

## Chapter 1: Introduction to Bird Sanctuary

### 1.1 Name, location, constitution and extent

Nagi Dam Bird Sanctuary and Nakti Dam Bird Sanctuary (N&NBDS) are situated in the Jhajha forest range of Jamui forest Division. Both these bird sanctuaries came into existence due to formation of reservoirs behind the Nagi and Nakti dams constructed by the Irrigation Department. As the land for reservoir has already been acquired by the state government, no public rights exist in the sanctuary area. There are no private installations inside the sanctuary as well. Together, these sanctuaries form two Important Bird Areas (IBAs) of Bihar which are very closely located and are almost similar in habitat and natural landscape. These water bodies are a haven for the resident as well as migratory birds.

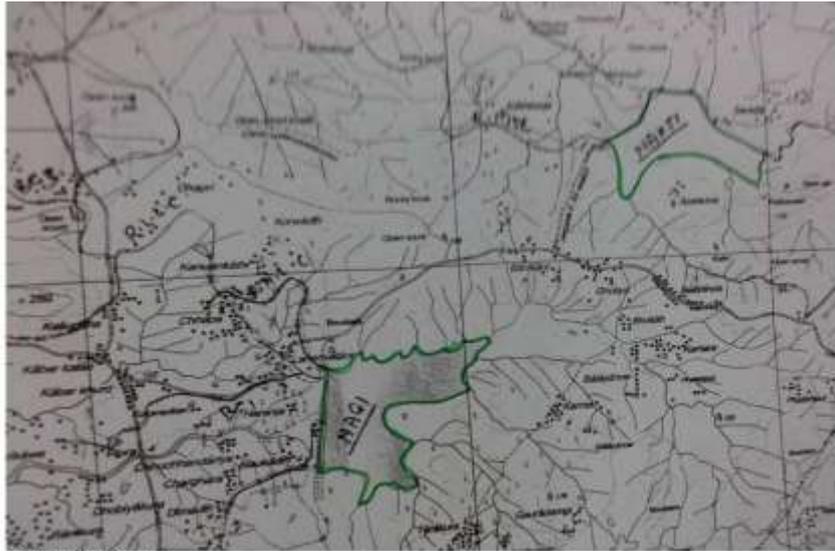
The Nagi and Nakti reservoirs, together with the civil structures and installations related to the dam, and comprising a total area of 191.51 hectares and 332.58 hectares respectively, were declared as bird sanctuaries on 25<sup>th</sup> February 1984 and 22<sup>nd</sup> July 1987 respectively under section 18 of the Wildlife (Protection) Act, 1972, due to presence of migratory birds in the reservoirs. The gazette notification of Nagi and Nakti Dam Bird Sanctuary has been annexed as Appendix-IA & IB. A proclamation in District Gazette under section 21 of Wildlife (Protection) Act, 1972 was issued by the Collector, Jamui on 16.11.1997.

Final notification under section 26A of the Act was issued on 04.09.2009.

Both the sanctuaries are surrounded by a similar undulating landscape that include barren as well as agricultural land interspersed with rocky hillocks. Outcrops are visible on some part of sanctuary which adds in the landscape beauty of the area. The Nagi and Nakti rivers, which have been dammed giving rise to the sanctuary water bodies, are fed by rainwater and local streams. Both these water bodies are quite deep, with a clear water surface. In keeping with the main objective of construction of the dams, the reservoirs supply water to local farmlands downstream, as there are cultivable lands adjacent to both the water bodies.



Photo 1.1: Outcrop at Nagi Dam Bird Sanctuary



**Map 1.1: Scanned copy of topo sheet showing Nagi and Nakti Dam Bird Sanctuary**

Taking the geo-location of the Nagi and Nakti dams as the location for the corresponding sanctuaries, these could be represented by the following geo-coordinates:

Nagi Bird Sanctuary – Latitude-  $24^{\circ} 49.379'N$ , Longitude  $86^{\circ} 24.001'E$ .

Nakti Bird Sanctuary – Latitude -  $24^{\circ} 51.290'N$ , Longitude  $86^{\circ} 26.711'E$

## 1.2 Approach and access

The Nagi Dam and Nakti Dam bird sanctuaries are two sanctuaries so close to each other that they can be taken as one bird area. The direct access to the sanctuaries is by road only. They are located approximately 7 km north-east of Jamui- Jhajha road. The distance from Jamui railway station is 31 km and 12 km from Jhajha railway station, where most of the important trains make a halt. Nearest airport is Patna which is almost 200 km away.

Both these sanctuaries are connected to the headquarters of Jamui district of Bihar and Deoghar District of Jharkhand by all-weather roads. The highly revered Jain pilgrimage site of Lachhuar and temple city Deoghar is barely 50 km and 80 km respectively away from the sanctuaries. Although the sanctuaries are accessible in all seasons, best time to visit bird sanctuary is in winters when migratory birds of various species flock together in thousands.

### **1.3 Statement of significance/Importance**

#### **1.3.1 Important Bird Area (IBA)**

These two bird sanctuaries are the Important Birds Areas (IBAs) designated on international forum fulfilling the IBA CRITERIA of holding more than 1% of total bio-geographic population of a particular species and congregation of  $\geq 20,000$  water birds in these lakes. About 1,600 Bar-headed Goose (*Anser indicus*) have been recorded from this site (A. Mishra pers. comm. 2002). According to Wetlands International (2002), 1% threshold of this species is 560; accordingly, the population of Bar-headed Goose at this IBA site amounts to about 3%. An area encompassing both the lakes could be considered as one IBA.

#### **1.3.2 Recreational value**

The landscape of Nagi and Nakti Dam Bird Sanctuaries is very attractive. The Sanctuary serves as one of the important sites for the bird watching, especially during winter season. Because of its location in the rural and rocky landscape, it attracts tourists for its recreational and aesthetic values also.



Photo 1.2: Flock of Bar-headed Geese at Nagi Dam Bird Sanctuary

### 1.3.3 Groundwater recharge

Ground water in this area is a vital resource for agriculture, domestic water supply and other uses. It is also the single largest and most productive source of irrigation water and plays a critical role in sustaining agriculture during droughts. The fall in tree cover in and outside the forest areas reflects in the shape of scarcity of water as the replenishing of ground water becomes difficult. The floodplains of the Sanctuaries recharge the ground water. As a result, the mean depth or water table becomes high in the post-monsoon season. Thus, good amount of water gets trapped in the aquifer. This availability of extra water helps in agriculture and it is also available for household consumption.

### 1.3.4 Fish Diversity

The Sanctuaries are rich in fish diversity. A total of 36 fish species so far have been reported from these two bird sanctuaries together.

Earlier, the Irrigation Department used to auction fishing in both the reservoirs, but after notification as Bird Sanctuary, fishing is prohibited. However, sporadic incidences of fishing by the local people have come to notice but these are very few in numbers.



Photo 1.3: *Ambassis nama*(Chanari)      Photo 1.4: *Glossogobius giuris* (Bulla)

### 1.3.5 Awareness and Educational Value

These areas possess potential to attract students of biology to study aquatic flora and fauna. Apart from this, the area also provides an opportunity for awareness regarding the ecological significance in general and avifauna in particular among local people, eco-tourists, bird watchers, school children and college students etc.

### 1.3.6 Biomass extraction

The villagers of the nearby areas are dependent on these Sanctuaries mainly for livestock grazing and grass extraction. A large population of grazing livestock, especially goats, buffaloes and cows depend exclusively on the areas in and around the Sanctuaries and get their fodder from it.

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## Chapter 2: Background information and attributes

The Nagi Dam bird sanctuary is the reservoir formed by damming of the local Nagi River and similarly, Nakti Dam bird sanctuary is the reservoir which is made by damming of the Nakti River. Both these are man-made reservoirs. Earlier, the submerged area used to have an undulating terrain surrounded by hills. There was a constant shortage of water for irrigation purposes. Nagi dam was prepared after recommendation of the planning commission under first five year plan in 1955-1956 for irrigation purposes. It was completed in second five years plan in 1958. Its cost was ₹3 crores. Nagi was built to irrigate about 9850 acre land. Construction of Nakti Dam was started in year 1969-1970 and completed in year 1983. Nakti was built to irrigate approximately 7000 acre land it means Nakti Lake has relatively less irrigation potential.

As a result of construction of these two dams, now sufficient quantity of water gets impounded in the reservoirs during rainy season which is later utilized for irrigation through a canal network running downstream. These reservoirs are home to many species of fish, amphibians, birds, reptiles etc.

### 2.1 Bio-geographic zone and wetland types

India is divided into ten bio-geographic zones. These sanctuaries are technically fall under the Gangetic plains but the characteristics and

topography of these areas are somewhat similar to the Deccan plateau. The forests are located on the hills and undulating tracts lying south of the river Ganges and extend to the somewhat level and flat top of the Chakai plateau. The hilly tract covered by the forests comprises a number of low hill ranges and isolated peaks, which are an extension of the Vindhyan series entering the forest division from the south. The most extensive range is Giddheshwar or Giddhaur Hills and Satpahari Hills.



Photo 2.1: Undulating terrain having slope towards west.

The Jamui Forest Division in its present form was created after bifurcation of Munger Forest Division and subsequent transfer of three forest ranges -Jamui, Jhajha and Chakai to Jamui Afforestation Division which took place for convenience in Management and administration.

2.1.1 River systems:

Kiul is the principal river of Jamui district which originates in the Kharagdiathana of Giridih and enters Jamui through a narrow gorge near the Satpahari hills. However, it is in no way connected with the Nagi and Nakti river out of which the bird sanctuaries are formed.

The main river which discharges water in Nakti Dam is river Nakti. Small streams like Pairgaha, Salga, Sabaijore, Sairaiya, Bhelbinda, Kubri, Bijala acts as tributaries to River Nakti.

Nagi Dam bird sanctuary derives water from River Nagi and tributaries to river Nagi are in the form of stream Karma, Tarakura and Gauradangi.

**2.2 Boundaries**

The Nagi Dam Bird Sanctuary is surrounded by Kusauna and Kubri village on east, Kathabajara village on west, Baijala and Burikhar village on the north and Belbinjha and karahra village on the south.

The Nakti Dam Bird Sanctuary is surrounded by Gamharia and Saraia on the east, KathbajraandJugra villages on the west, Baijala and Jugra on the north and Belbinjha, Kubri and Kusauna villages on the south.

