	It passes through Bania-3 & 4 Compartments and falls into Buribasra
Malangi	It passes through Barodabri-1 & 2 Compartments.
Kulti	It passes through Barodabri-6 Compartments.
Gorumara	It passes through Mendabari-3 & Bania-4 compartment and ultimately falls into Kaljani river outside the sanctuary.

II. Seasonal Water Sources

Seasonal water sources retain water during rainy season i.e., from June to September

Name of River / Jhora	Description
Titi	It passes through Titi-1, 2 & 3 compartment and then flows outside the sanctuary.
Howri	Originates from hills of Bhutan traverse through Titi block and ultimately falls into Torsa. First one km. of the river contains water throughout the year. Rest retains water only during rainy season (June to September).
Dayamara	It is a small Jhora and it originates from Titi-1, passes through Titi-2 and falls into Howri at Jaigaon-1 Compartment.
Kalikhola	It originates in Titi-1, passes through Titi-2 and ultimately falls into near Ballalguri village.
Purnekhola	It is a small Jhora which originates from Titi-1, passes through Titi-2 and ultimately falls near Ballalguri village.
Sanjoykhola	It lies in Titi-1 block which is hilly in nature. So, during rainy season Many small Jhoras are formed but they are purely temporary and unpredictable. Many small springs are there which retain water throughout the year in small pockets.

2.5.2 FLOODS

Floods are nature's tool for habitat management and they play key role in creating new grassland and maintaining them. Floods occurred during 1952, 1954, 1964, 1968, 1993, 1996, 2001, 2014, 2015 were remarkable. Of these, 1968 flood was a physiographic landmark since this resulted in a total change in the course of river Torsa from below Hasimara bridge on LRP Road (NH – 31C). Before this flood, the main flow of the river Torsa was through the western arm of the National Park, presently known as "Char Torsa". But because of silt deposition after the flood, this channel of Torsa was completely blocked up and entire flow of the river entered into Siltorsa constituting only one course. This resulted in heavy flood in the forests of Bania, Chilapata and Barodabri blocks along course of Siltorsa. The National Park also benefited during heavy rains in second week of September in 1984. Heavy rains occurred on 19th July(992 mm) 1993 and 12th July 1996 and because of which the National Park got heavy flooding, which helped a lot for management of grassland, though road

connectivity was totally cut off due to washing out of wooden bridges and a few hog deer, chital, wild boar and python died. Ultimately all washed out bridges were rebuilt in the year 1994, 1996 and roads were repaired wherever required.

Extensive measures of protective works against the flood damage by river Torsa was done by the Irrigation Department ever since 1954. A protective embankment has been constructed near Deodanga(south of Chilapata-4 compartment) up to Bania-1 to provide protection to the forests of that area. To prevent river Siltorsa from entering Kalijhora stream, another protective bundh was created by Irrigation Department in the year 1979 on a stretch of about 1.5 Km. near Siltorsa Watch Tower. After 1993 flood some sausage works were constructed on Hollong River near Hollong Beat Office and N.W.C Beat. Some of these structures again got damaged during 1996 flood.

River training works along western bank of river Torsa prevented the flooding of grasslands of JP-3, 4, 5 and Torsa-1, 2 & 3 compartments leading to woody succession and weed infestation in these areas. But this human intervention was corrected by nature in the years 2014 and 2015 in the month of August heavy rains caused flood in the area and one course of River Torsa entered in Sisamara River and the embankment made at the site of Siltorsa Watch Tower was washed out. Since then some portion of the National Park are being flooded in every monsoon which is having beneficial impact upon Rhino habitat of the National park. [Rivers of Jaldapara in Map-03]

2.6 HABITAT ATTRIBUTES, RANGE OF WILDLIFE, THEIR DISTRIBUTION AND STATUS

2.6.1 Vegetation

2.6.1.1 The Biogeographic Classification

The National Park lies in the biogeographical Zone 7 B (Lower Gangetic Plain) as recognized by Wildlife Institute of India, Dehradun (Rodgers and Panwar, 1988, subsequently revised in 1997).

2.6.1.2 The Forest Types

Generally, the entire forests of Jaldapara National Park fall under the North Indian moist tropical forest of Champion and Seth's recent classification. The species which is commonly found within the forest and is most important from the economic and ecological standpoint is Sal (Shorea robusta). This species occurs with its usual associates, namely Chilauni (Schima wallichii), Chikrasi (Chukrasia tabularis), Champ (Michelia champaca) and Bahera (Terminalia bellerica). Jaldapara National Park contains a total 585 Nos. of identified plants species which belongs to 429 genera, 111 families including 91 grass species and 19 orchid species.

Other important species which are also commonly seen are Sidha (Lagerstroemia parviflora), Panisaj (Terminalia myriocarpa), Lampati (Duabanga sonneratioides), Lali (Amoora wallichi), Lahasune (Amoora rohituka), Kainjal (Bischofia javanica), Simul (Bombax cieba), Khair (Acacia catechu), Sissoo (Dalbergia sissoo) and Siris (Albizia procera). Forest Type in Map-04

On the basis of the composition of crop the forest can be classified into six (6) distinct types as described below;

Sl. No	Type	Champion & Seth's Classification	Principal Forest Compartment of occurrence.
1.	Riverine forests	Northern dry deciduous seral Khair Sissoo Association (5B/1S2)	River banks of Torsa in Jaigaon-1 & 2, Titi-3 & 4, Hasimara, Jaldapara, Malangi and Torsa blocks.
2.	Sal forests	Eastern Bhabar Sal and eastern terai sal ($3C/C_1b$ and $3C/C_1c$)	Chilapata Range.
3.	Wet mixed forests	Sub-Himalayan Secondary Wet-mixed Forests ($2B/2S_3$)	Bania block of Chilapata Range
4.	Semi ever green forests	Eastern sub montane semi-evergreen ($2B/C_1$)	Titi – 1 & 2
5.	Evergreen forests	Northern Tropical evergreen ($1B/C_1$)	Along the stream banks of Chilapata Range
6.	Savannah forests	Sal savannah ($3C/DS_1$), Lower alluvial savannah	Riverine areas of Nilpara & Jaldapara Range

I. Riverine Forests

This type of forests corresponds to recent Champion and Seth's Classification of Northern dry deciduous forest. Seral type of Khair (Acacia catechu) , Sissoo association (5B/1S2) is seen on either bank of river Torsa in Nilpara Range and Lankapara Range, in a narrow strip on either side of the river Torsa running through Jaldapara East Range. It is basically deciduous forest, which is dominated by Khair (Acacia catechu) and Sissoo (Dalbergia sissoo) occurring in pure patches and grasslands which are colonized by Khair (Acacia catechu)and Sissoo (Dalbergia sissoo), finally yielding place to Simul (Bombax cieba), Sidha (Lagerstroemia parviflora) and many other seral species such as Toon (Toona ciliate), Gamar (Gmelina arborea), Kainjal (Bischofia javanica), Pitali (Trewia nudiflora) and Kadam (Anthocephalus indicus) etc., with successive changes in edaphic conditions and progressive stability as one moves away from the river front.

Tanki (Bauhinia purpurea) is common in river beds where the permanent water table is deep. Harra (Terminalia chebula) Kainjal (Bischofia javanica), Chalta (Dillenia indica) and some other seral species like Toon (Toona ciliate), Gamar (Gmelina arborea) appear to do well where water table is not low.

II. Sal Forests

According to Champion and Seth's Classification this type of forest belong to Northern tropical moist deciduous forest (3C/C1) and contain both Eastern bhabar (3C/C1b) and Eastern terai sal (3C/C1c). Sal (Shorea robusta) forests occur on the well-drained alluvium soil. Course gravels and boulders in bhabar area carry a fair percentage of Sal in an admixture of various deciduous species chiefly by Bahera (Terminalia bellerica), Sidha (Lagerstroemia parviflora), Tantari (Dillenia pentagyna), Odal

(Sterculia villosa), Kumbhi (Careya arborea) and Chilaune. A higher portion of evergreen species is now commonly found in Sal forest further south in Chilapata Range where the soil is full of humus. In terai, though Sal is the predominant species and sometimes almost pure, numerous other species are Parari (Stereospermum tetragonum), Kowla (Machilus villosa), Angari (Phoebe attenuate), Bahera, Pakasaj (Terminalia spp.) Champ (Michelia champaca), Patpate (Meliosma simplicifolia), Lali (Amoora wallichi), Chilaune are also found.

In Sal forest the understorey is composed of Lahasune, Malata (Macaranga denticulate), Tanki and Gineri (Premna bengalensis). The gound flora is mainly composed of Leea spp, Assamlata, Bhant (Clerodendron infortunatum) and several climbers, Arare Kanta (Mimosa spp), Bhoria (Bauhinia vahili), Debre lahara (Spatholobus roxburghii) etc.

III. Wet Mixed Forests

This type of forests consists of dense evergreen trees with or without scattered, deciduous trees standing above general canopy. This type, however, should not be confused with the evergreen forests described subsequently. According to Champion, this type covers successive stages to north tropical evergreen forests. He designates it as sub-Himalayan secondary wet mixed forest (2B/2S3) and includes western portion of Bania preservation plot as a typical example. The forests here appear to be recent one and are gradually replacing Sal (Shorea robusta) which is found around the plot. More mesophytic species like Jam (Syzygium spp), Kawla and Parari have replaced Sal. The composition is again generally tending to a crop in which Nageswar (Mesua ferrea) and Roktan (Myristica longifolia) predominate. Other important species of this wet mixed type are Champ (Michelia champaca), Lali (Amoora wallichi), Lahasune, Dysoxylum spp and Bhadrase (Elaeocarpus varuna) & obviously Sal is in close association here.

IV. Semi-Evergreen Forest

This type belongs to Eastern sub montane semi evergreen forests (2B/C1b) according to classification of Champion and Seth's. This type is found in Titi-1, 2 and 3 compartments. Composition in the top storey consists of Chilauni (Schima wallichii) in association with Tanki (Bauhinia malabarica), Toon (Toona ciliate), Lampati, Moina (Tetrameles nudiflora), Champ (Michelia champaca), Gamar (Gmelina arborea), Chikrasi (Chukrasia tabularis) and Gokul. Lower storey is composed of Angare, Litsaea spp, Dysoxylum spp, Sinduri (Mallotus philippinensis). etc. In some place choya bans (Dendrocalamus hamiltonii) are also found.

V. Evergreen Forest

This type belongs to Northern tropical evergreen forests (1B/C1a) according to classification Champion and Seth's. Absence of Dipterocarpus is the notable feature. Shorea robusta is present in place of Shorea assamica. This type of forest along with Lator, Dysoxylum and Stereospermum is found along the streams and wet pockets of Chilapata Range and occupies a very small area in comparison to other forests.

IV. There are three distinct types of savannah forests recognized by Champion and Seth in this area

A) **Moist Sal Savannah (3C/DS1)** is characterized by presence of scattered sal (Shorea robusta) along with Kumbhi, Amloki (Emblica officinalis), Sidha (Lagerstroemia parviflora), Tanki etc. Predominant grasses are Saccharum species, Arundo donax, Phragmites karka, Imperata cylindrica and Themeda arundinacea.

B) Low Alluvium Savannah Woodland (3/IS1) is characterized by Bombax- Albizzia association. This type is met in riverine flats that tend to be flooded during rainy season but dry out during rest of the year. Jaldapara National Park is typical representative of this type where Simul (Bombax cieba), Siris (Albizia procera) and other important species like Khair (Acacia catechu), Kainjal (Bischofia javanica) and Pitali (Trewia nudiflora) appear. Grasses are very dense, sometimes 4-5 m. high and consist of Saccharum narenga; S. spontaneum, Phragmitis karka, Arundo donax, Themeda arundinacea, Imperata cylindrica etc.

C) Eastern Alluvial Grassland (4D/2S2) is found in patches inside the National Park where, like the previous type, tract is deeply flooded during monsoon and becomes completely dry in summer months and soil becomes stiff. Alteration of moisture conditions seems to inhibit any tree growth and has resulted in pure grassland on banks of river Torsa. Grasses are very tall and are principal dwelling place for One Horned Rhinoceros (Rhinoceros unicornis). Grass species found here are Saccharum spontaneum. Saccharum narenga, Saccharum longisetum, Themeda arundinacea, Phragmitis karka and Arundo donax etc.

D) Edge Grassy tracts occurring on the riverine formation are the association of primary succession. The Savannah types described in earlier paragraphs bear a great deal of resemblance. Edaphic factors, composition and development help us to distinguish one from the other. The savannah has often resulted due to change during the river following flood and deposition of sand which destroyed the standing crops and brought about such drastic edaphic changes to encourage grass growth once again. Striking examples of such reversion to grassland is clearly demonstrated in some parts of Jaldapara East, West and North Ranges.

Grassland on New Gravels Sand beds: There are often changes during the rivers following flood and a new deposition of gravels and sands take place over the standing vegetation along the river banks. This condition causes destruction of older seral stages and brings about complete edaphic changes where some pioneer tree species and grasses colonize the new deposits. Here the soil is very porous and dry during summer and is almost devoid of humus. Grasses are mainly dominated by Saccharum spontaneum, Bothriochloa pertusa, Apluda mutica, Vetiveria zizanioides, Chrysopogon aciculatus, Pennisetum glaucum, Setaria intermedia, S.palmifolia and others in association with almost pure formation of Dalbergia sissoo, Acacia catechu and a purple flowered herb Exacum tetragonum. This type is found in some part of Chilapata, Lankapara, Jaldapara and Malangi area of the National Park.

In some places of the river bed only Kush grasses are found but gradually Saccharum narenga are replacing the Kush, in areas where soil formation has improved. Kush is found just on the both sides of river bed and on islands along the course of river. Obviously, the area is sandy and gravelly. Due to formation of soil primarily Saccharum narenga

grasses are coming up in patches and gradually Sissoo (Dalbergia sissoo), Sidha (Lagerstroemia parviflora), Khair (Acacia catechu), Simul (Bombax cieba) are taking over in patches with more improved soil. In due course, if these areas are not disturbed, they will be automatically transformed into grasslands with Sissoo (Dalbergia sissoo), Simul (Bombax cieba), Khair (Acacia catechu) etc.

Hydrophytic Vegetation

There are some wetlands, water pools & permanent water streams present within the National Park which contain the following hydrophytes -

Typha angustifolia, Eleocharis palustris, E. retroflexa, Ludwigia octovalvis, Alternnthera sessilis, Polygonum barbatum, Commelina benghalensis, Panicum paludosum, Echinochloa colona, Leersia haxadra, Vallisneria nutans, Hydrilla verticillata, Potamogeton pectinatus, Aponogeton undulates, Sagittaria trifolia, Butomopsis latifolia, Najas minor, Monochoria vaginalis, Floscopa scandens, Coix lacryma and others.

2.6.2 Food for wild animals:

Rhinoceros (Rhinoceros unicornis) is the keystone species of Jaldapara National Park which eats grasses, monocotyledonous species, dicotyledonous species, aquatic species, climber species and sometime weeds also. Detailed list of species preferred by Rhinoceros is given in Annexure–14.

In Jaldapara National Park following weeds are found abundantly

Sl No	Name	Botanical Name
01	Banmara	Eupatorium odoratum
02	Bhat	Clerodendron infortunatum
03	Putush	Lantana camara
04	Hatubhanga	Leea asiatica
05	Ban Tulsi	Ocimum tenuiflorum
06	Sickle Pod	Cassia tora
07	Assam lata	Mikania micrantha

Out of these weeds, Eupatorium, Clerodendron , Lantana and Leea cover extensive areas. An intra and interspecific weed competition is being noticed in most cases. In comparison to all other weeds Eupatorium, Mikania, Lantana and Leea hold a predominant position in which they are apparently suppressing other weeds like Cassia tora, Clerodendron etc. While Eupatorium and Leea are more prominent in grasslands, Mikania and Lantana are predominant in open/ degraded sites as well as in high forests. Out of these weeds, Rhinoceros sometimes have been seen to eat Mikania and to some extent Eupatorium and Clerodendron. There is no evidence to believe that the Rhinoceros consumes Leea, Cassia tora or Lantana. Rhinoceros utilizes weeds when suitable grasses are limited.

In Jaldapara National Park, extensive growth of Mikania infestation had resulted in filling up of small and large open patches with the weed. So, Rhinoceros may be compelled to use Mikania as food. Dung analysis towards the end of last century and direct observation had shown that an appreciable percentage of food for Rhinoceros

consisted of Mikania. Rhinoceros preferred only tender vegetative shoots and tendrils and they never use older stem of Mikania species. It may be possible that due to extensive growth of Mikania inside the National Park, Rhinoceros were compelled to change their dietary habit and forced to browse on tender shoots of Mikania which usually they don't prefer. Mimosa himalayensis is also found as weed in the NP which is not that much alarming now but it may pose a threat to the grassland habitat in the PA as there is no natural system of weed suppression in the PA.

During day time Rhinoceros take too thermal covers either in tall grassland or in the more weeded areas of Malata(*Macaranga denticulate*), Siris(*Albizia procera*), Kainjal (*Bischofia javanica*).
Other herbivores like Elephant, Gaur (*Bos gaurus*), Sambar (*Cervus unicolor*) feed on fodder species like Amla (*Emblica officinalis*), Bahera (*Terminalia belerica*), Bahar /Dawa (*Artocarpus lakoocha*), Bhadrase (*Elaeocarpus varunua*), Bohori (*Cordia dichotoma*), Barahar /Bot (*Ficus bengalensis*), Chalta (*Dillenia indica*), Dudhila (*Ficus nemoralis*), Dumri(*Ficus glomerata*), Guenyhlo (*Callicarpa arborea*), Gayo (*Bridelia retusa*), Haritaki (*Terminalia chebula*), Kabra (*Ficus infectoria*), Khair (*Acacia catechu*), Khoksa /Jog Dumur (Ficus hispida), Kimbhu (*Morus lea vigata*), Lator (*Artocarpus chaplasha*), Malagiri (*Chinnamomum ceidedaphne*), Pipal (*Ficas religiosa*), Sindure (*Melotas philiepinensis*), Tanki (*Bauhinia malabarica*), Garjo (*Climber*)(*Tinospora cordifloia*), Gayolahara (*Bridelia stipularis*). Pakur (*Ficas rumphii*), Totola (*Orozylum indicum*) which are available in Forest blocks like, Mendabari, Bania, Chilapata, Torsa, Malangi and Jaldapara. Recently "Damal" (*Utrica crenulate*) are being utilized by Gaur (*Bos gaurus*).

Hog Deer and Hispid Hare - Grass species -Imperata cylndrica is main fodder for Hog Deer which is found in Forest blocks of Hasimara, Jaldapara, Barodabri, Mendabari & Bania.

2.6.3 Determination of Feeding Habit of Rhinoceros in Jaldapara National Park, (Work Done By Sri LK Banerjee, Botanical Survey of India)

Feeding habit of Rhinoceros in Jaldapara National Park has been ascertained by the analysis of fecal samples.
Various methods were used for determining the food preference in ungulates (Storr, 1961; Stawart, 1967, Brahmachary etal, 1970). On some occasions direct observation was also carried out in the field on elephant back to find out the feeding habit during dry season. It has been found that Rhinoceros chiefly subsist upon tall grasses and some herbs and when they are scarce, Rhinoceros are compelled to feed upon young leaves, fruits, flowers, some aquatic weeds and some soft small grasses and sedges or the supplementary cultivated crops as found in the nearby villages.

As per study done by Banerjee (1993) on food analysis of Rhinoceros, grasses in the ground contribute a major portion (75.6%) of its diet in comparison to other herbs, foliage, fruits and flowers of various tree species. In total 16 species of grasses were encountered in the fecal matter. Among these, Saccharum narenga, S. arundinacea, and A. longisetosum var hookeri were found most preferred food comprising 16.5%, 17.3% and 18.2% respectively of the total grass consumed. Other 13 grasses namely Saccharum spontaneum, S. longisetosum, S bengalens, Thysonoloena maxima, Imperata cylindrica, Phragmitis karka, Cymbopogon gidarba, C.jwaranensa, Arundo donax, Arundinella bengalensis, Heteropogon contortus, Setaria paimifolla, Themeda caudate,

Apluda mutica as a whole comprising only 23.6% of the total grass consumed. Among, the herbs, foliage and flowers, consumed fragments of the leaves and young shoots of Dalbergla sissoo and Acacia catechu were found most common in the faces (6.3% and 5.2% respectively). Flowers of Bombax ceiba and Oroxylum indicum comprise 3.2% of such food whereas herbs and unidentified species were found to comprise 6.2% and 3.2% respectively.

2.6.4 Seasonal Changes in Food Habit

Observation on seasonal changes in food habit (Banerjee, 1993) was made with the help of data collected from various sources. Fragments of the plant species which could be identified in the fecal matters with certainty have been considered. Grazing of some plant species which have been observed directly in the field during the dry season is also included. Some plant species which were mentioned by the forest staff as occasional Rhinoceros food have also been considered. Though Rhinoceros ramble in search of food and mostly graze on grassy vegetation, yet the diet composition differs between the wet season(June to September) and dry season (March to May). Due to scarcity of grasses in dry season, considerable portion of herbs, aquatic weeds, sedges, and small soft grasses become common food during March to May. During the month of April and May, Rhinoceros feed on young foliage of Acacia catechu, Dalbergia sissoo, Macaranga denticulata, Trema orientalia, Syzygium cumini, Ficus hispida, F. semicordata, Litsea monopetala along with flowers of Bombax ceiba, Oroxylum indicum and others which are found to be most common associates in the savannah woodland vegetation. With the onset of rains followed by lush growth of tall and hard grasses in the low-lying savannah grasslands, a change in the food preference of Rhinoceros could be seen in between June and September. Same food preference may continueup to January with little changes. Contribution of food plants consisting of grasses, sedges, herbs, foliage, twigs and flowers of tree species in the diet during dry and wet seasons could be classified into 3 categories from the nature of different grazing counts as follows.

A. Tall and hard grass category.
B. Tree leaves, flowers and twigs category.
C. Herbs, Aquatics, small grasses and sedges category.

Fodder Grases of Jaldapara National Park in

1. Choto Chepti :	*Axonopus compressus*	13. Dal Grass:	*Eragrostis sp.*
2. Banshpata Grass :	*Setaria palmifolia*	14. Dhadda:	*Saccharum narenga*
3. Chukka Grass:	*Persicaria chinensis*	15. Chepti:	*Themeda arundinacea*
4. Aalu Grass:	*Borreria alata*	16. Dhansi:	*Digitaria ciliaris*
5. Kema Grass:	*Comellina diffusa*	17. Malsa:	*Saccharum longisetosum*
6. Durba Grass:	*Cynodon dactylon*	18. Chouru Grass:	*Pannicum crasgalli*
7. Nal Grass:	*Arundo donax*	19. Bansh pata:	*Curanligo orchioidis*
8. Marua Grass:	*Eleufine indica*	20. Purandi:	*Alpinia malaccensis*
9. Eloa Grass:	*Iperata cylindrica*	21. Lemon Grass:	*Cymbopogon flexuosus*
10. Jaru Grass:	*Setaria genienlata*	22. Khagra:	*Phragmites karka*
11. Bhutta Grass:	*Tripsacum laxum*	23. Hogla:	*Typha angustifolia*
12. Kashia Grass:	*Saccharum spontaneum*	24. Madhua :	*Sachharum aurundinecea*

2.6.5 Communities and Species of Conservation Importance

Jaldapara National Park has an excellent habitat for the Great Indian One-Horned Rhinoceros along with many other species which have great ecological significance. Jaldapara has savannah grassland habitat which harbours many grassland species and has complex dynamics of various habitat types and various ecotones. Within a stretch of 3-4 km, 3 to 4 types of plant communities can be observed. Major habitat types of Jaldapara are given below;

Sl No.	Habitat types	Compartment included	Area in Sq. Km.	Percentage cover
1.	Dry mixed forest	Titi-1, 2, 3 & 4, Jaldapara-3, 4, 5, Torsa-1, 2, 3, Chilapata-4B, Hasimara-4.	46.17	21.32
2.	Wet mixed forest	Jaldapara-2, Hasimara-4, Mendabari-6, Bania-3, 4, Barodabri-1, 2, Chilapata-2, 3B.	12.41	5.73
3.	Mixed Sal forest	Barodabri-1, 2, 6B, 7B, Mendabari-6, Bania-1, Titi-1, 2, 3, Salkumar-1, 3.	17.61	8.13
4.	Grassland	Hasimara-3, JP-3, 4, 5, Malangi-1, 2, 3, Chilapata-1, 3B, Bania-8B, BD-7B, Torsa-2	30.55	14.11
5.	Grassland and Khair-Sissoo Succession	Hasimara-1, 2, 3, 4, Dalsingpara-1, 2, 3, 4, Jaigaon-1, 2, Titi-4, Jaldapara-1, 2, 3, 4, 5, Malangi-1, 2, Chilapata-3B.	42.90	19.81
6.	Grassland with Simul-Siris Succession	Dalsingpara-1, 2, 3, 4, Jaigaon-1, 2, Titi-1, 2, 3, 4, Torsa-1.	22.59	10.43
7.	Bamboo brakes	Titi-1, JP-3, Bania-1.	1.23	0.57
8.	Plantations	Mendabari-3, 4, 5, 6, Bania-1, 2, 3, 4, Titi-2, 3, 4, Jaigaon-1, Hasimara-1, 2, Dalsingpara-3.	26.40	12.19
9.	Sandy river beds & degraded patches, Forest villages.	Barodabri-6 (a), 7 (b), Hasimara-2, Malangi-2 & 3, Chilapata-2.	16.65	7.69
		Total	216.51	100.00

The Data represented in the above table, is a broad estimation as it is very difficult to find out exact area due to presence of various types of habitat and its complex dynamics and presence of various ecotones which are hard to delineate.

Out of the above habitat types, pure grasslands, grasslands with Khair(Acacia catechu)-Sissoo(Dalbergia sissoo) succession and grass land with Simul (Bombax cieba)-Siris (Albizia procera) succession are more important as a habitat of

Rhinoceros, Hispid Hare (Caprolagus hispidus), Hogdeer (Axix porcinus) apart from grassland birds and many other smaller animals. These three types of habitats constitute a total of 96.04 sqkm covering 45 % of total area of the NP.

Pure grasslands are sometimes invaded by Khair (Acacia catechu)- Sissoo (Dalbergia sissoo) and Simul(Bombax cieba)- Siris association due to the natural process of succession. Pure grassland occurs in small patches in Hasimara-3 (Near Torsa river bed) JP-3, 4 & 5, Malangi-1, 2, 3, Chilapata-1,3b, Bania-8b, Barodabri-7b and Torsa-2.

Grassland with Khair (Acacia catechu)-Sissoo (Dalbergia sissoo) succession are also found, as small islands in the river beds and along the old course of Torsa (Western leg of National Park).

To enumerate the density and composition of species and frequency of occurrence of diverse species of Jaldapara National Park, line transect were laid out and Point Centered Quartet (PCQ) method was followed. From the study density of plants per hectare and frequency of distinct species in percentage had been calculated. Results are given in Table-1.

2.6.6 Species of Conservation Importance

Jaldapara National Park is famous internationally for the presence of savannah grassland which is the home of the Great Indian One Horned Rhinoceros. These savannah grasslands are the only remnants left inside the Protected Areas in West Bengal. Species of grasses in savannah grassland mentioned below must get conservation importance given below;

Sl No	Botanical Name	Local Name
1	*Saccharum narenga*	Dhadda
2	*Saccharum arundinaceum*	Madhua
3	*Saccharum spontaneum*	Kashiya / Kush
4	*Arundon donax*	Nal
5	*Setaria palmifolia*	Bash Pata
6	*Phragmitis Karka*	Nal Khagra
7	*Saccharum longisetosum var. hookeri*	Malsa
8	*Themeda arundinacea*	Chepti
9	*Imperata cylindrical*	Elua / Ulu
10	*Alpinia nigra*	Purandi
11	*Saccharum ravennae*	Ekra

Plants of Jaldapara National Park which needs exceptional care for conservation are given in Table-2. There is a very endangered plant rediscovered in the PA – Hibiscus fragrans, a climber Hibiscus plant, which has been notified under section 38 of Biodiversity Act, 2002 vide Govt of India MoEF's notification dt. 31st March, 2010. It needs special conservation attention.

2.6.7 Limiting Factors for Flora

Plant species of Jaldapara National Park are subjected to several limiting factors such as;

2.6.7.1 Weeds

Weed is a major problem in Jaldapara National Park. Except the teak plantations, all other plantations are infested with prolific weed growth particularly during rainy season Leea spp invades the grasslands and younger plantations. Other weeds are Lantana camara, Eupatorium odoratum, Ageratum conizoides, Clerodendron spp, Cassia tora, Solanum nigrum, Mimosa himalayensis is also found as weed in the NP which is not that much alarming now but it may pose a threat to the grassland habitat in the PA as there is no natural system of weed suppression in the PA.

2.6.7.2 Grazing

There are large number of fringe villages and Tea gardens all around the National Park. Illicit grazing is common in forest fringes of Torsa, Jaldapara, Dalsingpara, Hasimara, Titi and Chilapata blocks. During dry season and especially in March-April, illicit grazing becomes more acute. Obviously grazing intensity is more in proximity of near fringe villages and Tea gardens than other areas.

2.6.7.3 Fire

Fire is common in the National Park though in low degree. Fire is caused generally by grazers, or by women folk collecting Simul (Bombax cieba) floss within the forest. Ground fire occurs in Titi, Torsa and Jaldapara blocks during dry months between December and March.

2.6.7.4 Congregation Wild Animals

Wild animals are generally rotational grazer. But when there is the scarcity of fodder wild animals congregate on same habitat causing destruction of habitat which finally leads to weed infestation.

2.6.7.5 Insects and Fungi

Damage to the forests and plantations of the National Park by insect and Fungi are reported in Bania, Mendabari & Titi blocks, though not on any significant scale.
fungi such as;

(a) **Polyporus shorea** (Sal root fungus) attacks the heartwood near root but its progress is very slow. Control burning can scale down the incidence of this fungus.

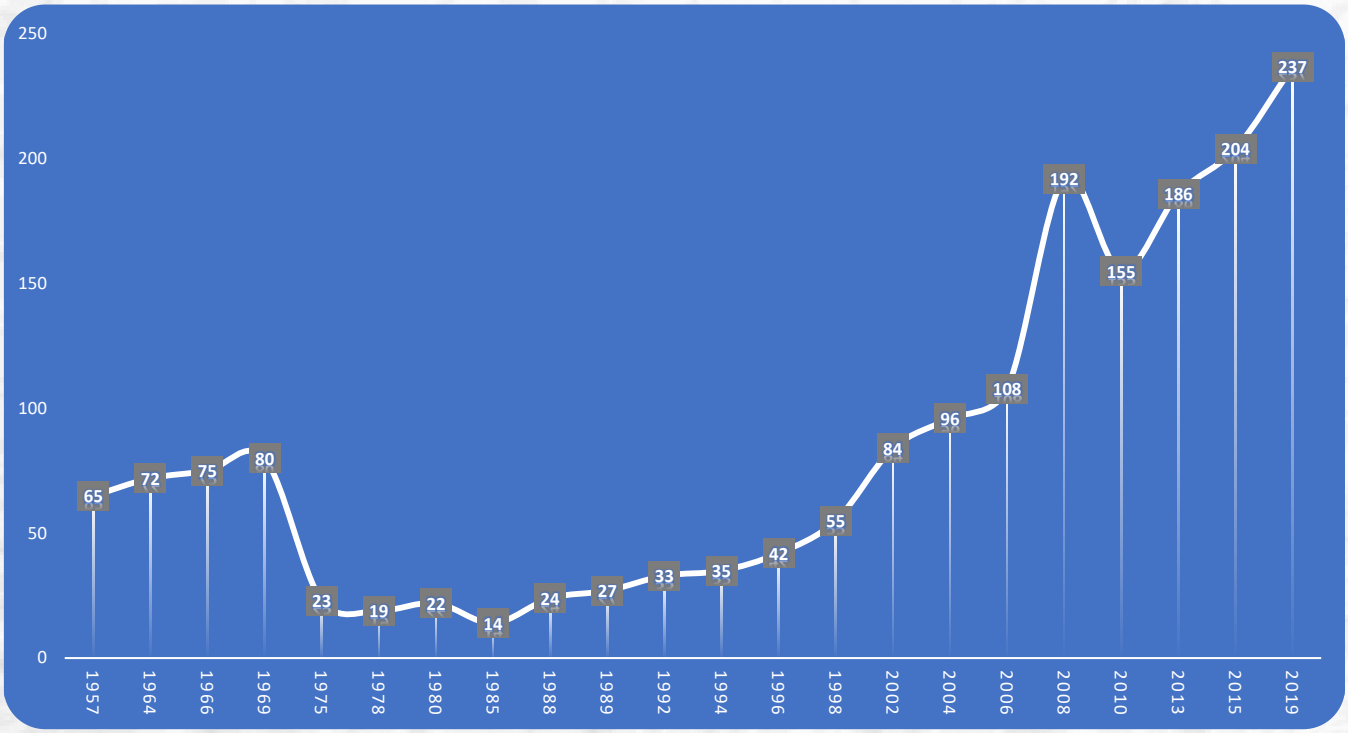
(b) **Fomes caryophylli** causes heart rot of Sal pox like marks are found on the stem as external symptom. This fungus travels from the roots to the heartwood and can transfer from root of one tree to another if the roots are touched to each other.

2.6.8 Wild fauna

2.6.8.1 Mammals and Their Status

The National Park is very rich in wildlife and contains at least 11 species included in Schedule-I mammals of the Wildlife (Protection) Act, 1972 including presence of the Great One-Horned Rhinoceros. A list of fauna of the National Park is given in the Annexure-9, and sex-wise classification of Rhinoceros population is given in Table-3.

Growth of Rhino Population



Population Dynamics of other wild animals of Jaldapara National Park is given in Table-4.

2.6.8.2 Status of Different Vertebrates

Turtle-As per preliminary report of Sri S Bhupati, Research Biologist, Wildlife institute of Deheradun, 8th October 1993, comparative abundance of turtle species in Jaldapara National Park as per survey conducted during the period 24th May to 9th June 1993 is given in Annexure-15.

Fish–As per survey conducted by Wildlife Wing Directorate of Forests and Himalayan Nature and Adventure Foundation Siliguri during 2006 and 2007, 88 species have been recorded. List of fishes given in Annexure-16.

2.6.8.3 Distribution and habitats, Habitat quality and quantity

Distribution of wild animal is ultimately governed by the availability of food and water in association with shelter. On the basis of Habitat type the Forest of Jaldapara can be classified in nine (9) types which have been described in this chapter under item 2.6.5

Major Forest Type Wise Distribution of Animal

Distribution of wild animals is ultimately governed by the availability of food and water in association with shelter. Based on habitat types, Jaldapara forest can be classified into nine types of Habitat.

2.6.8.3.1 Wet Mixed Forest (Wet Semi-evergreen Forest)

It has a closed canopy of considerable height and a fully shaded forest floor covered with leaf litter. Grasses and other herbs are usually very less and the top storey is formed by some wet mixed deciduous species. Grazing and browsing of ungulates are very rare except in some degraded places where the canopy is open.

Food resources available in this type are mainly underground corns and tubers of *Costus speciosus*, *Curcuma amada, Globba racemosa, Hedychium gracile, Zingiber roseum, Molineria capitulate, Dioscorea bulbifera, D.pentapylla, Asparagus racemosus, Arisaema speciosum, A. tortuosum, Colocasia esculenta, Ariopsis peltata, Lasia spinosa* and others.

Foliage of small trees and shrubs, at lower canopy level, comprises of *Litsaea monopetala, Macaranga denticulata, Leea asiatica, Ehretia acuminata, Mallotus philippinensis, Fagerlindia fasciculata* and trees *bearing fleshy fruits like Syzygium cumin, S.cumini, S.operculatum, Listsaea glutionosa, Saplum baccatum, Cinnamomum glaucescens, Parsea gamblee, Elaeocarpus lucidus, Ficus bengalensis* and many others. Since this type of habitat is rich in foliage trees and fleshy fruits, a sizable number of arboreal Rhesus macaque and squirrels are found here. Due to absence of grass, large herbivores usually are not found except some wild boars which can dig up underground corns and tubers. Rhinoceros avoids such habitat.

Such type of habitat is found in patches in the compartments of JP-2, Hasimara-4, MB-6, Bania-3 & 4, BD-1&2, CP-2 & 3b. Though water sources and covers are available, as food is insufficient, herbivores avoid this type of vegetation.

2.6.8.3.2 Dry Mixed Forest

This type of habitat is found in Titi-1, 2, 3 & 4, JP-1, 3, 4 & 5, Torsa-1, 2 & 3, CP-4 b and Hasimara-4 compartments in patches. Jaldapara National Park comprises a very complex type of vegetation. No forest is found continuously. So, animals are also distributed in pockets. Mainly deciduous tree species of medium to large height are found here which form an open canopy. Considerable quantity of grasses, shrubs and herbs are available during the monsoon.

This type of vegetation provides more suitable habitat to wildlife than wet mixed forest. Population of monkey, squirrel and other arboreal species are less due to lack of fleshy fruits and leaves. Ungulates like Deer, Gaur (Bos gaurus) and even Elephant prefer this type of vegetation. Rhinoceros are also found frequently in this forest type. Of late, Rhinoceros seldom visits the Titi forest crossing National Highway, but Rhinoceros have established habitat in Torsa and Chilapata block.

2.6.8.3.3 Mixed Sal Forest:

This type of vegetation consists of mainly sal (Shorea robusta) along with some other species as middle storey, and found in BD-1, 2, 6b, 7b, MB-6, Bania-1, Titi-1, 2, 3 and Salkumar-1 & 3 compartments. This habitat is not suitable for herbivores because food is not available though cover and water are available.

2.6.8.3.4 Savannah Grasslands including Grassland with Khair-Sissoo and Simul-Siris Succession

Riverine grass lands and savannah wood land occupy 45 percent of the total floral cover of the National Park. This type of vegetation offers best type of grazing/browsing ground for Rhinoceros, Sambar (Cervus unicolor), Hog Deer, Barking Deer, Chital, Elephant & Gaur. Leaves, flowers and fruits of Acacia catechu, Bombax ceiba, Dalbergia sissoo, Oroxylum indicum, Emblica officinalis in grass land are highly preferred by large herbivores as food.

This type of vegetation is found in JP-1, 2, 3, 4 & 5, Hasimara-1, 2, 3, 4, Malangi- 1, 2, 3, Torsa-1, 2, 3, Chilapata-1, 2, 3b, Jaigaon-1, 2, Dalsingpara-1, 2, 3, 4and Titi-1, 2, 3 & 4 compartments. Out of them, herbivores are not found in Jaigaon-1, 2 & Dalsingpara-1, 2, 3, 4 Compartment. In Titi, Deer, Gaur and Elephant are distributed sparsely. Distribution of animals is highly concentrated in National Park area.

2.6.8.3.5 Riverian Fringes (Evergreen Forest

This type of vegetation is mainly found in small strips along the rivers and streams and dominated by *Ficus semicordata, F. racemosa, Bischofia javanica, Duabanga grandiflora, Bridelia retusa, Dillenia pentagyna, Macaranga denticulata in association with grasses Saccharum spontaneum, S.narenga, Themeda arundinacea* and others. Leaves fruits and twigs of this formation are palatable food for sloth bears, sambar (Cervus unicolor), elephants (Elephas maximus) and monkeys. Due to presence of water Rhinoceros also visit these areas frequently, especially in dry season.

2.6.8.4 Habitat Preference of Wild Mammals

Rhinoceros occur in JP-3, 4, 5, Malangi-1, 2, 3, Torsa-1, 2, 3, Chilapata-1, 2 compartments with greater concentration. JP-2 & Hasimara-3, 4 compartments have good grassland with Sissoo (Dalbergia sissoo), Simul (Bombax cieba) & Khair (Acacia catechu) but these comptts, suffers from water scarcity, especially during dry season. During rainy season concentration of Rhino increases there but during summer season due to scarcity of water sources concentration of Rhinoceros gradually decreases. Maximum concentration of Rhinoceros is found in JP-3 & 5, Torsa-2, and CP-1 & 2 compartments. New fodder plantations are highly grazed by Rhinoceros. Rhinoceros migrate from one area to another inside the National Park and they easily cross Buritorsa River. Rhinoceros seldom found in Titi, Jaigaon and Dalsingpara block, beyond National High Way 31C. Now, they cross the river Torsa and have established habitat at Bania and Mendabari blocks.

Hog Deer distributed in same habitat as of Rhinoceros. Hog deer (Axis porcinus) distribution is represented below as per direct observation.