Exact latitudes and longitudes position of the Nagi&Nakti Dam Bird sanctuaries are as follows:

Table No.-2.1: GPS location of N&NDBS

<u>Nagi dam bird Sanctuary GPS reading</u>		
Eastern tip	N 24 49 15.6	E 86 24 43.3

Western tip	N 24 49 0.0	E 86 23 57.2
Southern tip	N 24 48 13.6	E 86 24 15.5
Northern tip	N 24 49 26.9	E 86 24 13.9
<u>Nakti Dam Sanctuary GPS readings</u>		
Eastern tip	N 24 50 12.5	E 86 26 24.9
Western tip	N 24 50 57.4	E 86 26 22.4
Southern tip	N 24 50 24.0	E 86 26 00.0
Northern tip	N 24 51 17.7	E 86 26 41.8

### 2.3 Altitude/Terrain types

In the present shape, the area of sanctuary is almost plain with a gentle slope towards west. The surrounding terrain is slightly undulating. Altitude of Nagi and Nakti Dam Bird Sanctuary is approximately 200 meters above mean sea level.

### 2.4 Geology, rock and soil

#### 2.4.1 Geology and Rock:

The alluvial soil thins out to the south of an imaginary line joining Banka, Munger and Gaya, and the stable shield of granitic and metamorphic rocks of archaean age, the oldest system recognized by geologists, rises gradually southwards. Outcrops projecting above the surface of the shield are ridges of resistant rocks. Chiefly quartzite and fine-grained rocks of granite family are found, but the general character of the countryside is that of an old plain surface.

Southwards of Jhajha this old peneplane is criss-crossed by river valleys formed due to rivers eroding and cutting their channels downwards, showing evidence of fairly recent uplift which has been responsible for this much younger topography .

Further south are several types of schists and gneisses, as for example, mica schists, phyllite and slate, hornblende with schist, quartzite, calci-gneiss grading into dolomite and impure limestone, sparse granite schists, and granitic gneisses. The upper crust of soil over the schists and slates is fairly thick and carries the forests.

#### 2.4.2 Soil:

The top soil of this hilly terrain is lateritic in nature. The soil found in this zone is quite thin and is easily ploughable. A meager crop of Kulthi, Kodo, Til, Mustard and Arhar is harvested from it. The thinness of the soil is attributed to the late up-lift which has made soil susceptible to desiccation and erosion.

### 2.5 Catchments characteristics

The catchment area of Nakti and Nagi Dam Bird Sanctuary is undulating and mostly surrounded by hills with a westerly slope. The area is largely forest land which is partially degraded. In the last few years plantation works as well as soil and moisture conservation measures taken up have rehabilitated the degraded forest to some extent. Apart from forest lands there are some barren and arable private land on which marginal agriculture is practiced.

## 2.6 Hydrological features

### 2.6.1 Source of water

Seasonal rivers and streams are the source of water to Nagi and Nakti Dam Bird Sanctuary. Precipitation in the catchment area reaches the dams via these rivers and stream. Precipitation is mainly in the form of rain water. South – west monsoon is the main source of rainfall in this area. The bulk of the rainfall is received from middle of June to early October every year. There have been incidences of severe droughts in the past adversely affecting vegetation.

### 2.6.2 Climate and Rainfall

The climate of this area can be described as mean between the scorching heat of west and moist of the east. The seasons are the same as in other parts of Bihar.

Winter starts from November when the mornings and evenings are very cool and pleasant. In December and January the temperature goes down and the nights are very cold. There are mild showers during this period and one experiences biting cold during the night and early morning. In February, the nights are cold but the days become progressively warmer until the hot weather sets in March.

The spring season here is very short. It usually starts in February and lasts till early March. Nights are refreshing but the days are warm and sometimes quite hot in the month of March

The hot weather sets in the beginning of March and lasts till the middle of June. During this period the westerly wind blows through the arid sun-baked plains of Central India and causes high temperature and

low percentage of humidity. This is the time when there are stray cases of *loo* (extremely dry and hot summer winds) and a few fall victim to it each year. In evening the temperature falls down and the nights are not as uncomfortable.

The monsoons usually break in the third week of June and continue till late September. Although the temperatures fall down, the heat remains stuffy and sultry during the day and night-time.

## 2.7 General ecological features including flora and fauna

The forests of this division are mostly of deciduous nature except in moist valleys and by the side of streams where moist sal forms almost a pure crop varying from sapling to pole stage with a few scattered middle age trees. But the extent of this type of Sal crop is very limited due to aspect, topographical and biotic factors.



Photo 2.2: Forest area of Catchment

2.7.1 The aquatic vegetation types and extent

As 90% area of both the dams consist of clear water, hence it is most suitable for avifauna. Due to clear water, microphyte variety and population is quite less here. Presence of merely 15 macrophytes has been observed in Nagi and Nakti Dam reservoirs combined.

Table No.2.2: Aquatic Macrophytes of N&NDBS

<b>LOCAL /VERNACULAR NAME</b>	<b>BOTANICAL NAME</b>	<b>FAMILY</b>
Hydrilla	<i>Hydrilla verticillata</i>	Hydrocharitaceae
Tapeweed	<i>Vallisneria natans</i>	Hydrocharitaceae
Curryleaf pondweed	<i>Potamogeton crispus</i>	Potamogetonaceae
Sagu pondweed	<i>Potamogeton pectinatus</i>	Potamogetonaceae
Rice flatsedge	<i>Cyperus iria</i>	Cyperaceae
Bulrush	<i>Scirpus articulatus</i>	Cyperaceae
Shushni	<i>Marsilea minuta</i>	Marsileaceae
Hornwort	<i>Ceratophyllum demersum</i> L.	Ceratophyllaceae
Duck lettuce	<i>Ottelia alismoides</i>	Hydrocharitaceae
Arrow head	<i>Sagittaria sagitifolia</i>	Alismaceae
Hugle	<i>Typha angustata</i>	Typhaceae
Creeping spikerush	<i>Eleocharis palustris</i>	Cyperaceae
Khudepana/Duck weed	<i>Lemna minor</i>	Lemnaceae
Water lily	<i>Nymphaeodes cristata</i>	Menyanthaceae
Bladderwort	<i>Utricularia</i> sp.	Lentibulariaceae



Photo 2.3: Photo of Aquatic Macrophytes at N&NDBS

### 2.7.2 Vegetation type and composition in the catchments

The catchment area of the Nagi Dam and Nakti Dam sanctuaries is comprised of Tropical Dry Deciduous Forests. It contains miscellaneous species like *Diospyros melanoxylon*, *Buchanania lanzan*, *Anogeissus latifolia*, *Terminalia tomentosa*, *Lagerstroemia parviflora*, *Boswellia serrata*, *Pterocarpus marsupium* and *Acacia catechu* with a few patches of Sal (*Shorea robusta*) here and there. The undergrowth comprises of *Holarrhena antidysentrica*, *Carissa spinarum*. Among the climbers found are *Bauhinia vahlii* and *Acacia canescens*. The most commonly found grass is Sabai grass. In the past few years, plantation of mixed species like *Acacia auriculiformis*, Khair (*Acacia catechu*), Amla (*Emblica officinalis*), *Eucalyptus*, etc have been done in catchment areas. In Nagi and Nakti Dam Bird Sanctuaries, small ficariums have also been developed in which only *Ficus* species have been planted in year 2016 and 2017 respectively.

### 2.7.3 Species and communities of conservational importance

Being a bird Sanctuary, conservation of plant species and communities important for bird and feeding are of prime concern

nesting. Indigenous plant species like *Ficus* species, *Morus alba*, *Sisigium cumini*, *Acacia nilotica*, *Zizyphus species*. Etc. should be planted and conserved. For bird species like prinias, munias, stonech at, bluethroat, farnoclines etc., bushes and long grasses along the bank should be maintained properly. For water birds, aquatic communities like *Hydrilla*, *Najas*, *Nymphaea* etc. are very important. Even some *Typha* patches should also be maintained for geese, ducks, herons etc. A part from that mahua, kend, sal are the most important terrestrial species which need conservation.

#### 2.7.4 Fauna

##### 2.7.4.1 Birds:

Both Nagi as well as Nakti Dam Bird Sanctuary is a good site for both migratory and resident birds. Bar-headed Goose, Grey-lag Goose, Red-crested Pochard, Common Pochard, Pintail, etc are some of the important migratory aquatic birds. About 1,600 Bar-headed Goose (*Anser indicus*) have been recorded from this site (A. Mishra Mandar Natures Club. 2002). 3000 Red Crested Pochard were counted in 2013 by Arvind Mishra of Mandar Nature Club. Mishra revisited this site thoroughly after more than a decade in 2013 and then repeatedly visited in 2014-2015 and observed that still these lakes seem to attract more than 20,000 birds during winter. At present there are 136 birds species reported from these two bird sanctuary by Mandar Nature Club.

Beyond the cultivated areas, these water bodies are surrounded by barren, rocky terrain. Consequently, dry land birds are also seen, such as

the Indian Courser, Indian Sandgrouse, Yellow-wattled Lapwing, Indian Robin, Ashycrown, Sparrow-Lark, etc.

Endangered Bird Spp Reported from these sites

Black-bellied Tern *Sterna acuticauda*

Lesser Adjutant *Laptilos javanicus*

Near Threatened Bird Spp Reported from these sites

Darter *Anhinga melanogaster*

Oriental White Ibis *Threskiornis melanocephalus*

Ferruginous Pochard *Aythya nyroca*

River Tern *Sterna aurantia*

Painted Stork *Mycteria leucocephala*

The site falls in Biome-12, i.e. Indo-Gangetic Plains, but species of Biome 5 and Biome-11 are also sighted, in these two bird sanctuary .

Bird Species of Biome 05: Eurasian High Montane (Alpine and Tibetan)

1. Brown-headed Gull *Larus brunniceps*

Bird Species of Biome 11: Indo-Malayan Tropical Dry Zone

1. Ashy-crowned Sparrow-Lark *Eremopterix grisea*
2. Black Ibis *Pseudibis papillosa*
3. Indian Chat or Brown Rock Chat *Cercomela fusca*
4. Indian Courser *Cursorius coromandelicus*
5. Indian Robin *Saxicoloides fulicata*
6. Yellow-wattled Lapwing *Vanellus malabaricus*
7. Grey-headed Starling or Chestnut-tailed Starling *Sturnus malabaricus*

8. Lesser Golden-backed Woodpecker or Blackrumped Flameback  
*Dinopium benghalense*
9. Indian Grey Hornbill *Ocyeros birostris*
10. Jungle Babbler *Turdoides striatus*

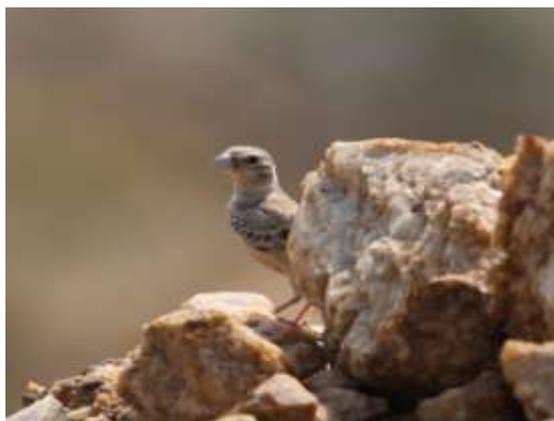


Photo 2.4: Female and Male of Ashy-crowned Sparrow-Lark

Exhaustive check list of the resident and migratory birds is being given in Appendix-II.

The area seems to be free from hunting and poaching of birds. Even the smaller wetlands or ponds in the remote villages of Chakai / Chandramundi region in the periphery, migratory birds were found comfortably swimming. At Chandramundi village, in a smaller village pond, 150 Pintail, 2 Bar Headed Goose and 6 Ruddy Shelduck were observed.

Nagi and Nakti Dam Bird sanctuaries are one of the best sites for the birdwatchers and the beginners who can easily observe them from the roads on the dams without causing much disturbance. There is limited need of the watch towers for the birdwatchers or the tourists for

this reason. But the outsiders hesitate to visit this naxal affected area and this could be one of the reason that the poachers and hunters also do not dare to enter this are and the birds remain protected. Local community seemed to be happy to see the assemblage of birds here and agree to protect them. One can observe both water birds as well as the birds preferring the habitat of rocky terrain. Number of resident birds like Moorhen, Jacana etc. are found less in number may be due to less amount of supporting weeds. Surprisingly, the number of raptors was also found to be very less.

#### 2.7.4.2 Mammals, reptiles and other obligate species, their status

Both the Nagi and Nakti dam Bird Sanctuaries are closely located and their geographical characteristics are more or less the same i.e high and rich catchment area with variable base. Rocky and muddy catchment areas surrounded by agricultural lands are the common features of both the sanctuaries. Plantation by the forest department in these recent years in the nearby areas of both the sanctuaries will certainly increase the wildlife (flora and fauna). Birds are taking full advantage from both the closely located sanctuaries for their roosting, feeding as well as breeding.

Assemblage of large number of birds in these two (sanctuaries) clearly indicates the presence of their forage. Possibility of animals in large quantities like fishes, crustaceans, mollusks, amphibians, reptiles and certain mammals is certainly a matter of investigation.

However, only fishes, amphibians, reptiles and mammals were surveyed and studied in detail to prepare a baseline data of these animal groups.

Table No2.3: - No of Species of different animal Groups reported from N&NDBS

S.No	Animal Group	No of Species	Details in Annexure
1	Fish	36	Appendix- III
2	Amphibians	03	Appendix- IV
3	Reptiles	18	Appendix- V
4	Mammals	28	Appendix- VI

## 2.8 Habitat quality, quantity and key areas

The quality of water in the Nagi Dam and Nakti dam Sanctuary is very good. The population surrounding both the sanctuaries are very spares. The agriculture practiced uphill in the catchment is very limited. Most of the agriculture is practiced below the reservoir where water is available through canals. The overall biodiversity of the region is not affected adversely. This wetland is a manmade reservoir, which was built basically to meet the demand for the agricultural therefore, irrigation department of Bihar Released water according to the mentioned purposes. Hence, the water level in the reservoir is not maintained according to the ecological requirement of flora and fauna, especially birds. There is a need of scientific study of level of water required for aquatic flora and fauna and accordingly water level will be maintained in

consultation with irrigation department. Siltation of the reservoir is also a concern as the rain water coming in to reservoir brings in silt. The silt removal may become necessary in due time otherwise the water will tend to occupy more areas.

## 2.9 Major functions and values

### 2.9.1 Direct use value

Because both Nagi and Nakti Dam Bird Sanctuary are manmade wetland so their direct use value at present is only for irrigation. Income generation from tourism may be another direct use value of these wetlands



Photo 2.5: Tourism facility at Nagi Dam Bird Sanctuary

### 2.9.2 Indirect use value

These two Bird sanctuaries are providing significant ecosystem services in terms of ground water recharge, erosion control, recreational values, educational value and aesthetic values. The barrage is the source of water for the irrigation and domestic purposes.

These Dam sites have recreational and aesthetic values which are valued by the residents as well as tourists and hence it is tourist attraction. these indirect values although acknowledged by ecologists are unaccounted by economists and are entirely ignored by the local administration. Economic evaluation of these functions should be made for such fragile wetlands.

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### Chapter 3: History of management and present practices

#### 3.1 General

Both Nagi as well as Nakti Dam was constructed for irrigation purpose and they became functional in year 1958 and 1983 respectively.

Total notified area of the Nagi Lake sanctuary is 191.51 hectare or 1.915 km<sup>2</sup> and that of Nakti lake sanctuary is 332.85 hectare or 3.3258 km<sup>2</sup>. After construction of the dam over river Nagi and Nakti rivers the state government has declared them as bird sanctuaries. The collector of the Jamui district issued a proclamation in the district gazette under section 21 of the wild life protection act 1972 on 16.11.1997. Since the land has been acquired by the state government for the reservoir, there is no right of people to interfere in any activity of the lake and use water for any purpose other than agriculture. This has been reported by the collector, Jamui to the government. Final notification of the sanctuary under section 26A of the wild life protection act 1972 was issued by the state government on 04.9.2009.

Nagi dam and Nakti dam both are manmade reservoirs in the Jhajha range of Jamui Forest Division. they were constructed by the irrigation department primarily for the purpose of the irrigation through canal systems below the catchments. Later on, both the sites were recognized to be important due to breeding of the migratory birds in the winter. Hence slowly there was demand to declare them as sanctuaries.

Both these sites are now a protected area and its administrative control from Sanctuary point of view, lies in the Divisional forest

Officer Jamui. However, the land is the property of the irrigation department of the state of Bihar. Both the Sanctuaries are very important due to presence of pure and clear water mass and presence of thousands of birds. There is ample feed in the surrounding areas where agriculture is practiced.

### **3.2 Legal status and land tenure in the surrounding areas**

The land of the Reservoir areas of both the sanctuaries are property of the Irrigation Department, Bihar. However after the declaration of the Bird Sanctuary the administrative control of the reservoir area from the wildlife management point of view lies with the Forest Department. In surrounding areas the lands are primarily of three types: Forest lands in patches, Gair Mazarua lands and private occupied lands which are cultivated. These forest lands are notified forests. The dry deciduous forest of sal and associates is found in them. Many forest areas have become degraded and become barren. The plantation work done by the forest department in last few years has been established. Gair Mazarua Lands are revenue department lands which belong to the state of Bihar. They are mostly barren. Private lands are cultivated lands which are experiencing rain fed cultivation in one season only. The rabi crop is not possible in the area because of scarcity of water. Hence in most of the areas rain fed cultivation is practiced. In arable areas near the canals rice cultivation is practiced.

### 3.3 Leases

There are no leases on the lands inside the sanctuary area. After the construction of the Dam, the reservoir were initially, leased for fishing on annual basis. Later on after declaration of the bird sanctuary this practice has been completely stopped.

### 3.4 Dependency on wetland

People of surrounding areas come into Sanctuary for defecation, cremation, biomass extraction, and daily water use. Local from nearby areas bring their livestock into the Sanctuary for grazing and wallowing. Fuel Wood and fodder grass collection is done by families of nearby areas.

#### 3.4.1 Water harvesting (Irrigation)

Water stored in both the reservoirs is primarily used by the Irrigation department for releasing in to canal systems for the irrigation purposes. The water is utilized by the villagers for cultivation of the crops.



Photo 3.1: Canal originating from Nagi Dam Bird Sanctuary

### 3.4.2 Fishing

At present fishing is prohibited in the sanctuary and it is illegally done sometimes. Boats for fishing were not observed but very few people are fishing using the tubes to venture in to the lakes especially in the Nagi Dam. Sometimes illegal fishing is reported but not in winter which is the season for migratory birds.

The department of Animal Husbandry and Fisheries, Government of Bihar had prohibited fishing lease in these two bird sanctuaries in 1993. This resulted in the form of ban on fishing lease completely. The survey in 2013 clearly suggests that the number of birds has markedly increased in these bird sanctuaries during last decade.

### 3.4.3 Biomass cultivation

The reservoir is full in the rainy season and it is at the minimal level in the month of May and June. There are chance of cultivation of few crops inside the sanctuary along the periphery of the reservoir, but forest department always keep vigil on such activities.

### 3.4.4 Biomass extraction

Biomass extraction is not done from the reservoir or sanctuary . The removal of weeds from the periphery of the reservoir is not in practice, as the aquatic weeds are not popular with cattle. There are no trees in the reservoir which could be extracted. Grasses are extracted by local people.

### 3.4.5 Religious sentiment

There is one Durga temple in the periphery of the Nagi Dam bird Sanctuary which is visited by the local people. During the Nawami

Puja(Durga Puja), a fair is organized at the temple where villagers from the nearby villages assemble. Apart from that Chhath puja is also done in these two sanctuaries.

### **3.5 Status of Protection**

Though there is not much protection mechanism, other than a few forest staff, there has not been any attempt to poach wild birds in this remote area. Local people are not in the habit of poaching birds.

#### **3.5.1 Encroachment & other forms of wetland reclamation**

There has been no incidence of encroachment in this distant remote areas. As the area is acquired by the irrigation department after paying the compensation, Hence there is not any attempt of encroachment or other type of wetland reclamation. The villages are not very near and there is no attempt to build house etc in the reservoir area. Sometimes cultivation of marginal crops takes place in fringe areas.

#### **3.5.2 Poaching of water birds and other animals**

No incidence of poaching of birds has been reported in the sanctuary. The local people lives in harmony with the resident and migratory birds and they do not harm them. There is no report of killing of other wild animal in and around the sanctuary.

#### **3.5.3 Sand mining, quarrying and other activities**

There is no scope of sand mining in the area as the land in the reservoir is rocky and moramy in nature. Sand is not available in the reservoir. Hence the extraction of the sand is not done. As far as quarrying is concerned it is not done in the reservoir area.

#### 3.5.4 Illegal biomass extraction

Both the reservoirs are devoid of woody vegetation, trees. Hence there is not much scope for illegal extraction of wood but grasses are extracted by local people.

#### 3.5.5 Livestock grazing in the wetlands and in the surroundings

During lean season the stray cattle move around the periphery and graze freely. However, the aquatic vegetation is not the preferred type of feed. Hence the cattle feed upon, the terrestrial grasses growing on the periphery and surrounding areas.



Photo 3.2: Grazing at Nagi Dam Bird Sanctuary

#### 3.5.6 Sewage, effluent and solid waste disposal

There is no incidence of sewage, effluent and solid waste disposal in the sanctuary area. Hence, both the sanctuaries are pure to that extent. Idol immersion is done by the local person which is one of the causes of pollution up to very limited extent. Agro chemicals used in nearby agricultural field may cause chemical pollution up to some extent.



Photo 3.3: Idol immersion at Nagi Dam Bird Sanctuary.

### 3.5.7 Wildlife Health

At present there is no disease surveillance of migratory and resident birds in these two sanctuary and in nearby areas. There is a need of disease surveillance at least in migratory birds for bird flu.