Ranges/ Density	Jaldapara West Range	Jaldapara East Range	Jaldapara North Range	Kodalbasti	Chilapata
High Density	Torsa-2	MLG-1, CP1, CP-2	HM-3A	BD-1B, BD-2, BD-6B,7B	MB-6B, BN-1B
Medium Density	JP-4 & 5,	MLG-2 & 3	JP-4	Nil	Nil
Low Density	T-1 & 3	CP-3B & 4B	JP-1 & 2, HM-3 & 4	Nil	Nil

Asian Elephants: In the past, Elephant herds never permanently stayed in the National Park. But now 5 to 7 Elephant herds consisting of about 10 to 12 Elephants each almost permanently reside in Jaldapara National Park. Bania and Mendabari blocks provide excellent habitat for Elephant. They keep on crossing Torsa River to enter western part of the National Park and sometimes move up to Titi forest and return. Now the Elephants keep on moving specially in crop season from Chilapata to Buxa via Beech – Bharnabari TG and Nimitijhora TG, from Jaldapara to Dhumci via Khairbari RF – Rangalibazna, Chhekamari village and via Khairbari village from Titi.

Chital: Spotted Deer are found mainly in forest fringes and edges of JP-3, 4, CP-1, 2, 4, Torsa-1 & 2 Compartments. However, maximum concentration is now found in JP-3, CP-1, and T-2 compartments. Chital is not indigenous to Jaldapara; they had been introduced in the 1960s.

Sambar & Barking Deer: Mainly prefers wooded land and distributed in JP-3, 4, 5, M-1, 2, 3, CP-1, 2, 3b, T-1, 2, 3 Compartments and Titi blocks.

Wild Boars: are distributed throughout the National Park.

Monkeys: prefer woodland and are distributed in all woodland areas of the PA.

Leopards: occur in the fringe forest areas and nearby Tea Gardens & are occasionally found in JP-1, 2, 4, 5 Compartments and Bania, Mendabari blocks, on Madarihat Hollong Road, Madarihat Siltorsa Road and Hasimara Chilapata state high way Road and found in Titi blocks.

Tigers: used to be concentrated in Malangi, Jaldapara, Torsa, Chilapata and Bania blocks till 2004. But after that no tiger (Panthera tigris) has been reported in the National Park.

Avifauna & Herpeto: Fauna: are distributed all over the National Park. Distribution of avifauna is no doubt higher along the river course and streams. A total of about 246 species of avifauna are found in the National Park.

2.6.8.5 Niches of Wildlife

Not much work has been done regarding the specific niches occupied by various animals and birds in the National Park. The Rhinoceros is the important animal of savannah grassland. Rhinoceros are most frequently found in JP-3, 4, 5, (22.25 sqkm.), Chilapata-1, 2 (77.96 sqkm.) and Torsa-1, 2 (18.83 sqkm.) in the National Park. Hog deer almost occupies same habitat as Rhinoceros. Cheetal is seen to occupy forest fringes and edges. Sambar (Cervus unicolor) and barking deer prefer woodland. Leopard (Panthera pardus) prefers boundary of the forest area where fringe villages and Tea Estates are present. Tiger (Panthera tigris) prefers open grassland avoiding dense savannah. Elephants (Elephas maximus) move all over the National Park.

2.6.8.6 Previous Distribution of Rhinoceros

Apart from Jaldapara and Gorumara, Rhinos were previously reported from Bholka (erstwhile Buxa Division), Patlakhawa (then then Cooch Behar SF Division). As many as 10 Rhinos were reported each in Bholka and Patlakhawa in 1955-56 (Ref. annual report). Rhinos (probably migratory from Manas in Assam) were reported from Bholka up to 1967-68 (ref. Annual Reports) & Rhinos (Probably migratory from Jaldapara) were reported from Patlakhawa up to the mid-seventies (ref. Retired Officials).

2.6.8.7 Dispersal and Migration

Presently, Rhinoceros of Jaldapara National Park are not known to migrate much except to the villages around Buri Torsa River in western fringe, Paschim Simlabari fringe to CP- 3A, CP-4A and Bania-8A and Dakshin Mendabari Village fringe to MB-3 and Bania 3 during paddy cultivation season. Rhinoceros were generally concentrated in Jaldapara, Hasimara, Malangi, Chilapata and Torsa block. But now they cross Torsa River and stay at Mendabari, Bania and Barodabri blocks and sometimes reach up to Mendabari and Bania forest villages and even up to Mantharum Beat. A case was recorded in 1981 when a Rhino migrated from Jaldapara National Park to Nimati Range of Buxa Division in 1999 where one rhino reached to Jainty, Buxa Tiger Reserve. In the past it was a regular feature of migration of Rhinos from Jaldapara to Patlakhawa forests of then Cooch Behar Social Forestry Division, but from mid-seventies, it has stopped. There is record of migration of elephants (Elephas maximus) and Gaur (Bos gaurus) between Jaldapara National Park and Buxa Tiger Reserve through Chilapata forests. Occasionally, Gaur (Bos gaurus) stray out of Jaldapara National Park to enter the nearby villages in the night and can even stray up to distance of 20 km. and cause human-wildlife conflict.

2.6.8.8 Distribution of Natural Salt Licks

There is no natural saltlick in the National Park. But elephants (Elephas maximus) are known to visit a place in Titi-1b (called Kalamati) near Ratikhola and eat black colored soil. The Coordinates of the Location is 26°48'38.12" N, 89.16'52.59"E. Such soil requires chemical test to know its composition.

2.6.8.9 Endemic, Rare and Threatened Species

As stated earlier, there are presently at least 11 species which are included in Schedule-1 of the Wildlife (Protection) Act, 1972, 8 species are listed in Red data Book of the IUCN and 9 species are listed in the appendices of CITES. Detail list has already been given in Chapter-1 (Part-1.3.3).

Rhinoceros, Hispid Hare (*Caprolagus hispidus*) and Hog Deer (*Axis porcinus*) are found in Jaldapara National Park. Swamp deer (*Cervus duvauceli*) once existed in Jaldapara National Park but ultimately became reportedly extinct sometimes in late sixties.

Major vulnerable and endangered species of Jaldapara National Park like Rhino, Hispid Hare (*Caprolagus hispidus*), Hog deer (*Axis porcinus*) are obligate to some key areas, where they are concentrated. Rhinoceros are distributed in places having savannah grassland with good water sources.

Hog deer (*Axis porcinus*) prefers such habitat and Tiger (*Panthera tigris*) also prefers open grassland with good water sources as in JP-3, 4, 5, Chilapata-1, 2 Torsa -2 & 3, and Malangi-1, 2 & 3. All these compartments have good natural water source like Chirakhawa, Sissamara, Buri Torsa, Sukta, Sukti, Malangi, Kalijhora etc. Considering Rhino concentration, water holes, wallow pools have been created at JP-3, JP-4, JP-5, CP-2, Torsa-2, Malangi-1, 2 & 3 compartments, which retain water throughout the year. Considering all these factors, Jaldapara-3, 4, 5 Compartments. (18.83 sqkm.), Chilapata-2,3 (7.96 sqkm.) and Torsa-1 & 2 (18.83 sqkm.) Compartments and Malangi-1,2 & 3 are recognized as key areas.

2.6.8.10 Re-introduction of species:

During the year 1963-64, 6 gayals (Bos frontalis)-4 females and two males were introduced in the National Park. But they are no longer to be seen in the National Park. An attempt to release cheetal (Axis axis) was made in the past. 14 cheetals were counted in the National Park in 1964 but none survived for long. Another attempt to introduce cheetal was made in 1982 when 19 animals (10 males and 9 females) were released. Some more cheetal were released in 1983. In August, 1984, cheetal population was observed to be rapidly established and could be seen in small groups in various parts of the National Park.

Their population in subsequent years has increased reasonably and the number was 71 in 1988 and 114 in 1989 census. Now though cheetals are found in JP-3 Compartments and other Compartments (JP-4 & 5, T-1, CP-1) also, present sighting of cheetal has become very rare. Attempts were also made to introduce Sangai (Cervus eldi eldi) in the National Park and three specimens (2 females and 1 male) procured from Calcutta Zoo in July 1984 but the same did not survive.

There was an attempt to reintroduce Bara Singha (Cervus duvaceli duvauceli) sine 1998. In 1998, 1 adult male, 4 adult females and 1 fawn were brought from Lucknow Zoo in kept in captivity near Jaldapara East Range Office campus for breeding. The stock was connected with Lakhimpur, Kheri, UP. Later on in 2014 (23.01.14) 2 more adult males and 3 adult females were received from Lucknow Zoo again. Though breeding took place in captivity inside the PA, due to lack of sufficient stock no release in wild could take place. In 2016 about 7 individuals died due to a sudden attack of FMD after a flood. On 29th June 2019 the whole stock were sent to North Bengal Wild Animal Park, Siliguri. (4 adult males, 3 adult females and 1 female fawn).

2.6.9 The limiting factors for fauna:

Wild animals of Jaldapara National Park are subjected to several types of limiting factors as detailed below which affects the population of wild animals and their habitat.

2.6.9.1 Poaching

Rhinoceros is one of the most precious wild animals in the grey world because of its horn which fetches a high price in clandestine market. People in some countries believe that it has aphrodisiac properties although which is scientifically not proven. Rhinoceros horn consists of only keratin, like human hair and nails. Rhinoceros in Jaldapara National Park are susceptible to poaching. Records in Jaldapara National Park were inadequately maintained prior to 1968. Total 31 Rhinos were poached between 1968-69 and 1970-73. Rhino poaching remained controlled in between 1973 to1977. In 1978 one Rhino was poached but 1979 was no poaching year. During the year 1980 to 1985 eleven (11) Rhinos were poached. No Rhino was poached in 1986-1990. In 1991 to 1993 three (3) Rhinos were poached. There was no Rhino poaching from 1993 to 1996. However from 1997 to 2001 six (6) Rhinos were poached. From 2002 to 2013 there is no poaching occurred in Jaldapara National Park. But again from 2014 to 2015 seven (7) Rhino had been poached and one (1) Rhino was poached in February 2018.

Not only Rhino but other animals like deer, wild boar, wild fowl etc. were hunted frequently. Sometimes, wild boar and deer enter the premises & crop fields of the fringe villages during night and are exposed to greater chance of killing, sometimes even by village dogs. As per record a Tiger (Panthera tigris) in Torsa-1 Compartments of TEC Beat was killed in February 1990 and a sub-adult Makna elephant (tuskless male) was reportedly killed in Hantapara Tea Estates (near Titi forests) in July 1983 and in 2005 in the month of February a Tusker was poached at BD-7 compartment at Kodalbasti Beat.

2.6.9.2 Monoculture Forestry Practice

Due to plantations of teak in Titi, Bania and Mendabari blocks, habitat of wild animals has changed. Naturally carrying capacity of the habitat is considerably reduced because of such adverse habitat changes. However, taking lessons from paste monoculture planting has been totally done away with. Both tree and fodder plantations are being planted with variety of local species.

2.6.9.3 Grazing

Grazing by cattle along the fringe areas of the National Park is a problem as it reduces the availability of food to the wild herbivores and exposes them to the risk of cattle borne diseases.

2.6.9.4 Illicit Felling

Illicit felling of trees and collection of fire wood are also a limiting factor for conservation of fauna.

2.6.9.5 Forest Fire

Forest Fire normally occurs in Torsa, Hasimara Block and BD-1B, BD-1A, BD-6B, 7B, MB-6B, BN-1B and BN-8B, CP-3B, MLG-2, MLG-1 forest compartment. All this forest fire is manmade. Normally the cow herders and fisherman ignite fire in the forest.

2.6.9.6 Fishing and Poisoning

Since the National Park has many perennial rivers illicit fishing is prevalent along the fringes. Mostly fishing occurs in River Torsa in Hasimara-3, Jaldapara-2 and Malangi-1 compartment.

2.6.9.7 Collection of NTFP

Illegal collection of dry fungus, Simul cotton, thatch grass and any other NTFP items affect habitat adversely.

2.6.9.8 Corridor

There is very specific old corridor of wild animal specially Elephant (Elephas maximus) and Tiger (Panthera tigris) in between Jaldapara National Park and nearby Forest Divisions like Buxa Tiger Reserve and Reserve Forest of Jalpaiguri Division. These corridors are being encroached by human settlements and Tea Gardens causing hindrance to the natural movement of wild Animals.

2.6.9.9 Disease

Wild animals particularly herbivores, are very susceptible to diseases, most of which are transmitted through domestic cattle. Anthrax, Rinderpest, Foot and Mouth disease, Pasteurellosis, Tuberculosis are the common diseases which causes death of wild animals. In 1968, 31 gaurs (Bos gaurus) died in Jaldapara National Park due to rinderpest and subsequently gaur (Bos gaurus) population became sparse in the National Park.

In the year 1993 & 1994, 3 wild tuskers died due to attack of Anthrax in Torsa-2 & 3 Compartments. In recent past, around 1998-99 population of wild boar became dwindling due to Swine fever.

2.6.9.10 Tourism

Tourism may educate the visiting people about the conservation and richness of the Bio-Diversity of the National Park. Controlled tourism within sustainable carrying capacity helps in conservation, but unrestricted tourism changes the behavioral pattern of the wild animals and pollutes the habitat apart from creating managerial issues because of conflicting interest of ever enlarging interest groups.

CHAPTER-3

CHAPTER-3
HISTORY OF MANAGEMENT AND PRESSENT PRACTICES

3.1 GENERAL

Although the area of the present National Park has remained under the control of Forest Department since 1865, no records are available of its management till 1875 when for the first-time scheme for systematic management was prepared by Dr. William Schlich, the then Conservator of Forests. In the working plan of Buxa reserves (1905-06 to 1919-20) Mr. C.C. Hatt prescribed selection felling to be followed by natural regeneration. But since these areas were rather poorly stocked, it remained virtually untouched.

It was only in the next working plan of Buxa Forest Division (1929-30 to 1948-49) that Mr. C.K. Homfray emphasized the need for maintenance and improvement of the "Savannah" areas which provide habitat for the rich grassland fauna of this tract like Rhinoceros, Swamp deer (Cervus duvauceli), Hog deer (Axix pocinus)and many other animals. In fact, the need for constituting it as a National Park was felt at this time by Mr. C.K.Homfray.

Under Shebbeare's Plan (1919-20 to 1924-25) Titi Block came to Hill Working Circle and prescriptions were of clear felling and artificial regeneration on a rotation of 80 years and trees over the exploitable girth might be removed from anywhere.

Titi was under Miscellaneous Working Circle in Fourth Working Plan (1919-30 to 1944-45). Clear-felling and artificial regeneration on a rotation of 40 years was laid down.

Ultimately the Bengal Rhinoceros Preservation Act came into force in 1932 providing for the protection of one horned Rhinoceros. Jaldapara was however, declared as a Game Sanctuary in the year 1941 only. A separate Game Sanctuary Working Circle was created in the 5th Working Plan of Buxa Division virtually entailing the present area of the National Park except for Salkumar Block which continued to be worked under Sal (Shorea robusta) Conversion Working Circle. The primary objective of constituting a separate Game Sanctuary Working Circle was to preserve and develop the stock of indigenous flora and fauna. All types of extractions, including thatch collection, were prohibited except limited felling of timber trees by departmental agency. Control burning in alternate years and removal of evergreen crop invading the grassland were carried out in "Savannah" areas.

Consequent to the constitution of Cooch Behar Forest Division in the year 1951, management of this Game Sanctuary came under the preview of Cooch Behar Forest Division. The first working plan of this Division was prepared in the year 1962-63 and the prescription was given for a period of 10 years. An area of 24950 acre (9951.23 ha.) was kept under Sanctuary Working Circle. The same area was continued in the second plan also (1972-73 to 1981-82) under the Sanctuary Working Circle. Emphasis in these plans was to create and maintain glades, saltlicks and periodic removal of trees invading the grasslands. A Tourist Lodge at Hollong was constructed. Rampant poaching gave a setback to the management of the then Sanctuary with as many as 28 Rhinos killed between 1968& 1972.

The then Jaldapara Wildlife Sanctuary was brought under the management of Wild Life Division-II with effect from 10.2.1982 from Cooch Behar Division. First Management Plan of the Sanctuary was prepared for the period 1981-82 to 1985-86 which was approved by the Chief Wild Life Warden. West Bengal vide his office Memo No. 1376/ WL(C) 2W-274, dated 8.6.1982. This management plan prescribed for raising fodder plantation to supplement food resources of herbivores, providing salt licks and wallow pools, eradicating Mikania and cutting back of trees to arrest the successional development of the grassland areas. Commercial felling was prohibited during the plan period.

Infrastructure of the then Sanctuary for protection was strengthened and more fire arms, R.T. networks

and vehicles were provided.
However, two important targets of the plan viz, relocation of the habitations between the two legs of the Sanctuary and translocation of Rhinoceros and re-introduction of swamp deer (Cervus duvauceli) and wild buffalos (Bubalus bubalis) could not be achieved. Cheetal (Axis axis) were, however, successfully released in the then Sanctuary during 1982-83 and their population was showing upward trend but now population is not being recorded.

The 1st Management Plan expired in March 1986, but its prescriptions have been followed during the following years.

One important development during this period has been the launching of "Fringe" area development scheme in the fringe villages of the then Jaldapara Wildlife Sanctuary in the 1990-91. Under this scheme, works have been undertaken in the fringe villages for raising fuel wood plantations, distribution of seedlings for farm forestry, improvement of village roads, construction of culverts and bridges, provision of drinking water, irrigation facilities, community pond, duckery and Piggery unit etc. The idea was to provide alternative sources of fuel and fodder and to improve the economic condition of the villagers to reduce their dependency on the resources of the then Sanctuary and to win their sympathy and co-operation for the cause of protection of wild fauna and flora. This approach was significantly different from the approach adopted in the past when the then Sanctuary authorities worked in complete isolation from the forest fringe dwellers and ruthless policing was thought to be the only effective way of controlling biotic interferences in the then sanctuary. Obviously, another significant development has been the extension of the then Jaldapara Wildlife Sanctuary by 100.98 sqkm in August 1990 with the inclusion of forest of a few compartments of Titi, Jaigaon, Dalsingpara, Mendabari and Bania blocks.
Subsequently, in November 1995, management of entire the then Jaldapara Wildlife Sanctuary has been brought under the unified control of Cooch Behar Division.2ndManagement plan was written and approved under UNDP project in the year 1996.

During 2nd Management plan period 1996-97 to 2006-07, habitat improvement works like creation of fodder plantation, Weed Control, Over Wood Removal, Control Burning and digging of wallow pool were undertaken and Eco-Development programs were continued under UNDP project, CSS and State Plan.

During 3rd Management plan period from 2007-08 to 2016-17 Habitat improvement works like creation of fodder plantation 1552 Ha, Weed Control 970 Ha, Over Wood Removal 810 Ha, Control Burning 1254 Ha. had been done and digging of some wallow pools and water harvesting structures was also done.
List of Habitat Management Works can be seen in Annexure-17.

The strategies adopted during the third Management plan period where continued for one year during 2017-2018 during preparation and finalization of this management plan.

Management of the park had been done with the same objective of "Protection and Conservation of Bio-Diversity with special emphasis on GIOH Rhinoceros as the flagship bearer species" with similar strategies of protection and habitat management. This concerted effort has yielded the desired result and population of flagship bearer species i.e GIOH Rhinoceros has increased many folds.

3.2 TIMBER OPERATION INCLUDING BAMBOO AND FIREWOOD HARVEST

Silvicultural systems and tending operations prescribed in the previous Working plans were as following.

3.2.1 Madarihat Range:

These forests came under the British rule in 1866, before which most of the best timber had been harvested. The forests continued to be open to indiscriminate felling till 1874. After reservation, some "rest "was given to the forests and then by 1884 tea gardens first began to draw their supply of fuel from the forests and even to take small timber.

3.2.1.1 The First Working Scheme (1892-93 To 1898)

In 1892-93 the outline of a working plan was drawn up, prescribing coppice with standard system.

3.2.1.2 Haines Working Plan (1898 TO 1905)

It prescribed selection felling in some places and rest of the area to be managed under coppice with standards system on a rotation of 25 years and 100 years for coppice and standard respectively. Khair (Acacia catechu) and Sissoo (Dalbergia sissoo) were to be managed under "Silvicultural rules" tending to remove old trees and improve the crop.

3.2.1.3 Traffords Plan (1905-1918-19)

In this plan Sal (Shorea robusta) Working Circle was differentiated from the mixed Working Circle (WC). Coppice with standard on a rotation of 20 years was adopted. Experiments in artificial regeneration commenced in 1910 and continued in subsequent years and the results had been sufficiently promising to justify these methods for being prescribed at that time.

3.2.1.4 Shebbeares Plan (1919-20 TO 1924-25)

Shebbeare divided the forests of Jalpaiguri Division into five Working Circles out of which only four WC's covered the Madarihat Range.

A. Plateau Working Circle: One felling series each in Dumchi and Titi were formed. There were two types of coupes. In the main coupe clear felling of all species except Sal (Shorea robusta) was done on 40 years rotation. At the same time felling of Sal (Shorea robusta) over 2 feet in diameter was to be done. In the fuel coupes, fuel species were removed on area basis on a rotation of 40 years. Kukat (Misc) trees utilizable for planking and likely to deteriorate in the next 20 years were to be removed from 1/10th of the periodic block-II annually.

B. Stable Sissoo Working Circle: The prescription was to clear fell and cultivate up to 1/40th of the area in each of the tree felling series each year, by sowing, plantation with the most profitable species.

C. Unstable Sissoo Working Circle: Titi river was allotted to this Working Circle. Trees of exploitable girth could be felled anywhere. Dry Khair (Acacia catechu) and sissoo (Dalbergia sissoo) also could be removed from anywhere. Experimental plantation over 1/40th of the entire area could be raised in any one year.

D. Hill Working Circle: In Titi Hill clear-felling and plantations could be done on a rotation of 80 years and trees over the exploitable girth could be removed from anywhere.

3.2.1.5 Fourth working plan (1926-27 to 1945-46)

In this Working Plan there were 4 WC's, but only two were applicable to the forests of Madarihat Range.

A. Miscellaneous Working Circle: In this Range, there were three felling series viz Dumchi, Khairbari and Titi. Clear felling and artificial regeneration on a rotation of 40 years was laid down. Selection felling and thinning on 15 years cycle were done in areas outside Periodic Block-1. Dry felling was left at the discretion of the Divisional Forest Officer.

B. Khair And Sissoo Working Circle: The main felling was dry Sal (Shorea robusta) felling on a 5-year cycle. Clear felling could be done over not more than 1/40th of the total area in any one year. Selection felling in 10 year cycle was allowed; the girth limits being 3 feet for Khair (Acacia catechu), 6 feet for Sissoo (Dalbergia sissoo) and 10 feet for Simul (Bombax cieba).

3.2.1.6 Fifth working plan (1942-43 to 1956-57)

The fourth Working Plan was revised before the expiry of its period. Out of the six Working Circles formed in the Fifth Plan only three were applicable to Madarihat Range.

A. Sal Selection Working Circle: 7553 acres of Titi block was allotted to this Working Circle. Selection felling on 20 years cycle was adopted. The lower girth limit was 7'-6" for Sal (Shorea robusta) and 6'-4" for other species. Clear felling could be carried out without limit provided that no coupe was less than 10 acres in any one year. Teak was the main species with Lasune, Angare in alternate diagonal lines. The selection felling yield for sal (Shorea robusta)was 50 trees per year and for every 5 Sal (Shorea robusta)trees removed at least one acre was to be clear felled and planted with Sal (Shorea robusta)and other valuable species.

B. Soft Wood Working Circle: Entire Dumchi and Khairbari blocks were allotted to this Working Circle.

C. Riverain Working Circle: 2056 acres of Titi block came under this Working Circle. Selection system was adopted, and exploitable girth was fixed at 3' for Khair (Acacia catechu) and 6'4" for other species. A minimum of 1500 trees of Khair were to be removed annually and removal of other species was dependent on market demand. Dry Khair (Acacia catechu) could be removed from anywhere. Special felling of other species was allowed on a 10 year cycle. Climber cutting in the natural forest was to be carried out on 10 year cycle. The selection felling of Sal (Shorea robusta) only depleted the stock. The compensatory plantations of sal (Shorea robusta) viz. 1 acre for every5 trees removed were not done. Only 75 acres were planted under the prescription of clear felling during the 15 years of the plan period. In the prescriptions for riverine Working Circle, no step was taken to safeguard against over exploitation of Khair (Acacia catechu) because no assessment of the growing stock was made. During the period 1957-58 to 1958-59 prescriptions of the fifth Working Plan were followed. During the period 1959-60 to 1961-62, three annual working schemes were drawn, based on the Fifth Working Plan.

3.2.2 Nilpara and Chilapata Ranges

Prior to Working Plan – The forest has been in the charge of the Forest Department since 1866, but up to 1874-75 the working was very irregular, and records are incomplete.

3.2.2.1 Schlichs Working Plan(1874-75 to 1905)

The first Working Plan was incorporated by the late Sri William Schlich in his Administrative Report for 1874-75. From 1888 onwards, the exploitable girth of Sal (Shorea robusta) was raised from 5' to 6' and the size of the annual coupe was fixed by anticipated demand.

3.2.2.2 Hatts Working Plan (1904 to 1919-20)

This plan prescribed selection felling on a 15-year cycle with an exploitable girth of 6'-3" for Sal (Shorea robusta) 6'-6" for Sissoo (Dalbergia sissoo) and 10'-0" for others (at a point 4' from the ground) combined with improvement felling. The improvement felling was applied to inferior sal (Shorea robusta) and other species interfering with promising Sal (Shorea robusta) and to Sal(Shorea robusta) which was so obviously defective that it could not grow into a good tree of exploitable girth.

3.2.2.3 Shebbeares Working Plan (1920-21 to 1924-25)

This plan had seven Working Circles out for which only 5 were applicable to the two Ranges under review.

A. Sal Working Circle: Shebbeare prescription for this Working Circle was of 20 year rotation for fuel wood species, 40 years for kukat and 80 years for sal. All three classes grow mixed together and the coupes corresponding to three rotations was made simultaneously in the same felling series.

B. The Plateau Working Circle: This Working Circle is almost same like sal Working Circle except that no clear felling was prescribed for sal which was only found over comparatively smaller areas.

C. The Stable Sissoo Working Circle: The prescription was to clear fell and cultivate up to 1/40th of the area in each of the tree felling series each year, by sowing or plantation with the most profitable species.

D. The Unstable Sissoo Working Circle: Three kinds of felling were prescribed:
(a) Unregulated Felling: Trees over the exploitable girth could be removed from any area.
(b) Dry Khair And Sissoo – could be removed from any part of the area.
(c) Experimental Clear-felling: Over an area not exceeding 1/40th of the whole Working Circle annually could be felled.

E. Tea Garden Working Circle– The maximum annual coupe is 1/20th of each felling series and the nature of the felling in any given part of this area was dependent on the steps that can be taken to restock it.

3.2.2.4 Period from 1925-26 to 1928-29

Pending the completion of the new working plan, Shebbeare's plan continued to be in force for a further period of four years up to 1928-29.

3.2.2.5 Fourth Working Plan (1929-30 to 1944-45)

Ten Working Circles were formed in this plan but Nilpara and Chilapata Ranges were covered only by five Working Circles.

(i) Sal Uniform Working Circle – There were five felling series viz. Bhutri, Salkumar, Barodabri, Mendabari and Bania. Clearfelling followed by artificial regeneration on a rotation of 80 years was adopted.

(ii) Miscellaneous Working Circle.

(iii) Khair And Sissoo Working Circle: Main prescription was dry felling of Khair (Acacia catechu) and Sissoo (Dalbergia sissoo) over 1/5th of the total area of each felling series (North Torsa, South Torsa & Gobur Basra).

(iv) Savannah Working Circle: Malangi and Chilapata blocks covering a total area of 8293 acres formed this Working Circle. The reason of creating this circle was for preservation of grassland fauna like wild Buffalo (Bubulas bubalis), Rhino, Swamp Deer (Cervus duvauceli) and even Hog Deer (Axix porcinus). Consequently, the practice of early burning was discontinued, and no cultural operation was prescribed. Great stress was laid on the importance of protection from illicit grazing. Dead and dry timber, thatch and other minor produces could be removed from the whole working circle.

(v) Cane Working Circle – Exploitation of cane was prescribed on a four-year cycle. Homfrays Working Plan was designated for 20 years i.e. up to 1948-49, with a recommendation for revision after seven years. It was followed till end of 1944-45 with certain amendments made time to time. No revision could be undertaken after seven years due to shortage of staff.

3.2.2.6 Fifth Working Plan (1945-46 to 1954-55)

There were 10 Working Circles in this plan but the two Ranges under consideration were covered by only six of these.

(i) Sal Conversion Working Circle: Entire Salkumar block, major portions of Barodabri blocks and parts of Mendabari, Bania and Chilapata blocks came under the Working Circle.

Silvicultural System: Clear felling followed by artificial regeneration by taungya. Rotation of 100 years. No. of periodic block is 5. Removal of dead and dry trees on a cycle of 5 years over the entire area except the plantations was prescribed. A special selection felling in whole area except PB-1 was designated as an extra ordinary measure to exploit the over-mature trees during the first 5 years of the plan. Sal (Shorea robusta) was the principal species for artificial regeneration.

(ii) Short Rotation Miscellaneous Working Circle: Major portion of Bania Block and part of Mendabari block were included in this Working Circle to form Bania felling series.

Silvicultural System: Clearfelling followed by artificial regeneration by taungya. Rotation of 50years was prescribed. No of periodic blocks are 5. Special felling, dry felling was prescribed in the same manner as in the sal (Shorea robusta) conversion Working Circle.

(iii) Long Rotation Miscellaneous Working Circle: Not applicable to Jaldapara area.

(iv) Torsa Working Circle: Whole of Jaigaon, Dalsingpara and
Hasimara (except 14 acres) were allotted to this Working Circle. No felling series was formed, and clear felling was not allowed. Selection felling of

Khair (Acacia catechu), Plywood and Matchwood species on 15 years cycle was the main prescription.

(v) Riverine Working Circle: Not applicable to the then Jaldapara area.

(vi) Game Sanctuary Working Circle: 24,950 acres of forests came under this circle. No operation was prescribed except improvement of savannah lands.

3.2.2.7 Period From 1955-56 To 1958-59

Though the 5th Working Plan was prepared to cover a period of 20 years viz. from 1945-46 to 1964-65, yet revision of the plan after 1954-55 was necessary. But due to scarcity of staff, this revision could not be undertaken. During the period 1955-56 to 1958-59 works of the Division were carried out based on the 5th Working Plan.

3.2.2.8 Period 1959-60 To 1961-62

Three annual working schemes were prepared for these three years based on the previous Working Plan and various operations were carried out according to these schemes. Cooch Behar Forest Division was formed in the year 1951 taking out Madarihat Range from Jalpaiguri Division and Nilpara and Chilapata Ranges from Buxa Division and combining with the forests of erstwhile Cooch Behar State.

3.2.2.9 The First Working Plan

Under this Division was prepared in the year 1962-63 and the prescription was given for a period of 10 years. In the first Working Plan the following Working Circles (WC) were prescribed - Teak Working Circle, Long rotation Working Circle, Short rotation Working Circle, Riverine Working Circle, Sanctuary Working Circle, Undeveloped Working Circle

3.2.2.10 Second Working Plan (1972-73 To 1981-82)

The second working plan described five (5) working circles - Teak working circle, Industrial Timber working circle, Development working circle, Riverian working circle, Sanctuary working circle

3.3 1ST MANAGEMENT PLAN OF THE THEN JALDAPARA WILDLIFE SANCTUARY (1980-81 to 1985-86):

Approved by the than Chief Conservator of Forests and ex-officio Chief Wildlife Warden, West Bengal vide his office order no: 1376/WL/(C)/2W-274 Dated: 08/06/1982 for five years.

3.3.1 Wildlife conservation measures:

The First management plan prescribed following measures.

i) Maintenance of glades and salt licks
ii) Maintenance of fodder cultivation area
iii) Creation of Wallow pools
iv) Introduction of fruit trees
v) Maintenance of Fire line and patrolling tracks (2 to 3 mtr width, 184 km)
vi) Mikania eradication
vii) Cut back operation
viii) Creation of boundary trenches
ix) Sanctum sanctorum (JP-3,4,5, Torsa-1,2 – No tourist permitted)

3.3.2 Forestry Operation

These had been undertaken so far only in the forests of Salkumar block of the then sanctuary. This block comprises of an area of 1234 acres (501.97 ha) and occurred in isolated patches of forest in between two legs of the then Sanctuary near southern boundary. It was allotted to Teak Working Circle and an area of 6.88 Hectares had been prescribed to be felled annually followed by artificial restocking with Teak, Champ (Michelia champaca), Gamar (Gmelina arborea), Simul (Bombax cieba), Chikrasi (Chukrasia tabularis). Areas likely to be water logged were normally to be planted with Pakasaj (Terminalia tomentosa, Jarul (Lagerstroemia flosreginae), Kainjal (Bischofia javanica) and Chaplash. Salient features of the Teak W.C. were as follows :

(a)	Rotation	70 years.
(b)	Exploitable	2 m. girth at breast height
(c)	Conversion period	70 years

Salkumar block was previously managed under Sal (Shorea robusta) uniform Working Circle (Fourth WP. 1929-30 to 1944-45) of Buxa Division, Sal conversion Working Circle (Fifth WP. 1945-46 to 1954-55) of Buxa Division, long rotation Working Circle (First Working Plan of Cooch Behar Division). But in the first management plan of the then sanctuary, the Block was proposed for management under Teak Working Circle which is quite unusual. Although, Wildlife concentration in Salkumar block was very scanty, but Teak is also not indigenous to the area. First management plan also prescribed plantation of Teak along with Champ (Michelia champaca), Gamar (Gmelina arborea) and Chikrasi (Chukrasia tabularis).

The first management plan (1981-82 to 1985-86) expired on 31-3-1986 and thereafter, the then Sanctuary has been managed based on annual plans prepared by the Divisional Forest Officer, Wildlife Division II.

3.3.3 Tending Operations

Climber Cutting- There was prescription for climber cutting both in high forest and in plantations but full prescription could not be worked out at any stage due to paucity of labour and fund. Since 1963-64, when the Silviculture (North) division took up the work of thinning, all plantations of 8 years old were thinned and climber cutting was done all over the prescribed area.

3.3.4 Thinning in Plantations

First Working Plan prescribed 10 years thinning cycle for plantation older than 15 years. These younger plantations were to have been thinned in a 5 year thinning schedule. In the year 1963-64, special staff were sanctioned under the Silvicultural Division (North) who undertook thinning of all plantations. Plantations, earlier than 1955 were thinned by the Territorial Divisional Forest Officer, where there was congested crop. A new Division viz. Cultural Operation Division took up the work of thinning in all the Divisions in plain sunder the then Northern Circle. Younger plantations were to be taken up for thinning by the territorial Divisional Forest Officer. Presently, all thinning operation is done by territorial DFO whatever prescription is adopted in Working Plans.

3.3.5 Fire Protection

The history of fire protection is interesting which began in about 1877. Protective measures consisted of

i. Cleaning and burning artificial boundaries
ii. Cutting and cleaning double fire lines
iii. Burning savannah
iv. Burning trashes inside natural boundaries

Problems began to be noticed in the shape of increased evergreen undergrowth and a consequent fall in natural regeneration of Sal. This caused some forests to urge of introduction of regulated burning. Conflicting views were held as to the amount of damage that would result from fire as compared to the benefits that might accrue from it. Leaf litter fires, allowed in the forest from 1914, did not help much in reproduction of sal. In many places, forest floor was too moist to be burnt. Burning on a big scale was therefore, abandoned. Only experimental burning was permitted. But accidental fires occurred almost annually in the riverine forests where the undergrowth was tall grasses.

Continued fire protection for a long time changed the composition of the undergrowth. Grass was practically eliminated and replaced by evergreen shrubs except in riverine area. Leaf litter decomposing on the forest floor formed a thick layer and the organic content of the soil increased.

This along with undecomposed debris that blocked the water channels tended to make the area moister. At present to control the spread of natural fires only fire lines are maintained. These fire lines also act as a patrolling path as well as motorable road.

3.3.5 Fire Protection

Spacing of plantation varies from species to species and scheme to scheme. Line sowing of seeds was done in case of Sal (Shorea robusta) and seedling plantation or direct sowing was done in case of other species according to the suitability of the species. There was no hard and fast rule for species composition in plantation. It was dependent upon soil condition and other factors. Crop composition varies from time to time. Sal with Jarul(*Lagerstroemia flosreginae*)& Kainjal (*Bischofia javanica*), Sal (*Shorea robusta*)with Champ(*Michelia champaca*), Sal (*Shorea robusta*)with Champ(*Michelia champaca*) & Malagiri, Sal with Champ (*Michelia champaca*)& Chikrasi(*Chukrasia tabularis*), Sal with Jarul(*Lagerstroemia flosreginae*),Pitali, Sal with Champ (*Michelia champaca*) and Gamar (*Gmelina arborea*), Sal with Toon (*Toona ciliata*) & Latore, Sal (*Shorea robusta*)with misc. species combination was planted. In some area, pure Teak plantation was done although it was not desirable. In some Compartments, Teak with combination of Pakasaj, Jarul (*Lagerstroemia flosreginae*)& Simul(*Bombax cieba*), Sal (*Shorea robusta*)& misc. species, Chikrasi(*Chukrasia tabularis*)& Pakasaj, Sal (*Shorea robusta*)& Jarul (*Lagerstroemia flosreginae*), Champ(*Michelia champaca*), Chilauni(*Schima*

wallichii), Lampate – Champ(*Michelia champaca*) – Pakasaj, Simul (*Bombax ceiba*)-Siris (*Albizia procera*) - Mandar, Jarul (*Lagerstroemia flosreginae*)-Sissoo(*Dalbergia sissoo*) -Gamar (*Gmelina arborea*) etc were planted. In some older plantations purely misc. species were raised in different compositions like Champ (*Michelia champaca*) – Gamar (*Gmelina arborea*) – Lasune, Kadam – Champ(*Michelia champaca*), Jarul(*Lagerstroemia flosreginae*) – Gamar (*Gmelina arborea*), Simul (*Bombax ceiba*)–Kadam, Kadam – Toon (*Toona ciliata*) – Gamar (*Gmelina arborea*), Gamar (*Gmelina arborea*)– Lahasuni – Toon (*Toona ciliate*), Khair(*Acacia catechu*) – Sissoo(*Dalbergia sissoo*)-Simul(*Bombax cieba*) (in riverine area), Panisaj – Toon (*Toona ciliata*) – Pakasaj, Jarul (*Lagerstroemia flosreginae*)– Siris(*Albizia procera*), Panisaj -Pakasaj, Khair(*Acacia catechu*) – Sissoo (D*albergia sissoo*)– Sidha(*Lagerstroemia parviflora*), Simul (*Bombax ceiba*)– Kainjal (*Bischofia javanica*)– Siris(*Albizia procera)* – Sidha(*Lagerstroemia parviflora*) – Chilauni, Champ(*Michelia champaca*) – Jarul (*Lagerstroemia flosreginae*)– Pitali. Some monocrop plantations were found species like Chikrasi (*Chukrasia tabularis*), Sal (*Shorea robusta*)etc.

3.3.7 Bamboo Working Circle

None of the then Sanctuary area except Titi block did have natural bamboo. So, no bamboo working circle was adopted in the earlier plans. Bamboo had great demand in fringe villages, forest villages as well as in Tea Gardens. But source of supply was only limited to the Titi forest. Kakwa or Choya bans (Dendrocalamus hamiltonii) was available only to a limited extent. Plantation of bamboo was also not done.

3.3.8 Firewood Collection

Timber extraction was done in different felling series of silvicultural systems–like clear felling or selection felling. After extraction of timber tops, branches etc. were converted into firewood. Huge amount of fire wood was extracted from thinning of plantations. During clear felling, species having no timber or plywood value were directly converted into firewood. Much of the drift timbers were converted into firewood. Firewood had tremendous demand and supply was much lower than demand.

3.3.9 Non-Wood Produce

Besides timber and firewood, the then Sanctuary had a rich source of Non-wood produces or Minor Forest Produce (MFP) or non-timber forest produce (NTFP). There was many NTFP's present but there was no definite extraction procedure adopted to collect it. Villagers went inside the forest and sometimes illegally collected NTFP according to their demand.

3.3.10 Other Program and Activities

Many programmes and activities were undertaken by the forest department to improve the then Sanctuary from different angles of management e.g. habitat improvement, protection of flora and fauna, staff and local people's welfare etc. It was needless to mention that only forest department was doing activities in the then sanctuary. No NGO was yet involved in activities related to Sanctuary and fringe area. No special programmes and activities were taken up in the then Sanctuary except forestry, wildlife and eco-development related works. Different programmes and activities taken up by Forest Department under various state plan and Centrally Sponsored schemes were as follows:

(i) Afforestation activities.

(ii) Improvement of communication.