### 3.5.8 Interagency programs and problems

There is no interagency coordinated programs in the villages around the Nagi as well as Nakti Bird dam sanctuary.

### 3.5.9 Human activities in the surrounding areas

People around the sanctuary are mostly peace loving. They are mostly based on the agriculture and animal husbandry. Other important occupation is making of beedi from kendu leaves and kendu leaves collection. Many people go to the nearby markets and cities in search of daily jobs. However the area gets disturbed in the nights due to left wing extremism.

### 3.6 Tourism

Tourism infrastructure and interpretation in N&NDBS is at its infancy. Even though large no of migratory birds visit these two bird sanctuary but tourist inflow is negligible.

#### 3.6.1 Scope

The natural landscape of N&NDBS is very attractive. N&NDBS is a very good place to enjoy boating and bird watching. N&NDBS is located near Jamui-Deoghar Highway. Deoghar and Lachhuar are two important religious sites where tourist inflow is very good. These tourists may be attracted to these two ecotourism destination, if proper infrastructure will be provided.

#### 3.6.2 Visitor statistics

No proper visitor statistics is available as there is no permanent establishment in the Sanctuary for tourism. Hence movement of visitors in and around both the sanctuaries is not regulated. However there is observation that the number of visitors increase during the winter season when the migratory birds flock in large numbers. Apart from that people from nearby areas visit these places for picnic.

#### 3.6.3 Interpretation program

The interpretation programme presently involves signage depicting important birds of Bird sanctuaries and some directional signage. The place lacks a proper interpretation centre.

#### 3.6.4 Facilities

There are no accommodation and/restaurants facilities available for visitors in or around the Sanctuary. There are few benches, signage

and publications (a leaflet) area are available for visitors, but these are not enough and need to be improved. Facilities like drinking water/toilets, eco guides and interpretation centre and museum need to be introduced in the N&NDBS.



Photo 3.4: Information centre and Sitting facility at Nagi DBS.

### 3.7 Research, monitoring and training

#### 3.7.1 Research & Monitoring

Research and monitoring are two important aspects which have been never properly taken care. The current study is only preliminary study in N&NDBS covering various aspects like flora, fauna, socioeconomic study, etc. This current study is certainly helpful in generating baseline data.

#### 3.7.2 Training

Training is an important activity which is left untouched. There is no sensitization and technical input provided to regular as well as contractual staffs.

### **3.8 Wildlife conservation strategies and their evaluation**

This is the first management plan of N&NDBS, therefore prior to this plan no management or conservation strategies were developed and so question of evaluation doesn't arise. Even though some interventions were carried out in the past, which has some positive impact on the management of the bird sanctuary.

### **3.9 Administrative set up**

There is no separate administrative setup for N&NDBS. Territorial staff perform the duty of the sanctuary also. The sanctuary administration is controlled by the Divisional Forest Officer, Jamui with the help of the range officer, Jhajha. There are beat officers and forest guards and they perform the duty of the sanctuary apart from their regular territorial duty. Forest Guard quarters have been constructed near the sanctuaries but these quarters were never occupied so, the forest guard quarter near Nagi DBS is used as an information centre. Two motor cycles have been purchased for patrolling. There is a dearth of lower level staff and facilities at their disposal.

### **3.10 Communication**

Communication networks in the sanctuaries are not up to the mark. There is an all-weather road between Jhajha and Jamui and to the sanctuaries. There is a need for fast vehicles and official mobile communications for the forest staff.

### 3.11 Summary of threats to wetland and wildlife

The silt deposition is taking place in the lakes from the surrounding agricultural fields and forest areas. If this continues, the water depth will be reduced in the dams and the people around the area, depending on this water for irrigation will be deprived. Secondly, when the lakes will be shallower, the water spread will be more that may inundate the agricultural land of the villagers.

People are pumping out the water of the lakes in to their fields using large pump sets. This will adversely affect the maintenance of minimum water level required for the birds. Unregulated Grazing is also a threat to these two sanctuary.

The land ownership still continues with the department of Water Resources and water for irrigation is being released from the sanctuary. There should be an agreement within the Department of Environment and Forest Department and Department of Water Resources to maintain the minimum and maximum water level in these two water bodies suitable to the birds.

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**Chapter 4 : The Wetland area and interface land use situation**

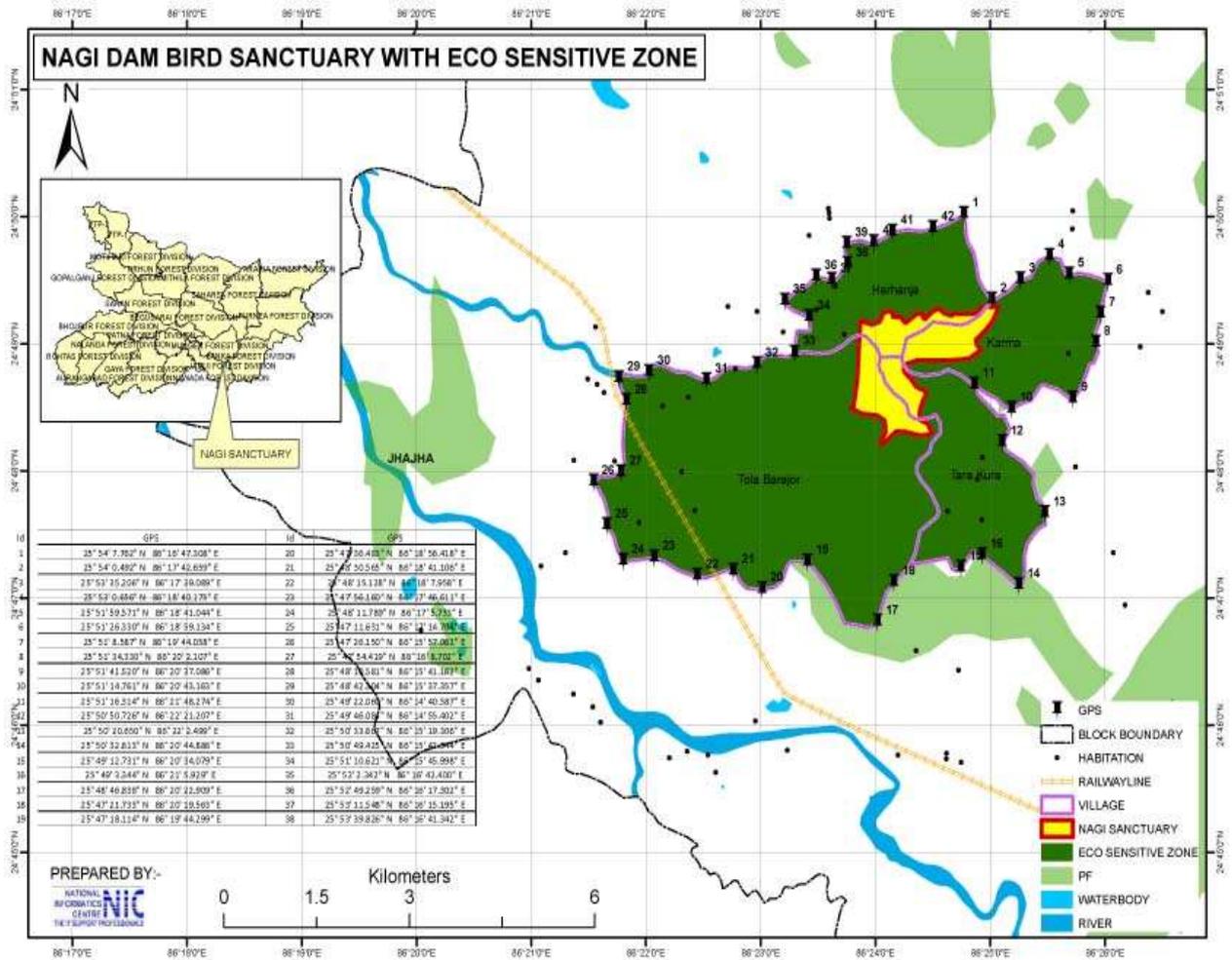
**4.1 The existing situation in the Zone of Influence (ZI)**

The Eco sensitive zone as proposed for Nagi Dam bird sanctuary and Nakti Dam bird sanctuary are the villages in an area within 500 meter from the boundary of sanctuary. There are four villages in the ESZ of Nagi Dam sanctuary and six villages in the ESZ of the Nakti Dam Sanctuary. All the villages have primarily agriculture practicing population. Many villagers are engaged in Beedi making and service sector etc. The peripheral GPS locations of Eco sensitive Zone of 500 meters as proposed to the Ministry of Environment, Forest and climate change, Government of India, New Delhi, from the boundary of Nagi dam Bird Sanctuary are given in the Table 4.1a & 4.1b Showing GPS locations of boundary of Eco sensitive Zone of Nagi Dam Bird Sanctuary.

Table 4.1a: Showing GPS locations of Eco sensitive Zone boundary of Nagi Dam Bird Sanctuary

Id	GPS	Id	GPS
1	24° 50' 0.773" N 86° 24' 46.312" E	22	24° 47' 10.188" N 86° 22' 26.900" E
2	24° 49' 20.404" N 86° 25' 0.989" E	23	24° 47' 18.857" N 86° 22' 4.368" E
3	24° 49' 29.938" N 86° 25' 15.949" E	24	24° 47' 17.264" N 86° 21' 48.063" E
4	24° 49' 41.097" N 86° 25' 31.124" E	25	24° 47' 34.050" N 86° 21' 39.535" E
5	24° 49' 32.400" N 86° 25' 41.394" E	26	24° 47' 54.508" N 86° 21' 32.572" E
6	24° 49' 29.175" N 86° 26' 1.638" E	27	24° 47' 58.880" N 86° 21' 46.938" E
7	24° 49' 13.795" N 86° 25' 57.791" E	28	24° 48' 32.665" N 86° 21' 49.837" E
8	24° 49' 0.220" N 86° 25' 55.232" E	29	24° 48' 43.389" N 86° 21' 45.901" E
9	24° 48' 33.736" N 86° 25' 43.380" E	30	24° 48' 46.283" N 86° 22' 1.693" E
10	24° 48' 28.937" N 86° 25' 11.262" E	31	24° 48' 42.416" N 86° 22' 31.710" E
11	24° 48' 40.318" N 86° 24' 51.771" E	32	24° 48' 50.020" N 86° 22' 58.149" E
12	24° 48' 13.176" N 86° 25' 6.253" E	33	24° 48' 55.398" N 86° 23' 17.734" E
13	24° 47' 39.726" N 86° 25' 28.529" E	34	24° 49' 12.232" N 86° 23' 25.339" E
14	24° 47' 5.817" N 86° 25' 15.058" E	35	24° 49' 19.984" N 86° 23' 12.591" E
15	24° 47' 14.015" N 86° 24' 44.712" E	36	24° 49' 31.244" N 86° 23' 29.027" E

Id	GPS	Id	GPS
16	24° 47' 19.748" N 86° 24' 55.856" E	37	24° 49' 29.700" N 86° 23' 37.217" E
17	24° 46' 48.463" N 86° 24' 1.060" E	38	24° 49' 37.206" N 86° 23' 45.427" E
18	24° 47' 7.068" N 86° 24' 9.715" E	39	24° 49' 46.712" N 86° 23' 45.001" E
19	24° 47' 16.840" N 86° 23' 24.594" E	40	24° 49' 47.685" N 86° 23' 59.211" E
20	24° 47' 3.956" N 86° 23' 0.847" E	41	24° 49' 52.623" N 86° 24' 8.827" E
21	24° 47' 12.553" N 86° 22' 45.825" E	42	24° 49' 54.244" N 86° 24' 30.089" E

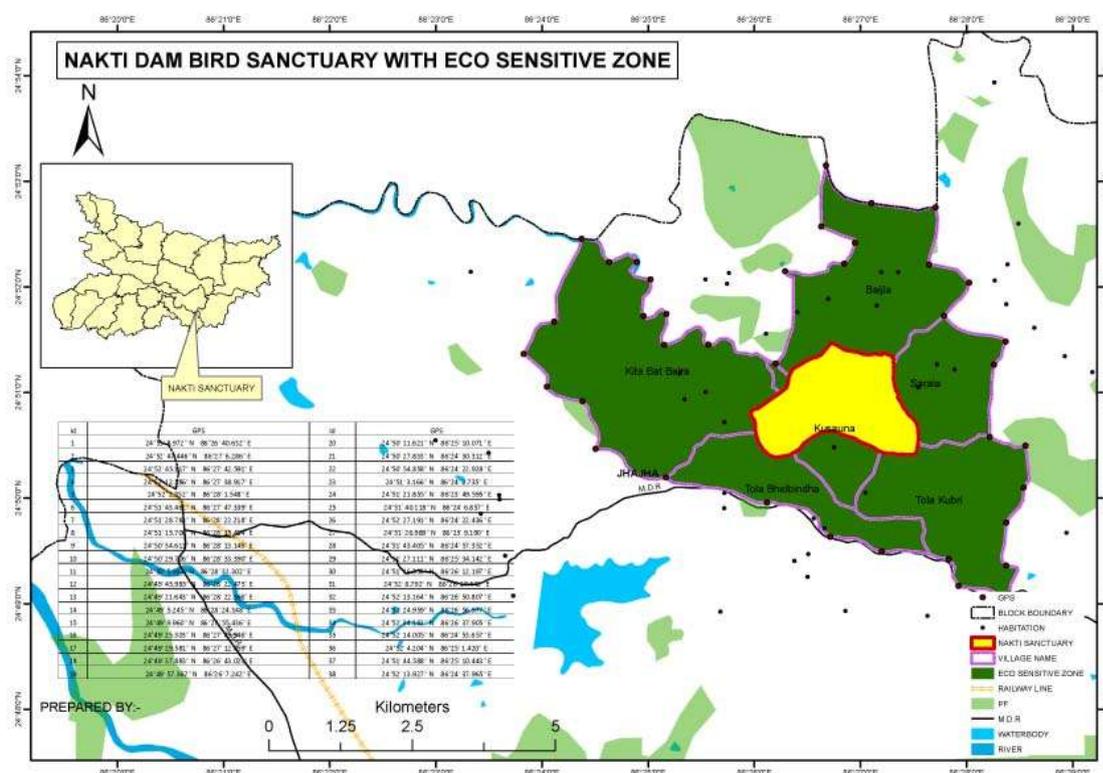


Map 2A : Showing ESZ of Nagi Dam Bird Sanctuary

The peripheral GPS locations of Eco sensitive Zone of 500 meters as proposed to the Ministry of Environment and Forest New Delhi, from the boundary of Nakti dam Bird Sanctuary are given in the Table 4.1b.

Table 4.1b: Showing GPS locations of Eco sensitive Zone boundary of Nakti Dam Bird Sanctuary

Id	GPS	Id	GPS
1	24°53' 8.972" N 86°26' 40.632" E	20	24°50' 11.621" N 86°25' 10.071" E
2	24°52' 47.446" N 86°27' 6.286" E	21	24°50' 27.833" N 86°24' 30.312" E
3	24°52' 45.117" N 86°27' 42.591" E	22	24°50' 54.858" N 86°24' 22.928" E
4	24°52' 12.586" N 86°27' 38.917" E	23	24°51' 3.166" N 86°24' 2.735" E
5	24°52' 2.352" N 86°28' 1.548" E	24	24°51' 21.855" N 86°23' 49.595" E
6	24°51' 43.462" N 86°27' 47.339" E	25	24°51' 40.118" N 86°24' 6.857" E
7	24°51' 28.783" N 86°28' 22.218" E	26	24°52' 27.191" N 86°24' 22.436" E
8	24°51' 15.706" N 86°28' 15.494" E	27	24°51' 26.989" N 86°25' 9.190" E
9	24°50' 34.611" N 86°28' 13.146" E	28	24°51' 43.405" N 86°24' 57.352" E
10	24°50' 29.706" N 86°28' 33.390" E	29	24°51' 27.111" N 86°25' 34.142" E
11	24°50' 5.933" N 86°28' 32.302" E	30	24°51' 16.356" N 86°26' 12.197" E
12	24°49' 45.985" N 86°28' 22.475" E	31	24°52' 8.792" N 86°26' 17.443" E
13	24°49' 21.643" N 86°28' 22.366" E	32	24°52' 13.164" N 86°26' 50.807" E
14	24°49' 5.245" N 86°28' 24.348" E	33	24°52' 24.959" N 86°26' 56.977" E
15	24°49' 9.960" N 86°27' 55.436" E	34	24°52' 34.182" N 86°26' 37.905" E
16	24°49' 25.303" N 86°27' 49.946" E	35	24°52' 14.005" N 86°24' 53.657" E
17	24°49' 29.581" N 86°27' 12.059" E	36	24°52' 4.204" N 86°25' 1.420" E
18	24°49' 37.883" N 86°26' 43.023" E	37	24°51' 44.588" N 86°25' 10.443" E
19	24°49' 57.367" N 86°26' 7.242" E	38	24°52' 13.927" N 86°24' 37.965" E



Map 2B : Showing ESZ of Nakti Dam Bird Sanctuary

The lat long position of the villages falling in the Eco sensitive zone of the Nagi Dam BS & Nakti Dam BS are given below in the table 4.2.

Table 4.2: List of Villages Falling in the Eco-Sensitive Zone

<b>NAGI DAM SANCTUARY ESZ VILLAGES WITH LAT-LONG OF ONE LOCATION</b>					
Sl. No.	Village	Block	District	LAT.	LONG.
1	Tara Kura	JHAJHA	JAMUI	24° 47' 58.120" N	86° 24' 48.809" E
2	Harhanja	JHAJHA	JAMUI	24° 49' 24.828" N	86° 24' 9.256" E
3	Karma	JHAJHA	JAMUI	24° 49' 2.733" N	86° 25' 15.696" E
4	Tola Barajor	JHAJHA	JAMUI	24° 47' 58.331" N	86° 23' 7.677" E
<b>NAKTI DAM SANCTUARY ESZ VILLAGES' LAT-LONG</b>					
Sl. No.	Village	BLOCK	DISTRICT	LAT	LONG
1	Kusauna	JHAJHA	JAMUI	24° 50' 39.634" N	86° 26' 43.819" E
2	Saraia	JHAJHA	JAMUI	24° 51' 3.799" N	86° 27' 43.852" E
3	Kita Bat Bajra	JHAJHA	JAMUI	24° 51' 12.111" N	86° 25' 0.264" E
4	Baijla	JHAJHA	JAMUI	24° 51' 58.465" N	86° 27' 4.974" E
5	Tola Kubri	JHAJHA	JAMUI	24° 49' 58.848" N	86° 27' 51.745" E
6	Tola Bhelbindha	JHAJHA	JAMUI	24° 50' 5.223" N	86° 26' 20.325" E

4.1.1 The location, extent, boundaries and natural attributes of the Zone of Influence

The Nagi Dam Bird Sanctuary, Jamui lies between latitude N 24:49' and longitude E86:23' & E86: 24' in the Jamui District of Bihar and extends over an area of 191.51 ha. Whereas the Nakti Dam Bird

Sanctuary, Jamui lies between latitude N 24°50' and N 24°51' and longitude E 86°26' and extends over an area of 332.58 ha.

Area of eco-sensitive zone of Nagi and Nakti Dam Bird Sanctuary is 21.04 sq km and 23.29 sq km respectively.

Draft Notification of Eco-Sensitive Zone of Nagi and Nakti Dam Bird Sanctuary is given in Appendix- VIIA & VIIB respectively.

#### 4.1.2 Villages in and around the wetland

There are eight villages which are situated near to Nagi Dan Bird Sanctuary whereas seven villages are situated near Nakti Dam Bird Sanctuary.

In the locality around Nagi dam, these eight villages are Tarakura chhapa, Tulsikura chhapa, Chhapa, Gora damni, Haranja, Loharia tand in chhapa panchayata, Karma of Karhara panchayata and Nakuadih of barajora panchayata.

Among these villages Gora damni is smallest having only 48 families whereas Tarakura chhapa is the largest having 194 families. The total population of these eight villages is 4853.

The villages named Kusauna, Baijla, Bhelbinda, Kathbajra, Phoksa, Jugra phoksa and Saraia are situated close to the Nakti dam Bird Sanctuary. Saraia is under Paingaha Panchayata whereas other six villages are under Baijla Panchayata.

Among these villages Kathbajra and Jugra Phoksa are very small having only 43 and 47 families respectively, whereas Sarai is the largest having 175 families. The total population of these seven villages is 3885.

Health facility is not proper in these villages. There are some primary health centre with very poor facilities and people very frequently go to Jhajha city for treatment. Literacy level is also very low in these villages.

#### 4.1.3 Ethnic identities, traditions, customs, relationships between distinct groups

There are only two religious communities stay in these villages. Muslim population is approximately 10 percent and rest are Hindu. They live together amicably and have common culture and share all activities of village equally.

#### 4.1.4 Relationship with wetland

Although in these two wetlands fishing is banned, some local people catch fishes and snails for food. Local people protects the birds of these two sanctuary. Apart from that locals use these two sanctuary for open defecation, bathing, cattle grazing, cremation work, etc.

#### 4.1.5 The state of people's economy

On an average 40-60 percent population of these villages are dependent on agriculture. Bidi (native cigarette) making, broom making from munja grasses are two other important house hold activities in these villages. They also have domesticated animals like cattle, goat and poultry from which they derives some additional income.

## 4.2 Dependency of People on Forest

Local people uses forest resources also for their livelihood. In addition to the income from agriculture, house hold business of bidi

making, broom making and cattle farming, they get extra help from forest products.



Photo 4.1: Bidi making by local people.