(iii) Intensification of management and protection.
(iv) Fire protection including maintenance of fire lines and control burning of grassland.
(v) Habitat improvement work.
(vi) Immunization of cattle of fringe villages and departmental elephant.
(vii) Procurement of chemical, capture equipment's and drugs.
(viii) Soil conservation and stream bank erosion control work.
(ix) Establishment of rescue center at Madarihat for rescued animals.
(x) Awareness generation and nature education activities.
(xi) Site specific eco-development work.
(xii) Amenities for forest staff.
(xiii) Periodic census of wild animals.
(xiv)Research and monitoring work.

3.3.11 Forest Protection

Forest protection was the job of the personnel of Wildlife Wing, Forest Department. Regular patrolling round the clock was organized to protect the forests and wild life. 0.315 Rifle and DBBL guns were used during patrolling. Patrolling was done on elephant back in Rhino concentration areas. Patrolling on foot, on bicycle and by vehicle was also done regularly.

RT networks had been installed in most offices. Moreover, walkie talkies were used by patrolling teams. Almost all the Beats were provided with elephant for intensive patrolling. Detailed list of captive Elephants of Jaldapara is given in Annexure-18. Extensive road networks, fire lines, patrolling paths etc. were constructed. Watch towers also had been constructed in vulnerable areas and patrolling camps (7 Nos) were set-up at some strategic places. A total 60.00 km. energized fencing line and 5 km animal proof trenches had been created to protect animals from straying out, controlling wild animal depredation and to prevent cattle grazing inside the then sanctuary.

Eco-development Committees had been formed in the fringe villages to protect forest and wild life with active support from Eco-development Committee members.

3.3.12 Legal Status

The forest of the then Sanctuary prior to their reservation continued to be unoccupied waste lying open to indiscriminate felling and was described as "Open Forest". These forests came under the British rule in 1865 after treaty between Bhutan Dzong and the then British Government. The first reservations were made in 1878 according to the Indian Forest Act (Act VIII of 1878) and the process continued till 1940. Thus, all the forest areas constituting the then Sanctuary enjoys the status of Reserved Forests under the provisions of the Indian Forest Act, 1927. The area was first declared as a Game Sanctuary in 1941 vide Govt. Notification No. 10547-For dated 12.11.1941. Subsequently, it was amended vide Notification No. 5238-For dated 3.4.1943. After the promulgation of the Wild Life (Protection) Act, 1972, a fresh notification, in supersession of all previous notifications, was issued under section 18 (i) of the act vide Notification No. 5404-For dated 24.6.1976, declaring 115.53 sq. km. as the then Jaldapara Wildlife Sanctuary. Subsequently, Collector of Jalpaiguri District carried out proceedings for settlement of rights and concessions in 1987 as envisaged in sections 19 to 24 of the Act. The Government of West Bengal further issued an order No. 7245-For Dated 31.8.1990, further notifying an area of 100.98 sq. km. as the part of the then sanctuary.

3.3.13 Hunting

Legal hunting of Rhinos was permissible in Bengal till promulgation of the Bengal Rhinoceros Preservation Act, 1932. Erstwhile Maharaja of Cooch Behar, however, had exclusive right to hunt Rhinoceros within his jurisdiction. Hunting had been the major factor for decline in Rhino population in North Bengal till the twenties after which the poachers took over. Heavy hunting could be cited as the sole reason for the extinction of Rhinoceros from Garodhat Reserve in Cooch Behar. Reliable records of hunting of Rhinos are not available except those kept by the Maharaja of Cooch Behar from 1871 to 1905. During this period only one Rhinoceros was killed in the year 1893 in the then Jaldapara Wildlife Sanctuary. Besides Rhino, other species hunted were different kinds of deer, wild boar, Jungle fowl etc. Hunting of all species was prohibited after the area was notified as a Wild Life Sanctuary. During Holi and Chaitra Sankranti festivals group hunting was a tradition of tribal people.

3.3.14 Other Illegal Activities

Poaching, illegal felling of trees, illegal removal of NTF's & encroachment were the main illegal activities including fishing, boulder collection, illegal grazing etc.

Poaching: Protection of Rhinoceros was the biggest problem of the then Jaldapara Wildlife Sanctuary. More Rhinos have been lost to poaching than to natural reasons. As the Rhinoceros were in small numbers so loss of one Rhinoceros was meant great setback to the conservation efforts. Last case of Tiger (Panthera tigris) poaching was in 1990. Laborers from the nearby tea estate were reported to indulge in poaching of Deer, Wild Boar, Jungle Fowl. It was suspected that poaching of Bears for their bile and gall bladers was used to take place in Jaigaon. Fishing also took place in Torsa, Bania and Hollong River although it was not on commercial basis and did not create much problem.

Illegal Felling of Trees: It was a very common illegal activity and a very serious problem and mainly done for timber & firewood. It was found in all the blocks, but in Salkumar, Torsa, Hasimara, Jaigaon, Titi, Jaldapara Blocks it was more a serious problem. There were many saw mills and veneer mills present in Falakata & Madarihat around the then sanctuary. Firewood was collected by people not only for their own use but for sale to sweet shops and local markets for their subsistence.

Women folk near Madarihat also were indulged in felling of trees and removal after splitting them into billets. Removal of timber or firewood by trucks was rare but rafting of timber through Torsa River was common and it became a severe problem during rainy season. Sometimes boats were used to carry such illicitly removed timber. Mainly sal, sissoo (Dalbergia sissoo) and other valuable species were felled illegally but simul (Bombax cieba), udal etc. were also felled for plywood industries.

Illegal Removal of NTFP's: Simul (Bombax ceiba) floss and thatch were two common NTFPs which were collected from the then sanctuary. Illegal collection of such items could not be ruled out as because villages and agricultural lands were very close to the then sanctuary. Detailed survey was required to know the status of forest boundary and encroachment.

Encroachment and Other Illegal Activities: Cases of encroachment in the sanctuary had not been reported.

3.3.15 Domestic Livestock Grazing

Grazing of domestic livestock was very common in the then Jaldapara Wildlife Sanctuary. Shape of the then Jaldapara Wildlife Sanctuary was like a trouser. Villages were present in between two legs of the then sanctuary as well as outside the then sanctuary. A total of 32 villages were present in the fringes of the then Sanctuary. Those 32 villages had a large cattle population. A fair percentage of these cattle used to graze inside the forest. Livestock of 32 fringe villages received very little veterinary care.

3.3.16 Wild Fire

Wildfire was not a severe problem, but ground fire was common. Wildfire was mainly man made. Illicit fellers, grazer, thatch collectors, simul (Bombax ceiba) floss and other NTFP collectors, knowingly or unknowingly, set the forests on ground fire during dry season i.e. December to March. Uncontrolled fire was always harmful to forest and wildlife. Sometimes poachers lit fire to expose the wild animals. Wildfire used to occur in Jaldapara, Malangi, Chilapata, Hasimara and Titi blocks but the net areas burnt due to wildfire was restricted to only few hundred hectares.

3.4 2nd MANAGEMENT PLAN 1997-98 TO 2006-07

The second management plan of the then Jaldapara Wildlife Sanctuary was written by P.K. Pandit, WBFS and published by Wildlife Circle West Bengal in the month of August 1997.

➢ **Objectives of the Management Plan**

- To conserve Bio-Diversity with special stress on conservation of the GIOH Rhinoceros, a flagship and indicator spp.
- To ensure active participation of fringe population in management and development of the sanctuary
- To facilitate and promote field-oriented research activities for proving technical input to Management of the Sanctuary.
- To encourage eco-friendly, nature tourism for promoting nature education and generation of conservation awareness and entertainment of the visitors.

➢ **Strategies**

- **Zonation and zone plan:** The sanctuary was divided into three management zones;
  - **Wilderness zone**: JP-1, Titi-1,3, HM-3,4, BN-3,4 Jaigaon-1, MB-3,4 Total = 64.77 sq km
  - **Habitat Improvement zone:** JP-2,3,4,5, MLG-1,2,3, CP-1,2,3B(Part), Torsa-1(Part), 2 (Part), 3(Part), MB-5(Part), 6 (Part), BN-1, 2, HM-1,2, SLK-1,2,3,4, Jaigaon-2, DSP-1,2,3,4, Titi-2,4 Total Area = 165.62 sq km
  - **Eco-Tourism Zone:** It was overlapping with the both the above zones, Compartments were – JP-5, Torsa-1, HM-1, BD-1B(Part),2,6B, 7B a small part of BN-3 (Bania Ruin), a narrow strip along high way through MB-4, a small strip along the road through Titi-3 and 4 and a small patch on the fringe of Torsa-2 (Kunjanagar) and Salkumar block, Total area approximately 25 sq km.
- Conservation of Bio-Diversity
- Control of Poaching
- Reorganization of Range, Beat, and Camp
- Strengthening Communication network
- Provision for arms and ammunition for staffs
- Strengthening of wireless network
- Establishment of legal cell
- Establishment of intelligence network
- Coordination among various law enforcement agencies
- Incentive and reward to staff

- Publicity, Nature education and awareness generation
- Habitat improvement
  - Over wood removal and fodder plantation (Annual Target – 60 Ha)
  - Weed eradication and climber cutting (Annual Target – 100 ha)
  - Control burning of old grasses (Annual Target–60 Ha)
  - Control of wild fire (Annual Target 70 km of fireline)
  - Maintaining special habitats for other species
- Control of grazing of domestic livestock and grazing by Departmental Elephants, plantation outside PA in village land annual target 25 ha.
- Reforestation of degraded forest areas (Annual Target–60 Ha)
- Thinning of older plantations and conversion of monoculture plantations into mixed plantations (Annual Target – 20 Ha)
- Soil and water conservation measures
- Embankment protection
- Construction of water harvesting / recharging structure
- Control of illegal wood based industries
- Control of illegal removal of timber, fuel wood and non timber forest produce (NTFP)
- Supply of fuel wood to EDC Members
- Alternate provision for staff fire wood
- Control of Man-Animal conflict
- Veterinary care for wild animals and departmental Elephants
- Veterinary care for rescued Elephants(Elephas maximus)
- Trans-boundary problems
- Reintroduction of Rhinos as preventive measure for improving genetic diversity.
- Reintroduction and rehabilitation programme
- Eco-Development activities
- Tourism Area / Routes
  - Vehicle safari from Hollong- 5 sqkm over JP-5 and Torsa-1 Compartment
  - Vehicle safari from Barodabri-1B,6B,7B and Bania-3 (BN Ruins) and Mendabari – 4 Compartment total 8 sq km
  - Vehicle safari from Madarihat to Toto para through Titi-3, 4 and HM-1, 2total 6 sqkm
  - A small patch in Torsa-2 adjoining Kunjanagar Beat Office, Total area 2 sqkm
  - Vehicle safari from Shilbari hat to Salkumar Forest block, total area 4 sqkm
  - Elephant Riding from Hollong not more than 4 Elephants and for Barodabari not more than 2 Elephants
- Development of Madarihat Nature Interpretation Center and Kunjanagar watch tower cum interpretation center.
- Organizing nature camps
- Development of Nature trails

3.5 3rd MANAGEMENT PLAN FOR THE PRIED FROM 2007-08 TO 2016-17:

In 2012 the then Jaldapara Wildlife Sanctuary was legally notified as Jaldapara National Park vide Government notification no: 973-For/FR/O/ IIM-44/11 Dated: 27/04/2012 under section 35 of Wildlife (Protection) Act, 1972.

➢ Objectives of the Management Plan

- To maintain the representative bio-diversity and where necessary to restore the demographic indicator of population dynamics of all endangered, endemic, vulnerable, rare species of flora and fauna with special focus on the flagship species – The Great Indian One Horned Rhinoceros and its habitat
- To reduce the natural resource dependency of the local communities and mitigate human – wildlife conflict.
- To enhance the catchment capability of the river Torsa and its tributaries and increase the surface water availability.
- To establish mechanism and create opportunities for capacity building and thereby enhancing human resource development in effective management of the then Sanctuary.
- To enhance the wilderness experience to the visitors and promote the environmental awareness.
- To conserve and promote the traditional knowledge of the indigenous people and to protect the ethnic culture as well as historical heritage.

➢ Strategies

- Boundaries – External Boundary, Internal boundary and Ecological Boundary.
- Zonation –
  - Nature Conservation Zone: Compartments were – Jaigaon 1,2 Titi-1, 2, 3 and 3B(Part), HM-1, 2 BN-2, 3 (Part), MB-3, 4, CP-4B , BD-1B, 2 total area 71.8 sq km
  - Management Intervention Zone: Compartments were Jaldapara 1, 2, 3, 4, 5, MLG-1, 2, 3 CP-1, 2, 3B Torsa-1, 2, 3, Dalsingpara- 1, 2, 3, 4, BN-1, 3, 4 and 8B, Titi – 4(Part), HM-3 and 4, SLK-1, 2, 3, 4, MB-5, 6 BD-6B, 7B, Total area 144.71 sq km.
  - Tourism Zone- This particular zone was suggested to be an overlapping one with the earlier two zones and should comprise of parts of Jaldapara- 3 & 5, Torsa-1, Hasimara-1, 2, parts of Barodabri-1b, 2, 6 b and 7b, Mendabari : 6, a small part of Bania-3 (Bania ruin), a narrow strip along Highway through MB-4, a small strip along the road through Titi-3 and 4, and a small patch on the fringe of Torsa-2 (Kunjanagar), Chilapata – 4B & Salkumar Block.
- Illicit Felling Control
- Protection
  - Establishment of anti-poaching tower
  - Strengthening surface communication network
  - Provision for arms and ammunition
  - Upgradation of wireless network
  - Posting of Forest personal in the sanctuary
  - Night Patrolling
  - Foot patrolling
  - Elephant Back patrolling
  - Lady task force
  - Operation monsoon
  - Gates and barrier
  - Patrolling schedule
  - Rewards / incentives
  - Intelligence network
  - Capacity building
  - Role of EDC
  - Inter departmental coordination and sensitization
  - Law enforcement
  - Monitoring and evaluation
  - Fire Management
- Habitat Management
  - Control burning (Annual Target – 200 Ha)
  - Over wood removal (Annual Target – 300 Ha)
  - Fodder Grass plantation (Annual Target – 60 Ha)
  - Weed Eradication (Annual Target – 400 Ha)
  - Removing of monoculture (Annual Target – 75 Ha)
  - Reforestation 200 Ha

- Control of grazing of domestic livestock and grazing by Departmental Elephants, plantation outside PA in village land annual target 25 ha.
- Water moisture conservation works
- Provision of salt lick
- Control of Man animal conflict
- Captive Elephant Management
- Trans boundary problem and dolomite poisoning
- Corridor Management
- Eco- Development activities
- Eco-tourism area and activity

3.6 PROTECTION WORKS

3.6.1 Patrolling by elephant (Elephas maximus)

Almost every Beat and camp of earlier notified Jaldapara National Park was provided with patrolling elephants for effective patrolling. As the terrain was not suitable for patrolling on foot in tall grassland inhabited by Rhino & Gaur the only means of patrolling was on elephant back. Round the clock patrolling was done & on an average 35 elephants were being used for patrolling purposes.

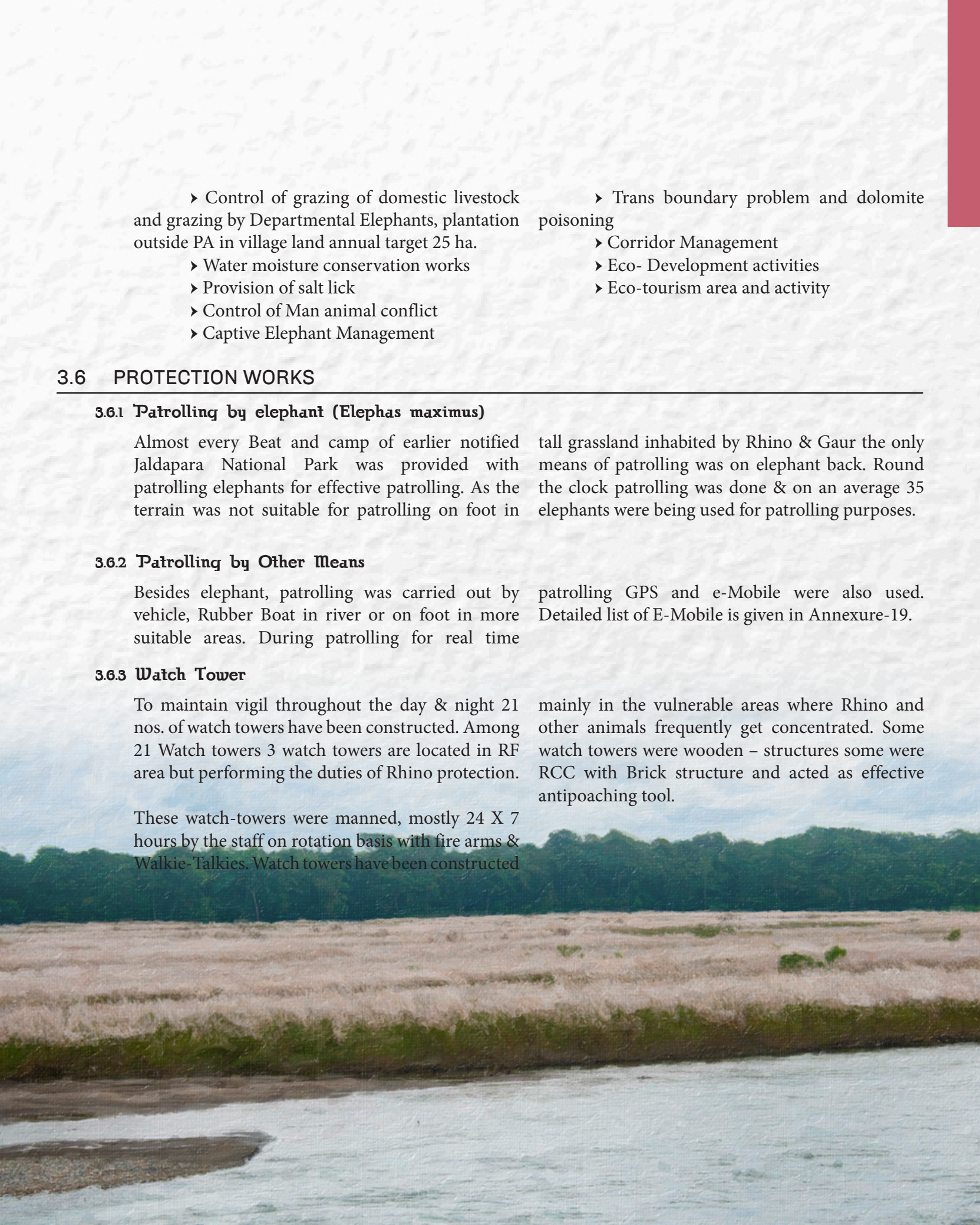
3.6.2 Patrolling by Other Means

Besides elephant, patrolling was carried out by vehicle, Rubber Boat in river or on foot in more suitable areas. During patrolling for real time patrolling GPS and e-Mobile were also used. Detailed list of E-Mobile is given in Annexure-19.

3.6.3 Watch Tower

To maintain vigil throughout the day & night 21 nos. of watch towers have been constructed. Among 21 Watch towers 3 watch towers are located in RF area but performing the duties of Rhino protection.

These watch-towers were manned, mostly 24 X 7 hours by the staff on rotation basis with fire arms & Walkie-Talkies. Watch towers have been constructed mainly in the vulnerable areas where Rhino and other animals frequently get concentrated. Some watch towers were wooden – structures some were RCC with Brick structure and acted as effective antipoaching tool.



3.6.4 Patrolling Sub-Camp

The area jurisdiction under each Beat in Jaldapara is less than the standard size, to ensure intensive protection. But, due to the typical geographical shape of National Park, villages present both inside and outside the legs create tremendous biotic pressure on the forest which necessitates establishment of additional patrolling camps or sub-Beats. To fulfill it, 5 patrolling Sub-camps were present along with 22 Beats.

Hasimara Beat was originally a camp, but from 1994 it has got the status of a Beat for effective protection work. All the beats were provided with fire arms, walkie-talkies and almost all beats were provided with patrolling elephants. All the beats were equipped with fixed RT Set.

3.6.5 Barrier

Check Gates - To check unauthorized entry of cattle and human beings into the forests, check posts, Manned and un-manned barriers have been installed. These check post effectively controls the entry of unauthorized tourists and trespassers. Among the barriers listed below some are in reserve forest area but are also controlling unauthorized entry in the PA. Detailed list of check gates is given in Annexure-20 & Location map of barriers of Jaldapara in Figure-3.

Energised Fencing - Considerable length of the exposed boundary of the National
Park (aprox. 60 km) is now having Energized fencing which is the most effective and cost effective method to check straying of wild animals but regular maintenance is required. Elephant depredation is common along the western to north-eastern fringe of the National Park. Multistrand energized fencing lines if maintained properly are the most effective ones.

Deep Earthen Trench- Deep earthen trenches can also control crossing of
cattle, Gaur (Bos gaurus) and elephants (Elephas maximus) across the boundary. 2 m x 1.5 m Section trenches can easily act as elephant (Elephas maximus), Gaur (Bos gaurus) and cattle proof barrier. Gaur (Bos gaurus) generally strays from Moiradanga - Kunjanagar - Bangdaki areas and Mendabari – Bania areas. A 5 km long trench was created during 1995 along the western boundary of Kunjanagar and Bangdaki Beat areas. However, the main defect of such trenches is that they get damaged very fast and their maintenance is quite labor-intensive and costly.

3.6.6 Provision of Sophisticated Wireless Network

The then Jaldapara Wildlife Sanctuary had a strong RT network of band 66 to 88 Mhz and frequency was 71.05 Mhz. But somehow the network was disrupted in the last phase of the last MP. During 2015 all RT stations have been reinstalled and new RT sets have been provided in the band 146 to 174 Mhz and frequency is 159.9 Mhz, the earlier northern circle frequency. Now Jaldapara National Park is provided with an intensive wireless network which presently all beats and anti-poaching watch towers of National Park have been provided with fixed RT sets for seamless connectivity been described in detail in Annexure-21.

3.6.7 Control of Cattle Grazing

Cattle grazing is a severe problem in Jaldapara National Park. To control it, 8 km cattle proof trench have been dug up and regular patrolling is done but seizing of cattle is not possible due to want of government registered pound "Khamar". Detailed format for record grazing is given in Annexure-22.

3.6.8 Establishment of Flying Squad

Madarihat Flying Squad, now called as Elephant Squad, was established as an antipoaching squad in the year 1988. The main functions of that squad were to assist various ranges in conducting raid operations, driving away of stray animal and taking up special assignments as and when required. Equipment register format is given in Table-5.

3.6.9 Development of Intelligence Network

A highly-personalized information system exists in the National Park through which information related to poaching and other illegal activities come to the knowledge of the officers and staff. Based on such information frequent raid programmes are organized. The information network is primarily operated by the frontline field executive staff and is assisted by Divisional Forest Officer, Jaldapara Wildlife Division and AWLW level intelligence efforts for certain important cases and in near past the staff of the National Park authority have been able to apprehend some notorious international wildlife poachers. Some of such cases are given in Table-6.

3.6.10 Provision of Fire Arms

At present the PA has 12 bore DBBL guns which are very old and is not manufactured now by Indian Ordinance Factory So, repairing of such old gun is very difficult. At present some 12 bore pump action DBBL guns and .315 Rifles are being supplied.

3.6.11 Corridor

At present the National Park has four main elephant passages (unnotified corridors) with surrounding Forests. It has also local intra-Divisional passages (corridors) of Elephant movement. The PA also had a Tiger movement corridor with Buxa Tiger Reserve through Barnabari and Dalsingpara Tea Garden. [Corridor detailed discussion in Chapter-8]

3.6.12 Communication

The entire National Park is connected well with motorable roads 147.79 km and non-motorable road 42.83 km, patrolling paths 193.04 km and fire lines within high sensitive and low sensitive zone 158.48 km(Acting as a patrolling path and fair weather motorable roads) for effective management and conservation. Detailed list of Patrolling path is given in Annexure-23. Many of the wooden culverts and bridges on these roads, however, get damaged whenever there is a flood.

3.6.12.1 Vehicles

At present, vehicles have been provided to the DFO, AWLW and ROs. The detailed list of vehicles is given in Annexure-24.

3.6.12.2 Departmental Elephants

Departmental captive elephants also act as regular means of communication, especially during rainy season besides protection and tourist duty. List of such departmental Elephants can be seen in Annexure-18.

3.6.13 Eco Development Woks

At present there are 34 EDCs around the PA. For their economic development and to reduce dependency on forest, various ECO-Development works have been executed in the EDC areas during last MP period and besides this 25 % of share of total revenue earned from ecotourism activities was shared with these EDCs. Presently, the EDC share has been increased to 40% of total revenue earned from ecotourism activities during end of 3rd Management Plan.

At the end of the plan period all the EDCs were resurveyed vide Govt. Resolution No: 40/FOR Dated: 03/01/2017 and PCCF General's letter No: 10400/CS/2M-253/11(PP-II) Dated: 05/01/2017. The order can be seen in Annexure-25. At present the total EDC are 49 nose. The details of FPC / EDC can be seen in Annexure-26.

During this plan period 25 EDC have been selected for WBFBCP (JICA) and community development works are being implemented in this EDCs. Details of community development works can be seen in Annexure-27.

3.6.14 Cattle Improvement

To protect the cattle of fringe villages against diseases, frequent immunization is done against FMD, Anthrax and other diseases from which wild animals in the PA may get affected. Detailed report on cattle vaccination is given in Annexure-28.

3.7 HABITAT IMPROVEMENT WORKS

Habitat of Rhinoceros and other animals had earlier degraded due to several reasons such as illicit felling, fuel wood collection, cattle grazing, weeds infestation, loss of grassland. For improvement of such habitats following management interventions were adopted.

3.7.1 Over wood Removal:

Important grassland habitat is being taken over by tree species in the process of natural succession. Some of the colonizing tree spp. were selectively removed to reduce congestion and maintain grassland habitat during the last plan period.

3.7.2 Indigenous fodder plantation:

In degraded area, and area after canopy opening of woodland, cleaning, burning and planting of indigenous grass species were carried out during the plan period.

3.7.3 Cut – back and control burning

In older grass fodder plantation areas grasses become course and unpalatable for the wild animals. Such grasses are slashed above ground level, and burnt during winter season, mainly in December, to facilitate regeneration of new palatable, nutritive shoots. Natural grasslands are also burnt in patches with fire belts during winter for the same reason. Thatch growing areas are also controlled – burnt according to necessity.

3.7.4 Salt licks

As natural saltlicks are not present in Jaldapara National Park, artificial saltlicks are maintained to supplement salt to the wild herbivores. Rock salts are mixed with soil and heaps are made. Presently salt is given in glades maintained in front of anti-poaching watch towers (Jaldapara WT, Kochubari WT, Chilapata WT) and in front of Hollong FRH.

3.7.5 Artificial wallow-pools

In general water is not a scarcity in Jaldapara National Park but water sources are not evenly distributed. In some compartments, natural sources for wallowing are absent. For effective habitat management, however, some artificial wallow pools have been created.

3.7.6 Weed eradication:

Weeds like *Leea spp, Lantana spp, Eupatorium spp, Cassia spp, Clerodendron spp,* had heavily infested many natural grasslands as well as old fodder plantations. These weeds were being eradicated manually as per priority during this plan period.

3.7.7 Soil Conservation

Erosion is not a major issue in Jaldapara National Park. Flood erodes one side of the river bank while creates soil depositions in other bank and thus creates scope of new grasslands. But in some parts of Titi block gully erosion needs to be attended and the Watch tower and building are to be protected by doing soil conservation works. Some soil conservation measures were taken to protect Dayamara cave in Titi Block during last plan period.

3.8 ECO-TOURISM INFRASTRUCTURE

3.8.1 Accommodation

There are, at present 5 places to accommodate the tourists making night halts in and around the National Park.

Hollong Forest Lodge: An excellent two storey wooden building during 1950s built by Forest Department, West Bengal is situated at Hollong, inside the forest and 7.0 km away from Madarihat having eight rooms,

Kunjnagar Eco: Park: In Kunjnagar ECO Cottage four double bedded rooms are available and in adjoining Tower House one double bedded room is available. Of recent construction a Deluxe double bedded accommodation is also available.

South Khairbari Eco Cottage: Three double bedded cottage and one 10 bed dormitory with attached lavatories and under online booking are available for night stay.

Mendabari Jungle Camp: Two double bedded rooms and one dormitory with four beds are available for night stay. From this place Bania Ruins (Nal Rajar Garh) are easily approachable.

3.8.2 Car safari

Besides tourists staying at Lodges, for other tourists who come to visit the National Park during day time provision of car safari is there for visit of the National Park in specified routes in four different shifts.

Madarihat-Hollong Tourist Lodge: Horindanga Watch Tower- Jaldapara Tower and back to Madarihat,
Madarihat-Titi Watch Tower: Lankapara Forest House and back to Madarihat (Trolley Line)
Kodalbasti: Hart road -Monteith Road- Rava Line- Pal Road- Shikari Line- Nalgarh- CC Line Beat Office and back to Kodalbasti via State High way
Chilapata: Shikari line - Pal road -Mendabari Watch Tower- CC Line Beat Office -Nalgarh and back to Chilapata via Kurmai Basti

Shifts are

- 1st Shift 6:00 AM to 8:00 AM
- 2nd Shift 8:30 AM to 10:30 AM
- 3rd Shift 12:30 PM to 2:30 PM
- 4th Shift 3:00 PM to 5:00 PM

Only authorized and specified gypsy vehicle can carry visitors inside the National Park. At present 44 vehicles owned by the fringe community are allowed for such safari

3.8.3 Elephant riding

Elephant riding can be done by visitors from Hollong Tourist Lodge and NEC Watch Tower. Four Elephants at Hollong Tourist Lodge and one Elephant at NEC Watch Tower are deployed for such riding. One Elephant can carry four visitors and for maximum three shifts in a day.

Shifts are

- 1st Shift 5:30 AM to 6:30 AM
- 2nd Shift 7:00 AM to 8:00 AM
- 3rd Shift 8:30 AM to 9:30 AM

3.8.4 Closed period

National Park remains closed for tourism every year from 16th June to 15th September (i.e 3 months). During last plan period there was no weakly closure of the PA.

3.8.5 Interpretation and Conservation Education

There was a Nature Interpretation Centre (NIC) at Madarihat which was established in the year 1988 and opened for visitors in the same year to educate visitors as well as local people in conservation of forests and wildlife. This NIC was remodeled in 1995 to include a light & sound show which has been discontinued.

A new NIC has been commissioned in March, 2007 with state of the art interpretative materials including relief displays featuring the typical habitat at Jaldapara National Park. It also displays a three-dimensional model giving an intimate feel of the real Jaldapara forest.

3.8.6 Eco Tourism Staff

A separate range, Eco-Tourism and Research Range looks after the Eco-Tourism in Jaldapara National Park.

3.8.7 Regulations under the West Bengal wildlife (Protection) rules 1973 (related to tourism)

Following regulations of the West Bengal Wild Life (Protection) Rules 1973 as amended vide G.O. No. 1386- For dated 20-3-1992 is relevant.

Rule 13: Fee for permit under section 28 and the conditions to be attached to such permit:

A permit holder, entering in to a National Park in a Specified motor car with such means of transport, shall be liable to pay, for each entry.

A permit holder entering to National Park must pay per person. Detailed list of fees for safai in Jaldapara National Park is given in Annexure-29.

3.8.8 Regulations Within the National Park

Besides as per Section 9,30,31,32 of WPA 1972 following activities are not allowed in the National Park.

1. No entry after sunset and before sunrise is permitted. Night driving is strictly prohibited in the National Park.
2. Entry in the sanctum sanctorum (Core area) of the National Park and movement outside tourism zone is prohibited.
3. Playing of transistors, tape-recorders, stereos and bringing in pets are not permitted in the PA.
4. Cooking in rooms is strictly prohibited, it to be done it kitchen only.
5. Littering inside National Park is prohibited
6. Damage of plant or animal life is strictly prohibited.
7. Feeding wild animals and captive elephants by tourists are not permitted.
8. Kindling fire in the forest is strictly prohibited.
9. Fast driving (speed more than 20km. per hour) and blowing of horn inside the National Park is strictly prohibited.
10. Tourists are not allowed to move out of the lodge complex on foot.
11. Shouting, loud singing, making noise, teasing or chasing of animals are prohibited.
12. Camp fire, camping etc are not allowed.
13. Use of flash light for photography of wild animals is not allowed.
14. Smoking is strictly prohibited.
15. Bathing in the river water is not allowed.
16. Carrying packed food and eating it within the National Park is strictly prohibited.
17. Disorderly conduct, misbehavior and drunken state are not permitted in the Forest Lodge and for any offence in this respect the tourist shall be liable to vacate the lodge.
18. Heater and other electrical gadgets shall not be used by visitors.
19. Seeking entry to the tourist lodge without reservation is prohibited.
20. Carrying plastic and plastic materials is prohibited.
21. Any breach of the above direction or rules of the National Park shall attract the penal clause of the Wildlife (Protection) Act, 1972 and in such an event, besides any other legal action, the visitor's entry permits are liable to cancellation, and they may also be debarred from future entry in to the National Park.

3.8.9 Training, Research & Monitoring

There is a vast scope and need of research on Jaldapara National Park, being very rich in flora and fauna. Large and small herbivores, carnivores, avifauna, amphibian, reptilian, Pisces and micro fauna are found adequately in the National Park. Recognized research institutes, universities have so far shown little interest in management- oriented researches in Jaldapara. Though few articles were published but no systematic scientific study which may help the PA managers to incorporate pertinent issues in the Plan except in a few cases were carried out.

Till now exclusive research works on Jaldapara have been done by Sri L.K.Banerjee, 1993 Botanical Survey of India (Plant resources of Jaldapara Rhino Sanctuary) and Sri. D. Ghosh, I.F.S. 1991 (Studies on the Eco – status of the Indian Rhinoceros (Rhinoceros unicornis) with special reference to its altered habitat due to human interferences in Jaldapara Sanctuary, West Bengal)

3.9 RESEARCH ACTIVITIES

3.9.1 Earlier Research Activity

1. "Estimate of palatable Biomass in Jaldapara National Park with special reference to Rhinoceros unicornis" was done by Prof. A. P. Das, Chanda Ghosh and Dibyendu Bhowmick of North Bengal University during 2003 under UNDP sponsorship.
2. "Project for Biodiversity Conservation in North Bengal Plains through Landscape Planning" by Mr. Jayant Kulkarni of Envirosearch, Pune during 2003 under sponsorship of UNDP.
3. Tanushri Biswas, Utah State University has done research on "A Spatio-Temporal Analysis of Land Cover & Vegetative Transition within Brahmputra Basin -Loss of native Grasslands due to Changes in flooding regimes and Land use" during 2006-07.
d. Snake Survey was conducted by Snake Specialists of North Bengal.
4. Gitanjali Banerjee, WII Dehradun, has undertaken a study on "Nutritive ecology of Great One Horned Indian Rhino & and the role Sympatric Ungulates play in their spatial co-existence in the floodplain grasslands in the then Jaldapara Wildlife Sanctuary".
5. Survey of Ichthyofauna (Fish Survey) was done in collaboration with Himalayan Nature & Adventure Foundation, Siliguri.
6. Survey of frogs and toads was done in association with local experts from Alipurduar.

3.9.2 Research activities on-going

1. Leopard (Panthera pardus) ecology in North Bengal including population Estimation, Population Dynamics, Distribution, Habitat Use pattern and human-Leopard (Panthera pardus) conflict by Aranyak, Assam, India
2 Ecology of Elephants (Elephas maximus) in North Bengal including population dynamics, migratory pattern, feeding habits and human- Elephant Conflicts by Aranyak, Assam, India
3. Ecology of Gaur (Bos gaurus) in North Bengal including population dynamics, migratory pattern, feeding habits and human- gaur (Bos gaurus) Conflicts by Aranyak, Assam, India
4. Impact of Habitat Management
5. Baseline survey of Forest Growing stock by Forest Survey of India, Dehradun

All Projects above are funded by WBFBCP (JICA)
6. Floristic exploration and conservation of endemic and endangered species in Jaldapara National Park

funded by UGC research award 2016 to 2018 for the teachers of college in National level by Dr. Chanda Ghosh North Bengal University. Funded by UGC

3.10 MONITORING

Monitoring is the basic component of Control of Function. Day to day monitoring of the National Park is needed for effective management. At present the following monitoring activities are being done.

3.10.1 Monitoring of Rhinoceros

Monitoring of movement and location of Rhino by regular sighting by staff in different compartments is being done regularly during regular course of staff patrolling. An animal monitoring book is maintained at every Beat and camps where they record day to day reports. Weekly report in prescribed proforma is sent to Range Officer, who then sends it to Assistant Wild Life Warden and a monthly consolidated result is sent by the Assistant Wildlife Warden to the Divisional Forest Officer. Prescribed proforma of daily monitoring of wild animals and monthly consolidated report of Rhino monitoring is given in Annexure-30.

3.10.2 Monitoring of Animals other than Rhino

Monitoring of other animals is also done regularly by regular sighting and recording it on animal monitoring book. This book is maintained in every Beat and Camp. Moreover, staff also records it on their duty registers. When a pug mark of tiger is found, it is traced and impression is taken in plaster of Paris. Movement of wild elephant (Elephas maximus) herd and gaur (Bos gaurus) is also monitored regularly. Detailed report is given in Annexure–31.

3.10.3 Monitoring of Animal Diseases

It is regularly done in the National Park as well as in fringe village to see whether any livestock of fringe area is/had been suffering from contiguous diseases like FMD, Anthrax etc.

3.10.4 Monitoring of Treated Animals

Treated animals require constant monitoring till it fully recovers.

3.10.5 Monitoring of Captive Elephant

There is a large No. of captive elephants which require constant monitoring regarding their health, diet, pregnancy, delivery, weaning of calf, care of weaned calf, disease etc. These monitoring works are done regularly through maintenance of ration register, medical register, service book, log book and thorough frequent checking of those registers by senior officers visiting the Park. Register to be maintained for management of captive Elephant of Jaldapara National Park is given in Annexure-32.

3.10.1 Monitoring of Rhinoceros

Habitat of Jaldapara National Park is changing gradually due to following reasons;

- Changes In Course Of River Torsa- During flood of 1968 course of Torsa changed from western to eastern side resulting in change in vegetation composition due to changes in soil – moisture regime.
- Invasion Of Woody Species Into Grassland- Successional change has come up in grasslands because of the process of riverine succession as Khair (Acacia catechu), Sissoo (Dalbergia sissoo), Simul (Bombax cieba), Siris (Albizia procera) etc. are invading the grassland and are gradually changing the forest composition.
- Weeds and Climber Growth- Due to fast growth of weeds and climbers, habitats have been affected in some compartments.

However, at present, there is no well-established mechanism to regularly monitor the above changes.

3.11 TRAINING

At present specialized training of staff is very limited. Endeavour is always made to post a wild –life trained officer as Assistant Wildlife Warden. Only a few executive staff trained in wildlife has been posted in the National Park. Some sorts of training for the field level executive staff are occasionally arranged by the Department, either locally or at West Bengal Forest School, Dowhill Darjeeling. Gazetted officers and Range Officers are usually trained at Wildlife Institute of India, Dehradun.

3.11.1 Training of Mahut and Patawala

As Mahouts are the backbone of field patrolling units because of inaccessible terrain, training of Mahouts was organized in 2006, 2015 and 2017. Detailed list of Mahut and Pattawala is given in Annexure-33.

3.11.2 Training on other Management Issues

For the nature guides and staff of various Eco-Tourism centers hospitality and guide training was organized in 2015, 2016 and 2017. WTI, New Delhi has also imparted training to frontline foresters in the year 2004. Training organized on PA Management in 2016, Creation of grass fodder plantation and Energize fencing in 2017, Training of Extension workers in 2017, training on Micro-plan preparation in 2015. No specific training was imparted to staff on monitoring, technical aspects of natural resource management, legal aspects and armed/unarmed combats.

3.11.3 Training on Wildlife Population Estimation Works

One /two days' training is imparted to staff in interdivisional level for census of Rhinoceros, major carnivores, elephant and other wild animals. After such training trained personnel act as resource persons for training of field level staff to carry out census in effective manner. Elephant Census training and National tiger (Panthera tigris) assessment training were organized in 2017 and 2018 respectively.

Periodic Census Works

Periodic population estimation of Rhinoceros conducted in the year 1964, 1975, 1978, 1980, 1985, 1988, 1989, 1992, 1996, 1998, 2002, 2004 & 2006, 2008, 2010, 2012, 2015 & 2019. Detailed report given in sub-section 2.6.8.1.

3.11.4 Computer training to ministerial staff:

Divisional Office has been provided with computer facilities and to handle it, ministerial staff of Divisional Forest Office and field officers have been trained by a computer expert.

3.11.5 Training in Eco-Development Work

For sufficient motivation of the staff to overcome the barrier of red tapism and to be willing to work hand-in hand with the fringe people, training in executing eco developmental works or community outreach programmes is necessary, especially for the field level staff.