A plant species *Aristida setacea* (Broom grass) locally known as BIRNA used for making broom (Jharu) to clean the house.

They use forests as their pasture ground for cattle and goat. The leaves and wood collected from forests are used as their fuel. They also collect toddy from the palm trees and palm leaves are used in thatch making. The munja grass is used in broom as well as in rope making. Some of them illegally cut and sell fulewood also.

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## Chapter 5: Problem and Issues

### 5.1 Problems related to Physical Properties

The boundary of the Nagi Dam Bird Sanctuary as well as Nakti Dam Bird Sanctuary has been properly demarcated on the ground. There is no conflict in relation to land use and there is no illegal farming activities have been reported. There is a need of construction of permanent boundary pillars with cattle proof trench to avoid any encroachment and to reduce cattle grazing on these two bird sanctuaries.

#### 5.1.1 Land tenure issues

The land of both the reservoirs which are declared as bird sanctuary are property of irrigation department. After declaration of sanctuary the administrative control of this area also comes under forest department to manage wildlife specially birds. There is no encroachment for developmental activities.

#### 5.1.2 water quality degradation

The water quality seems to be good and there is no sign of eutrophication. There is a need of regular test of physical, chemical and biological property of the dam water. Apart from that there is a threat of pollution of these water bodies due to agro-chemicals used in catchment areas. So regular testing the content of agro-chemicals in the water is required.

#### 5.1.3 Siltation in the Catchments

Degradation in surrounding forest area and agriculture practices are the two factors which creates siltation in the wetland. There is a need

of intensive plantation and soil moisture conservation activities in the catchment area. Apart from farm that agro forestry activities should be promoted on surrounding arable land to minimize siltation.



Photo 5.1: Soil erosion in catchment area

#### 5.1.4 Water abstraction, demand and water shortage.

Both Nagi as well as Nakti was constructed primarily for irrigation purpose. Based on the demand of irrigation the water level of these two dams fluctuates but complete draining of the reservoir never happens. Complete draining of water especially at the time of visit of migratory birds must be avoided, even for repair of the dam.



Photo 5.2: Water extraction for drinking purpose

## 5.2 Socio-economic problems

### 5.2.1 Dependency of local communities.

People from nearby villages come into the sanctuary for various purposes. They use sanctuary land for open defecation, cremation, cattle grazing, grass extraction, fishing etc. Due to ODF (Open Defecation free) scheme the open defecation in sanctuary has decreased.

### 5.2.2 Livelihood issues

There are limited livelihood issues related to these two sanctuaries. Collection of grasses and Grazing of the cattle may be considered as a livelihood issues for few families.

## 5.3 Any other Issues (Miscellaneous issues)

### 5.3.1 Lack of adequate staff

There is no dedicated staff for Nagi & Nakti Dam Bird Sanctuary. Territorial staffs perform the duty of sanctuary also. There are less Than 30 % of sanctioned staffs working in these areas.

### 5.3.2 Inadequate facilities including eco- tourism facilities.

Information dissemination, interpretation facilities regarding ecotourism are in its infancy at Nagi but in Nakti there is no facility at all. Signage in and around these two sanctuaries is also not adequate.

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## Chapter 6: Vision, Objectives and Problems

### 6.1 The Vision

To sustain Nagi Dam and Nakti Dam Bird sanctuaries as a well managed man made wetland ecosystem which harbors its unique diversity and act as an important centre for avian fauna.



Photo 6.1: White Ibis and Red Crested Pochard

### 6.2 Goal

The main goal of the management is to secure ecological integrity of these two bird sanctuary and develop it as a centre for scientific exploration, research & education and ecotourism with the active involvement of local community.

### 6.3 Objectives of management

The Nagi Dam and Nakti Dam reservoirs were primarily constructed for the purpose of collection of runoff water from the catchment and collection of water of the flowing streams during rainy season for irrigation and other end uses in the downstream areas. Over the years, owing to development of a healthy aquatic ecosystem, the barrage started attracting wildlife, particularly birds in large numbers

adding another important value to the area which was subsequently declared as a Bird Sanctuary. Hence, the primary objective of creating the dam remains unchanged.

The proposed objectives outline below aims to strengthen the overall management regime of the sanctuary including wildlife values.

#### 6.3.1 Long term objective

1. To strengthen the existing management of sanctuaries for effectively maintaining its ecosystem service values.
2. To improve the habitat quality of sanctuary for aquatic flora and fauna.
3. To mitigate the anthropogenic pressures on Bird Sanctuaries by developing and promoting supplementary livelihood opportunities and income generating activities for local communities.
4. To promote twin sanctuaries as a centre for conservation education, research and ecotourism.
5. Ensure adequate quality water availability for maintaining ecological processes.

The proposed management aims at conserving the habitats suitable for wetland birds. Being a Bird Sanctuary, increase in both the number and diversity of native and migratory birds can be considered as the best indicator for the fulfillment of these objectives. Once this long term objective is fulfilled, the vision to develop Nagi Dam and Nakti Dam bird Sanctuary as a centre of excellence for conservation education and ecotourism can also be achieved. The objectives mentioned above are the prerequisite of the goal. There are outputs for each objective

which should be focused first for achieving these objectives. To fulfill these outputs different activities or management strategies are developed. There are some assumptions for each objective without which the complicity of achieving the objective increases. The goal of this management i.e. to secure the ecological integrity of the Bird sanctuaries, can only be met if the monitoring of different components of the sanctuary are done regularly. Continued legal protection and absence of any external threats are also assumed for this objective.



Photo 6.2: Grey-lag goose

### 6.3.2 Immediate objectives

1. Steering committee for the Guidance and coordination between different stakeholders.
2. Improvement in administration regime.
3. Improvement in facilities for tourist, interpretation centre, and safety measures including law and order issues.

4. Improvement in habitat suited to migratory and resident birds

#### **6.4 Problems in achieving objectives**

The funds required for the improvement in the sanctuaries should be made available to the forest department through which habitat improvement, tourist facilities, communication network can be improved. There is a need to improve the road network in the sanctuary for which the help of other line department and revenue administration is required. The Law and order is a major problem in the area as Jammu district as a whole is extremist affected district. There has been no adverse effect of this to the resident and migratory birds but the safety to tourists is always a question. Local villagers are never a problem in achieving the objective. Fishing or poaching is not a problem in the sanctuary.

##### **6.4.1 Inadequate inter-departmental co-ordination**

One of the constraint in achieving the objective is inadequate inter and intra-departmental co-ordination. For achieving this objective the coordinated effort of the various departments, *viz.*, Forest Department, Revenue Department, Irrigation Department, Water Resources Department, Agriculture Department and Fisheries Department along with the local management authorities is obligatory.

#### 6.4.2 Issue of law and order

Due to left wing extremism there is some problem in achieving objective which can be overcome by better coordination with police, administration and local people.

#### 6.4.3 Biotic Pressure

There are some biotic pressure like cattle grazing, open defecation, religious activities, cremation, etc which will create hindrance in achieving various objectives.

#### 6.4.4 Limited infrastructure and inadequate and untrained frontline staff

In order to establish NNDBS as a centre for conservation education, research and ecotourism, a sound infrastructural and human resource base needs to be developed. At present the infrastructure is a constrain which may be overcome in coming years. The issue related with frontline staff is really crucial and there is need of separate team of staffs for NNDBS.

To transform NNDBS as an important site for scientist, tourists and local people these problems should be handled carefully as well as sensibly.

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## Chapter 7: The strategies

### 7.1 Management Philosophy

The management philosophy or the approach towards management of the NNDBS needs a comprehensive strategy ranging from legal framework and policy support, institutional mechanism, capacity building and community participation. Several state, national and international level legislations as well as policy commitments that has been kept in mind while developing the management plan. Recently the Government of India promulgated wetland (conservation and management) Rules, 2010, which puts the regulatory framework for wetland conservation. India is also a signatory to the Ramsar Convention which forms the basis of wetland conservation worldwide. The Ramsar Convention suggests that wetlands should be conserved by ensuring their 'wise use'. Wise use is defined as sustainable utilization for the benefit of mankind in a way compatible with the maintenance of the natural properties of the ecosystem. Sustainable utilization is understood as 'human use of a wetland so that it may yield the greatest continuous benefit to present generation while maintaining its potential to meet the needs and aspirations of the future generations. Further it goes forward to suggest that 'Wise use' may also require strict protection measures.

#### 7.1.1 Degree of intervention

Natural biological processes like wetland ecosystems are fragile so, minimal degree of intervention with scientific basis has been followed in this management plan.

In situations where the cause and effect relationship is well understood, it may be justifiable to carry out interventions that helps to mitigate an altered natural feature of the ecosystem for achieving specific management objectives. This implies a good understanding of the ecology of the wetland at the habitat level, species level, hydrological level and other disciplines.

## **7.2 Strategies**

The broad strategies of this plan were worked out through an exercise of participatory problem analysis and strategy formulation. The major strategies for addressing the problems of the area in this management plan were worked out based on stakeholder consultation.

### **7.2.1 Boundaries of the sanctuary**

Boundaries of both Nagi and Nakti Dam BS are well defined in the notification but there is a need of proper survey, demarcation and construction of permanent boundary pillars. In some of the areas proper fencing is required to deal with various boundary related management challenges. Cattle proof trench should also be created and maintained to minimize biotic interference up to some extent. These work should be carried out on priority basis.

## **7.3 Zonation**

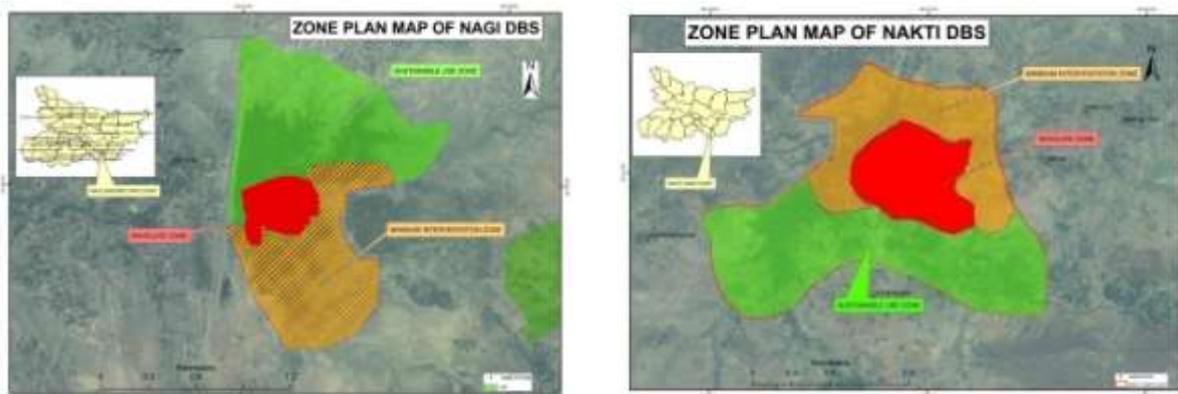
Considering the small are of these two sanctuary which is an area of reservoir of manmade dam, there is no need of a formal zonation. The entire area of the N & NDBS would be kept inviolate except the

tourism zone. The regulated grazing, grass collection etc should be prohibited in nearby areas. A very small portion of area may be allowed for some religious activities and rituals. (chhath Puja, Durga Puja, idol immersion), so that its impact can be minimized. One area may be dedicated for the controlled cremation work. By this uncontrolled cremation activity all along the reservoir bank can be avoided. These religious and rituals activities should be discouraged as far as possible.

### 7.4 Zone Plan

The entire area of sanctuary can be divided into three main management zones.

- (A) Inviolable Zone
- (B) Minimum Intervention zone
- (C) Sustainable use zone



Map 7.1: Zone plan map of N&NDBS

- (A) Inviolable zone

This zone will be in the centre of the wetland where no intervention will be done. This area will have higher water level. The

inviolable zone in Nagi DBS is quite smaller than Nakti because Nagi is a small Dam and having more biotic pressure and eco-tourism potential.

(B) Minimum Intervention zone

This will be the rest of the water areas where water is present even in the lean period. In these areas habitat improvement activities will take place.

(C) Sustainable use zone

This area is delineated so as to regulate the use of resources on Sustainable basis. This zone will be accessible by the dependent community as well as be tourists. This zone will be further subdivided into tourism zone and zone for dependent community.

(i) Tourism Zone

(ii) Zone for dependent community.

(c) (i) Tourism Zone: - The total area of 52.3 ha and 41 ha will be delineated as tourism zone in Nagi and Nakti Dam Bird Sanctuary respectively. The tourism zone of Nagi Dam(27.3%) has bigger share than Nakti(12.3%) because Nagi DBS is much more easily accessible to tourists and having better potential for nature tourism, In this area infrastructure for tourist like, bird watching trail, boating facility, etc will be developed.

(c)(ii) Zone for dependent community.

For some activities the local peoples are very sentimentally attached to these dams. So in each dam two such areas will be demarcated. One area will be for emersion of idols, Chhath puja and Durga Puja and on area will be demarcated for crematory.

**Table 7.1 Areas under various proposed zones in Nagi Dam Bird Sanctuary**

Zones	Area (ha)	% area	Comment
(A) Inviolable Zone	26	13.6	Central part of reservoir
(B) Minimum Intervention Zone	90.21	47.1	Area of Margin where habitat management work will be carried out.
(C) Sustainable Use Zone (C)(in ). Tourism Zone	52.3	27.3	Area for tourist and tourism infrastructure
(C)Sustainable Use Zone (C)(ii). Zone for Dependent community	23	12	Mainly for local community but may be used by tourists

**Table 7.2 Areas under various proposed zones in Nakti Dam Bird Sanctuary**

Zones	Area (ha)	% area	Comment
(A) Inviolable Zone	104	31.3	Central part of reservoir
(B) Minimum Intervention Zone	156.98	14.2	Area of Margin where habitat management work will be carried out.
(C) Sustainable Use Zone (C)(in ). Tourism Zone	41	12.3	Area for tourist and tourism infrastructure
(C)Sustainable Use Zone (C)(ii). Zone for Dependent community	30.6	9.2	Mainly for local community but may be used by tourists

## 7.5 Theme Plan

### 7.5.1- Habitat Management

Both the Nagi and Nakti Dam Bird Sanctuary have limited habitat diversity. There is a need to develop mosaic of habitats so that both number as well as diversity of birds will be improved.

#### 7.5.1.1 Improving the habitat for birds and other wild fauna.

For better source of nesting, breeding, basking etc there is a need of habitat management. These are the following habitat management activities which will be undertaken during the plan period.

- (i) Development of ficarium :- In ficarium mainly different *Ficus* species will be planted for better habitat of birds. Two small ficarium has already been developed at Nagi and Nakti DBS. Few more small pocket of ficarium will be developed.



Photo 7.1: Ficarium at N&MDBS

- (ii) Plantation of trees for butterflies:- one of the area may be developed as butterfly areas by planting some tree or shrub species which are important for butterflies and other insects.

- (iii) Plantation of water resistant species especially Jamun:- Water resistant species like jamun will be planted small pockets mainly near the reservoir bank for improvement in water quality and food for birds and aquatic fauna.
- (iv) Establishment of artificial snag by fixing dead dry tree, which will be used by birds for basking. Apart from that these dead wood will act as site of nesting for some birds like barbet, wood-pecker etc.



Photo7.2: Natural snag at Nagi Dam Bird Sanctuary

- (v) Artificial nest boxes on the trees for terrestrial birds will be kept for some rare bird species.
- (vi) Bar-headed geese and Grey-lag geese visits these two sanctuary area in very large number. Sprinkling of wheat in October-November in moist high ground near both the reservoir of the

sanctuary will attract and provide better habitat for Bar-headed geese and Grey-lag geese.

- (vii) Release of fingerlings only of those fishes which are naturally present in the reservoir to provide better as well as sufficient food to migratory and resident birds.

#### 7.5.1.2 Maintenance of water level and silt management

Regular bathymetry will be done of both the reservoir to know about the status of siltation and silt removal will be accordingly carried out to maintain the water level in the both the reservoir for better habitat of aquatic wildlife. Silt removal work will be done by Department of Water Resources with the permission of Department of Environment and Forest.

#### 7.5.1.3 Management of weeds

At present there is minimal aquatic weed present in the Nagi as well as in Nakti Dam bird sanctuary. There is a need of constant monitoring of weed infestation so that weed presence will be managed on time. Precautionary measures will be taken to avoid proliferation of any weeds.

#### 7.5.1.4 Provision of Quality Water

The use of pesticides and fertilizers in the surrounding agricultural fields needs to be discouraged. During religious rites and ceremonies, especially during *chatt puja*, specific sites should be identified and demarcated where religious rites and ceremonies can be conducted, while keeping the rest of the wetland area free from the polluting activities. Local people should be encouraged to use products made

from biodegradable materials for the puja. Ecodevelopment committees (EDC) along with the temple authorities should be involved in cleaning the waste generated during religious rites and ceremonies.

#### 7.5.2 Protection

Protection is most important pillar for success of any protected area. The main protection issue related to Nagi Dam and Nakti Dam bird Sanctuary is regular ingress by people for biomass resource present in the sanctuary. Majority of the ingress has been for cattle grazing, grass collection and up to some extent for fishing. Regular patrolling will be carried to check the prohibited activities.

##### 7.5.2.1 Prohibiting cattle entry, Grass Collection and Fishing:

There is a need of proper protection measures to avoid cattle entry in the sanctuary area. Apart from constant vigil cattle proof trench and fencing may be developed in some part of the boundary of both the sanctuary. Eco-development initiative in the form of providing better breed of cattle which can only be stall fed will reduce the pressure on the sanctuary. Local youth should be hired on contract basis as watchers who will help in protection.

Semi permanent protection shade will be created at few places which will be linked by temporary patrolling path. This path will also be used by bird watcher for bird watching. Peripheral fair weather road will be constructed for fast and effective patrolling.

There will be few boats, motorbikes and some bicycle for protection.

Some watch tower will be constructed at strategic locaions to check illegal trespass. These watch tower will also be used by bird watchers.

#### 7.5.3 Water Pollution

At present the water quality of both the bird sanctuary is not monitored on regular basis. But based on the physical condition it seems that water quality is quite good. Pre and post monsoon monitoring of water quality will be done every year because there is a possibility of runoff and leaching of agricultural chemicals into the reservoir.

#### 7.5.4 Issue of open defecation

Open defecation is a common issue for both these bird sanctuary. Proper awareness campaign along with providing toilet to local communities through eco-development activities will be undertaken. Open Defecation Free (ODF) scheme has minimize the frequency of open defecation but it should be totally stopped.

#### 7.5.5 Management of catchment area (Catchment Treatment Plan)

The catchment area of both these bird sanctuary is mainly forest land along with some non forest land. These non-forest lands are either government land or private land. On some of the non-forest land subsistence agriculture is practiced because of poor quality of soil and limited irrigation facilities.

These areas will be managed scientifically for the sustenance of these two wetlands.

##### 7.5.5.1 Management of forest land

- Proper soil moisture conservation measure will be undertaken.
- Organic manure like vermi-compost will be used for plantation in place of chemical fertilizer.
- Rehabilitation of degraded forest will be done by combining cultural operation with plantation.
- Grasses and medicinal plants will also be planted to minimize run off loss of soil.

#### 7.5.5.2 Management of non- forest land

On non- forest land minimal amount of agrochemicals like fertilizer, pesticides, fungicides etc should be used to maintain the chemical quality of the water of sanctuary. Apart from that soil and moisture conservation measure will also be undertaken to minimize siltation of the reservoir. These following measures will be carried out to manage non forest land.

- (i) Practice of integrated pest and disease management and integrated plant nutrient management.
- (ii) Cultivation of medicinal plants like lemon grass, etc which doesn't require much irrigation and agrochemicals.
- (iii) Promoting agro forestry and farm forestry with relatively more incentives.
- (iv) Establishment of orchards of Amla, Mango etc.

Department of Environment and Forest will support these activities through community development schemes of different lien department on priority basis.

#### 7.5.6 Development of forest Road Network

A network of well-designed fair weather forest roads can be constructed around the Nagi as well as Nakti Dam Bird Sanctuary. This road will be helpful in fast and efficient patrolling. The land of Sanctuary and forest land will be used for forest road construction. There will be a proper road alignment exercise before finalisation of forest road. These roads may be used by visitors and local people also.

### 7.6 Administrative issue

#### 7.6.1 Constitution of advisory committee

As per the provisions under section 33B (1) of Wild Life (Protection) Act, 1972 *“the State Government shall constitute an Advisory Committee consisting of the Chief Wildlife Warden or his nominee not below the rank of Conservator of Forests as its head and shall include a member of the State Legislature within whose constituency the sanctuary is situated, three representatives of Panchayati Raj Institutions, two representatives of non-governmental organizations and three individuals active in the field of wild life conservation, one representative each from departments dealing with Home and Veterinary matters. Honorary Wildlife Warden, if any and the officer-in-charge of the sanctuary as Member-Secretary”*.

The committee shall render advice on measures to be taken for better conservation and management of the sanctuary including participation of the people living around the sanctuary.

This Committee will inter alia look into the day to day affairs of the Sanctuary as well. Time to time the committee should consult the State Wetland Regulatory Authority and the Chief Wildlife Warden, especially with matters related to Development activities as listed in the Wetland Conservation and Management Rule, 2010.

#### 7.6.2 Cremation work

At present cremation work by local people is carried out all along the bank of reservoir. One small area will be earmarked for the cremation work where birds concentration in general is very low. Apart from that alternative cremation facilities will be developed on the suitable places like bank of river outside the sanctuary with the help of civil administration.