Eco-development work is a new idea and this work was quite new to the field staff. Protection of Forests and Wildlife with the help of local villagers was not an easy job, because field staff were not associated with such works previously. So training was required to staff regarding Rapid Rural Appraisal Study, Participatory Rural Appraisal Study and dealing with local people and to earn their trust and sympathy, motivation of local people and for creating awareness amongst the fringe people.
Different workshops were held to imbibe the concept of Joint Forest Management among the rank and file of the Division. Time to time training programmes like –routine forestry refreshers course and training on developmental activities like – improved agriculture, handloom, pisciculture, mushroom, piggery etc. were also imparted to staffs.

3.12 WILDLIFE CONSERVATION STRATEGIES AND THEIR EVALUATION.

Jaldapara National Park is home of the endangered great Indian one-horned Rhinoceros. Besides Rhino; other wild animals like elephant (Elephas Maximus), Gaur, Leopard (Panthera pardus), Sambar, Spotted Deer, Barking Deer and many other mammals are also present.

Rhinoceros existed in Sunderbans (A.C.Gupta, 1966, Wildlife of lower Bengal with particular reference to the Sunderbans, West Bengal Forest (Centenary commemoration volume – 1964, Forest Directorate, of West Bengal) and the district of Malda (Ajit Banerjee, 1966, Rhinoceros, A historical treatment, West Bengal Forests (centenary commemoration volume-1964, Forest Directorate, Govt. of West Bengal) within West Bengal till the second half of the century. One more species of Rhinoceros viz. Rhinoceros sondaicus, used to exist in North Bengal, but it became extinct much earlier. The last recorded sighting of the species was in forests of Chilapata in 1900 (Annual Reports on game Preservation or Wildlife Preservation) in Bengal Govt of Bengal (or West Bengal). Directorate of Forests for the year, 1936 – 37 (14.2)

Besides Jaldapara National Park (Torsa river flood plains) Rhinoceros was distributed in the flood plains of Sankosh-Rydak & Jaldhaka-Dyana Rivers in present Jalpaiguri and Alipurduar Districts.

Rhinoceros were reported to be plentiful in North Bengal till towards end of the 19th century. According to estimates of the Fawcus committee, there were about 200 Rhinos in Torsa region and a dozen or so in other pockets in North Bengal in 1920. Hunting records of Maharajah of Cooch Behar indicate that about 201 Rhinos were either killed or injured in North Bengal between 1871 and 1905 and death figure for the period 1890 – 1905 was 42.

In Jaldapara, during 1920's approximately 200 Rhinoceros (including Patlakhawa) were present and the population came down drastically to around 75 by 1968-69. Gradually the population came down to as low as 22 during the year 1980 due

to excessive poaching. Up to 1986 declining rate of Rhino population continued and the number came down to 14 only. But due to effective conservation strategies population reached to 204 during 2015 and till date the upward trend of population continues.

3.13 TRANQUILLISATION AND CHEMICAL IMMOBILIZATION OF WILDANIMALS

Jaldapara National Park is equipped with tranquillizing guns and chemical drugs and other capturing equipments like trapping cages, nets etc. Intra division level training is organized by National Park authority to train the staff on aforesaid aspects and this training is imparted for 3 days, with two to three such training sessions per year. Some field staffs have been trained in chemical immobilization, both in theory as well as in practical. Training on tranquilizing were organized in 2016, 2017. Detailed list of tranquilizing equipments and trained Staff is given in Annexure-34.

3.13.1 Capture of wild animals by trapping cage and net:

Necessary training is imparted to staff on capture of wild animals (especially strayed in Tea gardens) by using specially designed nets and trapping cages. Training on man-animal conflict mitigation was organized in 2016, 2017 and 2018. Details report on capture and rescued animals in Annexure-35.

3.13.2 Chemical Immobilisation operation / capture cage / nets.

The National Park authority have been provided with tranquilizer guns, and drugs like immobilon, Narcan, Rompun, Yohmbine, Ketamine etc for use in case of capture of the problem/injured animal. A few staff have also been trained up in use of dart guns. For capturing strayed leopards, captive trap cages and specially made Nylon wire nets are used. To transport captured animals like Gaur(Bos gaurus), Leopard (Panthera pardus) a specialized vehicle with chaining wheel and hydraulic lifting capacity need to be made.

3.14 CAPTIVE ELEPHANT MANAGEMENT:

The National Park possesses 79 captive Elephants (As on 01.02.2019). Central Pilkhana is located at Hollong. Rescued Elephant calves at present are reared at Central Pilkhana. There are other 26 Pilkhana where Elephants are kept for protection duties.

Tourists can go for Elephant Riding from central Pilkhana and NEC Watch Tower. Elephants are engaged for duty for 5 to 6 hours a day and another 6 hours they can go for free grazing. At night Elephants remain (Except Night Patrolling Duty) confined in Pilkhana. Elephants are given rest after attaining 60 years of age and not allowed in protection duty below 7 feet height. Weaning of calf normally is done at 18 to 30 months of age. Pregnant cow Elephants normally is spared from duty after 12 months' pregnancy. "Musth" Elephants are kept separately and managed with exceptional care and no duties are allotted to them. Elephants are given food supplements in form of rice, pulses, salts and green fodder for stall feeding at night. A Veterinary Officer is posted at Madarihat for giving veterinary care to all Elephants.

But as there is no veterinary assistance, need of veterinary assistance is felt all the time.

3.15 NOTIFICATION OF ECO SENSITIVE ZONE HAS BEEN PUBLISHED

The Master management plan for Eco-Sensitive zone is given in Annexure-36.

3.16 NTFP COLLECTION

Not permitted

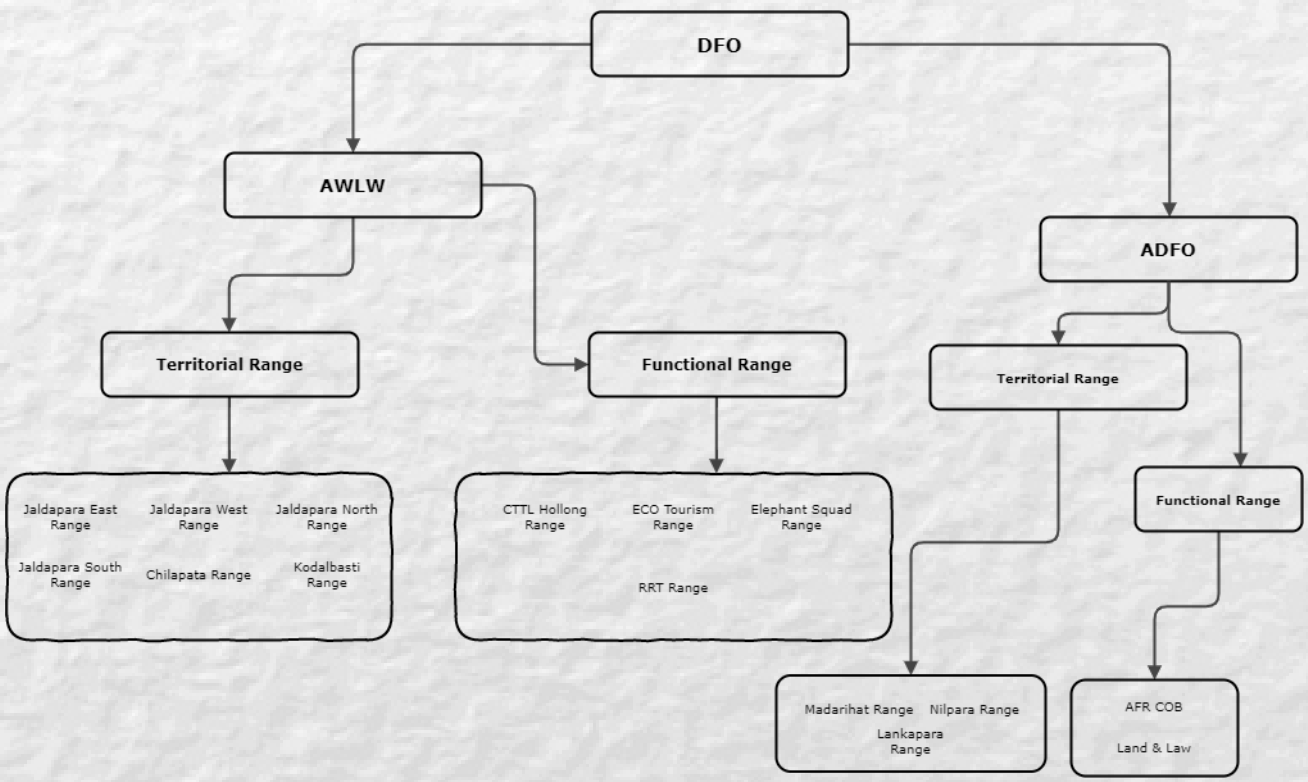
3.17 LEASES

No system of leases is present

3.19 ADMINISTRATIVE SET UP

The then Structure of Range, Beat of Jaldapara is given in Table-7 and present administrative structure is given in Table-8 & present administrative map of Jaldapara in Figure-4.

Assistant Wildlife Warden, Madarihat's Office is provided with 1 BS (RT), 2 Orderly (Lady), 1 PDL (Night Guard), 1 DL (Night Guard) and 1 Assistant Technician (Computer) for management of office. However, there is no sanctioned strength for that.



CHAPTER-4
THE PROTECTED AREA-INTERFACE LANDUSE SITUATION

4.1. EXISTING SITUATION IN THE ZONE OF INFLUENCE

There are 11 revenue villages situated in between the two legs of the National Park and concentration of wildlife in these two legs is appreciable. Moreover, 2 forest villages are situated within the National Park having around a thousand populations and more than one thousand five hundred cattle population. 12 tea gardens are also situated in the fringe areas. Labourers of these Tea Gardens maintain substantial number of cattle and reportedly carry out several illegal activities.

There are total of 53 fringe villages (excluding the forest villages) surrounding the National Park and having large human and livestock population. Detailed population in fringe villages given in Annexure–37, EDC Population in Annexure–38, Tea garden Population Annexure–39, Forest village population in Annexure–40 and Livestock population is given in Annexure–41.

A number of furniture shops and wood-based industries had been established in Madarihat and Falakata region. Detailed reoprt of furniture shop and wood based industries is given in Annexure–42. Income-level of the people residing around the National Park are in general is very low and substantial percentage of the population depends on the forest for their subsistence. Other employment generating activities are also scarce.

Taking all these factors into account, the extent of biotic pressure exerted on the National Park is very high.

In all the 53 villages and 12 Tea Garden and around the PA, there is a population of 2,36,257 comprising about 49,005 families as per 2011 census and the total livestock population in 53 villages and 12 Tea Garden is about 78,496 which comprises 49,482 cows and bulls, 1788 buffaloes and 27,226 other animals like pig's goats etc.

4.1.1. Forest Villages

There is only one forest village located inside the National Park boundary but there are other 11 forest villages located around the periphery of the National Park. The detailed list of Forest village is given below

Sl No	Range	Beat	JL No	Name of Forest Village	Location
01	MDT	SKB	43	South Khairbari FV	Periphery of the NP
02	MDT	NKB	41	North Khairbari FV	Periphery of the NP
03	MDT	DMC	54	Dhumchi Rava Basti FV	Periphery of the NP
04	LKP	BJT	53	Titi FV	inside the NP
05	KB	KB	140	Kodalbasti FV	Periphery of the NP
06	KB	MTR	139	Mantharam FV	Periphery of the NP
07	CP	CP	138	Kurmai FV	Periphery of the NP
08	CP	BN	137	Andu FV	Periphery of the NP
09	CP	BN	135	Bong FV	Periphery of the NP
10	CP	MB	09	Mendabari FV	Periphery of the NP
11	CP	BN	135	Bania FV	Periphery of the NP
12	JPS	SLK	134	Salkumar FV	Periphery of the NP

4.1.2 Fringe Villages

Out of a total number of 53 villages located in vicinity of the Park, 11 are located between two legs forming the southern part of the Park and remaining 42 are located on the outer side all around the Park. A list of all such villages is presented in Table given below;

Sl NO	Village Name	JL No	Police Station	Block	GP	Location
1	Natunpara	11	APD Kotwali	Alipurduar-I	Salkumar-I	between two legs
2	Jaldapara	10	APD Kotwali	Alipurduar-I	Salkumar-I	between two legs
3	Pradhanpara	9	APD Kotwali	Alipurduar-I	Salkumar-I	between two legs
4	Munshipara	8	APD Kotwali	Alipurduar-I	Salkumar-I	between two legs
5	Sidhabari	13	APD Kotwali	Alipurduar-I	Salkumar-I	between two legs
6	Salkumar Hat	2	APD Kotwali	Alipurduar-I	Salkumar-I	between two legs
7	Kalabnariya	6	APD Kotwali	Alipurduar-I	Salkumar-II	between two legs
8	Suripara	14	APD Kotwali	Alipurduar-I	Salkumar-II	between two legs
9	Jogendranagar	5	APD Kotwali	Alipurduar-I	Salkumar-II	between two legs
10	Surobari	16	APD Kotwali	Alipurduar-I	Salkumar-II	between two legs
11	Purba Kathalbari	17	APD Kotwali	Alipurduar-I	Purba Kathalbari	between two legs
12	Uttar Khairbari	37	Madarihat	MDT-BRP	Madarihat GP	Outside of the PA
13	Uttar Madarihat	46	Madarihat	MDT-BRP	Madarihat GP	Outside of the PA (Fringe)

14	Madhya Madarihat	47	Madarihat	MDT-BRP	Madarihat GP	Outside of the PA (Fringe)
15	Purba Madarihat	50	Madarihat	MDT-BRP	Madarihat GP	Outside of the PA (Fringe)
16	Umacharanpur	53	Falakata	Falakata	Choto Salkumar	Outside of the PA (Fringe)
17	Khawchandpara	54	Falakata	Falakata	Choto Salkumar	Outside of the PA (Fringe)
18	Sibnathpur	56	Falakata	Falakata	Choto Salkumar	Outside of the PA (Fringe)
19	Lachmandabri	57	Falakata	Falakata	Moirdanga GP	Outside of the PA (Fringe)
20	Kunjanagar	58	Falakata	Falakata	Moirdanga GP	Outside of the PA (Fringe)
21	Bangsidharpur	62	Falakata-	Falakata	Falakata-II	Outside of the PA (Fringe)
22	Mechbil	3	APD Kotwali	Alipurduar-I	Purba Kathalbari	Outside of the PA (Fringe)
23	Purba Kathalbari	17	APD Kotwali	Alipurduar-I	Purba Kathalbari	Outside of the PA (Fringe)
24	Paitkapara	18	APD Kotwali	Alipurduar-I	Patlakhawa GP	Outside of the PA (Fringe)
25	Paschim Simlabari	22	APD Kotwali	Alipurduar-I	Patlakhawa GP	Outside of the PA (Fringe)
26	Uttar Simlabari	23	APD Kotwali	Alipurduar-I	Patlakhawa GP	Outside of the PA (Fringe)
27	Dakshin Mendabari	10	Kalchini	Kalchini	Mendabari GP	Outside of the PA (Fringe)
28	Uttar Mendabari	9	Kalchini	Kalchini	Mendabari GP	Outside of the PA (Fringe)
29	Madhya Satali	5	Kalchini	Kalchini	Satali GP	Outside of the PA (Fringe)
30	Par Malangi	2	Jaigaon	Kalchini	Malangi GP	Outside of the PA (Fringe)
31	Mechiya Basti	25	Jaigaon	Kalchini	Jaigaon-II GP	Outside of the PA (Fringe)
32	Jaigaon	27	Jaigaon	Kalchini	Jaigaon-I GP	Outside of the PA (Fringe)
33	Totopara	33	Madarihat	MDT-BRP	Ballalguri GP	Outside of the PA (Fringe)

4.1.3 Tea Garden at The Periphery of The PA

There are 10 tea gardens located on Eastern and Western sides of Northern part of the Park. This has got great ecological significance because these tea gardens used to be continuous patches of forest till letter half of 90th Century. The Britisher chopped down all forest and set up these tea gardens purely for commercial purposes. This resulted in fragmentation of a continuous patch of forest along Himalayan foothills of the landscape and as such became barriers for free East-West long ranging movement of Elephant herds and also short range movement of range of other herbivore and carnivore species. This is one of the major causes of intense Man-Animal conflict in the region.

Sl No	Name of TG	JL No	Police Station	Block	GP
01.	Kadambini TG	61	Falakata	Falakata	Falakata-II
02.	Soudamini TG	04	Jaigaon	Kalchini	Malangi GP
03	Malangi TG	20	Jaigaon	Kalchini	Malangi GP
04	Bech TG	21	Jaigaon	Kalchini	Malangi GP
05	Dalsingpara TG	23	Jaigaon	Jaigaon	Dalsingpara GP
06	Torsa TG	24	Jaigaon	Jaigaon	Dalsingpara GP
07	Lankapara TG	30	Birpara	MDT-BRP	Lankapara
08	Gergenda TG	29	Birpara	MDT-BRP	Lankapara
09	Dhumchi TG	27	Birpara	MDT-BRP	Madarihat GP
10	Hantapara GP	28	Madarihat	MDT-BRP	Madarihat GP

4.2. ETHNIC IDENTITIES

A substantial proportion of the population comprise of tribes such as Totos, Mech, Ravas, Oraons, Mundas, Rajbansis, Nepalies etc. The people are mostly farmers or labourers in farms and Tea Estates. People belonging to the religions Hindu, Muslim and Christian reside in fringe villages and tea gardens.

People from the schedule caste (SC) and schedule tribe (ST) communities are represented in all the listed villages. The SC population varies from 1.67% to 82 .19% while the ST population varies from 4.81% to 89.75%. Out of these villages, 12 villages have ST population 100 %. Similarly, 6 villages have ST population above 50%. In four (4) villages, viz. Madhya Satali, Pashim Satali, Dakshin Mendabari and Uttar Mendabari, ST population exceeds 70% of the total population. Maximum number of ST population is found in Uttar Mendabari (89.75%) village. Similarly, maximum No. of SC population is found in Suripara (82.19%). Among the tribes, Oraon are mostly represented (28 villages) followed by Mechs (24 villages), Munda (23 villages), Kheria(13 villages), Santhal (7 villages) Ravas (6 vilages), Garo (3 villages),Toto (1 village) Tudu (1 village), and Kisku (1 village). Totos of Totopara villages are the most endangered tribe and are facing the danger of extinction. Similarly, The Jalda tribe, the original inhabitants of Jaldapara, appears to have become extinct.

In Ballalguri village, Nepali and Modesia are also present. Generally, people of fringe areas of Jaldapara National Park live in communal harmony. Generally they marry within the caste (except some inter caste marriage in case of love marriages). Relationship between the distinct groups is good. Hunting is the tradition among the tribes and they generally hunt wild boar, deer and avifauna. Durgapuja, Saraswatipuja, Shyama puja etc are main

festivals among the Hindus and for the Christians, Christmas is the main festival. But There are no communal feelings among Hindus, Muslims and Christians.

Villages present in between the two legs contain populations mainly belonging to Rajbanshi, Mech, Oraon & Muslims. Among Mechs, Batho puja is famous which is celebrated during the month of Baisakh. Batho is a male God. His wife Mainas is a Goddess of wealth. Baisakh is the first month in Bengali calendar, so Batho puja is celebrated during that month to satisfy the God. With Batho, another 16 Gods and Goddess are worshipped together. The place where Batho is placed called "Bathubrinda".

TOTO: Totos are the most endangered tribes and lives in Totopara near Titi forest block along Indo-Bhutan Border. Till now, 624 families and a total population of 2805 are present (2011 Census). The total Toto households is 248having total population of 1597 (Adult male 461, adult female 592, male child 365, female child 179) are present out of them 1436 are males and 1293 females (as on 03.07.2018). There are thirteen clans present amongst the Totos.

Totos generally don't marry into other castes, but some exceptions are present where Totos have married Nepalese of nearest Ballalguri village. Totos are neither Hindu, nor Muslim, nor Christian. They believe in worship of hill, river and other natural features & during worship they sacrifice chicken, goat, boar, duck and cow.

No dowry system is present during marriage. They traditionally marry within their relatives like cousins. Polygamy is common.
There are not many festivals except "Nyayu Puja" and "Anchu/ Ancha" Puja. Anchu Puja is celebrated during August to September and Nyayu puja is celebrated after 25 days of Anchu Puja. Hunting is not a tradition with Totos. Relationship of villages within their own group and other group is normally good.

Toto children in traditional Toto hut

4.3. RELATIONSHIP WITH FORESTS

Villagers of fringe villages are dependent on forests for fuelwood, small timbers, thatch grass, cattle grazing, and collection of other NTFPs. They also depend on some rivers and streams like Sissamara, Hollong, Chirakhawa and Buri Torsa, which flow through the National Park, for irrigation of their crops and for fishing. Landless and marginal farmers get employment as daily labours in different forestry and development works.

A few persons resort to illegal felling of timber and poaching. But general tendency for illegal felling and poaching is gradually decreasing among the fringe villagers. Relationship with forests in case of Toto tribe is usually good. Attitude towards conservation of forests and wildlife among fringe villagers are gradually changing towards positivity.

4.4. LAND USE PATTERN

Out of the total geographical area of the Alipurduar district, 24.37 percent area is under recorded forest, 19.5 percent under tea gardens, 36.90 percent under field crops and 19 percent under rivers, roads, towns, etc.

Agriculture including Tea Gardens and agro-based cottage industries control the economy of the district. As the demand for food increases, the intensity of cropping also increases.

4.5. PEOPLE'S ECONOMY

People residing in the fringe area of Jaldapara National Park are very poor. There is no industry around the fringe area. Agriculture is the main occupation. Most of the families are small and marginal farmers. Presence of large farmers are very less. Enormous number of landless labourers are present. Traditional agricultural practices are followed by the villagers. Irrigation facilities are very poor. Majority of the agricultural lands are under mono cropping due to lack of irrigation facilities.

Villages present in between the two legs are economically very poor and face the problem of transport facilities, other essential facilities and lack of developmental activities. Their main vocation is cultivation and agricultural labor or labor in forestry related works. Villages situated outside the leg also suffer from similar problems. Villagers maintain large number of cattle although most of them are less productive. Milk collected from the cattle is sold in the market. No dairy co-operative is present. Cow-dung is used as manure in agri field and is not used as fuel, because for fuel they are totally dependent on forests.

4.6. VOCATIONS

Vocation of fringe villagers is agriculture, animal husbandry and agro-based/forestry based/tea garden-based labourer. Number of service holders is very less. Except teaching in school there is hardly any scope of getting job here. Besides teaching a few others are engaged in Forest Department and in Banking sector. A few people are engaged in cottage-based industries. Total land under agriculture is estimated at 15,000 hectares.

Percentage of literacy in fringe area is very low with respect to other parts of the district. The nearest college is at Birpara& Falakata.

Unemployment is the major issue, villagers migrate to Bhutan, Kerala, Gujrat & Assam for getting work

as agricultural laborer, or tea garden laborer.

Rich farmers own land up to 6.5 acres, whereas small and marginal farmers own land around 2.5 acres to 0.5 acres respectively. There are also many landless people in the villages.

Basic facilities like health and education are very poor in between two legs of the National Park, 11 villages are situated but there is only one health center at Munsipara. Outside the National Park other health centers are at Madarihat, Kalchini and Falakata which are quite insufficient in respect of actual requirement.

In Totopara and Ballalguri irrigation facility is nil and modern Agri – technique is not used at all. In Totopara total human population is 2174 and Toto population is 1,300. Out of these populations, only 10 persons are in Govt. service (School teacher 3, Bank-2, ICDS-1 and Post Office 1 etc.). Others are having occupation of agriculture and labourers. In Totopara, there are two primary schools, one junior high School, one Bank, one Post Office, one Students' hostel (having 30 seats). There is one health centre, one veterinary Aid Centre & one agricultural marketing society. Main market is Madarihat but every Tuesday, a general Haat is arranged there. As they are primitive tribe, so central Govt's assistance comes frequently and Totopara gets more privilege than other villages. There is a partly metal road from Madarihat to Totopara and some buses run from Madarihat to Totopara. Totopara is situated at Indo-Bhutan border and at foothills so water table is very low. Nearest college is at Birpara which is 40 km. away. Totos are provided with electricity supply.

4.7 SUMMARY OF PROBLEMS FACED BY PEOPLE THAT AFFECT THE MANAGEMENT OF THE NATIONAL PARK AND THE ZONE OF INFLUENCE:

i) Subsistence agriculture, small holding, poor liquidity of farmers
ii) Shortage of grazing ground for their cattle
iii) Dependency on the National Park for fodder grasses & other NTFPs including firewood.
iv) Requirement for small timbers.
v) Crop raiding by wild animals mainly herbivores, cattle lifting and death of human beings by wild animals.
vi) Gradual reduction in the traditional mode of forestry operations, leading to shrinkage of employment opportunities.
vii) Closure of Tea Gardens on forest fringes.

CHAPTER-5

CHAPTER-5
PLAN OBJECTIVES AND CONSTRAINTS

5.1 OBJECTIVES OF MANAGEMENT

It is a fundamental approach to frame the objectives before structuring the blue-print of the management, and our island of wilderness amidst human ocean, Jaldapara National Park is no exception. Here the objectives are listed below aiming at the optimum scientific management of the National Park;

(I) To maintain the representative bio-diversity and wherever necessary to restore the demographic indicators of population dynamics of all endangered, endemic, vulnerable, rare species of flora and fauna with due importance to all different habitat types specially grasslands with associated faunal diversity.

(II) To enhance management capability for effective protection, conservation and management of the Park by capacity building and infrastructure augmentation

(III) To reduce the natural resource dependency of the local communities and to mitigate human – wildlife conflict.

(IV) To promote environmental awareness to evoke/ensure/gather public support for protection and conservation by enriching the wilderness experience to the visitors and by diversifying tourism activities including traditional knowledge ethnic culture and historical heritage of the locality.

(V) To promote the research and study to develop knowledge of floral and faunal diversity at different levels, ecology of different animals and habitat components, economics of ecological services, management issues and other relevant issues.

5.2 CONSTRAINTS IN ACHIEVING THE OBJECTIVES

Being a multifaceted dynamic entity, to achieve the objectives in Jaldapara National Park, there are many problems against each objective as listed below:

5.2.1 Constraints of Objective - (1)

5.2.1.1 Combating the poaching:

Rhinos in Jaldapara National Park are susceptible to poaching. Records in Jaldapara National Park were inadequately maintained prior to 1968. Total 31 Rhinos were poached between 1968-69 and 1970-73. Rhino poaching stopped between 1973 to1977. In 1978 one Rhino was poached but 1979 was no poaching year. During the year 1980 to 1985 eleven (11) Rhinos were poached. No Rhino was poached in 1986-1990. In 1991 to 1993 three (3) Rhinos were poached. From 1993 to 1996 no Rhino poaching was occurred. From 1997 to 2001 six (6) Rhinos were poached. From 2002 to 2013 there was no poaching occurred in Jaldapara National Park. But again from 2014 to 2015 seven (7) Rhino had been poached and one (1) Rhino was poached in February 2018. Rhinos are usually shot and killed for its horn. Some people in East Asia especially in China believes that Rhino Horn has aphrodisiac properties but scientifically it has been proved that the Rhino horn is composed of Keratine similar to human hair and nail only which has no medicinal properties. This threat remains till date because of -

- Vicinity to Kaziranga – Manas, epicentre of rhino poaching in India
- Extremely high monetary value of rhino horn.
- Vicinity to international wild life trade route, Siliguri-Jaigaon-Manas-Kaziranga-Myanmar

border.

› NH – 31C and LRP running through rhino areas providing very easy accessibility
› Poachers from north – east having terrorist connections and capabilities

› Fast evolving poaching techniques. Poaching records can be seen in Annexure-43.

5.2.1.2 Fire

Fire in the grass lands of Jaldapara National Park happens and every year vast tract of the grasslands, including some prime Rhino habitats, get burnt. Such uncontrolled fire is primarily caused by the poachers and illegal cattle grazers. There are also incidences that poachers or pedestrian inadvertently set fire to the grass lands by throwing lighted match sticks or burning bidi stub. Fire sensitive map can be seen in Figure-5.

Though fire has been used as a tool for managing grass land habitat, it has multiple deleterious impacts too. Uncontrolled fire can cause irreparable loss by damaging range of bio-diversity and infringing with ecological processes. The results of uncontrolled fire can cause irreparable loss by damaging the vegetation and wildlife and changing the composition of natural vegetation. The results of uncontrolled fire can be as follows: -

› Destruction of the eggs and chicks of grassland birds and eggs of reptiles that lay their eggs and rear their offsprings in the grassland, many invertebrates, smaller mammals like rodents and different micro-organisms are much prone to damage from fire.
› Increase the poaching incidences because of better visibility.
› Change in the Vegetation composition which may have adverse effect on floral and faunal diversity.
› Accelerated soil erosion because of soil desecration and temporary brittleness.
› Destruction of the organic matter, which contribute to the humus content of the substratum. This may cause deterioration of the soil and consequently, the productivity of the site may be lost.
› Destruction of critical habitats for some highly specialist species like Hispid Hare (Caprolagus hispidus) and fodder spp. after the outbreak of uncontrolled fire.
› Hot temperature generated on the top soil during fire destroys many microorganisms which inhabits the soil and thus stop their activities which are essential for the decomposition and recycling process.
› Animal populations are forced to abandon the fire-affected habitat and proceed randomly in various directions, which may disturb the spatio-temporal utilization of a habitat by animal species. The resultant effect may even disturb the predator-prey symbiosis.

5.2.1.3 Limited Flooding

From Eco-system point of view the vast grassland of Jaldapara needs periodical flooding from its perennial sources so that the grasslands can be rejuvenated. The National Park was fortunate enough earlier to receive the flood water of River Torsa, but it was extensively reduced due to heavy construction of embankment inside the National Park. On 27/08/2014 due to heavy rain the course of river Torsa entered in Sissamara river and in the month of August in the year 2015 some portion of embankment of Torsa river including the Shiltorsa protection watch tower washed away and some portion of JP-1, 2 and JP 3 got flooded. Yet water scarcity in the form of absence of periodical inundation may pose a serious threat to the habitat of mega herbivores. Flooding Zone map in Figure-6.

5.2.1.4 Weed Infestation

A few typical weeds and climbers like lemon grass, Leea spp. and Mikania spp. are infamous for colonizing the open forest areas of Jaldapara National Park which, in turn, suppress the growth of palatable fodder grasses and other tree species. Mikania spp. includes Mikania cordata and Mikania scandens. Other weeds that are commonly found are Lantana camara, Eupatorium spp., Clerodendron spp., Cassia tora and Solanum nigrum etc. All these weeds have the potential to damage the habitat of Rhino and other wild animals. Broad classification of Habitat map in Figure-7.

5.2.1.5 Illicit Felling of Timber and Illegal Collection of NTFP/Firewood:

Illicit felling of trees, especially Sissoo (Dalbergia sissoo), Khair (Acacia catechu) and Simul (Bombax cieba) from the fringe areas of the National Park is a fundamental problem. The problem is compounded due to the following facts:

- Presence of saw mills / veneer mills / furniture manufacturing units and homemade kathha industries, creating large demand of these species.

- Large gap between the demand and supply of firewood for domestic consumption in the fringe villages.

- Unemployment of landless labourers during non-agricultural seasons.

- Arrangement of daily livelihood for sustenance by selling forest produce.

Pressure of illicit felling of timber and firewood is mounted from the adjoining tea gardens of the National Park whose llabourers occasionally enter the National Park in large groups for collection of forest produce.

Crossing the killer track

Large scale illegal collection of drift timber from Torsa river bed during the monsoon season and rafting of illicitly collected timber along Torsa through the National Park, especially in Barodabri and Chilapata blocks is a serious is a severe problem. The details offence report can be seen in Annexure-44.

5.2.1.6 Socio-economic status of the people and interface between pa and fringe population

Jaldapara National Park, having a total notified forest area of approx. 216.51 sq km., is having a typical trouser like shape and each leg is about 25 km long. In some of the portions of the legs, the width is as low as 1 km. and in between the two legs, 11 revenue villages are situated. A total of 43 fringe revenue villages, 10 forest villages and 12 tea gardens with thousands of labour force are situated all along the boundary of the National Park and a total of around 2,36,257 human population live in the forest-habitation interface region.

5.2.1.7 Threatened Corridor

The National Park also forms part of the corridor for migration of elephants between inter-Divisions and intra-division forest. The widening NH-31(C), and upgrading the NFR into broad gauge, cutting across the middle of the National Park, and creating liner obstructions to the movement of wildlife from forest of north side of the NH-31C and NFR Railway line to south side forest and vice-versa. Many wild animals like Elephants (Elephas maximus), Leopard (Panthera pardus), Gaur (Bos gaurus), Sambar (Cervus unicolor), Lesser Cat, Reptiles and many invertebrates are being killed due to reckless driving of motor vehicles and Rail through this liner line.

New settlements in Bharnabari TE, Bech TE, Dalsingpara TE, Uttar Kharirbari (JL No- 37), Paschim Kharibari (JL No- 36), Madhya Madarihat (JL No- 46). Madhya Khairbari (JL No- 38), Uttar Chekemari (JL No- 45), Modhya Madarihat (JL No- 47), Purba Madarihat (JL No- 50), Dakshin Madarihar (JL No- 49) Paschim Madarihat (JL No- 48) Uttar Mendabari (JL No- 9), Dakshin Mendabari (JL No- 10), Nimti Domoni (JL No- 12) and Nimti Jhora TE (JL No- 11) are obstructing the movement of Elephant as follows;

- Titi forest to Dhumchi forest and vice-versa,
- Dhumchi forest to Khairbari and vice-versa,
- Jaldapara forest to Dhumchi and Kharibari forest and vice-versa.
- Buxa forest to Jaigaon forest and vice-versa.
- Buxa forest to Chilapata forest and vice-versa.

New settlements in Bharnabari TG, Dalsingpara TG and Bech TG have restricted the easy passage of Tiger (Panthera tigris) and other wild animals from Buxa Tiger Reserve to Jaldapara National Park. Discussed in detailed at preface of Chapter-8.

5.2.1.8 Un-Matched Living Condition

There has been rapid social change during recent past and accordingly requirements for quality life and expectations have changed a lot. Even small towns are having amenities that is absent in forested localities. New generation appears averse to modest living inside forest with basic facilities which are evident from the fact that the Directorate is finding it difficult to retain officers and staff recruited through tough competitions. There is need therefore to evolve matching lifestyle amenities at forest locations:

Building for residence of staffs at key locations: Building in the PA are not facilitated as per the modern requirement of drinking water, sanitation, lighting systems, access to fast communication, up-to-date competitive level of education, access to better medical facilities etc. List of buildings can be seen in Annexure-45.

More buildings are required to accommodate PDLs and DLs: A big chunk of man-power is non-permanent and additional accommodation is needed for this group of workers.

5.2.1.9 Habitat Degradation:

Shortage of rich grasslands areas in comparison to the requirement for herbivore population specially the GIOH Rhino causes constantly increasing habitat use pressure on limited areas. Whenever a natural grazing land rejuvenate due to natural process or artificial fodder plantation is created, all the herbivores congregate in those areas and graze upon the fodder species leaving the non-browsable species. Repeated use of such habitat by herbivores does not allow the fodder species to grow but encourages the non-browsable to grow vigorously as those species do not have any competitor. This process as rendering vast area of the PA as degraded habitat as the non-browsable species are suppressing the stock of palatable fodder

5.2.1.10 Trans-boundary problem:

The extreme northern boundary of the National Park (Titi and Jaigaon block) forms the international boundary with Bhutan. Large scale crossing over the border from Bhutan side into the National Park area is common and there is heavy pressure on the forests of this region for collection of fodder grass, non-timber forest produces and for poaching of wild animals.

The smugglers of Rhino horn, elephant tusks and bear gall bladder also take advantage of the international border and lack of proper coordination between the enforcement agencies of the two countries. They also use the townships in the border areas for carrying out smuggling activities.

Another problem is the large-scale mining of dolomite in the Bhutan hills which has resulted into increased siltation of river beds and some of these river pass through the National Park. Destruction of vegetation in the lower foothills on Bhutan side also appears to have adversely affected the micro-climate and most of the rivers flowing through Jaldapara National Park dry up during the dry season and get flooded during the monsoon.

5.2.1.11 Illegal Fishing

The fringe villagers are tempted for illicit fishing by poisoning water body which causes damage to conservation of bio-diversity.

5.2.1.12 Illegal collection of non-timber forest produce

Fringe villagers is tempted for collection of seeds, flowers, fungi, leaf and eggs cause damages the bio-diversity conservation.

5.2.1.13 Unauthorized access in the PA

The fringe village people always tend to cross the PA especially from the 11 villages between the legs of the PA in both directions (Eastern and Western) in several points of western and Eastern legs. These unauthorized movements also cause damage to the vegetation and increases threat of poaching.

5.2.1.14 Influx of Chemical Toxic Waste From Near By Tea Gardens

Recently several small tea gardens are coming up at the periphery of the PA which are using insecticides and pesticides. The drainage system of all tea garden is disposing all excess chemicals which are ultimately drained into natural streams entering the PA and causing damage to the bio-diversity conservation. Map of tea gardens around Jaldapara in Figure-8.

5.2.1.15 Drainage of Untreated Sewage To The River System

Urban areas like Jaigaon which are developing fast are disposing of sewage without any treatment to the Torsa River system is impacting forest ecology & affecting biodiversity conservation negatively.

5.2.1.16 Erosion

Titi bock of the PA is a hilly terrain. Degradation of forest in the forest of this block is inviting soil erosion.

5.2.1.17 Enclave Village

There are two enclaved villages in the National Park. Ballalguri village including Titi Forest village is situated within Titi forest block and Garar-Jote in Chilapata Forest block. Live stocks of these two villages are creating uncontrolled damage to habitat. Being situated inside the forested area, the land use is very poor and whatever the crop, the villagers do grow major portion of that destroyed by the wild animal. Protection of these villages by erecting fence is also not advisable as these villages are situated on active corridor of wild animals. Besides, all villagers depend on forest resources for their sustenance. Being located deep inside the forest near rich wildlife habitat, these villages remain as constant threat for protection.

5.2.1.18 Dolomite problem

Jaldapara National Park shares common boundary with Bhutan to the North. Several major & minor rivers &rivulets originate from Bhutan Himalaya & continue till Bangladesh flowing North to South of the Dooars before they form the tributaries to other major Rivers there. On closer scrutiny, it has been found that some streams coming down do carry silt load of minerals & their byproducts, harmful to the biotic systems. Unfortunately, Jaldapara National Park & its fringe area face the curse of such liquid poison, mostly Dolomite spreading over the area of Forest compartment Jaigaon-2 (Part)- 412.07 Ha, Titi-4 – 1176.38 Ha. HM-1 330.62 Ha, HM-4 200.07, JP-1 (Part) 182.00 Ha, JP-4 (part) 186.00 Ha, JP-5 (Part) – 261.00 Ha, and Torsa-1 Part – 161.00 Ha total area of 2909.14 ha and EDC cultivated land in the fringe. This is not only a serious threat to the wild flora & fauna but also to the civilians.

This survey was an attempt to unearth the geography behind, identification of the courses through which Dolomite effluent is flowing downstream, the perceived threat scenario of the National Park & its surrounding if the deposition continues & the possible attempts to get rid of the same. Map of Dolomite effected area in Figure-9.

5.2.1.18.1 The Dolomite Effluents: Origin & Down Flow

Needless to mention that the surface run off from the Bhutan hills prompts the poisoning in river systems behind the screen. On physical survey, it has been found that due to open cast mining at some of the hill tops within Bhutan territory delivers the surface flow with dolomite dust during heavy shower to the river flow coming from uphill & flowing down to the plains of Northern Dooars. It is obvious that post mining treatment seems to be very poor or not at all which further aggravates the situation. Also, this is to be kept in mind that due to faulty land use pattern and/or fragile soil character, erosion is at its optimum which accelerates dolomite dust mixing in the streams at time of flash flood or so. Being at geographically advantageous location above, the down flow poisoning spreads its aquatic tentacles through river webs & with so many streams, jhoras, and small springs flowing down from all sides interconnected with each other, silt load goes on increasing as we move further southwards to the Jaldapara National Park from Bhutan foothills.

5.2.1.18.2 Dolomite: Chemistry And Bio-Chemistry

Dolomite, which is named for the French mineralogist Deodat de Dolomieu, is a common sedimentary rock-forming mineral that can be found in massive beds of sedimentary rock sequences. From the chemistry point of view, it bears the formula CaMg (CO3)2 denoting its nature as a Calcium Magnesium Carbonate – differing with other Calcites in addition of magnesium ions. The compound is very common in cement preparation as a source of magnesium and as mineral specimens. It is worth mentioning here that Dolomite in addition to sedimentary beds is also found in metamorphic marbles, hydrothermal veins and replacement deposits. Studies over the years revealed that dolomite deposits on riverbed deter growth of moss and fungi as well as zooplanktons and it is also responsible for skin diseases in the mammals.

5.2.1.18.3 Change in Dolomite Scenario

Looking back before the year 1993, major Dolomite effluent was coming down through river Titi from hilly tracks of Lankapara and near Hantapara Tea garden, the downpours had a confluence with rivulet Bangri which actually was taking away the liquid poison from the PA as the course moves towards the Mujnai Tea Estate leaving behind Titi forest and its southern part – the mainland Jaldapara remained untouched.

The scenario got changed in 1993 in the month of June, when the major flood in this hilly terrain affected confluence of the courses of Titi and Bangri. Intense splash flood choreographed rhythmic waves of Titi to meet with other streams like Hollong, originating spontaneously from Titi forest itself instead of earlier confluence with Bangri, and poisoning begins.

Hollong with its silt load comes down to the National Park entering through Jaldapara North Range and after traveling a course of at least 16-18 km, poisoning further aggravates while Hollong meets with the major sweet water source in the PA, Buri Torsa river, the lifeline of Jaldapara West Range. Ultimately, the later one flows out beyond the PA further down South entering into civil areas of Falakata Block of Jalpaiguri District after delivering silt load in the PA in whole stretch all along the Jaldapara West Range.

Thus, since last 33 years, the National Park tolerates the liquid poison load, consuming with all its greenery to save the mankind as much as possible.

5.2.1.18.4 Present Status of Dolomite Poisoning In Jaldapara National Park

In a nutshell, at present, mainly river Buri Torsa and rivulet Hollong are facing the curse of Dolomite poisoning affecting vast area of Lankapara Range, Jaldapara North Range and Jaldapara West Range covering 11 Beat jurisdictions viz. Hollapara, Bhagajote, Lankapar, Hasimara, Titi, NWC, 50 FT, Hollong, Moiradanga, Kunjanagar and Bangdaki all harboring different endangered and threatened denizens in the wild like Rhinoceros, Deers, Elephants(Elephas maximus), Indian Bison(Bos gaurus), Hispid hare (Caprolagus hispidus), Lesser cats, numerous birds, reptiles, amphibians and a colorful floral array. It is obvious that pollution may be seen in the water courses only in open eyes but the inevitable impact on eco-system as a whole in long run will compel us to pay the cost of civilization and consequent development.

5.2.1.18.5 Adverce Impacts on flora and fauna

A. Poor quality of water

Being ascribed as the lifeline of Jaldapara North and Jaldapara West Range, Hollong and Buri Torsa respectively are of immense importance from availability of potable water point of view in the National Park. Unfortunately, both water channels face the curse of dolomite poisoning offering acute scarcity of potable water to the endangered and threatened species of the National Park. It is worth mentioning here that all these sensitive denizens of wild Jaldapara never consume any kind of turbid water for drinking purpose.

B. Dermatological Aspects

It seems to be posing a serious threat regarding skin diseases of the animals using the water for bathing and physiological heat dissipation purpose. Not only the wild animals, Departmental elephants too are susceptible to such liquid poison as practically skin rashes were noticed after regular bathing of later ones in Buri Torsa River – needless to mention, the same has been discontinued, but the perceived

threat to the Mega herbivores of swampy and marshy habitat cannot be denied.

C. Degradation of aquatic eco-system dynamics:
On practical survey based on floral diversity and Ichthyo-fauna abundance, it has been found obvious that the aquatic eco-system dynamics in dolomite infested river channels becomes degraded both qualitatively and quantitatively. Right from the phytoplankton and zooplankton, till the top-level consumers of carnivorous fishes, status survey offers disappointment from bio-diversity point of view which directly hints to the depletion of balance between biotic and abiotic factors of the eco-system.

D. Impact on avi-fauna
The National Park harbors a versatile array of avi-fauna depending on the aquatic food-chain and inevitably, if the aquatic eco-system gets depleted dependent consumers also do experience the threat of local extinction. Hence, the dolomite poisoning poses a holistic threat to the National Park.

E. Siltation and mineral deposition
Mineral deposition on the River banks and the siltation at the river bed affect the soil quality as well as any vegetative growth supposed to come up enhanced by soil moisture. Thus, the forest substratum also loses its quality.

F. Threat to fossorial adaptation
Numerous tiny creatures of different taxonomic levels adapted to the fossorial habit also suffer from great difficulty surrounding the river eco-system carrying the poison load of dolomite and such faunal diversity is found to be absent on practical field survey – the phenomenon affecting the diversity of the National Park.

G. Physiological disorders in consumer level bio-magnification in different trophic levels
According to the pyramid of biomass and energy, it is worth mentioning that the mineral deposition in physiological system will be subjected to bio-magnification leading towards concentration of heavy metals within the vital system. Mineral components of the dolomite as described earlier – on higher range of deposition can give rise to several abnormalities related to metabolism and excretion.

H. Biological oxygen demand (bod)
Obviously with heavy mineral load, the anaerobic situation of the eco-system aquifer offers high demand of dissolved oxygen and thereby denoting the Biological Oxygen Demand of the Water Sources on critical side which in turn depicts the inferior quality of the aquatic eco-system involved.

5.2.1.18 Grazing

The National Park is surrounded by villages with dense population and fringe areas of these forests are subjected to sporadic grazing by the cattle from these fringe villages. Presence of large exposed forest-village interface has compounded the problem. Although the extent of grazing as a problem in the Park is not very high, it has a potential of becoming serious threat for quality of habitat and as such this problem has always to be kept in high priority.

The cattle present in the fringe villages are characterized by poor health. The effect of cattle grazing is more pronounced during the dry seasons when there is competition for fodder between the wild herbivores and the cattle. The existing input for the cattle improvement is also very limited.
The population of livestock is the highest in the fringe of Torsa, followed by Chilapata, Jaldapara, Malangi, Hasimara, Salkumar and Baradabri Blocks. However, a study of intensive grazing in the forest areas shows that the same is highest in Baradabri Block followed by Hasimara, Jaigaon, Dalsingpara, Jaldapara, Torsa, Chilapata, Salkumar & Titi.
The problem arising out of grazing of livestock in

the National Park can be listed as below;

- Spreading of cattle-borne diseases like FMD, Anthrax and Rinderpest etc. to wild animals.
- Competition for fodder between the wild herbivores and domestic cattle.
- Effects of ecological pressure including affecting natural succession, reducing organic production in soil, affecting nutrient circulation, reducing soil moisture recharging and increasing surface run off, and changing soil pH value.
- The local people set fire to the grasslands indiscriminately for increased regeneration of young shoots to facilitate grazing of domestic cattle.

5.2.2 Constraints of Objective - (II)

5.2.2.1 Technical Capability / Skill of front-line Staff

Effective management of the Park in order to meet the stated objectives requires specific skill knowledge and capability of the frontline staff. There has been a long period of non-recruitment of Forest Guards and there is no sanctioned post of Mahuts and Patawalas. The vacancies so generated are compensated by deploying daily wage labourers who are in turn provided site and job specific training. But the background, qualification and age group of this man force form a hurdle towards effective capacity building.

5.2.2.2 Lack of opportunities for personal development of frontline staff

Although there is a general trend of improvement conditions in the offices located in cities, scope of providing personal development courses for frontline staff of the PA is amost nil.

5.2.2.3 Health and education facility

Health and education facilities are not as per requirements.

5.2.2.4 Conveyance

Only the Range Officers are provided with four wheeler vehicles. Range vehicle remains busy most of the time, to control Man-Animal conflict and protection duty. Very few Beat officers are provided with motor cycles which are also used in protection duty. So, frontline staffs who stay inside the PA, don't have any conveyance to collect their ration and other commodity. Due to the concentration of wild animals frontline staffs are also unable to move on foot.

5.2.2.5 Tough living conditions

The area falls within high rainfall region where annual rainfall touches 5000 millimeter which has impacts on road communication and condition of residential buildings. Camps and residential complexes are setup in remote areas where upkeep of facilities and amenities is a costly affair. Several camps remain detached from outside world for several days in rainy season. And efforts of the management to provide quality living condition to staff always fall short of expectations.

5.2.2.6 Rapidly changing modus operandi of Poaching Groups

Basic design of Forest Department continues to be revolving around the situation of the last century. Whereas wildlife criminals have evolved and made use of technology in every possible manner, the frontline staff of the Park depends heavily on age old technique. Although the Park has made best use of GIS and Mobile technologies, there is ample opportunity of upgrading the skill set of frontline staff on numerous fronts.

Hasimara Watch Tower at HM-3B Compartment

5.2.3 Constraints of Objective - (III)

5.2.3.1 Conventional Agricultural Practice

Fringe villages still do the conventional and seasonal cropping which does not yield much to develop their economy.

5.2.3.2 Insufficient Agricultural and Artisan Financing System

Although the entire area is agriculture based and almost entire population depends on agriculture and allied activities, the finance system available for this profession are insufficient.

5.2.3.3 Processing, Store And Marketing of Agricultural Product

The fringe villagers do not have storing capacity and marketing facility of their agricultural products near their village.

5.2.3.4 Irrigation System

The fringe villagers still do their agriculture on rain fed irrigation system. So, during the drought season they can't grow their crops due to the scarcity of irrigation water.

5.2.3.5 Vacant land in fringe villages

There is not much vacant land in the fringe villages, where fuel wood plantation can be raised to reduce the dependency of fringe village on Forest.

5.2.3.6 Knowledge About Non-Conventional Energy

The fringe villagers are not motivated and aware about the use of non-conventional energy instead of fuel wood.

5.2.3.8 Crop depredation by Wild Animals

Crops are damaged by wild animals. The ex-gratia payment cannot compensate the loss.

5.2.3.9 Infrastructure for alternate income generation

There are no industrial factories in the fringe villages for alternate income generation.

5.2.3.10 Weak building structure

Most of the village huts are temporary of nature and made up of bamboo and CGI sheet. These huts are very fragile in nature and easily get damaged by wild Elephants.

5.2.3.11 Elephant movement guiding techniques and equipment

The Elephant enters fringe villages during their natural movement from one patch to another and Human settlement come in the way between two forest patches. Afraid of damage to their huts and crops by the wild Elephants, villagers try to resist the natural movement of Elephants but they do not know how to guide the Elephant from one Forest to another Forest through their villages. Villagers also do not have enough watch tower to watch over the movement of wild elephant in strategic location, enough street light to use at night and enough elephant scaring materials like crackers.

5.2.3.12 Poor connectivity

Most of the fringe villages not relate to good road network. Due to this during Elephant depredation, the Elephant guiding team cannot reach the area in proper time and cannot control the depredation.

5.2.3.13 Cropping Pattern

The fringe villagers cultivate like maize, paddy, sugar cane, wheat, potato, pumpkin, cucumber etc. which are good fodder for wild Elephants. So, during the cultivation season all cultivated crop lure the wild Elephant and depredation increases.

5.2.3.14 Stressed Tea Gardens

Most of the tea gardens around the PA are sick or closed and create pressure on staff to control Human animal conflict and pose threat of exploitation of forest resources and poaching as well.

5.2.3.15 Highly Disturbed and Threatened Corridors of Movement

The Park is an island habitat for Elephant herds. Elephant herds are in age old practice of moving across Eastern and Western boundaries of the Park to and from BTR and Dalgaon Forest in Jalpaiguri District. There are five (5) identified corridors of movement of Elephant as per study of WTI and Indian Institute of Science, Bangalore and this are all under different types of use and are threatened.

5.2.3.16 Habitat fragmentation due to Rail and Road

There is a regular movement of Elephant herds from Northern part of the Park to Southern part of the Park and vice-versa as the later has rich grassland. This movement is not unique to Elephants and several other herbivores and carnivores adopted this movement pattern. But, in the early years of 21st century erstwhile miter gauge railway track from Alipurduar to Siliguri and Siliguri – Guwahati National High Way both passing through the National Park where upgraded. This track passes through five (5) protected areas of North Bengal and after upgradation more than 60 Elephants lost their lives in train accidents. This track in combination with the upgraded National High Way forms a difficult hurdle for North – South moving Elephant herds and has definite impact on HEC and as a consequence human Elephant conflict in the region has increased considerably.

5.2.4 Constraints of Objective - (IV)

5.2.4.1 Lack of Ecological Awareness

Very few visitors have knowledge about the PA management and its conservation values and restrictions in eco-tourism inside the PA as well. Hence most of them arrive in the area just by the fame of name Jaldapara NP creating different constraints in systematic management of eco-tourism in the PA.

5.2.4.2 Limited Ecotourism Staff

There is no trained staff for interpretation and orientation of visitors.

5.2.4.3 Lack of Modern Interpretation Tool

The PA has got serene natural beauty with beautiful hilly tracks, dense Forest and crystal-clear water river systems. In absence of proper modern interpretation tool/ Interpretation center visitors in the PA are not interpreted well about these treasures of the National Park. Thus, the tourist / visitors have become mere "sighter" rather than "observer" of wildlife and its habitat.

5.2.4.4 No Value Addition To Eco-Tourism

Visitors are left to visit the natural area with a temptation of sighting of wild animal. But there are many other ecotourism resources like ethnic culture and handicraft of various tribal communities around the PA. Values of such resources have not yet been added to eco-tourism in the National Park.

5.2.4.5 Inadequate Publications

Signage and publications are not enough to aware the visitors.

5.2.4.6 Limited Tourism Activity

Till now visitors are centric to Hollong and elephant riding. This is creating disturbances in some specific area leading to destruction of habitat.

5.2.4.7 Various Entry Gate

The National park is extended in three four (4) civil blocks viz Madarihat- Birpara, Falakata, Alipurduar 1 and Kalchini. All the blocks had been allowed one entry gate like Hollong gate, Salkumar Gate, Chilapata Gate and Kodalbasti Gate respectively. All the gates are acting separately creating management problems.

5.2.4.8 Bad Eco Tourism Experiences

Tourists visiting the National Park are not sure about the visit of national park till up to 6.00 hours before of the visit. This leads to a situation where a tourist must stand in long queues for extended periods of up to 12 hours in peak tourist season. Even then tourist is not sure of getting the ticket for car safari, elephant riding etc. As the tourists do not get ticket even after much of toil, they sometimes become hostile and both the Ecotourism staff and visiting tourist have poor ecotourism experiences.

5.2.4.9 Lack of Online Accessto Jaldapara

In modern information age most of the tourists/ people retrieve information from web sites and most people prefer to plan their tours in online mode. But the tourism facilities and activities of Jaldapara National Park are not available online. Whatever online booking facilities are available, it provides grossly insufficient information.

5.2.5 To Promotr Research And Study

- Infrastructure for researcher: There is no separate infrastructure for researchers to stay.
- Lack of hard toiling field-oriented researchers.
- Lack of fund for self-financed research project.
- Lack of Field Biologist.
- Lack of Assistant Field biologist

Elephant with Calf at Gopalpur TG

CHAPTER-6
STRATEGIES

Strategies are careful planning to achieve the objectives and overcome issues related to PA management. Without proper strategies management related issues cannot be addressed properly.

Management Plan of a Protected Area must have some objectives on which future management will be done. Achievement of such objectives is not that easy task as there are so many constraints in PAs and Jaldapara NP is no exception. Hence some clearcut strategies should be framed out to solve, mitigate and minimize such issues considering existing situations. Strategies should be simple, practical, objective oriented, time bound, crystal clear to staff and based on field knowledge and experience. PA management requires both short-term and long-term strategies

If the strategies can satisfy all these principles from the Management Plan point of view, they can be the best guiding principle to manage the mysteries of Nature, as far as possible and practicable.

6.1 PROTECTION

These are the common managemental interventions applicable to all over the PA to meet the similar convergent objectives for overall betterment of the National Park. Theme plans of a Management Plan link all zones by implementation of its prescriptions. Protection strategy is one of such management interventions. **Security Plan to ensure protection of Jaldapara National Park has been designed keeping in view the old protection practices in Jaldapara National Park and the recent security plans of Tiger reserves under the guidance of NTCA.**

6.1.1 Security Plan of Jaldapara National Park

6.1.1.1 Introduction

Jaldapara National Park area is fringed by 12 tea gardens and 53 revenue villages. Length of boundary of the National park is 165.20 km having population of around 2.36257 lakh as per 2011 census. The livestock population is 78.496 thousand (2011 census). In the north it shares 10 km boundary with Bhutan. The National Park is very rich in biodiversity and is the habitat of second largest population of GIOR, the high valued wild animal in present under world market. In view of huge human population sitting on the fringe and having porous border with Bhutan and easy access with Assam through NH 31C and NFR, pressure on poaching of such treasure animal like Rhinoceros is insurmountable.

6.1.1.2 Constraints For Forest Protection In Jaldapara National Park:

Socio Economic condition and culture of fringe people exert strong influence on forest and wildlife. Most of the fringe people are unemployed and poor. More over the cultural view of aboriginals and inhabitants in the fringe is also different. Mixture of such huge population which is primarily poor and depends on forest for livelihood exerts tremendous pressure on forests and wild life of the PA. The PA geography is also very peculiar and is interspersed with tea garden boundary and tea gardens occupy crucial corridors of wildlife resulting in huge man animal conflict. Elephant (Elephas maximus), Gaur (Bos gaurus) and Leopard (Panthera pardus) depredation is a routine problem here because of tea garden locations and huge human settlements within them and also in the fringe villages. Further these tea gardens harbour thousands of unemployed youth for whom Jaldapara is soft target for livelihood. In addition mountain Torsa river bisects the PA which acts as transit route of forest

criminals.

➛ **By Geography and Demography**

› Trouser shape of Jaldapara with total perimeter of 162.5 km

› 10 km long Indo-Bhutan International Border in North

› Easy access with Assam through NH 31C and NFR

› Indo-Bangladesh International Border only 15 km.

➛ **Sensitivity.**

› Whole PA is sensitive due to its shape

➛ **Factors Affecting Forest Protection**

› Acute shortage of grass root level of staff of all rungs.

› Lack of employment opportunities for fringe village populations

› Tea gardens harbouring thousands of unemployed youth

› Unrelenting elephant depredation compels staff to devote more time for guiding elephants from habitations to forest area almost throughout the year.

› Presence of armed gangs operating across Assam and in the border with Bhutan.

› 165km of boundary length needs to be guarded.

6.1.2 Protection of Forest Land and Forest Resources

The Strategies are;

6.1.2.1 Checking of Boundary

› In most of the area boundary demarcation is destroyed due to natural process. Ensuring boundaries is one of the most important aspect of protection and will become increasingly so with increase in human population and value of land. More so around a popular tourism destination like Jaldapara where land adjacent to Park boundary has very high commercial potential. Boundaries of the Park and adjacent Reserved Forest particularly with Forest Villages will be taken on priority basis, survey will have to done with Compartment maps and mouza maps as and when necessary and Boundary Pillars of Permanent nature made of concrete of sizes as prescribed by Working Plan Division (North). Boundaries should be checked with help of mouza sheets with proper forward bearing and backward bearing from a BENCH MARK. All corner points to be fixed by permanent boundary pillars with GPS coordinates.

› Boundary Register will be maintained mentioning all details as per Form. Detailed format is given in Table-9.

› Boundary pillar and boundary will be checked frequently with GPS co-ordinates. If, any encroachment is noticed, will be dealt with top most priority. Such encroachments will be immediately reported by the Beat Officer to the Range Officer and immediate legal action as provision of Laws of the Land should be initiated. Entire Forest boundary (Boundary of Forest land with Non-Forest Land) of a Beat will be allocated among FG/ HFG of the Beat by name, each of such FG/HFG will submit a quarterly boundary report to the concerned Beat Officer which will move upwards accordingly. All Forest Land Diversion cases under FCA, 1980 shall be duly recorded and reflected in quarterly boundary report.

› Block boundary to be maintained by cleaning bush and jungle of six (6) meter width.

› Compartment boundary to be maintained by cleaning bush and jungle of three (3) meter width. Detailed list of compartment boundary is given in Annexure–46.

6.1.3 Intelligence Network

Intelligence is the backbone of protection; it includes several approaches and strategies and it is very difficult to codify Intelligence strategies and structures. But it is always useful if a dynamic data base of all wildlife crime and criminals is maintained by the Park Management which is constantly revisited and revised.

- Maintenance of criminal dossier / suspected offenders register at Beat, Range and Division level. Surveillance over the suspected villages by Beat officers to identify the abnormal activities of village people viz sudden economic development, abnormal behaviour, unjust absent from home.

- Engagement of informer by Range officer, in bus stands, Railway stations, local markets (Haat), village area and such other areas.

- Selection of EDC member who has bonding with conservation and use the as source.

- Selection of local brokers, priest, vendors to use them as source.

- Selection of staff who have flare, wit and interest of information gathering and use them as source.

- Sharing of information among staff and officers on regular basis.

- Coordination with police and other intelligence agencies and sharing of information as per the level of hierarchy.

- CDR and CAF of suspect mobile number to be obtained from competent authority for analysis.

- Collection of information from Criminal Investigation Bureau and WCCB.

- Recent investigation in poaching cases revealed that sophisticated fire arms has been used in Rhinoceros poaching, so the fire arms in the hand of front line staff are required to be improved.

- Separate fund for maintaining intelligence network is provided to the Park Management which has been very useful in maintenance of Intelligence network. Such financial support has to be continued and revised as per changing scenario.

6.1.4 Various Protection Duty

6.1.4.1 Schedule of Regular Patrolling

- Early morning Elephant back rhino monitoring duty for a period of three (3) hours.

- Foot patrolling from 9:00 AM onward non-schedule basis up to 9:00 PM for a period of eight (8) hours.

- After noon Elephant back patrolling from 4:00 PM onward non-schedule basis up to night 4:00 AM for a period of three (3) hours.

- Vehicle patrolling duty from early morning to evening in non-schedule basis for a period of eight (8) hours

- Vehicle night patrolling from 8:00 PM to 5:00 AM in non-schedule basis for a period of eight (8) hours.

6.1.4.2 Elephant Back Patrolling

- With the rise of population of Gaur (Bos gaurus) in Jaldapara, a new challenge for working has emerged and is expected to escalate further. Earlier elephant back patrolling was a compulsion in rhino bearing grassland areas only and woodlands were used to be patrolled on foot. But, in recent years large woodland areas, particularly those adjacent to grasslands are being used round the year by Gaurs. These Gaur-bearing areas have been rendered unsafe for Foot Patrolling and the park has lost several staff in Gaur attack. Hence elephants have become necessary for patrolling even in woodlands now.

- All patrolling elephants are to be out for protection, monitoring and counting the sighted wild animals, sexing such wild individual and visiting dung piles in the morning in all beats, camps and watch towers at same time since 5:30 AM for three (3) hours every day.
- All patrolling elephant are to be out for protection duty from all beats, camps and watch tower in the afternoon in irregular pattern from 3.30 PM to 9.00 PM for a period of 2.30 hours every day as per the information gathered during morning patrolling.

- 25% of elephants used for morning patrolling are to be deployed during night (especially moonlit nights). This duty is to be monitored by Range officer.

- Same staff should go for elephant back patrolling for the day.

- GPS/eMobile, Walky-talky and fire arms are to be used during elephant back patrolling.

- GPS Coordinate of live rhino dung pile to be recorded and updated as per Proforma given in Table-10.

Elephant back patrolling

6.1.4.3 Maintenance of Rhino Photo Album

All Beat officers should maintain a Rhino photo album for target Rhino of his jurisdiction as format given in Table-11.

6.1.4.4 Foot Patrolling

- At any time of the day and night foot patrolling is to done in forest compartments through forest roads, patrolling paths, and observation lines. Patrolling is to be done for minimum eight (8) hours in one lap or in two (2) laps. Format of Duty register is given in Table-12.

- GPS/eMobile, Walky-talky and fire arms are to be used during foot patrolling

- To facilitate foot patrolling Forest roads, patrolling paths, observation lines are required to be maintained or developed in strategic locations.

- To strengthen protection and combat biotic pressure during the plan period 25 km earthen forest Roads and 50 km patrolling paths should to be made.

- Arms and ammunition are to be supplied as per requirements.

6.1.4.5 Vehicle Patrolling

- Vehicle are to be treated as mobile protection tower specially during night

- At night vehicles are to be placed in strategic locations to prevent poaching and illicit felling.

- GPS/eMobile, Walky-talky and fire arms to be used during Vehicle patrolling.

- All Range vehicles shall be in touch with each other through RT to combat any situation.

- All Ranges and some Beats should be provided with vehicles for protection of forest and wildlife apart from the vehicles of the DFO, ADFO and AWLW. A detailed list of vehicles used in Jaldapara National Park is given in Annexure-24.

6.1.4.6 Duty of Protection Watch Tower.

- At present there are twenty-two (21) protection watch towers are running in strategic locations. From protection watch tower regular Elephant back patrolling and foot patrolling is done. All the protection watch tower remain alert during nights and monitor over RT and night patrolling vehicles.

- To continue this protection duty all protection, watch towers should be maintained properly and four (4) new protection watch towers are required to be established. Location map of proposed protection watch tower is given in Figure-10.

- All protection, watch towers are to be manned 24x7.

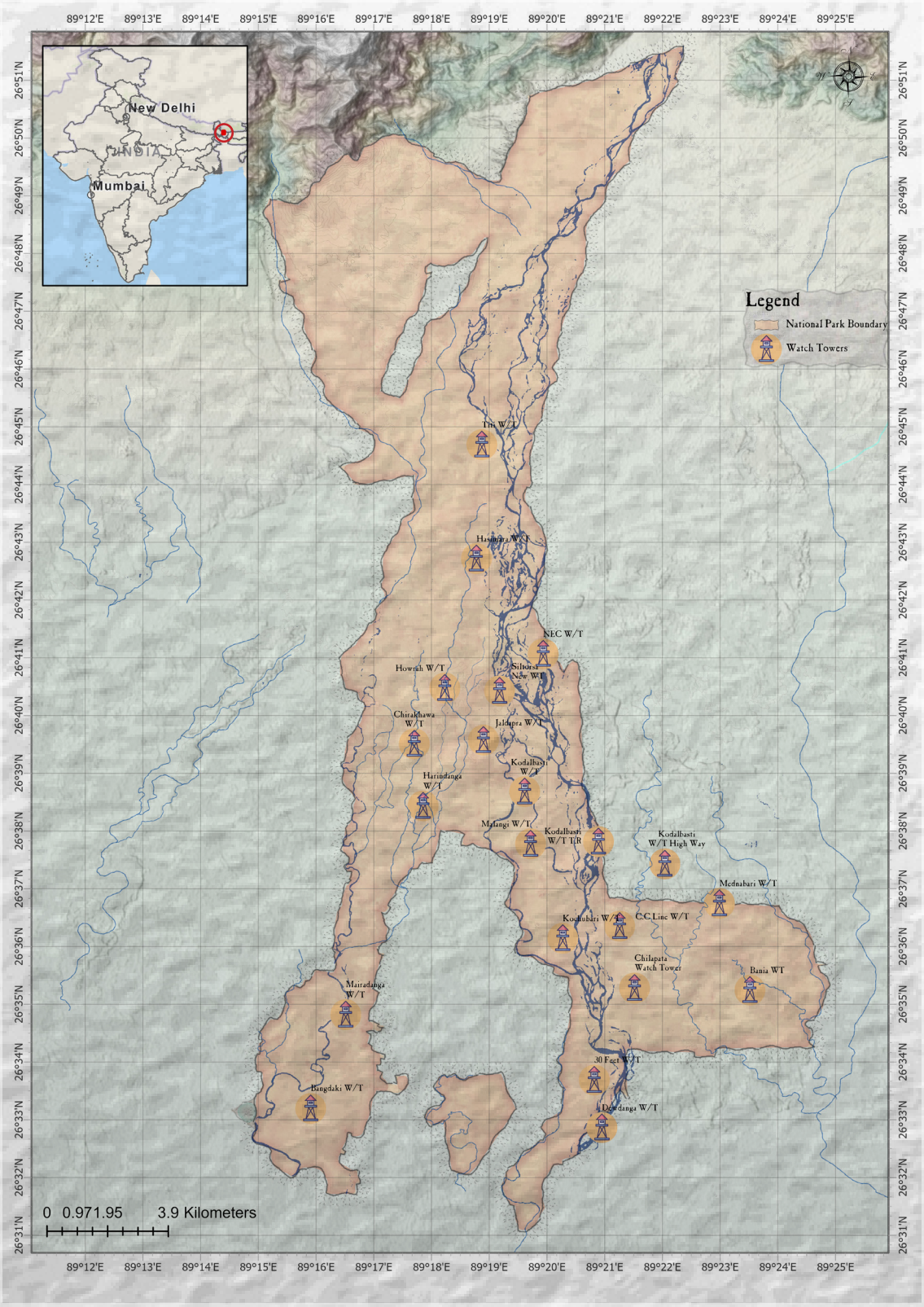
- Necessary suitable camping equipments and materials to be provided to Staff posted at WT.

- Duty of WT is to be recorded in a register. Format of duty register is given in Table-13.

The list of protection watch tower is given below

Sl No	Range	Name of Beat/WT/Camp	Longitude	Latitude
1	Jaldapara East Range	Kodalbasti W/T	26°38'40.96"N	89°19'36.86"E
2		Malangi W/T	26°37'46.72"N	89°19'42.98"E
3		Kochubari WT	26°36'8.63"N	89°20'16.48"E
4		Jaldapra W/T	26°39'34.48"N	89°18'54.04"E
5		30 Feet W/T	26°33'41.37"N	89°20'49.19"E
6	Jaldapara West Range	Chirakhawa W/T	26°39'30.70"N	89°17'42.10"E
7		Harindanga W/T	26°38'26.05"N	89°17'51.25"E
8		Mairadanga W/T	26°34'49.18"N	89°16'30.87"E
9		Bangdaki W/T	26°33'11.76"N	89°15'54.46"E
10	Jaldapara North Range	Siltorsa W/T	26°40'26.00"N	89°19'15.99"E
11		Hasimara W/T	26°42'43.04"N	89°18'46.68"E
12		Hawrah WT	26°40'28.54"N	89°18'13.81"E
13	Kodalbasti Range	Torsa WT	26°37'49.01"N	89°20'53.55"E
14		Kodalbasti High Way W/T	26°37'25.89"N	89°22'2.52"E
15		NEC W/T	26°41'4.01"N	89°19'56.12"E
16		C.C Line W/T	26°36'21.13"N	89°21'15.62"E
17	Chilapata Range	Mednabari W/T	26°36'44.92"N	89°22'59.28"E
18		Chilapata WT	26°35'16.84"N	89°21'31.07"E
19		Dewdanga WT	26°32'51.95"N	89°20'57.13"E
20		Bania WT	26°35'14.70"N	89°23'31.02"E
21	Nilpara Range	Titi WT	26°44'41.43"N	89°18'52.34"E

Location Map of Protection Watch Towers



6.1.4.7 Seasonal Protection Protocol

Considering the shape of the National Park, biotic pressure and dependency of fringe people on forest resources, seasonal protection protocol is devised.

- Raft control camp: During rainy season (June, July, August and September) trees are illicitly felled and rafted away through river. To control this rafting of timber two (2) camps at Chilapata Range and two (2) camp at Jaldapara East Range are to be temporarily set up with daily rated labours.
- Control of easy Access Duty: During dry period (February, March and April) rivers become dry and Watch towers and Beat offices are provided with extra daily rated labour to intensify protection duty.
- Festival Anti-Poaching Duty: During Holi and Baisakhi many tribal people still tend to go for ritual group hunting. During these periods extra man power is to be provided as daily rated labour to combat the situation in addition to duty with JFPC members.

6.1.4.8 Rapid Response Team (RRT)

A vehicle with RT and other equipments and dedicated staff along with a Range Officer has been placed at Madarihat under the control of AWLW to meet the urgent situation.

6.1.4.9 River Patrolling

There are five (5) rubber boats at Chilapata Range, Kodalbasti Range, Jaldapara North Range and Jaldapara East Range for river patrolling in Torsa river. This method of river patrolling is to be improved and continued. River patrols are particularly important as this mode is useful both in monsoon to check timber smuggling by rafting and in winter as a very effective mode of patrol to check human trespass in pristine grasslands

6.1.4.10 Lady Force

There is a group of women of fringe area who are in old habit of depending on forest to meet up their day to day need. They enter the PA in group and cause damage to forest and wild life habitat. Moreover, during raid programmes in villages, ladies come in between forest staff and offenders and resist forest staff to perform their duty properly. To tackle this issue ladies may engaged as daily rated worker and to be deployed with permanent staff until permanent lady force is appointed.

6.1.4.11 Use of Sniffer Dog

In case any offence is detected, the area of place of occurrence to be barricaded with ribbon/ rope and then the sniffer dog is to be used to investigate the offence.

MANAGEMENT OF SNIFFER DOG

- SOP to be followed. SOP for sniffer dog is given in Annexure-47.
- The sniffer dog to be checked properly and periodically by VO.
- Prescribed food and liquids to be provided
- Scheduled vaccination to be given.
- Kennel to be kept clean and hygiene.
- Playing ground to be kept clean and articles of exercise to be kept in playing ground.
- To develop the skill of investigations on forest offences, regular training to be given.

- Whenever any office is committed sniffer dog to be utilized.
- The Following registers are to be maintained
  - Duty register
  - Medical Register
  - Food Register
  - Service Book

6.1.4.12 Provision of Arms and Ammunition.

Fire arms are important to combat poachers and smugglers and for self-protection of staff. PA maintains arms and ammunition such as .315Rifles, DBBL, SBBL tranquillization gun and pump action gun. Detailed list of fire arms is given in Annexure-48. Side arms may be provided to ADFO, AWLW and ROs. Training/ Practice courses for field staff in handling fire arms should be conducted at regular intervals. Improvement of fire arms is to be done with new gun and ammunition for guns to be supplied on regular basis. List of persons holding fire arms' licences within villages inside the National Park boundary and within a zone of 10 km width surrounding the external National Park boundary is given in Annexure-48(A).

6.1.4.13 Monitoring of Suspects

- Houses of suspects to be visited regularly and a register of suspects to be maintained with interrogation report.
- CDRs of all suspects to be procured and studied regularly.

6.1.4.14 Area Dominance Activity

- Area dominance patrolling to be conducted along with police and other para-military agencies to show unity, integrity and strength of frontline staff.

6.1.4.15 Scanning of Forest Blocks

- Scanning to be done over all Forest block gathering all resources of Beat and RangesRange as per schedule.
- Each Beat should be scanned at least twice in a month.
- Scanning report is to be forwarded to DFO through AWLW. Format of scanning report is given in Table-14.

6.1.4.16 Joint Patrolling

To combat poaching and illicit felling the Range Officer Chilapata & Kodalbasti Range , Range Officer Jaldapara West & North Range, Range Officer Jaldapara West & East Range and Range Officer Jaldapara North & Lankapara Range will do joint patrolling regularly.

Checkdam over Buri Torsa River

6.1.4.17 Forest Protection Force

In Jaldapara Wild Life Division 2 (Two) forest protection force camps of State Armed Police are being maintained at Mendabari and Madarihat. They help forest staff in protection. They shall be maintained as being done now.

6.1.4.18 Elephants

Presently there are 79 departmental Elephants are maintained in Jaldapara NP. Among these 35 elephants are solely engaged in protection duty for effective antipoaching duty. A large area of the PA becomes inaccessible during rainy season when elephant becomes the only means of patrolling.

6.1.4.19 Control On Sawmills, Veneer Mills And Furniture Shops:

Regulation of illegal running of Sawmills and furniture shops is very much essential for protection of forest in Jaldapara NP. The following strategies are being proposed for this purpose –

- No new license to wood-based industries should be issued except in accordance with the High-Level Expert Committee appointed under order of the State Govt.
- Wood based industries having no proper license should be stopped functioning and legal action should be initiated against them. Regular and surprise checking of documents and stocks of wood-based industries should be carried out.
- Adequate precautions should be taken while issuing Transit Permits to veneer mills and sawmills to stop misuse of T.P.
- Banks, Panchayat and Departmental of Industries should be taken into confidence to check the mushrooming of wood-based industries and furniture shops.
- No Felling permission of tree in non-forest area is to be issued during closure period of the PA and no TP should be issued also.

6.1.4.20 Record of Forest Offences

Forest offences detected, should be recorded in TMNB with details and GPS coordinates of the Place of occurrence. All the offences are to be entered Forest Department form No 1682 and monthly reports to be sent to Divisional Forest Officer, Jaldapara Wildlife Division.

6.1.4.21 Record of CR Cases

All CR cases in the court are required to be recorded in a case register with full details as per Performa given in Table-15 and to be monitored sincerely.

6.1.1.3 Protection Monitoring Protocol

Proper wildlife and forest protection of a PA ensures a good conservation of its natural resources. With this objective, a "Protection Monitoring Protocol" (PMP) for Jaldapara National Park has been proposed with following salient features.

- Each Beat Officer shall maintain a map of his/her area showing the sensitive points which need to be provided special attention. This map shall be regularly updated.

› Beat Officer concerned shall plan their patrolling duties in such a manner that every part of his/ her jurisdiction is covered every week at least twice with special attention to sensitive areas.

› All the offences detected shall be plotted on map for the area with an index indicating nature of offence, which will be the "Offence Map" for the period over the jurisdiction. During dry months the incidences of fire should also be recorded on the map.

› The inspecting officers i.e. Range Officers &above shall provide necessary guidance and support to the Beats so that they can perform their job amicably.

› Each Range Officer shall visit all Beats and Camps within his jurisdiction once in week and check the duties performed over the period through record and discussions and note his observations in prescribed form. One copy of this form shall be kept in the Beat and the second copy shall be kept in the Range Office. The third copy shall be submitted to the DFO within 10th" of succeeding month through the concerned AWLW/ADFO. During his/ her inspection, the Range Officer will take spot decision for the issues which he/ she can solve at his/ her level which would include temporary redeployment of staff, joint patrolling with mobile squads or adjoining ranges and such more issues.

› For the issues, which are beyond his/ her level he/ she shall personally meet the concerned DFO and appraise him/ her about the situation.

› AWLW/ADFO shall inspect all Beats of PA at least once in every month and fill up the prescribed form on spot. They shall give one copy of this form to the Beat concerned and the other copy of all the Beats shall be submitted to the CCF/WLN by 10th of next month through the DFO who will mention the actions taken/suggested.

› DFO shall inspect at least one Beat randomly from any Range in a week and will ensure that he/ she inspects all Beats at least once in six months. He/ she shall also submit his/ her report to the CCF/WL N within 10thof succeeding month about the visits made by him/ her.

› Forms cover information about compartments visited during the week, night patrolling, seizures, arrests, diary submission, offence map, night halt, maintenance of fire arms and other records including Duty Register, Offence Register, and Duty output as well as inspecting officer's note. Hence, it is expected that this form shall provide necessary review of the protection duties performed, desired guidance to the subordinate staff and required inputs to superiors about the situation.

› Duty charts and performance proforma of the Elephant Squad/Mobile Ranges would be prepared by respective Range officer as per wild life depredation requirements and shall be revised regularly for every quarter. Monthly performance reports of the Squad Range / Mobile Ranges would be submitted by 7th of succeeding month by the Mobile Range Officer to the DFO through the concerned AWLW/ADFO, who in turn with their comments submit the same to the CCF/ WLN by 10thof the month. The Squad Range / Mobile Ranges may also be utilized for elephant/other wild life depredation duty also by providing necessary training and equipment inputs.

› DFO should ensure that the entire RT network of HQ, Field and Vehicles is effectively maintained with proper frequency and using codes. Respective AWLW/ADFO would personally check all the sets under their jurisdiction at least once in a month and ensure repair/maintenance of all such sets under their jurisdictions.

› PMP inspection report format in given in Table-36.

› Objective of the system is to institutionalize

monitoring with focus on "Protection" of forest and wildlife involving all. This will help to guide local staff to address their issues and in isolating the non-performers.

- Issues of urgency should be communicated immediately to the concerned officers.

- Initially the DFO with the help of AWLW/ ADFO would conduct Range wise workshops to explain the purpose and nature of such monitoring protocol and preparation of sensitivity maps. The forms may be translated in vernaculars as per field requirements.

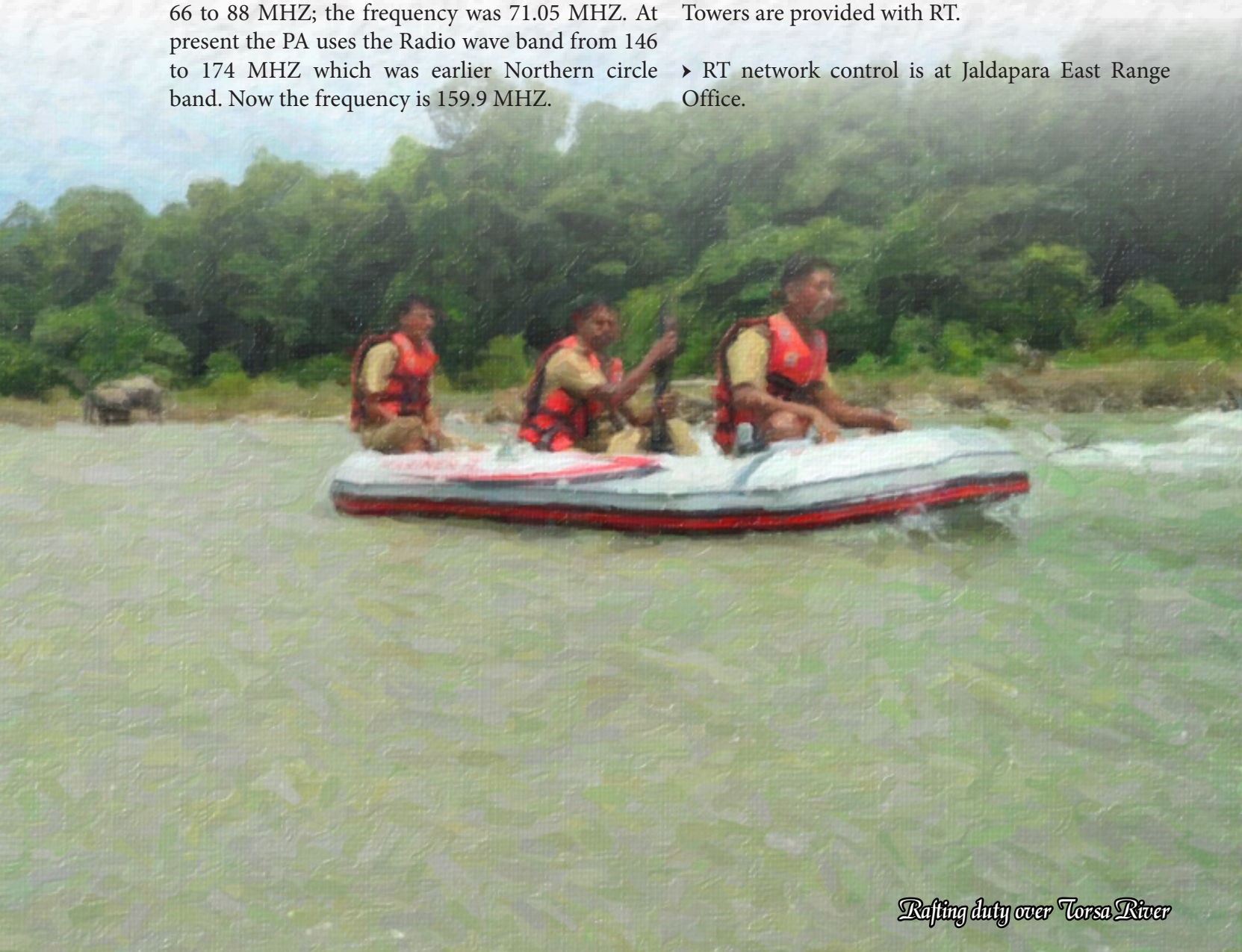
6.1.5 Communications

6.1.5.1 Radio Transmit Communication

- Previously the PA used Radio wave band from 66 to 88 MHZ; the frequency was 71.05 MHZ. At present the PA uses the Radio wave band from 146 to 174 MHZ which was earlier Northern circle band. Now the frequency is 159.9 MHZ.

- All vehicles, Range Offices, beat offices, Watch Towers are provided with RT.

- RT network control is at Jaldapara East Range Office.



Rafting duty over Torsa River

- Replacement, improvement and maintenance of RT system is to be done regularly.

- Schedule time of RT operation for all fixed stations is as follows
  - 6:00 AM (Every Day)
  - 11:00 AM (Every Day)
  - 5:30 PM (Every Day)
  - 8:30 PM (Every Day)
- Schedule time for RT operation for protection WT.
  - From 9:00 PM to 5:00 AM at one (1) hours interval, every day.

- The control at Jaldapara East and Rhino-1 at AWLW Office remain open for 24 hours.

- RT of all vehicles remain open whenever the vehicles are on duty.

- RT messages are recorded in prescribed format which is given in Table-16.

6.1.5.2 Construction, Improvement and Maintenance of Forest Road

- Forest roads are to be maintained post monsoon every year.

- All Forest roads are to be cleaned in different seasons

- New roads need to be constructed in Jaigaon Block -8.00 KM, Chirakhawa- JP WT Road – 3 KM, Howrah WT to HRD WT grassland Road -6 KM and Titi-4 Central Line to Lankapara Range Office -1 KM to control unauthorised access to the National Park.

- Jaigaon road is required to be improved for protection over the block and to facilitate Eco-Tourism

- Chirakahawa JP-WT Road is proposed as alternative to road from Hollong FRH to Jaldapara East HQ because the maintenance cost of existing road is very high due to presence of three (3) timber girder bridges which normally get damaged during rains almost every year.

- Grassland road from Howrah WT to Peacock avenue is proposed for improvement of protection duty in the grassland areas. Detailed list of forest roads is given in Annexure-49.

6.1.5.3 Creation And Maintenance of Patrolling Path

- All patrolling paths are to be maintained in all different seasons.

- New patrolling paths are to be created as per schedule. Detailed list of patrolling paths is given in Annexure-23.

6.1.5.4 Bridges and Culverts

There are 19timber girder bridges and 109 culverts in Jaldapara NP. These are to be maintained as and when required. Two iron girder bridges are proposed on Sisamara river.

6.1.5.5 Digitising Protection

Protection is a dynamic issue that must evolve with changing strategies and social environment to keep pace with the challenges. Few decades ago, poaching was a night bound activity, but now the strategies have changed, rhino poachers prefer forenoon time. Protection protocol of Jaldapara had been designed for 1980s scenario and has proved highly efficient in keeping poaching under check. But with introduction of digitisation in all walks of life and society, digital options for enhancing protection efficiency are available and have been used effectively in many other PAs. Electronic Eye surveillance system with Thermal and Visual Cameras kept on 45 m to 55 m tall towers with

effective coverage of 6.00 km radius are available and the same is proposed to be installed in the Park. Three Towers along Torsa river bed and one each at Harindanga and Moiradanga shall be installed to cover most of the grassland and the control Tower will be installed at Madarihat in office of the AWLW, Jaldapara, from where necessary instructions for Zeroing in on trespassers, fire locations or any other target areas will be issued on real time basis.

› Scientific equipments like GPS, e-Mobile, Trap camera and CC camera are to be used for real time smart patrolling. GPS has been proved very useful in protection and the same will be increasingly used by each party to track all patrol and to be able to develop technical capability of real time digitally locating trespassers with the help of E-Eye surveillance system, alerting patrol parties about the location of trespassers and zeroing in by navigation. Proposed E-Eye location map is given in Figure-11.

› These equipments are to be improved and maintained properly.

6.1.5.6 Gates and Barrier.

› All the check gates to be improved and maintained to control access to the National park .Four (4) manned check gates and eleven (11) unmanned Check post are there in the PA.

› Four (4) manned check gates are under the surveillance of CC camera. All of these gates are to be improved and maintained. Comparative analysis of CC TV footages at Chilapata and Kodalabasti may be very useful in monitoring entry and exit of people in the park through these check gates. Details of gates and barriers given in para no: 3.5.19.1

› A register is to be maintained at all manned check gate as the approved proforma given in Table-17.

6.1.5.7 Telephone, Computers and Internet Communication

For day-to-day effective communication with people outside the PA, telephone is one of the most efficient ways of the communication. Communication inside the PA is to be done over RT. In Jaldapara NP all the range offices have been provided with telephone communication, camera, GPS. More digital software may be provided to field staff for assisting in detection, registration and reporting of offence. All the Range offices and AWLW office are to be provided with computer and Internet connection to have proper office MIS and access to the Forest Offence Management System and other data base.

6.1.6 Camping Materials

Suitable camping gears are to be provided.

6.1.7 Enforcement

6.1.7.1 Awareness of Law:

Considering ever-increasing biotic pressures on the PA, it is very desirable that the law enforcing officers/ staff of the PA area are well-acquainted with and updated on various environment, forest and wildlife related Acts, such as the Indian Forest Act, 1927; the Indian Wildlife (Protection) Act, 1972, Forest Conservation Act, 1980, Biodiversity Act, 2002, Environment Protection Act, 1986 and maintain a very close working relationship with the police and judiciary.

Government has empowered the ranks of field staff of forest department to take cognizance of offences relating to forest and wildlife. Frontline staff of Jaldapara NP are always required to be kept well - prepared with necessary documents/ proforma prescribed under the above Acts for taking appropriate action and registering a forest/ wildlife offence. Park Management should also ensure that staff remain trained and updated on the latest amendments to the concerned Acts, and for this purpose easy Bengali, Nepali and Hindi translation of the concerned Acts may be circulated down to the lowest rungs for a better understanding of the subject. Besides, periodic Legal Workshops and discussions should also be organized, involving resource persons from the judiciary and the police department to guide staff in proper investigation of forest offences, procedural norms, and to simplify intricacies of the laws. Staff would be benefited by such arrangements, as these close interactions helps in bringing out various shortcomings/ mistakes in entire procedure which render the cases weak, increasing possibility of criminals going scot-free. Staff of the National Park require internal periodic refresher courses discussions, high level of discipline and motivation. Such discussions and workshops would build the confidence of the staff in the following:

- Arrest or apprehension of persons/ offenders engaged in illegal acts inside the National Park.
- Proper documentation of illegal activities for court proceedings, including evidence in the form of confiscated wildlife articles, relevant photographs, signed statements, and reports,
- Proper seizure of items prohibited under the Laws, or required as evidence to testify to an illegal act.
- Simple legal procedures in delivering the arrested offenders to the police/ court, and filing charges.

6.1.7.2 Liaison With Court

In present practice dealing of court cases is not much effective, and offenders are mostly acquitted for want of effective follow-up. Instead of legacy of failure, the PA authority, in recent times has got remarkable achievements in all poaching cases of Rhino resulting in conviction in Cr case no: 332/2016, 622/2015, 196/2016, 173/2016 and 841/2016 in ACJM Court Alipurduar. To continue such trend of success following steps are to be taken To ensure regular attendance on fixed dates in cause-listed cases, a special team of staff along with appointment of panel lawyer should be identified and earmarked for this purpose. The team should be entrusted with the job of attending the court regularly and apprise the DFO time to time. The team would also inform the concerned staff to take necessary actions in such cases required periodically. The team would also coordinate with APP/PP and maintain necessary records for every individual case and to make respective witness ready to appear in the court. The Court Liaison Unit would consist of

- One Range Officer, Law Cell
- One Deputy Ranger
- One Forest Guard
- One Computer Assistant to maintain necessary records

6.1.8 Inter Departmental Co-Ordination and Sensitization

Formal meeting to be conducted with Police, Customs and Judiciary to mitigate different types of field issues.

6.1.9 Amenities For Staff and Families

Frontline staff of the Park perform arduous duties and they deserve residential facilities as per living standards of the society. Hence efforts are to be taken for providing befitting accommodations with all necessary basic amenities.

6.1.10 Corridor Management

As such there is no notified wildlife or elephant corridor in the PA though some movement paths are there traditionally used by wild animals, especially by elephants for movement from/ to the PA to/ from other near forest patches like regular elephant passage routes- Rethi- Titi (via Dhumchi), Rethi-Titi, Titi – Buxa (via Torsa), Titi- Buxa (via Beech and Bharnabari TG), Nimati- Chilapata. For management of such passages following steps should be adopted.

- Effort to be made to limit the speed of vehicles and Train on NH-31C and NFR track
- Necessary signage to be installed along the side of road.
- A Register to be maintained to record the road / rail kill or death of wild animal outside of Forest area.
- Geo-Tag photograph to be taken of all such death.
- To record any death in liner barrier in corridor a register to be maintain as per proforma given in Table-18.
- In Elephant passages voluntary Elephant guiding village teams to be formed to minimise loss of life and property.
- Wildlife corridor notification and corridor management may be adopted as long-term strategy.

6.1.11 control of Fire

Fire has emerged as one of the major challenges for Bio-diversity conservation in Jaldapara National Park. Grasslands are very efficient in locking atmospheric carbon due to high biomass productivity of grasses. Huge mass of dry grass leaves lies on floor of grassland to add to soil as a part of nutrient cycling and carbon locking. Forest fire interrupts both the processes, releasing carbon back to the atmosphere and snapping the nutrient cycle before nutrient is added to the soil. This loss is apart from direct loss to live flora and fauna and hijacking the seral advancement to fire hardy colonizer weeds, again leading to loss of Bio-diversity. This plan therefore, identifies fire as one of the major challenges the management must tackle during the plan period and evolves effective fire control plan.

- To control manmade illicit wild fire a fire prone area to be divided in to two (2) zones 1) Highly sensitive zone 2) Low sensitive Zone. Fire sensitivity map is given in Figure-5. A total area of 82.19 sq km falls under highly sensitive fire zone and 37.62 sq km falls in Low sensitive Zone in the PA.
- In high sensitive zone, fire line to be made of five (5) meter width of total length 66.00 km.
- Special attention shall be paid to highly sensitive Fire Prone Zone of each Beat and these will be under constant vigil and human and cattle movement around this Zone will be strictly prohibited. AWLW shall submit a fortnightly report to the Division Office from January to April on status and measures adopted for each Sensitive Fire Zone.
- In low sensitive zone, fire line to be made of three (3) meter width in compartment line over 72.46

km over Motorable Road 150.79 km and over non-motorable road 42.38 km of total length km Length.

› All fire line to be maintained and created during winter by cutting grasses and burning so that it acts as fire resistant belt during fire season.

› Electronic-Eye Surveillance system will prove very useful in monitoring fire and controlling the same due to its being real time monitoring and its extent of coverage. This is expected that this system will help to achieve target of fire free grassland years.

› Fire extinguishing equipments are to be supplied regularly.

› Fire watchers are to be engaged during fire season.

› All forest roads are to be maintained as fire lines during fire season.

› After any fire incident, burnt area is to be scanned and a GPS track to be taken for reporting.

› Any fire to be reported to the DFO through AWLW.

› Before fire season, awareness meeting regarding ill effects of uncontrolled fire to be conducted.

› During fire season the patrolling staff shall act as fire control squad.

› When a fire is noticed it must be extinguished as quickly as possible.

› Staffs are to be motivated to act as fire extinguishing squad.

› During fire season all the watch towers shall act as fire watch towers.

› All fire incidents to be geo surveyed and area to be calculated

› A Fire incidence reporting register to be maintained as per specified proforma. Detailed list of fire line is given in Annexure-50. Format for record foret fire details is given in Table-19.

6.1.12 Control of Grazing

› Awareness meeting to be conducted in JFPC regarding the negative impacts of grazing.

› Stall feeding of village cattle in villages will be encouraged.

› Cattle to be captured and cowboy and owner to be arrested / compounded as the case may be.

› To keep captured cattle pound to be established at specific sites.

› To keep seized cattle, pound to be established in strategic location and for this purpose District Magistrate, Alipore Duar to be approached for granting to pound vide section 4 of the Cattle trespasses act 1871.

› Vaccination to be given to the village cattle to check the spread of contagious diseases,

› Grazing record and vaccination records to be maintained as per prescribed format

› No seized cattle to be released unless ownership certificates of cattle with details description is given by the concerned Gram Panchyat Pradhan. Grazing record to be maintained in a register as per format given in Table-20. Report on cattle vaccination is given in Annexure-28.

6.2 ZONE PLAN AND ZONATION

Zonation of National Park is required to achieve the different object of the management since different categories of area require different treatment and management practices. Zonation helps in setting aside different areas for different purposes. Here in this plan, the Zone shall be clearly demarcated and clear to all staff beyond any confusion. Jaldapara National Park is delineated into the following zones. At the time of delineation of zone area, it is noticed that 44.66 Ha area of Bania-1A and 16.71 Ha of Mendabari-1A which were woodland earlier, have been washed out during last plan period and now has come out as riverain natural grassland. During flood on September 2014 one course of river Torsa entered in Sisamara Jhora at Malangi -1 and 2 Compartment and washed out almost 261.09 Ha of grassland and the area now has become river and riverbank of Torsa. The Great Indian One-Horned Rhinoceros has been the flagship bearing species of the Park and the management has been Rhino centric which showed in types of intervention in this particular zone. Artificial grassland has been created and maintained in this particular locality for last 3 to 4 decades. In order to ensure sufficient palatable grasses for Rhinos activities like cut back and controlled burning, over wood removal and weed eradication had been taken up in the areas of artificially created grasslands. This plan however, takes ecosystem approach rather than species-oriented conservation approach and accordingly proposes the following action plan.

Jaldapara National Park will be delineated into three (3) distinct zones.

A. Wilderness Zone (No human intervention zone.)
B. Management Intervention Zone
C. Tourism zone

Constitution of Zones-

Zone	Present Management Plan 2018-2019 to 2027-2028	
	Block. / Compartment	Area
Wilderness zone	BD-1b, BD-2, BD-6b, BD-7b, BN-1a, BN-1b, BN-2, BN-3, BN-8b, CP-1, CP-2, CP-3b, CP-4b, DSP-1, DSP-2, DSP-3, DSP-4, HM-1, HM-2, HM-3a, HM-3b, HM-4, JP-1, JP-2, JP-3, JP-4, JP-5, MB-4, MB-5a, MB-5b, MB-6a, MB-6b, MLG-1, MLG-2, MLG-3, Titi-1b, Titi-2b, Titi-3b, Titi-4 (Part), Torsa-1, Torsa-2, Torsa-3	114.43 Sq km
Management intervention zone	BD-1b, BD-2, BN-4, BN-8b, CP-1, CP-2, CP-3b, CP-4b, HM-1, HM-2, HM-3a, HM-4, JG-1, JG-2, JP-1, JP-2, JP-3, JP-4, JP-5, MB-3, MLG-1, MLG-2, MLG-3, SLK-1, SLK-2, SLK-3, SLK-4, Titi-1a, Titi-2a, Titi-3a, Titi-4 (Part), Torsa-1, Torsa-2, Torsa-3	101.88 Sq km
Eco tourism zone	BN-4, BD-1B, BD-2, DSP-4, HM-1, HM-2, HM-4, JG-1, JG-2, JP-1, JP-3, JP-4, JP-5, MB-3, SLK-1, SLK-2, SLK-3, SLK-4, TITI-1A, TITI-1B, TITI-2B, TITI-3A, TITI-3B, TITI-4, TORSA-1 (Along the existing roads in the compartments and existing glades)	3.71 sq km (including 36.0 km road of 20 metre width)

Detailed zonation list in Annexure–51 and map in Figure-12.

6.2.1 Wilderness Zone

Classification of Habitat in wilderness zone in Figure-13, area detail is given in Annexure-52.

6.2.1.1 Objectives

- To ensure natural processes go unhindered.
- To protect the area from any biotic interference,
- To preserve all habitat types and the ecosystem as a whole,
- To maintain the genetic resources in dynamic and evolutionary state

6.2.1.2 Constraints in Achieving Objectives

- Heavy population around the area and threat of poaching and illicit felling
- Village cattle Grazing pressure
- Forest fire

6.2.1.3 Zonal Prescription

- This is the pristine sanctum sanctorum area of the park having best habitat quality and maximum concentration of wildlife. All the rivers of the park mainly the larger ones like Torsa, Malangi, Sissamara, Buri Torsa and Chirakhawa, their banks and surrounding areas having been recently formed by siltation, form best natural grasslands of the park.

- The wide course of river Torsa and oxbow formations of numerous other rivers listed above form variety of undulating, sloping, plain and submerged areas having differences in moisture regime. This variety of growing conditions creates variety of grass patches having diverse species composition and provides very good habitat to support diverse bio-diversity. There is no weed infestation in the area and have very good wildlife presence.

- High level protection to be ensured to maintain the sanctum sanctorum of the Zone

- Fire is the main challenge and is caused by cattle graziers in dry season to promote new shoot. This is a great hazard for the most important zone of the park and has been proved very difficult to be controlled. Detailed planning and intensive management has to be done to control fire.

- A separate chapter on Fire control plan is dedicated for the cause.

- Only management operation except for protection and fire control allowed in this zone will be over wood removal in areas where woody succession has set in and established. Any area having more than 60 no. of woody invasion per Ha will be selected for such operation.

- None to be permitted to visit the area except Biologist, researcher and on duty forest officer.

- Permission based research to be conducted to assess the role of nature.
- Monitoring and wildlife estimation to be conducted.
- No new opening of forest to be done. To facilitate protection existing road and other infrastructure to be improved and maintained.

6.2.2 Management Intervention Zone

This zone constitutes main area of focus for management as far as intervention is concerned. This Park has been pioneers in manmade grassland management in the country and about 15 sqkm of artificial grassland has been created and maintained for last 3 to 4 decades. This area serves as a good habitat not only for the GIOH Rhinoceros but for several other associated grassland fauna. But, there are challenges of weed infestation, woody succession, habitat degradation due to heavy use by different herbivores, fire and colonization by fire hardy weeds. Classification of Habitat in Management Intervention Zone is given in Figure-14 and area details in Annexure-53.

6.2.2.1 Objectives

- To maintain artificially regenerated grasslands and habitats as rhino habitats,
- To sanitize weed infested areas and make them available for rhinos,
- To facilitate scientific research and monitoring to assess the impact of human intervened works in the ecosystem.

6.2.2.2 Issues

- Weed infestation,
- Fire
- "Chicken Neck" at some places with external surrounding.
- Grazing of village cattle.
- Water scarcity during pinch period.
- Scanty availability of indigenous palatable fodder grass stock.

6.2.2.3 Zonal Prescription

- All activities of habitat management to be ameliorative
- Ecological niche for the various species from different Taxa to be conserved by scientific management practices involving minimum possible intervention.
- The Mosaic of forest floor to be maintained by scientific habitat management works.
- Fire management plan to be followed.
- Natural meandering of rivers to be allowed except protection of staff residential area,
- Introduction of exotic and non-browsable non grazable species to be banned.
- Indigenous fodder grass to be restocked.
- Indigenous tree fodder to be restocked by raising nursery.
- Fodder plantation to be kept under fencing for minimum possible period till establishment of root stock.
- Eco friendly structure and nature matching structure to be preferred.
- All non- biodegradable substances to be discarded.
- Fruit bearing tree and tree fodder sps and browsable climbers to be retained.
- Key area, snags, dead and decaying tree not to be disturbed.

6.2.2.4 Habitat Management Strategies.

Jaldapara National Park is one of the only two Rhinoceros habitats of the State and the Great Indian One-Horned Rhinoceros is the most sought-after species of the National Park and its population has increased considerably and gone beyond 200. But grassland areas are limited measuring only about 20% of the total area of the Park and hence intervention are necessary to support the increasing population by maintaining the artificial grasslands that have be created by way of grass plantations through the years. Other associated species of the National park are Elephants, Gaur, Common Leopard, and different species of deer, wild boar, and many species of birds, reptiles, amphibians and insects. An important development during second management plan period has been considerable increase of population of Gaurs. At present the PA has unique distinction of being home to all the three (3) mega herbivores of the country i.e. Asiatic Elephant, G.I.O.H. Rhinoceros and Gaur. This has great impact on the ecology of the Park by exerting great browsing and grazing pressure on the eco-system and accordingly modifying the eco-system. One salient example is patches of "Damal Forest" (Utrica crenulate) that were considered of no use to wildlife till recently, are now seen to be highly preferred by Gaurs. Hence management must devise means and ways to take up habitat management activities in a way that suite all the mega herbivores on one side and all the remaining herbivores on the other. Since the food chain in any eco-system is highly complicated and any large-scale manipulation of the ecosystem may set in an irreversible process of degradation, park authority must be extremely careful while carrying out habitat manipulation activities for conservation.

6.2.2.5 Grass Land Management

6.2.2.5.1 Objectives

- To create, improve, maintain and to increase habitats of all species by diversifying the floral species, i.e. conserving all different ecosystems or habitat types in totality
- To create, improve and maintain the floral biodiversity with special emphasis to increase the habitat of Rhinoceros
- To facilitate the essential requirements to be available for all representative taxa.
- To restore the grassy undergrowth by minimizing the weed infestation.
- To reduce the effect of monoculture of Dhadda – the most common indigenous grass.
- To enhance the forest floor quality in bio-geo chemical cycle.

6.2.2.5.2 Category of Grass Land:

For management of grassland total area of grass land can be divided into following category for better scientific management

A. Active Flood Zone

This area is extended over BD-1b, BD-2, BD-6b, BD-7b, BN-1a, BN-1b, BN-8b, CP-2, CP-3b, CP-4b, DSP-1, DSP-2, DSP-3, DSP-4, HM-2, HM-3a, JG-1, JG-2, JP-2, JP-3, MLG-1, MLG-2, MLG-3, TITI-1a, TITI-2a, TITI-3a, TITI-4 (Part) Total 3662.99 ha. or 36.62 Sq Km kept under Wilderness Zone and no intervention is prescribed except overwood removal, if required.

B. Riverian Natural Grassland

This area is extended over in the present course of Torsa i.e. BD-1B, BD-2, BD-6B, BD-7B, BN-1A, BN-1B, CP-1, CP-2, CP-3B, CP-4B, HM-3A, JG-1, JG-2, JP-2, MB-6A, MB-6B, MLG-1, MLG-3,TITI-4 (PART), Total Area – 1670.52 Ha or 16.70 Sq Km. and is kept under Wilderness Zone and no intervention is prescribed except overwood removal.

C. Man-Made Grass Land

This area is extended over BD-1B, CP-1, CP-2, CP-3b, CP-4b, HM-3a, JP-1, JP-2, JP-3, JP-4, JP-5, MLG-1, MLG-2, MLG-3, Torsa-1, Torsa-2, Torsa-3, Total area 3366.15 or 33.66 Sq Km.

Man-made grassland is subdivided into three (3) specific areas 1. Over Wood Area, 2. Degraded Area, 3. Weed Infested area. All fodder grass management activities are to be taken up in these areas. Distribution of area with its category is given in Table-21. Detailed list of classification of grassland in Habitat Management zone is given in Annexure-54.

6.2.2.5.3prescriptions

- Active flooding zones are identified and delineated and are the most important zone of the park. The areas include HM-3, BD-1b, JP-2, Mal-1, 2, 3, CP-3b, JP-5 compartments comprising an area of about 3662.99 Ha (Habitat type Map on Fig-16). This patch has very good grassland full of diversity and has maximum concentration of wildlife and of rhinos. This area is kept under Wilderness zone and no intervention except Protection and Fire control measures will be taken up in this area.
- Wherever habitat manipulation activities are being taken up, some control plots should be laid out for future monitoring of the effects of such manipulations.
- No exotic tree/fodder species should be introduced.
- Focus of habitat development should be aimed towards expanding the habitat and fodder base of Rhino and other herbivores

› Such habitat development works should be taken up which will also help in improving the habitat of other species without generating inter-species contest.

6.2.2.6 Grass Fodder Plantation

6.2.2.6.1 Prescriptions

This prescription will be followed in creation of indigenous grass fodder plantation in degraded areas, weed eradication areas and over-wood removal areas. These areas are located away from the active flooding zone, on higher altitudes and are not subjected to prolonged inundation during rainy season and therefore woody succession has either set in or in the process of setting in. Major area includes old plantation sites that have become coarse and unpalatable and hence lost its value as grazable bio-mass. There are other areas which were taken up for fodder plantation and subsequently have got heavy weed infestation due to several reasons. Remaining areas include near flooding line where plantations have not been taken up and erstwhile grassland is tending towards woodland.

› Identification of the area of plantation to be completed by December

› Plantation patches should be small, ideally not more than ten (10) ha to create a mosaic of habitats to maintain diverse habitat types on one hand and to cause minimum possible disturbance to existing eco-system in the other hand.

› Choice of species to be done as per soil condition and water table and water stagnation.

› Species are selected as per soil condition like

- In sandy soil: Dhadda (Sachharum narenga)
- In clay soil Chepti (Themeda aurundinacea)
- In clay moist soil with slope Malsa (Sachharum longisetosum)
- In shallow moist land Madhua (Sachharum aurundinecea)
- In water logged area:
  - ▹ Nol (Arundo donex)
  - ▹ Purundi (Alpinea nigra)
  - ▹ Hogla (Typha angustifolia)
  - ▹ Khagra (Phragmites kharka)
  - ▹ Ekra (Sachhurum hookeri)

› Special habitats like snag, den trees, caves, overhangs etc for creation of micro-climate as well as to support the micro-fauna to be maintained.

› Survey, demarcation of plantation area and initial cleaning burning to be completed by March-April. During cleaning, all coppicing non- browsable herbs and woody shrubs are to be uprooted.

› Alignment and Soil preparation to be completed by May.

› Spacing of planting slips to be 1m x 1m.

› 30 centimeter dia circular area to be cleaned in plantation area, the grass and soil to be dug and earth clods to be broken to dust and soil to be fully pulverized to make a good planting pit.

› Effort should be made to do maximum planting by seed sowing in circular Thalis of 30 cm dia by 15th of April. Whereas, the practice and results of Chepti (*Themeda arundinacea*) has already been tested and established, effort should be made to develop seed block for other local species like Madhua, Malsa, Ekra, Banspati, Nol, Khagra etc.

› Seed sowing is to be supplimented by slip planting as per requirment.

› Planting to be completed by May-June and if good pre-monsoon rains are received, it may even be

raised in April.

- Before planting the plantation area to be put under energized fence. Solar energized fencing technique is given in Annexure-55.

- 1st cleaning to be done in June, if plantation is completed within May.

- 2nd cleaning to be done by August

- 3rd cleaning to be done by September

- 4th cleaning to be done by November

- Fencing should be removed in the month of August- September during the creation year.

- In 1st year maintenance to be done by weeding & cleaning. One cleaning to be done in pre-monsoon and other cleaning to be done after monsoon.

- In 2nd year the plantation to be maintained by weeding and cleaning. One cleaning to be done before monsoon.

- In 3rd year the plantation should be put under winter flash cutback operation (discussed under separate item- 6.8.1.4) and utilized for two (2) more years.

- So the rotation of a grass fodder plantation is five (5) years.

- Plantation journal to be maintained properly and all the management works to be mentioned in the journal with GPS coordinates of all corners points.

- Annual target of creation of grass fodder plantation is 275 Ha.

- Detailed list of grass species preferred for grass fodder plantation is given in Table-22. Periodic table of creation of grass fodder in degraded grassland is given in Table-23 and Calendar of operations for creation of Grass Fodder plantation is given in Annexure-56.

Weed eradication operation under CSS

6.2.2.7 Weed Eradication

Weeds have become a great challenge for management in maintaining quality of habitat in parts of the park which are free from inundation for prolonged periods of time and there is heavy grazing pressure. Favored grasses are selectively grazed rendering the forest floor open which invites weed growth and weeds like Lantana camara, Leea spp., Clerodendron spp, Mikania, Eupatorium colonize the area and thereby degrading habitat quality. This is common in HM-3, 4, JP-3, 5 upland areas of Malangi-1, 2, 3, CP-3, 4 and Torsa-1, 2, 3 compartments. It is, therefore, proposed that weed eradication is taken up in routine manner every year. The target weeds will be uprooted from ground completely to ensure that no root stock remains in the ground. In case the target species flowers immediately before rainy season, the eradication work must be advanced accordingly. This can be done either manually or mechanically, although manual operation is effective, mechanical options may be explored, tested and adopted. Weeds will be uprooted and burnt prior to flowering. Periodic table of weed eradication is given Table-24. Total Annual target of Weed Eradication will be 450 Ha.

6.2.2.8 Over Wood Removal Followed By Creation of Fodder Plantatiom

6.2.2.8.1 Prescriptions

› Area of grass land, where grass fodder species is in the process of being suppressed by woody species and stock becomes very poor, is to be selected for over wood removal. These are transition area from low land to upland and get less frequent flooding during monsoon for smaller spans of time. Any patch having more than 60 no woody invasion per Ha should be selected for this operation.

› Over wood removal is to be followed by indigenous grass fodder plantation

› Annually 100 ha area to be selected and it should be included in annual creation of indigenous grass fodder plantation.

› All trees except Simul and fruit bearing species upto 60 cm girth should be removed by cutting flush to ground.

› Pioneer species like Sidha (Lagestroemia parviflora), Malata (Macaranga denticulate) to be removed.

› 60-70 No. of Simul (Bombax ceiba) tress above 60 cm GBH per Ha will be retained during over-wood removal because

- This species does not form a dense canopy and hence allows grasses to grow beneath it.
- This tree bears huge quantity of flowers during the months of January to March, which supports large number of bees and insects which in turn support numerous bird species and when these flowers fall on the ground, prove to be highly nutritious fodder/food for all herbivores including Sambar (Cervus unicolor), Hog Deer (Axix pocinus), Indian Gaur (Bos gaurus) and Rhinoceros. Simul (Bombax cieba) tree provides the very crucial highest vantage point for all raptors.

› Over wood removal to be done in the preceeding year of the plantation.

› Periodic table of over wood removal is given in Table-25.

›Annual target under this operation is 100 Ha.

6.2.2.9 Cutback Operation

6.2.2.9.1 Prescriptions

- Old and coarse clumps in the grass fodder plantations in the third & fourth year of plantation will be taken up for this operation.
- Grass clumps will be cut at a height of 45 cm in the month of December- January and spread over the area and left to decompose and mix with soil.
- A control plot of 0.5 ha will be maintained in each Beat taking up this operation. In this control plot the coarse grass clump will be cut at 45 cm, and the entire control plot area will be burnt under strict vigil so as to ensure no fire jumps and sprades, 3m wide fire line will be created around the selected area. Relative emergence of weeds, percentage coverage of the area under planted grass species and under invasive weeds and any other habitat attribute as felt necessary in future will be monitored.
- The cut area to be cleaned before monsoon and after monsoon for consecutive two years by uprooting non-browsable species.
- Periodic table of winter cut back is given in Table-26.
- Annual target under this operation is 60 Ha.

6.2.2.10 Tree Fodder Plntation In Degraded Forest.

6.2.2.10.1 Prescriptions

- The PA has 80 no of captive elephants being maintained for protection as well as for tourism purpose and there is a need of constant supply of fodder for them. Presently they are fed almost entirely with grasses which are not ideal fodder for elephants. This animal is basically a browser and total dependence on grass may lead to excessive and rapid wearing of their set of teeth which is limited to six, apart from other impacts on health and wellbeing of the animal not known as yet. It is, therefore, planned to develop browsable woodlands in vicinity of major camps and Pilkhanas to provide browsing areas for captive elephants.
- Area to be selected where tree density is less than 100 per Ha or in blank area.
- Degraded forest areas have been identified and delineated with the help of GIS and it works out to 4530.81 ha. Patches from this degraded forest area falling near Pilkhanas will be selected for raising tree fodder plantations to meet requirement of captive elephants and in remaining areas tree fodder plantations will be raised to augment habitat quality from view point of wild elephants to provide optimum habitat to wild elephant populations and Gaurs as well.
- Plantations may be raised in classic block plantation design or enrichment plantation design if otherwise suitable habitats can be optimized by filling up gaps created by illicit felling. Annual target for this type of plantation is 80 ha.
- Plantation should be put under energized fence for two years
- Area of one plantation should not exceed ten Ha.

(10 Ha)

› Tall seedlings of around 6 ft height either raised in own nurseries or procured from outside to be planted.

› Wide spacing of 4 m x 4m or 5m x 5m is to be used for this plantation and the planting pits should be of size 75 cm x 75 cm x 60 cm

› Planting Pit will be 60 cm deep, base width 30 cm top width 45 cm.

› Nursery to be raised two-year advance of the plantation.

› Attempt should be made to make use of pre-monsoon showers and planting should be completed by 1st week of May

› The preferred tree fodder species (browsable middle story tree) is given in Table-27.

› The Schedule of operations for creation of tree fodder is given in Table-28.

› Annual target under this operation is 30 Ha.

6.2.2.11 "Swot" Analysis of Jaldapara National Park as A Whole

Strength	Weakness
› Wildness Zone is less disturbed and no village inside the WL Zone. › Rich Biodiversity › Presence of Savanah grass land › Perennial river system › A part of Eastern Dooars Elephant Reserve › Motivated Staff. › Good number of elephants for protection duty › Good protection protocol. › Alert and aware JFPC act as social fencing › Rich ethnic culture › History of Conservation success Rhino no: 14 in 1985 to 204 in 2015. › Network of Watch Towers and Protection Camps	› Trousers like shape › High density population around the PA › Two (2) villages enclaved within the PA. › Situation of 'chicken neck' w.r.t. PA boundary. › Easy access all through the boundary › Old staff and untrained staff › Some area is highly fire prone. › Dependency of people on forest for sustenance › Grazing pressure of village cattle on PA. › Lack of permanent mahout and Grass cutter › Weed infestation and degradation of habitat › Some area is not approachable by elephants and vehicle during rain. › No study of carbon store › Corridors with nearby Forests are disturbed and National park is bisected by NH & Rail line.

Opportunity:	Threats:
▸ Relocation of enclaved villages and increase of habitat. ▸ Historical & architectural wealth. ▸ Promoting Eco-tourism. ▸ Supporting research & monitoring. ▸ Nature education. ▸ Training of all category staff ▸ Study on carbon store ▸ Awareness and JFPC Support ▸ Improvement of infrastructure for protection ▸ Human intervened grassland management ▸ Establishment of intensive intelligent system ▸ Corridor Management ▸ Captive elephant management ▸ Harvesting of Rain water	▸ Poaching of Wildlife specially Rhino ▸ Constantly increasing Man Animal Conflict ▸ Habitat destruction by illicit felling & Grazing ▸ Destruction by wild Fire ▸ Weed infestation ▸ Leaching of pesticides from Tea Gardens and poisoning of river and ponds for fishing ▸ Death of wildlife in Road and Rail accidents ▸ Water scarcity in pinch period. ▸ Possibility of Disease outbreak ▸ Dolomite deposition in rivers from Bhutan ▸ Soil erosion in Titi forest block silting up of River and Jhoras ▸ Increasing Tourist pressure and plastic pollution ▸ Loss of habitat and local extinction of species ▸ Need of space/land for variety of Development activities

6.3 FLOODING TO BE USED AS GRASSLAND MANAGEMENT TOOL

Natural grasslands are created and maintained by flooding and they survive till there is seasonal inundation for considerable period. Once flooding of an area becomes scarce and rare, natural succession takes the vegetation to woody and climax stage. This is an interesting socio-ecological interaction where floods are a boon for human society and rivers, wherever possible have been contained by constructing embankments on both sides to safeguard human settlements from flooding. In case of Jaldapara too, embankments had been constructed on both eastern and western banks at different points of time although the one on the East bank has been constructed at the southern boundary of the PA. The one on the west bank constructed towards the end of last century had visible impacts on the ecology of the park, the western part of the PA including whole of Hasimara, Jaldapara and Torsa blocks remained dry and devoid of annual flooding and dry regimes developed in this area. Consequences can be seen in the form of extensive weed infestation and

woody succession. Annual flooding within park boundaries is, therefore, a desirable natural bliss and taking a cue from the same seasonal flooding can be doctored at suitably selected sites by creating barriers across smaller streams like Buri Torsa and Chirakhawa at locations in JP-5, Torsa-1,2,3 compartments. Whereas masonry check dam has been constructed at Harindanga and a seasonal check dam made of sand bags is erected every year, both these can be made permanent and two more check dams are proposed in Torsa-2 and Torsa-3 compartments. Proposed location map of check dam is given in Figure-15. These sites have been selected on basis of Contour study. Contour map of Jaldapara in Figure-16.

Following are the GPS Coordinates where retaining walls can be made on streams so that water would flood by the lower areas which will in turn favour the palatable grass species to thrive. All these structures should be non permanent in nature and made of sand filled gunny bags and bamboos. No permanent structure on construction should be allowed to be built in case of making such seasonal reatining walls.

i) 26°38'34.69"N 89°18'4.58"E
ii) 26°38'24.95"N 89°17'56.35"E
iii) 26°38'23.89"N 89°17'48.23"E
iV) 26°36'56.87"N 89°16'54.04"E

6.4 CAPTIVE ELEPHANT MANAGEMENT

Elephants are keel of protection machinery in Jaldapara. Foot patrolling in a rhino land or in a Gaur (Bos gaurus) bearing area is very unsafe for staff. On the other hand, road transport will neither be possible nor effective for patrolling in this area. Captive Elephants have, therefore, been always maintained in the PA for patrolling purpose. At present there are 79 captive Elephants are there in the PA (as on 01.02.2019). Objectives of Captive Elephant Management are to keep all captive elephants healthy and disease free to utilize their optimum service in protection of habitat & wildlife monitoring, eco-tourism activity and managing man-animal conflict. Strategy for better captive Elephant management includes:

Guideline for captive Elephant Management issued by Director, Project Elephant is given in Annexure-57 is to be followed. Progeny of Captive Elephants of Jaldapara is given in Annexure-58.

6.4.1.1 Veterinary Care of Captive Elephant

At present there is one sanctioned post of Veterinary Officer. The Veterinary Officer is posted on deputation to the PA by Animal Resource Development Department. The Veterinary Officer is posted at Madarihat in AWLW Office Complex. At present there is no sanctioned post of Veterinary Assistant in the PA. For better management of Captive Elephants posts of two (2) Veterinary Assistants is required urgently; some frontline staff who are keen in Elephant care may also be imparted training under Animal Resource Department for doing the job of Veterinary Assistants in case of emergency. VO should prescribe medicine in medical register with proper dose.

VO should write the procedure of application of the medicine in simple manner so that Mahut can understand it easily.
For better health care of captive Elephant, vaccination done in a scheduled way. The vaccine schedule is given in Table-29.

6.4.1.2 Duty of Veterinary Officer In Respect of Captive Elephant Management

- VO should check the health of all captive Elephants monthly.
- VO should measure height and weight of captive Elephant annually.
- VO should check the Pilkhana Monthly to control Foot root disease.
- VO should check all Elephant restraining tools.
- VO should communicate all Mahut regularly to know about the health condition of the Elephant.
- VO should provide his service in Elephant care in24 X 7 basis.

6.4.1.3 Training of Captive Elephants, Mahut And Grasscutter

- At present there is no Elephant training center at Jaldapara National Park. Newly born Elephants and rescued Elephants are normally kept in Hollong Central Pilkhana at Hollong. All veterinary care is provided to newly born and rescued elephants and other Captive Elephants by the Veterinary officer of Jaldapara National Park.
- To train rescued Elephants, newly born calves, injured Elephants and problematic Elephants, a new Elephant training center is proposed to be established at Salkumar Forest Block as a long term strategies.
- The training center should be under a care taker and a separate Veterinary Officer and two Veterinary Assistants are to be appointed for this centre.
- The Elephant training center shall provide trained elephants for protection and monitoring duty, eco-tourism duty and also for man-animal conflict management duty.
- The Elephant training center shall also provide trained Mahuts and Grasscutters.
- The Elephant training center should have the capacity to train Twelve (12) Elephants at a time.
- All infrastructure like Pilkhana, Pilkhana Shade, Fencing, Mahut and Grasscutter Barrack, Dispensary, electrification, water supply, sanitation, garbage disposal, residence of VO, Veterinary Assistants and Care Taker and other staff should separately be established.
- Two water check dams are to be constructed over Sanjay River to facilitate bathing of Elephants throughout the year.
- Tree fodder and grass fodder area are to be established at Salkumar for free grazing and stall feeding.
- A separate veterinary laboratory is to be established at the same site.

6.4.1.4 Pilkhana Management

The place where captive elephants are kept is known as Pilkhana which should be established in dry, well-drained sites with shades.

- All Pilkhana should be well fenced. This fencing should be maintained regularly.
- Pilkhana should be cleaned regularly and should be treated with lime and bleaching to destroy the microbes and fungus.
- Pilkhana debris and dung to be carried away from the Pilkhana and burnt frequently.

- Pilkhana floor should be kept earthen (Sandy Soil).

6.4.1.5 Supplementary Food And Fodder

All captive elephants are to be provided with supplementary food as prescribed by veterinary officer. During feeding of supplementary feed presence of highest rank officer present is necessary. Present supplementary food details are given in Table-30.

- All Captive Elephants should be given enough green fodder at the Pilkhana in the evening as night fodder. In dry period Banana stems may also be provided if prescribed by the VO.

- Captive Elephants must be allowed for free grazing under the supervision of Mahut and Grasscutter from 10:00 AM to 3:00 PM every day.

- Green fodder grass to be brought by cutting and leafy fodder to be brought to by lopping of fodder tree.

6.4.1.6 Bathing

- Elephants should be allowed bathing minimum for one hour.

- Elephant nails, foot pads and base of the tusks and tushes are to be checked against any infection.

- During bath Elephants body should be cleaned with "Jhama" (Pumis stone) but not by the plastic or other rough materials.

- At the time of bathing nails should be trimmed if necessary.

- Bathing place should be identified in flowing water and it should be free from boulder.

- Captive Elephants should be allowed for dust bath.

- During bath Mahut should take care of the body parts where Elephant restraining tools are used and the area should be properly cleaned with "Jhama"

- Elephants should not be taken to bath just after the Duty. It should be allowed for grazing for at least 4 to 5 hours in shaded area which also allows cooling down of the elephants.

6.4.1.7 Duty

- Elephants should not be forced to work generally between 10:00 AM to 4 PM during summer in normal situation.

- Elephant can be deployed in duty normally for 5 hours a day, preferably in 2 shifts, 2½ hour each.

- Pregnant Elephants should not be put in duty after 13months of pregnancy.

- A cow Elephant after the birth of calf should not be deployed in duty till the calf attains the ages of 6 (six) months.

6.4.1.8 Daily Care of Elephant By Mahut And Grasscutter

- After completion of duty, Gaddi, Gadla and tying materials should be removed immediately and Mahut / Grasscutter should massage the back of the Elephant.
- In case of Swelling in body, hot and dry compress should be allied.
- Elephant duty materials like Gaddi, Gadla, Rope, Leather Belt, Julti, knee cap to be changed regularly.
- After bath coconut oil should be used in the leg at place where Beri and Dharna is used.
- Elephant should not be allowed to drink water immediately after heavy duty.
- Elephant should be kept in shades after heavy duty.
- Elephant should not be taken to bath directly from sun.
- Every morning the Pilkhana should be cleaned by the Patawala.
- In the morning Mahut should observe mood of the Elephant and then go for the duty.
- Bath is perhaps the most favourite routine for each elephant; each elephant should be provided at least 90-minute bath each day and the camp in charge will supervise bath once in each week.
- Mahut and Patawala should always be present during bath and feeding ration.

6.4.1.9 Registers To Be Maintained

- Service book
- Medical register
- Ration register
- Duty register
- Movement register

6.4.1.10 Elephant Restraining Tools

- Dharna – it should be made of high quality, light weight iron chain. For one Elephant 2 Dharna should be kept.
- Beri - it should be made of high quality, light weight iron chain. For one Elephant 2 Dharna should be kept.
- Dhumchi – it should be made of light weight, superior quality GI pipe.
- Ankush or Gajua – It should be made of light weight, superior quality Iron.
- Ballam - It should be made of light weight, superior quality Iron.
- Andu – It should be made of light weight, superior quality Iron. It should be use seldom.
- Khukri - It should be made of light weight, superior quality Iron.
- Rope – No nylon rope should be used. 2 to 3 sets of jute rope should be kept for each Elephants.
- Julti - No nylon "Julti" should be used. 2 to 3 sets of jute made "Julti" should be kept for each Elephants.
- Knee cap - No nylon knee cap should be used. 2 to 3 sets of jute made knee cap should be kept for each Elephants.

- Plastic sheets, Tarpaulin, Gaddi, Gadla, Rope and patti (leather belt) are to be checked and changed regularly.

6.4.1.11 Common Healthy Signs of Captive Elephant

- Free swinging of tail and trunk
- Flapping of Ear
- Feeding of leaves and grasses
- Playing with twigs
- Throwing mud on its back

6.4.1.12 Common Alarming Signs

- Static gesture
- Non-Flapping of ear
- Sniffing Mahut and Patawala and other nearby subjects
- Throwing articles towards Mahut, Patawala and others present nearby.
- Non-obeying the commands of Mahut and Patawala.
- Loss of appetite.

6.4.1.13 Common Ailments

6.4.1.13.1 Colic

Symptoms – Reduced water intake and loss of appetite, tendency to eat mud and chewing bark of tree, drowsy appearance and motionless for long time; mucous coating absent on the dung.

Impaction – impaction is a condition when undigested food materials cause a blockage in intestine. The condition is very painful. The animal stops defecating. Excessive consumption of grains and long climbers and excessive mud eating lead to impaction. In such conditions VO should be informed immediately.

6.4.1.13.2 Worm Infestation

It is very common in captive Elephant. Periodical deworming is a must in captivity under supervision of veterinary officer.

6.4.1.13.3 Foot Rots

These types of fungal infections in heel (Chadian) or soles and toes (Karri) of an elephant are invariably due to unhygienic condition of the Pilkhana and cause tremendous pain to the animal.

6.4.1.13.4 Lice

Lice are seen in ear folds, inner aspects of limbs and tail switch. It can be easily treated with insecticides.

6.4.1.14 Musth Elephant Management

A healthy male Elephant goes into Must after attaining puberty at approx 15 years of age. During Musth period Mahut must handle their Elephant carefully.

- Some of the symptoms shown at the early stage of Musth are given below
  - Quick response to the Command, that is quick movement
  - Frequent sniffing of Mahut and People with truck.
  - Swift changes moods and behavior

- Fixed gaze. Elephants stare at objects for a long time
- Eyes appear bright and red.
- Elephant dig around the tethering area.
- During a scrub bath, dirt comes off easily.
- Temporal region swells up.
- Urine dribbles constantly.
- Protruded penis.

› Some Management techniques of Musth Elephant

- Extra dharna and Beri to be kept ready for emergency in Musth period.
- During Musth Elephant must be kept chained for extended period
- During Musth, Mahut must attempt to move chain up and down the leg.
- During Musth period Elephant should be approached from back side of the animal.
- During Musth Elephant should be tied separately in a clean and hygienic place with enough shade.
- A tank of water to be kept at a distance reachable to the Elephant trunk only near the musth Elephant with running water supply system.
- The tethering site must be on a slight inclined to facilitate drainage of urine and dung
- Mahut must be present in the vicinity throughout the Musth period.
- Supplementary food and green fodder to be supplied as per prescribed by the Veterinary officer

6.4.1.15 Pregnant Elephant Management And Calf Management

› The quantity of ration is to be raised.

› A special diet consisting of vitamins, minerals etc. to be provided.

› Calf should be weaned out from 30th to 36th month of age.

› Weaned out calf to be put under training under an experienced Mahut.

› Rescued calf to be kept under experienced Mahut.

› Sterilized food and liquids to be given to the rescued calf as per VO's recommendation.

› Rescued calf should be put under training after three (3) years.

6.5 CONTROL OF DISEASE IN WILD.

The strategies are: -

Disease in wild cannot be treated, only preventive care can be adopted

› No pet to be allowed inside the PA.

› Post mortem of all carcasses to be properly conducted by veterinary officers and collected samples to be examined by competent authority.

› Carcases to be burnt properly and the area should be disinfected.

› SOP to be followed after death of wild animals. Detailed report given in Annexure-59.

› SOP to be followed for Rhino DNA index system. SOP for Rhino DNA index system is given in Annexure-60.

› Fringe village cattle liable to cause contamination to be vaccinated against any prevailing diseases as reported by the Animal Resources Development Dept.

› All staffs to be vaccinated against Zoonotic disease.

› Geo-Tag Photographs to be taken for all such death case.

› Register to be maintained as per Table-31.

6.6 REWARD AND INCENTIVE

Frontline staff of the Park has to face many inconveniences in their daily lives and work in a very difficult working condition. It is very important, therefore, to keep them motivated to ensure their efficiency. Opportunities like Bana Mahotsava, Bana Bandhava Utsava, Wildlife Day, World Environment Day, Forest Martyr's Day etc. to be planned to felicitate park staff and different cultural events or sports events and other social functions may be organised to keep them all interested and keen in their duties. Insurance cover for staff in addition should be arranged.

6.7 HUMAN RESOURCE DEVELOPMENT

6.7.1 Capacity Building of Frontline Staff

- Frontline staff like PDL and Bana-Shramik to be imparted training on forestry and wildlife management for better implementation of conservation strategies.
- Front-line staff like Head Forest Guard, Forest Guard, Beat Officer, Range Officer to be imparted refresher training on Forest and wildlife management for better implementation of conservation strategies.
- The frontline staff like Head Forest Guard, Forest Guard, Beat Officer, Range Officer to be given training on handling and use of fire arms in the competent institution.
- The frontline staff like Head Forest Guard, Forest Guard, Beat Officer, Range Officer to be given training on use of electrical gadgets like GPS, Mobile, Computer, Solar systems, energized fencing for better use of them.
- The frontline staff to be given training on motivation, ECO Development activities, for better implementation of all forestry projects.
- Half yearly training to Mahut and Patawala to be given by Elephant experts.
- An Elephant Training Centre is express requirement for the PA and it will serve the dual purposes of training elephants as well as Mahuts and Patawallas. Salkumar is a suitable location and this centre should be established on a priority basis.

6.7.2 Opportunities For Personal Development Of Frontline Staff

A member of frontline staff is the unit of Forest organization to perform all forestry activities. So, if all the frontline staff becomes skilful, the organization becomes skilful. To make a frontline staff skilful, training on personal development on various aspects of life like stress management, meditation, physical capacity building etc. to be imparted regularly.

6.7.3 Exposure Visits of Frontline Staff

To develop confidence of frontline staff, to learn various techniques of forestry activities and to learn the techniques of handling different field situations frontline staff to be given the scope of exposure tour annually.

6.7.4 Incentive For Frontline Staff

Frontline staff are always working in precarious situation inside the PA. They need to do perform their duty on foot and elephant back. During discharge of duty apprehension of getting injury and which may lead to casualty. So to motivate all staff, they should be kept under insurance cover.

6.8 MANAGEMENT OF KEY AREAS

Key areas, all over the forest like the riparian habitat area, dens, caves etc. should be kept untouched these should be monitored that management activity, implemented elsewhere, disturbs the same. These areas should be protected from domestic livestock.

Caves of stalactite and stalagmite in Titi block and rock outcrops (Dayamara Cave) will be preserved and protected carefully. Many mammalian and other species extensively use these areas for their shelter.

Burrows will not be disturbed because hare, rat, mouse, pangolin, mongoose and many other nocturnal animals take shelter there.

Challenges

Owing to unrestricted pilgrimage and worship, the stalagmites are now getting damaged by the pilgrims as they trample through. As large gatherings takes place during Holi, when it is visited by more than five hundred persons for three consecutive days, tremendous pressure and irreparable damage are afflicted to the cave as well as its surrounds. In addition to these, as the cave is situated beside the upper course of river Dayamara, the formations are prone to damage by flash floods and erosion. One part of the cave has already been destroyed by flash floods in the past. Till date there is no management strategy for protecting this which should be formulated immediately to avoid further destruction of it as detailed below-

- Protecting the cave from ongoing flash flood erosion and soil erosion by river training works.
- Erecting suitable fencing with gates for restricting/ regulating pilgrimage during festive seasons, Holi in particular.
- Putting signage and display boards with conservation messages.
- Conservation awareness programmes with a holistic approach towards PA management.

6.8.1 Management Of Unique Habitat

Unique habitats of snags, dead/dying trees, fallen woods are the micro habitats of minute flora and fauna and thus to be managed undisturbed.

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Those habitats offer beautiful examples of forest dynamics and can represent eco-system units of action, like detritus food chain etc.

Retention of several hollow, top drying, partially dead, or fully dead (snag) standing trees are to be retained. Such trees are used by a variety of specialist wildlife species, particularly woodpeckers, barbets, nuthatches, hornbills and many other smaller mammals.

Niche of fallen tree is used by surprisingly diverse array of life forms, ranging from soil bacteria to fungi, molluscs to arthropods, amphibians t reptiles and many smaller mammals.

Fruit and seed-bearing trees, canes and bamboo clumps are to be retained. Existing stock of canes are to be preserved for propagation and existing canebrakes may be cleaned before monsoon.

Trees with deeply twisted boles, furrowed bark or peeling bark, with natural cavities will be retained because bats, shrews, snakes, often use such natural crevices and cavities as hiding, resting and nesting sites. Such trees will not be removed during over wood removal operation and these trees should be identified and preserved carefully.

There are few cane brakes located in Torsa-2 & Torsa-3 forest compartment and all such locations are to be identified and such areas to be conserved. No alignment of roads should be laid across such brakes, due care to be taken to ensure flow of water to such brakes, no water harvesting structures to be constructed in a manner to change the water regime of the location, no extraction of cane from such areas to be allowed and special care to be taken to stop illegal collection of canes.

6.9 Salt Lick

6.9.1 Artificial Salt Licks

- Glades are to be maintained in JPE Range at JP-WT at JP-3 Compartment, Kochubari WT at CP-2 Compartment, Siltorsa WT at JP-2 Compartment and Hollong FRH at JP-5

- Micro nutrients form of Rock salt, Molasses, common salt to be given in strategic locations in rotational manner

- Five (5) KG molasses, five (5) kg rock salt are to be given in all salt licks on alternate day.

- Glades are to be clean monthly by uprooting weeds.

- Salt lick map shown in Figure-18.

Elephant clan at Hollong salt lick

CHAPTER-7
ECO-DEVELOPMENT

7.1 EDC And ECO Development

National Forest policy lays stress on management of the Forest as a national asset to be protected and enhanced for the well-being of the people and nation. The same policy also highlights the active involvement of all fringe population in the management and development of Forest resources.

In June 1990 the government of India passed a significant resolution providing specific guideline regarding the formation, functioning, right and responsibilities of community Forest management groups. The government also launched a centrally sponsored scheme called "ECO-Development around National Park and Sanctuary" in 8th plan with a provision of Rupees 10.20 crores and since then Union Government is giving emphasis on centrally sponsored ECO-Development projects.

Eco-Development is a process and not-just a one time action. It has been defined as a site specific package of measures developed through people's participation with the objective of promoting sustainable use of land and other resources, as well as on-farm and off-farm income generation activities which are not deleterious to PA values (Panwar 1992). The objective is to promote conservation, but this, in turn, should mean better lives for local people and generation of significantly satisfying occupation for fringe forest dwellers at all levels.

Eco-Development is a joint effort performed by all agencies, Government or non-government organizations and the stakeholders, with the Forest Department playing a facilitating and nodal role. The PA Manager has to decide in consultation with those sister agencies and people the extent to which a particular activity or development is required, how much is being done or is being planned by some other agencies and then decide on the level of such activities for which resources will have to be found.

7.2 Detail of EDC

There were 34 ECO Development Committees (EDC) before the publication of the present resolution number 40-FOR Dated: 03rd January 2017. After the publication of the present Resolution all ECO-Development Committee has been re-surveyed and reconstituted as JFPC. The administrative position and demographic details of JFPC around the National Park has been given in Table-32 and Table-33. EDC / FPC location map is given in Figure-17. At present there are a total no of 72 Eco Development and Fortest Protection committees under the Jaldapara Wildlife Division.

7.2 Functions Of EDC

ED Committee must ensure protection of Forest and wildlife by preventing trespasses, encroachment, grazing, Fire, poaching, illicit felling by performing their duty. The EDC must inform any secret information about poaching and forest offence to the Forest department. The EDC must actively participate in mitigation of Human-Wildlife Conflict and render assistance to the forest

personnel. To monitor the performance of the EDC a EDC duty register is prescribed in Table-34.

7.3 Evaluation of Satisfactory Service of EDC

To comply the clause 5C(iii) and 5B(3) of resolution number 40-FOR Dated: 3rd January 2017, the functions of EDC to be evaluated by the Range Officer, annually and according to the score obtained by the EDC, usufruct benefits to be determined and to be allotted to the EDC. The amount of usufructs (in INR) to be distributed to EDCs are to be decided on the performance of the EDC.

The procedure of such evaluation is proposed as follows.

1. Total Marks of Evaluation 300
2. Half marks for two-day duty performance total 182
3. Beat Officers notion on EDC marks - 20
4. Offence detection inside and outside of PA based on Information - 12 for minimum 12 incidents.
5. Role in assisting in anti-depredation duty- 50 for minimum 50 incidents.
6. Frequency of meeting- 36 for 36 meetings.
7. The Marks to be deducted from the total marks obtained by the EDC for the following offences with the magnitude given against the criteria of offence

a. If any FIR lodged against any villagers for wrong handling the on-duty staff during human wildlife conflict mitigation duty in village area – Number to be deducted 25.

b. If any poaching is detected in the Beat forest area- number to be deducted – 100

c. If any fire is detected in Beat area – number to be deducted - 5.

d. If any grazing is detected – number to be deducted – 5.

e. If any felling, fishing, poisoning is detected, number to be deducted – 5.

f. If any encroachment is detected, number to be deducted – 100.

7.4 Strategy For People's Participation Activity

- Motivation of frontline staff at per national Forest policy's view regarding peoples' participation in conservation of Forest and Wildlife and wellbeing of local people.

- Motivated staff shall conduct meeting with the EDC Member and other agencies like panchayats regularly to aware the EDC Member about the joint forest protection and conservation of wildlife

- Motivation meeting should be conducted as per below mentioned schedule.

- Beat Officer / staff should conduct village meeting at least two (2) in a month.

- Beat officer / Staff should conduct EDC executive committee meeting at least once in a month at Beat Office

- Range Officer should attend at least four (4) such meeting in a month.

- AWLW / ADFO should attend at least four (4) such meeting in month.

- The agenda, discussion and proposals of such meeting to be written in minutes' book and to be forwarded to the Divisional Forest officer with proper recommendation through proper channel.

- AGM should be conducted regularly and evaluation of EDC should be disclosed in the AGM, besides other activity as per Act.

- Member Secretary shall inform about the EDC Meeting to DFO through proper channel.

7.5 The Possible Eco-Development Activity

The broad category of ECO-Development activities can be as follows;

- Improvement of Irrigation facilities
- Facilitating Improved agriculture
- Skill building of agriculture labour
- Capacity building of educated youth
- Control of wild animal depredation
- Facilitating use of non-conventional energy
- Facilitating self-help group formation and their income generation schemes
- Minor infrastructure development activity
- Agro-Forestry
- Facilitating improved animal husbandry and fishery.
- Improvement of drinking water facility

7.6 Microplanning

Before execution of any ECO Development work the Micro plan of the EDC for a specific time frame should be prepared and annual plan of operation should be approved by the Divisional Forest Officer. Expenditure of the usufructs share whatever the EDC receives from the Divisional Forest Officer, should be done under the approved annual plan of the EDC. The 80 % among of usufructs share should be used to solve the issues related to Forest and Wildlife like Wild animal depredation management, Fire control and grazing control etc.

Under West Bengal Forest Bio-Diversity Conservation Project microplans of 25 EDCs have been prepared, micro plans for the rest of the EDCs are to be prepared through PRA.

7.7 Rights Settled Under The Scheduled Tribes And Other Traditional Forest Dwellers (Recognition Of Forest Rights) Act, 2006

Detailed report is given in Annexure-61.

CHAPTER-8

MAN ANIMAL CONFLICT

Jaldapara National Park spans over four (4) civil blocks along with international boundary with Bhutan. It is an integral part of Eastern Doors Elephant Reserve up to eastern bank of river Torsa. The National Park is attributed with unique savannah grassland along the flood plains of perennial river Torsa and is very rich with Elephant tree fodder in Chilapata. Jaldapara is a very important part of landscape extending from Mahananda WLS in the west up-to Nepal border to Buxa and Manas in the East. There is constant movement of Elephants from Buxa in the east to Jaldapara and from Jaldapara to Jalpaiguri in the West. During this movement elephants and their herds cross several Tea Gardens and villages. Such numerous patches of human settlement in the path of movement or so-called corridors of Elephants create hurdles against the movement of Elephants. Besides this hurdle, nutritious crops like paddy, potato and maize are grown on the path of movement resulting in gradual change in food habit of Elephants and thus luring the innocent animals leading to Human-Elephant Conflict (HEC). There are well established movement paths (unnotified corridors) between forest patches of Buxa, Jaldapara and Jalpaiguri. Details of such movement paths (unnotified corridors) is given below.

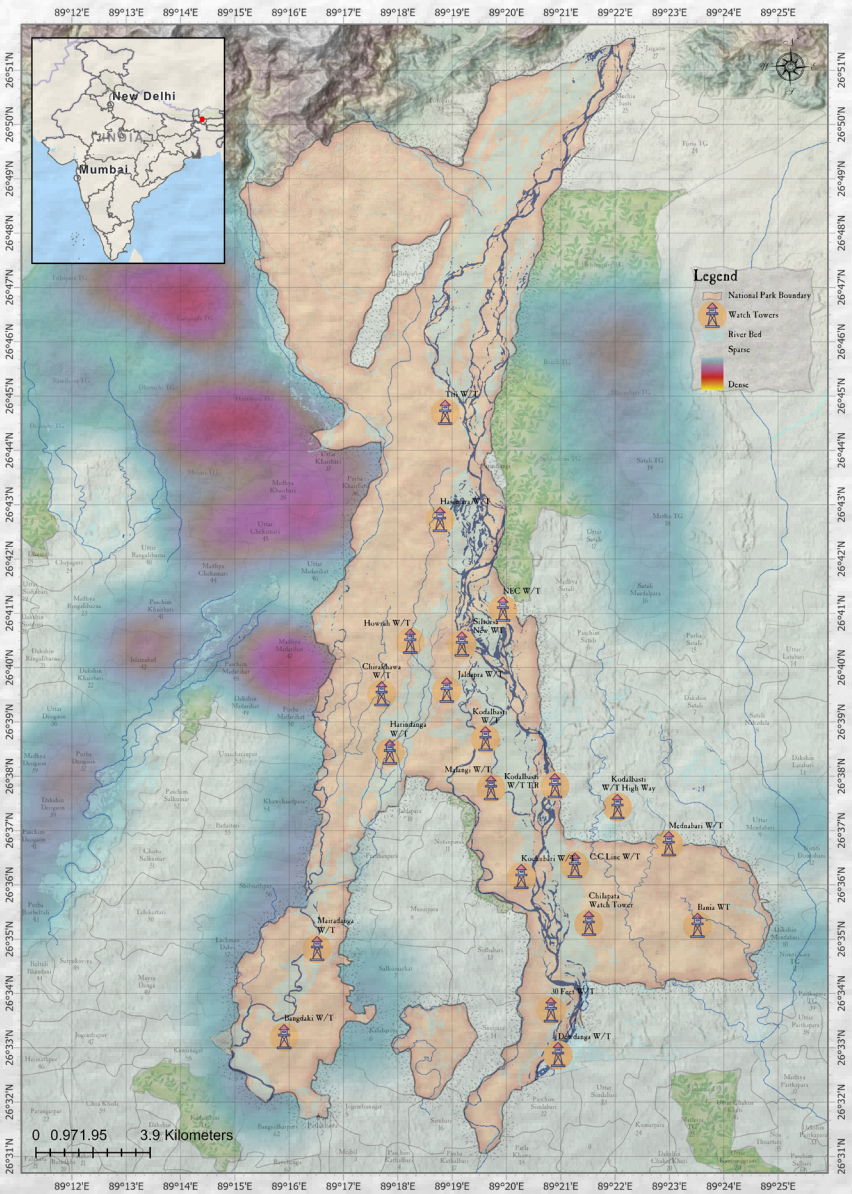
However, whole landscape of North Bengal in districts of Alipurduar, Jalpaiguri. Kalimpong and Darjeeling may be considered as "landscape level corridor" in all practical purposes.

Corridor	Territory Involved	Remarks
1. Bhutri-Dalsinghpara-Titi Corridor	Bhutri-Rangamati Forests of BTR (West) Division and Jaigaon Dalsingpara Forest Block of Jaldapara National Park	Average distance is about 9k m via bharnabari te, dalsingh para te and beach te mainly. No railway track comes across this corridor but asian high way is the liner obstruction.
2. Mendabari-Nimati Corridor	Nimati Range of BTR (West) Division and Southern Half of Jaldapara National Park.	Average distance is about 3km via Patkapara and Nimtijhora TE. Human Settlements and Kaljani River lays on the corridor. No Railway Track involved within the Corridor.
3. Titi - Dhumchi - Dal more Corridor	Titi Forest block of Jaldapara National Park, Dhumchi Forest of Jaldapara Wildlife Division and Dolmore Forest of Jalpaiguri Division.	Average distance 10 km via Hantapara, Mujnai, Dhumchipara, Ramjora, Dalmore, Goplapur, Lankapara TG. No Railway Track involved within the Corridor.
4. Titi - Dumchi-Dalga on-Dalmore Corridor	Dumchi forests of Madarihat Range of Jaldapara Wildlife Division and Dalgaon Range of Jalpaiguri Territorial Division.	7 km average via Dhumchi TG Birpara RG and Sisubari Village. NFR Railway Track passing through the corridor.

Intra-Divisional Occasional/ Fixed Corridor

Corridor	Territory Involved	Remarks
1. Dhucmhi – Khairbari - Jaldapara Corridor	Dhumchi Forests and Jaldapara Forest .	Dakshin Madarihat, Madhya Madarihat , Paschin Khairbari, Madhya Rangalibaza, Chapaguri are within the corridor. NFR Railway Track and NH-31C passing through the corridor.
2. Dhumchi-Titi Cor ridor	Dhumchi Forests under Jaldapara Wildlife Division and Titi Forest block of Jaldapara National Park.	Uttar Khairbari, Mahdya Kharibari, Madhya Chekamari are within the corridor. NFR Railway Track passing through the corridor

Conflict Zone Map



8.1 MITIGATION OF HUMAN-ELEPHANT CONFLICT

Due to effective protection, habitats of Elephants have been considerably improved in the PA landscape and now Elephants stay all through the year in the PA which was not usual till late 1980s. Aerial length of the National Park from North to South is 36.00 KM but the East-West width is ranging from only ½ km to 10 km. Elephants residing in the PA keep on moving every day around the PA and come across many human habitations leading to acute HEC regularly. To mitigate such conflicts following measures are proposed to be adopted.

- Regular ecological corridors in between forest patches must be secured by ensuring movement without hurdles along these paths, otherwise elephants will try to find alternatives which will lead to more destruction.
- Solar energized fences to be erected at strategic locations to stop southward movement and allowing East-West movement. PA management must be extremely cautious in selecting the route and not compromise to public pressure for erecting fences everywhere. There are demands for erecting fences north of Madarihat which has not to be accepted or it will be adding hurdles to natural movement. Detailed discussed in item no: 6.7.1.18.

- Farmers to be encouraged to erect community managed solar energize fence around their crop and properties.

- Interior village roads to be illuminated by solar lighting.

- Villager farmer to be motivated for raising alternative crops

- Strengthening of wildlife squad at Madarihat with staff and vehicle.

- During peak depredation season i.e. during June to August and December to February all territorial ranges in the PA to be provided with extra vehicles, labours and sufficient conflict management equipments and materials.

- Ex-gratia payment for human casualty, hut damage and crop raid to be disbursed as early as possible.

- Village Elephant Guiding Teams (Voluntary Squads) to be mobilized and trained for guiding Elephant movement from village to Forest area during peak season of depredation as first line of defence.

- EDC to be motivated to form Elephant Guiding Team in the EDC area to manage Elephant depredation.

- Awareness meeting regarding Elephant behaviour and biology and movement to be conducted periodically.

- Presence of Elephant to be intimated to the local people through group SMS.

- Staff to be motivated for quick response in case of receipt of human-elephant conflict message.

- Elephant movement alert system to be installed along forest boundary.

8.2 MAN-WILD ANIMAL CONFLICT MITIGATION

The PA harbours good numbers of Leopard (Panthera pardus), Gaur (Bos gaurus), Sambar (Cervus unicolor), Wild Pig (Sus scrofa) and other deer and reptiles community. In natural course all such wild animals frequently stray out from the National Park. To mitigate the conflict between Human and Wild Animal the following measures need to be adopted

- Tranquilizing team with all equipment and vehicle to be kept ready 24x7 so that the tranquilizing team can response quickly.
- Tranquilizing equipment and drugs to be made available 24X7.
- Tranquilizing training/ Refreshers' course to be imparted to the staff frequently to keep them in practice.
- To transport tranquilized animal a specialised vehicle to be improvised and placed with the tranquilizing team.
- Awareness signboards regarding Dos and Don'ts in case of wildlife straying to be installed in strategic locations.
- Human-Animal conflict mitigation awareness meetings/ interactions to be conducted frequently.
- HEC management equipments like cage, net, search Light, Battery, snake catcher, Leopard (Panthera pardus) protection guard to be made available to the staff.
- Rescue van, vehicle to be made available in the best capacity possible.
- Labour for loading and unloading tranquilized animals to be provided as and when required.

8.3 POST CAPTURE MONITORING OF ANIMAL

- As soon as an animal is captured its vital signs – respiration pulse, response to stimuli throughout body reflexes, and body temperature should be noted immediately.
- Maintenance of near normal rectal temperature, pulse rate and respiratory rate of wild animal are – indicative of the animals' wellbeing. Monitoring of these vital signs at frequent intervals is important as they provide clues to the progress of recovery or the lack of it, to enable the provision of the required veterinary attention.

Recorded normal rectal temperature, pulse and respiratory rate in different animal

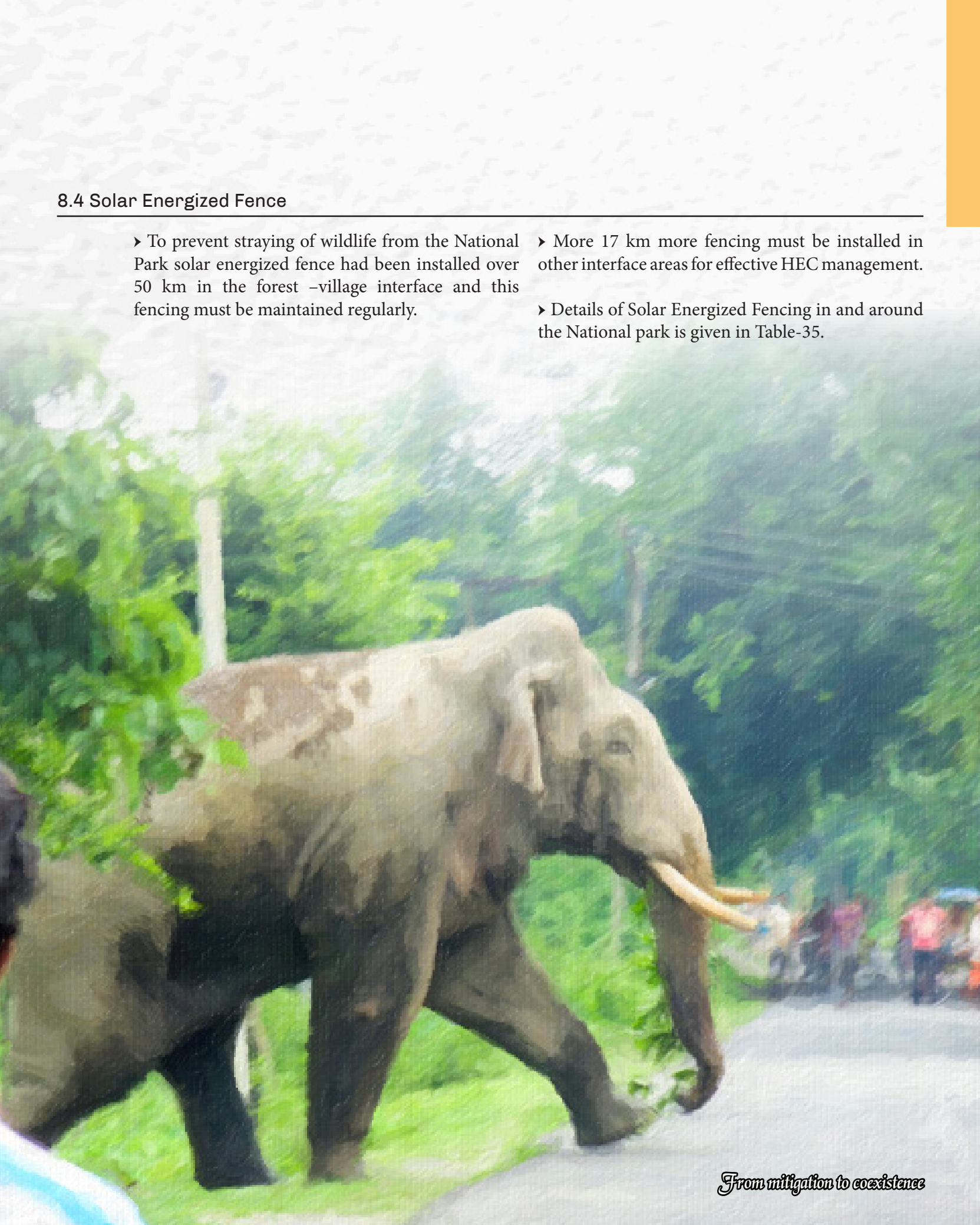
Species	Temperature (°F)	Pulse / Minute	Respiration / minute
Elephant	97.5 to 99.00	30	4 to 6
Rhinoceros	98.6 to 102.2	70 to 140	20 to 40
Deer	102.92 to 104.00	55 to 75	20 to 30
Cat	99.5 to 100.94	60 to 90	10 to 15

Field record for chemical immobilization of wild animal is already given in Annexure-34.

For post capture care wild animal may be kept at South Khairbari Leopard Rehabilitation Centre and after that animal may be released in strategic sites in wild.

8.4 Solar Energized Fence

- To prevent straying of wildlife from the National Park solar energized fence had been installed over 50 km in the forest –village interface and this fencing must be maintained regularly.
- More 17 km more fencing must be installed in other interface areas for effective HEC management.
- Details of Solar Energized Fencing in and around the National park is given in Table-35.



CHAPTER-9
ECO TOURISM

The Definition
Ecotourism is: "Responsible travel to natural areas that conserves the environment and improves the well-being of local people." (TIES, 1990)

Principles of Ecotourism
Ecotourism is about uniting conservation, communities, and sustainable travel. This means PA should follow the following ecotourism principles;

- Minimize impact to PA.
- Build environmental and cultural awareness and respect.
- Provide positive experiences for both visitors and hosts.
- Provide direct financial benefits for conservation.
- Provide financial benefits and empowerment for local people.
- Raise sensitivity to host countries' political, environmental, and social climate.

Eco-Tourism can be adopted as a strategy to mitigate some of the social constraints prevalent in the PA and can be considered as a management tool. ECO Tourism map of Jaldapara given in Plate-18.

9.1 STRATEGIES FOR CONTROLLED ECO-TOURISM IN JALDAPARA NATIONAL PARK

- National Park shall remain close from 16th June to 15th September every year.
- National Park shall remain close on every Thursday of a week.
- Visitor should be made aware and educated for nature tourism (for observation) and not to be lured to wild animal tourism (mere sighting)
- Limited number of visitors to be allowed inside the PA to ensure minimum impact to the National Park.
- Specific routes through which visitors shall be allowed to be identified according to emerging scenarios.
- Specific entry points of PA to be detailed with permissible number of vehicles and visitors.
- Specific vehicles to be permitted to enter the PA
- Before entering the PA every visitor to be interpreted and oriented
- No tourist shall be left alone without the proper trained guide.
- Elephant riding shall be done in specific area with limited number of visitors.
- To diversify the tourist interest place, facilities will be created like Zip lining, Rock climbing, Bird watching, Butterfly watching, Botanization and nature trail within Eco-Tourism zone.
- Value of ethnic culture and handicrafts to be added with the Eco– Tourism
- For properly guiding the visitors, Eco Tourist guides are to be trained and sensitized
- Infrastructure like Observation Tower, Nature trail and road to be constructed in new areas.
- Present interpretation facilities to be modernized with full digitalization at NIC Madarihat to attract visitors/ students in Nature Tourism.
- To reduce the pressure of the visitors in the PA, sink area within the PA like Salkumar Forest Block

and around the PA like South Khairbari, Kunjanagar Social Forestry resume land and Jaigaon 1 & 2 can be developed as places of tourist interest.

- To generate awareness about ecotourism scopes and limitations in addition to importance of ecotourism, publication, signage shall be made.

- For good tourism experience for both tourist and staff online booking system to be promoted.

- Free distribution of publications to be made.

- At present annually about 2 Lakh visitors enter the PA. Detailed report is given in Annexure-62.

- All tourism facilities should be made available online.

List of Tourists Routes for Wildlife Safari

Sl No	Name	Route Detail	Length
1	Route-1	Madarihat-Hollong-Harindanga-Jaldapara	11 km
2	Route-2	Jaldapara-Hollong-Harindanga-Jaldapara	5.83 km
3	Route-3	Madarihat-Hasimara-Titi-Lankapara	9 km
4	Route-4	Kodalbasti-Mendabari WT-Bania Ruins	17.54 km
5	Route-5	Chilapata- Bania Ruins-Mendabari WT	13.74 km

9.2 CALCULATION OF TOURIST CARRYING CAPACITY IN JPNP

Jaldapara National Park, owing to limitation caused by its shape can sustain tourism in a limited area only. Tourism routes have been identified in all possiable areas which can allow tourism without negetively affecting habitat quality and Man-Animal conflict. The Park has five (5) designated tourist routes of varying length in Tourism Zone. These routes run through different habitat types and terrain and as such provide opportunity to experience different forest types. There is a necessity to regulate a number of tourists, vehicles and trips in each of these five (5) routes in order to minimize impact on Ecosystem, ensure rich visitor experience and to facilitate proper nature education. The carrying capacity about the number of tourists and trips that can be allowed along each of these five (5) designated routes has therefore, to be worked out. The methodology of calculation of carrying capacity of tourists inside the Ecotourism zone of Jaldapara National Park has been adopted from NTCA guidelines of "MODEL CALCULATION) ESTIMATION OF VISITOR CARRYING CAPACITY" published in the year of 2010 which forms a yardstick of calculation of the same in many National Parks of the Country. Whereas, carrying capacity has been worked out and presented on Annexure-63, the permissible number of trips per day along each tourist route and permissible number of vehicles along each routes is presented in the following tables;

Effective permissible capacity of Tourist Routes of Jaldapara Wildlife Safari

Sr. No.	Route	Route Detail	Effective Permissible Capacity
1	Route-1	Madarihat-Hollong-Harindanga-Jaldapara	52 Trips /Day
2	Route-2	Jaldapara-Hollong-Harindanga-Jaldapara	27 Trips / Day
3	Route-3	Madarihat-Hasimara-Titi-Lankapara	42 Trips / Day
4	Route-4	Kodalbasti-Mendabari WT-Bania Ruins	82 Trips / Day
5	Route-5	Chilapata- Bania Ruins-Mendabari WT	64 Trips / Day

Table of existing Routes with permissible number of vehicles

Sl No	Routes	Alloted Vehicle
01	Madarihat-Hollong-Harindanga-Jaldapara	13
02	Salkumar Gate - Jaldapara-Hollong-Harindanga-Jaldapara	6
03	Madarihat-Hasimara-Titi-Lankapara	10
04	Kodalbasti-Mendabari WT-Bania Ruins	20
05	Chilapata- Bania Ruins-Mendabari WT	16
	Total	65

The brief details of all the safari vehicles along with the name of owners are given in Annexure-65.

9.3 Elephant Riding from Hollong

Elephant back riding facility for visitors is available from Hollong Forest Rest House and from NEC tower in three trips every day except Thursday. Visitors are given this priceless facility to roam around the adjacent forest area of Jaldapara-5, Torsa-1 & BD-1B Forest Compartments (limited parts) on Elephant back to experience the biodiversity and aesthetic beauty of the National Park closely. Details of Elephant Riding schedules are given below;

Trip	Time from	Time to	Number of Elephants	Number of visitors per trip
1st Trip	5:30 AM	6:30 AM	5+2	20+8
2nd Trip	7:00 AM	8:00 AM	5+2	20+8
3rd Trip	8:30 AM	9:30 AM	5+2	20+8

Elephant back riding route map is given in Figure-19.

- Route-1 (Existing) Madarihat to Hollong FRH to Horindanga WT to Jaldapara WT and Back to Madarihat. (13 vehicles)

- Route-2 (Existing) Salkumar Gate to Jaldapara WT to Horindanga WT – to Hollong FRH. (6 vehicles)

- Route – 3 (Existing) Madarihat to Hasimara Beat via NH-317 to Titi WT – to Titi Central Road to Lankapara FRH and Back to Madarihat. (10 vehicles)

- Route – 4 (Existing) Kodalbasti Check Post to Hart Road via HM Chilapata Road to Monteith Road to Mendabari WT to Bania Ruin via Hasimara – Chilapata Rode and back to Kodalbasti Check Post. (20 vehicles)

- Route – 5 (Existing) Chilapata Check post to Mendabari WT via Chilapata – Hasimara Road to Paul Road to Bania WT to Bania Ruin via Chilapata – Hasimara Road to Kurmai Basti and back to Chilapata Check post. (16 vehicles)

- Rock climbing in Hollapara Beat, one day trekking route up to "Dayamara Cave" from Hollapara Beat Office, package day visit over Jaigaon block can be promoted.

- Canopy walk at Salkumar Beat may be promoted.

- Lankapara trekking route from Lankapara Range HQ to Chilownidara to Lankapara TG to Lankapara RL to Titi River to Pipeline to Dayamara to Howri River to Totopara to Lankapara HQ or vice versa.

- A nature walk trail in Salkumar Beat may be promoted. A butterfly trail from Mendabari Beat to Mendabari WT may be promoted.

- A bird watching trail can be promoted form Lankapara Rest House up to central line.

- To distribute the tourists throughout the non-closure period online booking system to be developed.

9.5 ECO-TOURISM INFRASTRUCTURE TO BE DEVELOPED

- Amphitheatres may be established at Folk culture area at entry points.

- Public toilets to be constructed at every entry point and Folk culture area.

- Handicraft desks to be established at suitable locations for showcasing and sale of tribal and local handicraft items.

- To organize outreach program one vehicle with interpretive facilities may be made available. This vehicle will install the awareness stall in different fair during festive season and show videos clips of local bio-diversity.
- Tourist feedback and suggestion box to be placed at prominent places.

- Sufficient number of interpretive signage to be provided all along visitors' routes.

CHAPTER-10
RESEARCH, MONITORING AND EVALUATION

10.1 THE SPECIFIC OBJECTIVES OF RESEARCH AND MONITORING AND EVALUATION WILL BE AS FOLLOWS

- To identify the specific fields concerning the management of the National Park for initiating field-oriented research
- To establish a mechanism for sustaining departmental, collaborative and contract research studies.
- To initiate time bound and specific research activity for providing input to Management techniques.
- To ensure horizontal linkage between the research topic and the management goal for enhancing managerial capabilities.
- To develop a monitoring mechanism as a control function to oversee achievements of objectives for necessary rectification, if required.
- To initiate and promote sustainable human resource development (SHRD) through capacity building courses of the departmental personnel for individual as well as organizational development.
- To conduct population estimation of Wildlife periodically.

10.2 THE FOLLOWING STRATEGY TO BE ADOPTED

- A field laboratory will be established at Madarihat with AWLW Office, for which one post of biologist and one post of assistant biologist should be created.
- Departmental research establishment should primarily concentrate on field-oriented research and monitoring on various management activities
- Emphasis should be on collaborative and contract research, for more detailed and exclusive studies, with the assistance of reputed institution and organization which can be useful for better planning and management of the PA.

Proposed Research Topics

- Status surveys for Hispid Hare (Caprolagus hispidus), Pygmy Hog, Otters and Pangolin (Both Indian and Chinese), Porcupines, Lesser Cats.
- Species use and preference studies for all the three mega-herbivores Rhinoceros unicornis, Elephus maximus and Bos gaurus.
- Ecological Impact of all the mega herbivores found in the park on habitat.
- Economic Evaluation of Ecosystem Services of the Jaldapara NP.
- Ecology of dominant weeds like Lantana camara, Leeea asiatica, Clerodendron infortunatum, Michania spp and any other species colonizing large areas.
- Ecological analysis, reasons and impact study of absence of top predator in the park
- Assessment of impact of ECO-Tourism in conservation of Bio-Diversity.

10.3 DATABASE MANAGEMENT

A computerized data repository and supply system should be developed in the office of the assistant wildlife warden and a laboratory to be established.

10.4 CAPACITY BUILDING WILL BE PRIMARILY OF THE FOLLOWING KINDS

- In house training to be organized at local level with subject matter specialists from the department and from outside for staff, nature guides, EDC members and other stake holders.

- Training of National park personnel in departmental training institutes in West Bengal.

- Training of National Park personnel in other premiere institutes like Wildlife Institute of India, KFRI etc.

- Schedule of such training will be fixed by the PA Manger which will be approved by the Chief Wildlife Warden.

10.5 ESTIMATION OF WILDLIFE POPULATION

- Beneficial effect of management practices get reflected in the population dynamics.

- To understand the population dynamics of wildlife, estimation of wildlife will be conducted in intervals. Generally for Rhino, it is done in 2 (two) years intervals.

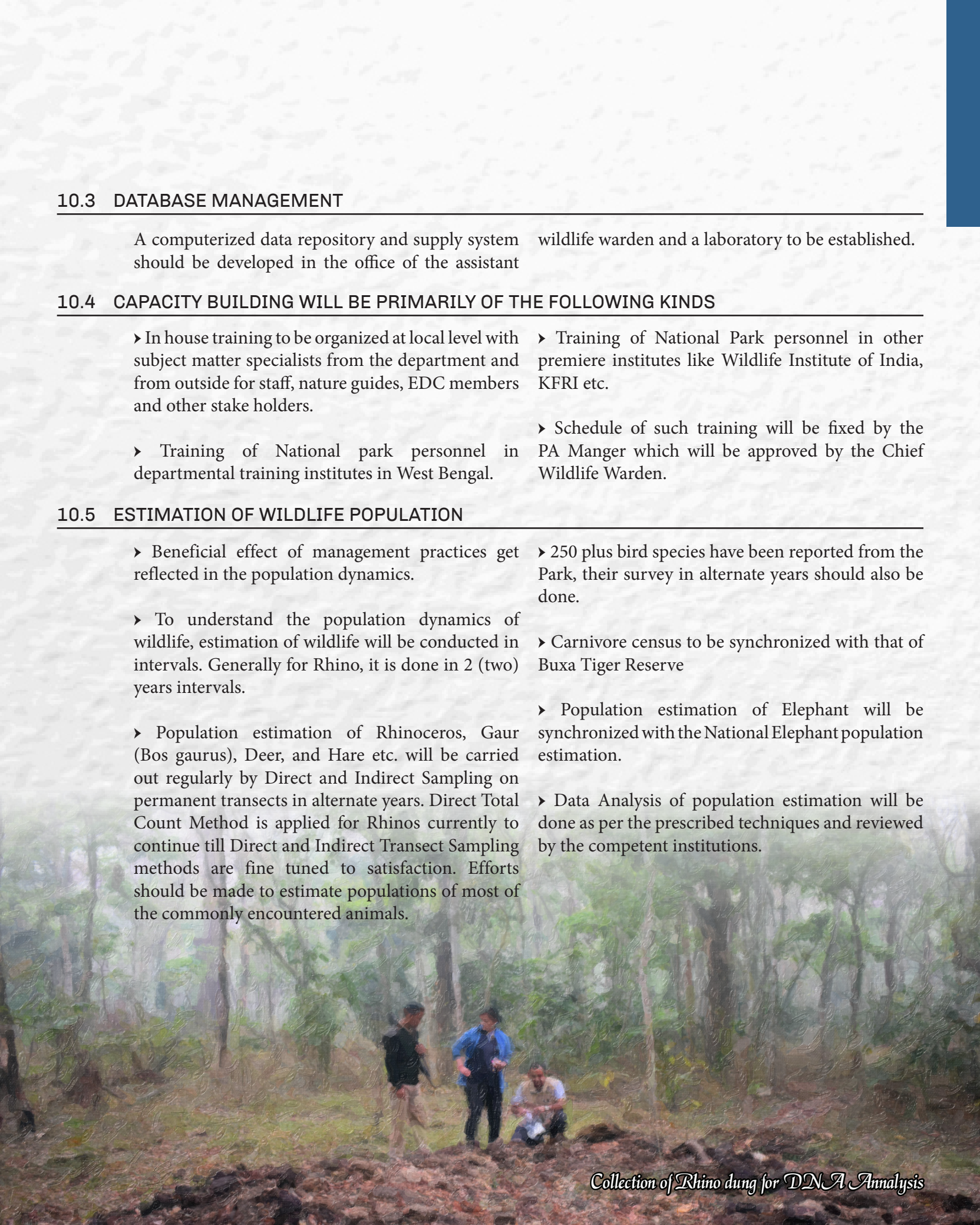
- Population estimation of Rhinoceros, Gaur (Bos gaurus), Deer, and Hare etc. will be carried out regularly by Direct and Indirect Sampling on permanent transects in alternate years. Direct Total Count Method is applied for Rhinos currently to continue till Direct and Indirect Transect Sampling methods are fine tuned to satisfaction. Efforts should be made to estimate populations of most of the commonly encountered animals.

- 250 plus bird species have been reported from the Park, their survey in alternate years should also be done.

- Carnivore census to be synchronized with that of Buxa Tiger Reserve

- Population estimation of Elephant will be synchronized with the National Elephant population estimation.

- Data Analysis of population estimation will be done as per the prescribed techniques and reviewed by the competent institutions.



Collection of Rhino dung for DNA Annalysis

CHAPTER-11

CHAPTER-11
ORGANIZATION AND ADMINISTRATION

11.1 ORGANIZATION AND ADMINISTRATION

Organizing and execution are the next stages of Management function after planning. Organization structure should be buildup and modified to ensure most effective implementation of the objectives.

As per the latest reorganization of forest directorate, made effective from 1995 the then Jaldapara Wildlife Sanctuary had undergone vast changes in the administrative setup and structure. Prior to that 115.53 sq km of the erstwhile Jaldapara Wildlife Sanctuary notified in 1976, where under the exclusive management of Wildlife Division – II with head quarter at Jalpaiguri. Extended part of the then Sanctuary which were notified in 1990 and which were previously under the control of Cooch Behar territorial Forest Division had then been brought under a unified management cover a total, 216.51 sq km and then entire territory of the then sanctuary have been placed under Cooch Behar Forest Division with effect from Nov'1995.

11.2 THE RESULT OF SUCH REORGANIZATION AND CONSEQUENT CHANGES

- Merger of the extended area with the originally notified area under unified management have facilitated the prospect of extended Rhino Habitat.

- Rhinoceros population has crossed 200 nos.

- Titi Block, Jaigaon Block, Dalsingpara Block and part of Hasimara 1 and 2 compartments which are located in the North of NH 31 C and NFR are for all practical purpose excluded from traditional Rhinoceros habitat. The area was though targeted for enrichment for Elephant habitat, not much could be achieved.

- For better administration head quarter of Lankapara Range have been changed from Madarihat to Bhagatjote.

- For better protection and management Titi Beat has been transferred from Lankapara Range to Nilpara Range.

- For protection and management two (2) new Beats have been created under Lankapara Range, namely Lankapara and Bhagatjote.

- Two (2) Beats, Dalsingpara and Nilpara have been created under Nilpara Range.

- Office of the Assistant Wildlife Warden is situated at Madarihat, but no staff strength has been provided.

- Typographical Error in notification declaring the erstwhile WLS into a National Park needs to be rectified regarding Titi 4, BD 1B, Bong Forest village and Salkumar forest village.

- It is vfelt that BD 6A and 7A to be included in PA as Rhinoceros are frequently staying in the area.

- The reorganized administrative setup of Jaldapara Wildlife Division is previously discussed in point no: 3.5.29

- It is felt that long boundary of PA from NWC Beat to Bhagatjote Beat, along Purba and Uttar Khairbari Mouza (Madarihat-Totopara Road) is unprotected. To strengthen the protection of area of Titi Beat, the beat along with the EDC should be brought under the control of Lankapara Range from Nilpara Range and Beat Head Quarter may be set up near "Jamtala" near Titi-4 which very vulnerable from protection point of view.

Joint patrolling with sniffer dog "Rani", SSB and Polilce at fringe villages

CHAPTER-12
CONTROL

12.1 CONTROL

Role of control function in management is to ensure that regulations to keep the strategies are on the right track for achieving the objectives. Regulatory mechanism ensures correcting the deviations at every stage for keeping the focus of activities on the objectives and goals. Hence it constitutes the last, but not the least, important function of management and it runs concurrently along with the implementation process. Control mechanism prescribed for the management of Jaldapara National Park will be as follows;

- Record of deviations and achievement vis-a-vis target.
- Deviation Statements should be maintained in the standard prescribed proforma which is applicable throughout the state. Detailed format is given in Annexure-64.

12.2 FOLLOWING ADDITIONAL CONTROL FORMS ARE PROPOSED: -

12.2.1 Record of Water Holes

Record of all the natural and existing artificial water holes as well as the newly created waterholes should be maintained in the following format-

SI.NO	Category (Natural/ Artificial	Perennial/ seasonal.	Location Comptt. / Coordinates	Year of creation.	Cost.	Whether in regular use by Wild animals (Y/N)

12.2.2 Record of Weed Control Works

Record of Weed Control works should be maintained in the following format

SI. No	Location: Block/ Comptt.	Status of site	Year of operation	Major spp. of weed	Area of operation (Ha)	Cost	Post operation maintenance.			
							1st yr.	2nd yr.	3rd yr.	4th yr.

*Whether High Forest/Tree Plantation/Fodder- Grass Plantation/Natural Grassland/ Forest Blank

12.2.3 Record of Over Wood Removal Areas Followed By Fodder Plantation.

It Should Be Maintained In The Following Format;

SI. No	Location: Block/Comptt	Year of operation	Area of operation	Tree spp. retainer.		Tree spp. removed.		Total cost	Post operation status					
		Year	Ha	Sps.	No/ ha.	Sps.	No/ ha.	In INR	Yr. 1	Yr. 2	Yr. 3	Yr. 4	Yr. 5	Yr. 6
1	2	3	4	5A	5B	6A	6B	7	8	9	10	11	12	13

12.2.4 Record of Habitat Improvement Works Through Cut Back And Control Burning Of Old Grass Plantation/Grassland;

It should be maintained in the following format;

SI. No.	Location Block/ Comptt.	Year of operation		Area of operation	Status before operation		Cost	Post operation status					
		Month	Year	Ha	Yr. of plntn.	Major spp.	Rs.	Yr. 1	Yr.2	Yr. 3	Yr. 4	Yr. 5	Yr.6
1	2	3	4	5	6	7	8	9	10	11	12	13	14

12.2.5. Record of Soil-Moisture Conservation Works.

It should be maintained in the following format;

SI. No.	Location of area			Original status before work	Year of work	Cost	Type of structure	Effective area treated	Post- work status				
	Block	Comptt.	Geo location			In INR		Ha	Yr. 1	Yr. 2	Yr. 3	Yr. 4	Yr. 5
1	2	3	4	6	7	8	9		10	11	12	13	14

12.2.6 Record of Offences.

It should be maintained in the following format;

SI. No.	**Date of detection of offence**	**Category of offence report**		**Booked under IFA or WLPAct.**	**Location of commission of offence**	**Quantification of damage**	**No. of person arrested**	**Period of detention of the offen-dears (PC/ SC)**	**Type of punishment.**			
		O.R. No.(POR/ COR/ UDOR)	Date						Date of order	Punishment.		Status
										Imprisonment	Fine	
1	2	3	4	5	6	7	8	9	10	11	12	13

12.2.7. Record of Straying of Wild Animals.

It should be maintained in the following format;

SI. No.	**Date of straying**	**Animal**		**Location**		**Date and time of receiving information**	**Date and time of staff reaching the spot**	**Action taken.**				**Fate of the animal(killed or capture)**	**Details of release**	
		Spp. Including sex.	No	From where straying	Into where straying			Used Tr. Guns	Used net	Used fire arms	Cage		Date	Place
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

12.2.8 Record of Wildlife Depredation.

It should be maintained in the following format;

SI. No.	Date/ period of depredation	Spp. Of wild animal involved	Location of depredation	quantum of crop damaged (Area in Ha)	No. of huts damaged	No. of per sons killed	No. of per sons injured	Cattle lifted (In No) and name of anima lifted	compensation paid Date of payment	Action taken to prevent depredation	Reaction of depredation
1	2	3	4	5	6	7	8		9	10	11

12.2.9 Record of Animal Diseases And Mortality.

It should be maintained in the following format;

SI. No.	Date of detection	Animal Spp. And No.			Type of Disease	Probable reason of death/dis-ease/ injury	Condition of injury/car-cass/ animal	Action taken			Whether animal recovered	Whether offender arrested	Whether offender punished
		Spp.	Sex	No				Used Tr. guns	Used medicine	Other	Period		
1	2	3	4	5	6	7	8	9	10	11	12	13	14

12.2.10 Record Of Inter-Agency Coordination Programmes.

It should be maintained in the following format;

SI. No.	Date of coordination meeting	Convened by	Specific agenda items	Agencies participated	Agencywise no.of participants	Major recommendations
1	2	3	4	5	6	7

12.2.11 Record of Infrastructure Development In The Sanctuary

It should be maintained in the following format;
(roads/bridges/culverts/building etc.)

SI. No.	Type of infrastructure	Year of original construction	Cost of original construction	Physical qty.	Location details	Maintenance status					
						Year-1		Year-2		Year-3	
						Type of maint	Cost	Type of maint	Cost	Type of maint	Cost
1	2	3	4	5	6	7	8	9	10	11	12

12.2.12 Record of vehicles.

It should be maintained in the following format;

SI. No.	Type of vehicle	Registration No.	Date of purchase	Place of deployment
1	2	3	4	5

12.2.13 Record of RT sets.

It should be maintained in the following format;

SI. No.	Location of installation	Type of set	Frequency	Date of Procurement	Name of manufacture	Cost	Remarks
1	2	3	4	5	6	7	8

12.2.14 Record of power fencing/boundary fence/trenches.

It should be maintained in the following format;

Sl No	Type of Structure	Location	Quantity	Cost	Effectivity
1	2	3	4	5	6

12.2.15 Record of Arms and Ammunitions.

It should be maintained in the following format;

SI. No.	Type of arms/ ammunition	Place of deployment	Quantity	Date of purchase	Cost	Remarks
1	2	3	4	5	6	7

12.2.16 Record of Visitors

It should be maintained in the following format;

SI. No.	Place of visit	No. of visitors				Total no. of visitors		Facilities used					General remarks of tourists
		Adult		Children		Indian	Foreigner	Video camera	Car safari Route	Elephant ride place	Picnic	NIC Place	
		Ind.	For.	Ind.	For.								
1	2	3 A	3B	4A	4B	5 A	5B	6	7	8	9	10	11

12.2.17 Record of Outbreak of Fire.

It should be maintained in the following format;

SI. No.	Date	Place of incidence of fire Block/ Comptt	Net area affected by fire	Cause of fire, if known	Action taken after the incidence	Time when fire noticed	Date and time when fire extinguished	
							Date	Time
1	2	3	4	5	6	7	8	9

12.2.18 Record of the research projects.

It should be maintained in the following format;

SI. No.	Name of research project	Agency undertaking the project	CWLW permission Ref	Date of initiation	Projected date of completion	Brief note on research objectives	Scheme under which research project taken up
1	2	3	4	5	6	7	8

12.2.19 Record of Lands.

It should be maintained in the following format;

Sl NO	Comptt No	Area in Ha.	Sections under IFA RF/PF/UCSF	Section under WLPA	Notification No. and date under IFA	Not. No. and date under WL(P) Act.	Remarks
1	2	3	4	5	6	7	8

12.2. 20 Record of personnel.

It should be maintained in the following format;

SL No	Category of staff	Name	Place of present posting	Date of present posting	Place of previous posting	Date of previous posting	Trained in	Date of posting in Divn.	Date of posting Circle
1	2	3	4	5	6	7	8	9	10

Location of works like "cut-back and controlled burning", "over wood removal", "canopy opening" and "weed eradication" should be approved in advance by the Chief Conservator of Forests, Wild Life Circle (North)

Physical targets fixed under the management plan over a period of 10 years, should be evaluated every 5 years (Mid term evaluation) and the targets and goals are to be refixed, if necessary, based on evaluation of effects of such activities vis-a-vis the objectives of management. Any deviation from target by more than 10% will require approval of the Chief Conservator of Forests, Wildlife Circle (North), and for more than 50%, prior written approval of the Chief Wildlife Warden will be required.

At the end of first five years of the plan, a thorough evaluation of the plan will be made and interim changes of the plan, if necessary, will be carried out. Any modifications in the component of the works including incorporation of new activities will require the approval of the Chief Wildlife Warden.

Provisions should be made for incorporation of any action plan that may be recommended by ongoing research projects, like "Elephant study", "Rhino study", "Leopard study" and "Gaur study", when final recommendations of such studies are received.

CHAPTER-13
BUDGET

Financial statement of Jaldapara Management plan over a period of 5 Years. Consolidation, infrastructure development, protection and communication (Subject to Approval of Annual Plan of Operations by Competent Authority)

Sl No	item of works	MPI No	Unit	1st Year		2nd Year		3rd Year		4th Year		5th Year		Total
				Phy.	Rs. in Lakh	Phy.	Rs. in Lakh	Phy.	Rs. in Lakh	Phy.	Rs. in Lakh	Phy.	Rs. in Lakh	
Consolidation, infrastructure Development, Protection and Communication														
1	Survey of Boundary of PA	6.7.1.1	km	30	0.60	30	0.60	30	0.60	30	0.60	30	6.00	8.40
2	Construction of Boundary pillar and fixing	6.7.1.1	Nos	100	7.50	100	7.50	100	7.50	100	7.50	100	75.00	105.00
3	Secret Fund	6.7.1.2	Month	12	3.00	12	3.00	12	3.00	12	3.00	12	30.00	42.00
4	Purchase of vehicle	6.7.1.5	Nos	2	14.00	2	14.00	2	14.00	2	14.00		0.00	56.00
5	Fuel for vehicles	6.7.1.5	ltr	96000	72.00	96000	72.00	96000	72.00	96000	72.00	96000	720.00	1,008.00
6	Maintenance of Vehicles	6.7.1.5	Month	12	4.80	12	4.80	12	4.80	12	4.80	12	48.00	67.20
7	Construction of Watch Tower	6.7.1.6	Nos	1	10.00	1	10.00	1	10.00	1	10.00		0.00	40.00
8	Purchase of gun	6.7.1.7	Nos	15	8.25	15	8.25	15	8.25	15	8.25	15	82.50	115.50
9	Supply of ammunition	6.7.1.7	Nos	1000	0.45	1000	0.45	1000	0.45	1000	0.45	1000	4.50	6.30
10	Supply of warless set	6.7.1.8	Nos	5	2.25	5	2.25	5	2.25	5	2.25	5	22.50	31.50
11	Supply of Walkley talkie	6.7.1.8	Nos	5	0.75	5	0.75	5	0.75	5	0.75	5	7.50	10.50
12	Maintenance of RT Tower	6.7.1.8	Nos	2	2.00	2	2.00	2	2.00	2	2.00	2	20.00	28.00
13	Engagement of DL for seasonal protection Duty	6.7.1.9	Nos	1000	2.34	1000	2.34	1000	2.34	1000	2.34	1000	23.40	32.76
14	Food for sniffer Dog	6.7.1.13	Month	12	0.60	12	0.60	12	0.60	12	0.60	12	6.00	8.40
15	Medicine for sniffer dog	6.7.1.13	Month	12	0.30	12	0.30	12	0.30	12	0.30	12	3.00	4.20
16	Kennel Maintenance	6.7.1.13	Month	12	0.60	12	0.60	12	0.60	12	0.60	12	6.00	8.40
17	Improvement of playing ground	6.7.1.13	Month	12	0.60	12	0.60	12	0.60	12	0.60	12	6.00	8.40
18	Purchase of GPS	6.7.1.14	Nos	20	4.00	20	4.00	20	4.00	20	4.00	20	40.00	56.00
19	Trap Camera	6.7.1.14	Nos	20	3.00	20	3.00	20	3.00	20	3.00	20	30.00	42.00
20	Binocular	6.7.1.14	Nos	10	1.50	10	1.50	10	1.50	10	1.50	10	15.00	21.00
21	Installation of Electronic Eye	6.7.1.14	Nos	2	150.00	2	150.00	2	150.00	2	150.00	2	1,500.00	2,100.00
21	Making Check -Gate	6.7.1.15	Nos	2	1.00	2	1.00	2	1.00	2	1.00	2	10.00	14.00
22	Improvement of Check gate	6.7.1.15	Nos	2	1.00	2	1.00	2	1.00	2	1.00	2	10.00	14.00

Sl No	item of works	MPI No	Unit	1st Year		2nd Year		3rd Year		4th Year		5th Year		Total
				Phy.	Rs. in Lakh	Phy.	Rs. in Lakh	Phy.	Rs. in Lakh	Phy.	Rs. in Lakh	Phy.	Rs. in Lakh	
23	Legal expenses	6.7.1.17	Month	12	1.20	12	1.20	12	1.20	12	1.20	12	12.00	16.80
24	erection of energize fence	6.7.1.18	KM	5	12.50	5	12.50	5	12.50	5	12.50		0.00	50.00
25	Improvement of Solar Energize Fence	6.7.1.18	km	10	4.00	10	4.00	10	4.00	10	4.00	10	40.00	56.00
26	Construction of ROS Quarter (JPW and ETR)	6.7.1.24	Nos	1	15.00	1	15.00		0.00		0.00		0.00	30.00
27	Construction of Beat Office	6.7.1.24	Nos	2	20.00	2	20.00	2	20.00	2	20.00	2	200.00	280.00
28	Construction of Barrack	6.7.1.24	Nos	2	20.00	2	20.00	2	20.00	2	20.00	2	200.00	280.00
29	Construction of Boundary wall	6.7.1.24	Mtr	1000	100.00	1000	100.00	1000	100.00	1000	100.00	1000	1,000.00	1,400.00
30	Boulder sausage work for protection of beat camp and road	6.7.1.24	m^3	4000	200.00	4000	200.00	4000	200.00	4000	200.00	4000	2,000.00	2,800.00
31	Provision of Running Water	6.7.1.24	Nos	2	10.00	2	10.00	2	10.00	2	10.00	2	100.00	140.00
32	Supplying Gen. Set	6.7.1.24	Nos	1	2.50	1	2.50	1	2.50	1	2.50	1	25.00	35.00
33	Solar Home Lighting	6.7.1.24	Nos	10	5.00	10	5.00	10	5.00	10	5.00	10	50.00	70.00
34	Construction of new Road	6.7.1.25	KM	3	4.50	3	4.50	3	4.50	3	4.50	3	45.00	63.00
35	Improvement of Forest Road	6.7.1.25	KM	15	11.25	15	11.25	15	11.25	15	11.25	15	112.50	157.50
36	Seasonal Cleaning of Forest Road	6.7.1.25	KM	194	17.46	194	17.46	194	17.46	194	17.46	194	174.60	244.44
37	Improvement of Culvert	6.7.1.25	Nos	15	37.50	15	37.50	15	37.50	15	37.50	15	375.00	525.00
38	Improvement of Timber guarder Bridge	6.7.1.25	Nos	4	10.00	4	10.00	4	10.00	4	10.00	4	100.00	140.00
39	Making of Fair weather Road	6.7.1.25	km	10	4.00	10	4.00	10	4.00	10	4.00	10	40.00	56.00
40	Making of iron guarder bridge	6.7.1.25	km	1	40.00	1	40.00		0.00		0.00		0.00	80.00
41	Maintenance and Clearing of Patrolling Path	6.7.1.26	km	193	15.44	193	15.44	193	15.44	193	15.44	193	154.40	216.16
42	warning and awareness sign board at corridor	6.7.1.29	Nos	10	1.00	10	1.00	10	1.00	10	1.00	10	10.00	14.00
43	Awareness Meeting	6.7.1.29	Nos	2	0.50	2	0.50	2	0.50	2	0.50	2	5.00	7.00
44	Supply of Torch Light	6.7.1.31	Nos	100	0.10	100	0.10	100	0.10	100	0.10	100	1.00	1.40
45	Supply of Dry Cell	6.7.1.31	Nos	300	0.06	300	0.06	300	0.06	300	0.06	300	0.60	0.84

Sl No	item of works	MPI No	Unit	1st Year		2nd Year		3rd Year		4th Year		5th Year		Total
				Phy.	Rs. in Lakh	Phy.	Rs. in Lakh	Phy.	Rs. in Lakh	Phy.	Rs. in Lakh	Phy.	Rs. in Lakh	
46	Supply of Search Light	6.7.1.31	Nos	100	1.50	100	1.50	100	1.50	100	1.50	100	15.00	21.00
47	Supply of Umbrella	6.7.1.31	Nos	100	0.20	100	0.20	100	0.20	100	0.20	100	2.00	2.80
48	Supply of Rain court	6.7.1.31	Nos	100	0.40	100	0.40	100	0.40	100	0.40	100	4.00	5.60
49	Supply of gum-boot	6.7.2	Nos	100	0.70	100	0.70	100	0.70	100	0.70	100	7.00	9.80
50	Cleaning of camp site	6.7.1.31	Nos	35	10.50	35	10.50	35	10.50	35	10.50	35	105.00	147.00
51	Cleaning of Fire Line (HS)	6.7.2	KM	66	38.61	66	38.61	66	38.61	66	38.61	66	386.10	540.54
52	Cleaning of Fire Line (LS)	6.7.2	KM	72	25.20	72	25.20	72	25.20	72	25.20	72	252.00	352.80
53	Engagement of Fire watcher	6.7.2	DL	400	0.94	400	0.94	400	0.94	400	0.94	400	9.36	13.10
54	Cattle vaccination	6.7.3	Nos	15000	3.75	15000	3.75	15000	3.75	15000	3.75	15000	37.50	52.50
55	Disposal of Carcass	6.7.4	Nos	25	2.50	25	2.50	25	2.50	25	2.50	25	25.00	35.00
56	Training to staff	6.7.7.1	Nos	2	2.00	2	2.00	2	2.00	2	2.00	2	20.00	28.00
57	Exposure visit of staff	6.7.7.3	Nos	2	2.00	2	2.00	2	2.00	2	2.00	2	20.00	28.00
58	Conveyance for staff	6.7.7.6	Month	12	1.20	12	1.20	12	1.20	12	1.20	12	12.00	16.80
Captive Elephant management														
1	Medicine for captive Elephants	6.7.8.1	Nos	69	41.40	69	41.40	69	41.40	69	41.40	69	414.00	579.60
2	wages for Mahut and Patawallas	6.7.1.3	Ha	138	20.70	138	20.70	138	20.70	138	20.70	138	207.00	289.80
3	Pilkhana Management	6.7.8.4	Nos	22	11.00	22	11.00	22	11.00	22	11.00	22	110.00	154.00
4	Shade for Pilkhana	6.7.8.4	Nos	2	5.00	2	5.00	2	5.00	2	5.00	2	50.00	70.00
5	Supply of Ration for Elephants	6.7.8.5	Nos	69	5.18	69	5.18	69	5.18	69	5.18	69	51.75	72.45
6	Elephant restraining Tool	6.7.8.10	Nos	15	1.50	15	1.50	15	1.50	15	1.50	15	15.00	21.00
7	Supply of Green Fodder	6.7.8.14	Nos	4	3.00	4	3.00	4	3.00	4	3.00	4	30.00	42.00
8	Supply of Baby Food for Calf	6.7.1.15	Nos	3	3.60	3	3.60	3	3.60	3	3.60	3	36.00	50.40
Habitat Management														
1	Over wood removal	6.8.1.2	Ha	200	70.00	200	70.00	200	70.00	200	70.00	200	700.00	980.00

Sl No	item of works	MPI No	Unit	1st Year		2nd Year		3rd Year		4th Year		5th Year		Total
				Phy.	Rs. in Lakh	Phy.	Rs. in Lakh	Phy.	Rs. in Lakh	Phy.	Rs. in Lakh	Phy.	Rs. in Lakh	
2	Lantana eradication	6.8.1.2	Ha	100	35.00	100	35.00	100	35.00	100	35.00	100	350.00	490.00
3	Advance nursery	6.8.1.2	Ha	400	80.00	400	80.00	400	80.00	400	80.00	400	800.00	1,120.00
4	Creation of Fodder Plantation with 3rd Year Maintenance	6.8.1.2	Ha	400	500.00	400	500.00	400	500.00	400	500.00	400	5,000.00	7,000.00
5	Fencing	6.8.1.2	km	100	250.00	100	250.00	100	250.00	100	250.00	100	2,500.00	3,500.00
6	control of non browsable species	6.8.1.5	Ha	400	100.00	400	100.00	400	100.00	400	100.00	400	1,000.00	1,400.00
7	Winter cut back	6.8.1.6	Ha	200	50.00	200	50.00	200	50.00	200	50.00	200	500.00	700.00
8	Advance work for tree fodder nursery	6.8.1.6	Ha	100	25.00	100	25.00	100	25.00	100	25.00	100	250.00	350.00
9	Creation of Tree Fodder with 5 year Maintenance	6.8.1.6	Ha	100	150.00	100	150.00	100	150.00	100	150.00	100	1,500.00	2,100.00
10	Maintenance of Glade	6.8.3	Nos	4	2.00	4	2.00	4	2.00	4	2.00	4	20.00	28.00
11	Supply of micronutrient	6.8.3	kg	4000	0.40	4000	0.40	4000	0.40	4000	0.40	4000	4.00	5.60
Water management														
1	Making wallow pool	6.8.2.1	Nos	4	4.00	4	4.00	4	4.00	4	4.00	4	40.00	56.00
2	RCC Check Dam	6.8.2.2	m^3	500	50.00	500	50.00	500	50.00		0.00		0.00	150.00
3	De-siltation of water body	6.8.2.4	Nos	10	5.00	10	5.00	10	5.00	10	5.00	10	50.00	70.00
4	Construction of earthen dam	6.8.2.6	m^3	50	5.00	50	5.00	50	5.00	50	5.00	50	50.00	70.00
	EDC ECO Development (Irrigation facility)			0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00
1	Dug Well	7.5	Nos	10	4.00	10	4.00	10	4.00	10	4.00	10	40.00	56.00
2	Irrigation cannel	7.5	km	10	2.50	10	2.50	10	2.50	10	2.50	10	25.00	35.00
3	Supply of agricultural implements	7.5	nos	50	2.50	50	2.50	50	2.50	50	2.50	50	25.00	35.00
4	Supply of solar street light	7.5	nos	10	3.50	10	3.50	10	3.50	10	3.50	10	35.00	49.00
5	Construction of culvert	7.5	nso	10	7.50	10	7.50	10	7.50	10	7.50	10	75.00	105.00
6	improvement of Village road	7.5	km	5	1.25	5	1.25	5	1.25	5	1.25	5	12.50	17.50
7	capacity building training	7.5	nos	4	1.00	4	1.00	4	1.00	4	1.00	4	10.00	14.00

Sl No	item of works	MPI No	Unit	1st Year		2nd Year		3rd Year		4th Year		5th Year		Total
				Phy.	Rs. in Lakh	Phy.	Rs. in Lakh	Phy.	Rs. in Lakh	Phy.	Rs. in Lakh	Phy.	Rs. in Lakh	
8	Man animal conflict mitigation watch tower	7.5	nos	5	12.50	5	12.50	5	12.50	5	12.50	5	125.00	175.00
9	Supply of seedlings	7.5	nos	25000	3.75	25000	3.75	25000	3.75	25000	3.75	25000	37.50	52.50
	Man Elephant conflict			0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00
1	Hiring charge of Extra vehicle	8.1	Nos	48	12.00	48	12.00	48	12.00	48	12.00	48	120.00	168.00
2	Supply scaring equipment's	8.1	Nos	50	5.00	50	5.00	50	5.00	50	5.00	50	50.00	70.00
3	Wages to village team	8.1	Nos	15	4.20	15	4.20	15	4.20	15	4.20	15	42.00	58.80
4	Ex-gratia Payment	8.1	Nos	1	20.00	1	20.00	1	20.00	1	20.00	1	200.00	280.00
5	Awareness meeting	8.1	Nos	2	1.00	2	1.00	2	1.00	2	1.00	2	10.00	14.00
6	Supply of capturing articles	8.2	Nos	5	1.25	5	1.25	5	1.25	5	1.25	5	12.50	17.50
7	Supply of improvised vehicle for translocation	8.2	Nos	1	25.00		0.00		0.00		0.00		0.00	25.00
8	Supply of chemical / drugs of tranquilization	8.2	Nos	1	0.50	1	0.50	1	0.50	1	0.50	1	5.00	7.00
ECO Tourism														
1	Digitalization of NIC	9.1	Nos	1	25.00		0.00		0.00		0.00		0.00	25.00
2	Guide Training	9.1	Nos	2	0.50	2	0.50	2	0.50	2	0.50	2	5.00	7.00
3	Signages	9.1	Nos	20	1.00	20	1.00	20	1.00	20	1.00	20	10.00	14.00
4	Preparation of Web Site	9.1	Nos	1	2.50	1	2.50	1	2.50	1	2.50	1	25.00	35.00
5	Development of nature Trail	9.2.1	KM	3	3.00	3	3.00	3	3.00	3	3.00	3	30.00	42.00
6	Supply of Rafting Boat	9.2.1	Nos	2	5.00		0.00		0.00		0.00		0.00	5.00
7	Construction of Amphitheatre	9.2.3	Nos	1	7.50	1	7.50	1	7.50	1	7.50	1	75.00	105.00
8	Construction of Toilet	9.2.3	Nos	1	1.50	1	1.50	1	1.50	1	1.50	1	15.00	21.00
9	Purchase of Vehicle for outreach programme	9.2.3	Nos	1	15.00	1	15.00	1	15.00	1	15.00	1	150.00	210.00
Monitoring														
1	Supply of Computer	10.3	Nos	1	1.00		0.00		0.00		0.00		0.00	1.00
2	Residence for filed biologist	10.3	Nos	1	15.00		0.00		0.00		0.00		0.00	15.00

Sl No	item of works	MPI No	Unit	1st Year		2nd Year		3rd Year		4th Year		5th Year		Total
				Phy.	Rs. in Lakh	Phy.	Rs. in Lakh	Phy.	Rs. in Lakh	Phy.	Rs. in Lakh	Phy.	Rs. in Lakh	
3	Estimate of Wildlife	10.3	Nos	1	5.00		0.00		0.00		0.00	1	50.00	55.00
4	Miscellaneous	10.3	Nos	1	1.00	1	1.00	1	1.00	1	1.00	1	10.00	14.00