#### 7.6.3 Religious Activities like Durga Puja, Chhath Puja, emersion of idols,etc

There is a temple inside the Nagi dam bird sanctuary where local fair is organized during Durga Puja. Apart from that chhath puja is also practiced on large scale in there two reservoirs. These religious activities will be regulated.

Emersion of idols also take place after several festivals like durga puja, diwali etc. There is a need of providing alternative sites for this and this activity should be regulated with the help of local civil administration and local Joint Forest Management and Protection Committee.

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## **Chapter 8: Ecotourism, Interpretation and conservation Education**

### **8.1 General**

Nagi Dam Bird Sanctuary as well as Nakti Dam Bird Sanctuary has huge potential of eco-tourism for bird watching. But at present ecotourism, interpretation and environment education in NNDBS are at an initial level. The wetland gained prominence due to the large flocks of migratory birds arriving in these wetland each year.

*Environmentally responsible travel and visitation to natural areas, in order to enjoy and appreciate nature (and any accompanying cultural features, both past and present) that promotes conservation, have a low visitor impact and provide for beneficially active socio-economic involvement of local peoples.* (World Conservation Union (IUCN) 1996)

### **8.2 Objectives**

(a) To develop eco-tourism for recreation, education interpretation and scientific exploration.

(b) To develop love and affection for all forms of birds, wild flora and fauna and to inculcate the idea of conservation of biodiversity in the minds of the public in general and students in particular.

(C) To ensure ecologically sustainable ecotourism, which is responsive to the economically profitable for the local communities.

### **8.3 Strategies**

Effective ecotourism, require the protected area personnel be able to work closely and knowledgeably in collaboration with local people

and community leaders as well as with a wide variety of tourism industry representatives, including tourism operators, travel agents, eco guides, government tourism agencies and others. Protected area personnel must be able to guide the sometimes conflicting interests of all the ecotourism stakeholders so that they come together for the benefit of the protected area and achieve its conservation goals.

Ecotourism zone will be temporal apart from spatial. It means apart from demarcating area for ecotourism activities, area will also be set aside for different area at different season. For example row boating will be restricted in small area during season of migratory birds but the area of row boating will be enhanced during rest of the period. That is why relatively bigger area has been dedicated to tourism zone in Nagi DBS. The ecotourism zone will be further subdivided into two zone

- (a) Nature watch sub- zone.
- (b) Conservation education sub- zone.

#### 8.3.1 Nature watch sub- zone

In this sub zone eco-tourism will be allowed to observe nature particularly bird watching through nature trail or through row boats. This activity will be guided by local eco- guides. On the nature trail some bird watching huts will be developed with basic facilities of binocular, etc.

#### 8.3.2 Conservation Education Sub-zone

The main conservation education sub-zone will be only at Nagi Dam Bird Sanctuary which will offer educational and recreational opportunities within a relatively natural environment.

This zone will consist of information-cum-visitor centre, interpretation centre. This Sub-zone will be properly fenced. In this Sub-zone parking facility, basic amenities like toilet and drinking water, cafeteria cum souvenir shop, etc will be available for visitors.

## **8.4 Development of facilities**

### **8.4.1 Entry Gate**

A big entry gate with barrier and barrier shade will be constructed to regulate entry in both Nagi and Nakti Dam Bird Sanctuary.

### **8.4.2 Nature trails and other interpretative trail**

A nature trail will be developed both in Nagi and Nakti. On these trail some self interpretational signage will be fixed. Few bird watching huts will be developed on these trail so that visitors may stop for some time and enjoy bird watching from these huts.

### **8.4.3 Parking Place**

A parking place will be developed in conservation education sub-zone in Nagi Dam Bird Sanctuary. Shades of parking place may be developed by solar plate so that dual purpose of solar energy as well as parking shade can be achieved. Solar energy will be used to run the different eco tourism facilities.

### **8.4.4 Signage and temporary signs**

There is a need of well developed directional and temporary signage at Nagi and Nakti Dam Bird Sanctuary. These signage will be in coherence with the natural habitat.

8.4.5 Basic amenities centre like toilet, drinking water, cafeteria-cum-souvenir shop

All basic amenities will be developed near Nagi Dam Bird Sanctuary. These structures will be constructed as far as possible from local materials and they should depict the local village structures from outside.

8.4.6 Row Boating

Only row boating will be allowed for tourist with eco guides. Motor as well as paddle boats will not be allowed. Floating jetty will be developed both in Nagi as well as in Nakti. Initially boating facility will be managed by forest department but slowly it will be transferred to local Eco development Committees under the supervision of sanctuary management.

8.4.7 Publications

Publications would act as a means of publicity for the area and the department. Publications like brochure, leaflet, checklist of birds, identification guide of aquatic flora and fauna, posters, outreach materials, etc will be developed. Website of NNDBS will be developed on priority basis.

8.4.8 Rest areas with benches

Resting huts with benches will be developed in Nagi and Nakti Dam Bird Sanctuary. At some places covered resting areas will be also developed.

### **8.5 Nature camps**

Nature camps for school children and college students will be regularly organized in Nagi and Nakti DBS. School and colleges located in nearby town like Jamui, Bhagalpur, Munger, Patna etc will be the priority target.

### **8.6 Eco Guides**

Local educated youths from the adjoining area may be trained as eco guides. This is an effort to involve the community in tourism initiatives. At present there are not much visitors and therefore the youths may see no advantage of pursuing their career as eco guides. So, initially these eco guides will also work as watcher. However, once these facilities are developed and visitors start flowing, there would be immense opportunities for the youth. These youths can take groups of students/ visitors on a journey around the wetland. They can also be deployed to take care of the conservation education sub-zone.

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## Chapter 9: Eco development

### 9.1 Rationale of Eco-development

Eco development is a strategy to overcome such unsustainable and incompatible resource use practices by the dependent communities for their livelihood in and around bird sanctuary through regulated (sustainable and compatible) use and alternatives through participation of various stakeholders.

In wetland area role of local people is very important. If the local communities are not involved in the conservation then they often see the conservation measures as a threat to their livelihoods or resource uses. Therefore community involvement in wetland management is crucial for those attempting to ensure sustainable management of wetland resources and bird sanctuary.

There are 8 villages and 7 villages around the Nagi and Nakti Dam Bird Sanctuary respectively. At present Joint Forest Management and Protection Committees(JFMPC) are functional in these village which will act as eco development committee(EDC).

### 9.2 Objectives

- 1) To involve the fringe villagers around the NNDBS in planning, protection and conservation by generating awareness on the value of these two bird sanctuary.
- 2) Developing site specific eco-development micro-plans with the active participation of local communities.

- 3) To develop alternate sources of income to divert pressure on these bird sanctuary, while strengthening the economic condition of the villagers.

### **9.3 Strategies**

Dependency of local villagers for cattle grazing, grass collection, open defecation, cremation will be addressed properly. Some religious sentiments related to these two bird sanctuary like Chhath puja, Durga puja, emersion of idols would also be managed properly. Following activities may be undertaken as a strategy for lessening the dependency of neighboring village communities on their wetlands and ensure cordial relationship with them.

#### **9.3.1 Capacity building**

The process of capacity building has to begin with the formulation of a team comprising of the frontline staff of the Forest Department, local villagers (JFMPC members) and NGO representatives. This team will have to be trained in the microplanning process and establish linkages with line agencies. Capacity building programme will have to be decentralized so that the team could further take up the work of training the village community and other stakeholders.

The other important aspect of capacity building will be to provide skills related to livelihoods issues. For this experts from the concerned agencies will have to be involved as and when required or people from these villages will go to different places to get skill based training for self

employment. After the skill development proper support will be provided for their self employment.

### 9.3.2 Micro planning and Local livelihood issues

The process of micro planning has to focus particularly on initiating alternative livelihood options compatible with the conservation initiative of these two bird sanctuaries. The micro-plans for Joint Forest Management and Protection Committee named Nagi, Tarakura, Chhapa and Karma, etc of Nagi Dam Bird Sanctuary and Joint Forest Management and Protection Committee named Bhelbinda, Baijala, Kathbajara and Phokasa, etc of Nakti Dam Bird Sanctuary will have to be prepared. Micro-planning process should provide flexibility and space to the dynamic needs and issues of the area. Therefore, it is suggested that the micro-plans should be revisited periodically, in a participatory manner, so as to modify the existing activities or incorporate the designed ones, keeping in mind dual benefit of the community and protection of these bird Sanctuaries. This exercise of re-looking the micro-plans may have to be done at an interval of every two-five years. Sustainability of the livelihoods will have to be addressed by not only providing benefits of income but also strengthening institutions (JFMPCs, SHGs, Nature Clubs, etc.), building some physical assets as well as generation of social capital. Management of community development fund for JFMPCs will be an important aspect of the programme.

### 9.3.3 well defined role in protection

The JFMPCs in Nagi and Nakti Dam Bird Sanctuary will always keep in focus on involvement of local people in the protection work. In fact, the JFMPC members should ultimately become the main string of protection for these bird Sanctuary in association with forest staff. The eco guides and other user groups will have to play a very important role in protection, even when there are no tourists. Such arrangements will be worked out by the Sanctuary management. In monitoring also, involvement of other stakeholders will be necessary so, as to make the process transparent.

### 9.3.4 Viable Agricultural land use practices like medicinal plant cultivation Agro forestry/Farm forestry/Orchard Development

There is a need of adopting alternate viable land use for arable land. Agro forestry and Farm forestry is quit successful in this area Present Agro forestry scheme of forest department with better incentive may be undertaken in these areas. Cultivation of dryland medicinal plants, orchards etc may be started with the help of lien departments.

## 9.4 Village level strategies

Village level strategies are very important to target the local issues effectively and efficiently. The main challenge for the management of these Sanctuaries is ensuring protection, strengthening the livelihood opportunities of local people and linking the benefits of wetland conservation to the local communities. To develop and nurture such an arrangement, the process of eco-development needs to spread over a

reasonable period of time in which various concurrent actions may be initiated.

The immediate eco development actions/ activities will comprise of the following:

- 1) Making JFMPC more functional and viable.
- 2) Initiate the micro planning process JFMPCs wise in the fringe villages
- 3) Implementation of entry point and support programme activities.
- 4) Provide alternative livelihoods to the local people including promotion of ecotourism.

#### 9.4.1 Proposed Eco-development Activities

##### 9.4.1.1 Entry Point Activities

- Approach road for hamlets
- Community Hall and JFMPC office
- Fish culture in Community Pond
- Small Irrigation Facilities
- Drinking Water Facility
- Medical and Veterinary Camp, etc

##### 9.4.1.2 Income Generation Activities

- Dairy farming, Poultry Development
- Improvement in Cattle breed
- Development of Eco tourism and village tourism

- General Shop, tailoring shop with machine.
- Promotion of local handicraft, etc

#### 9.4.1.3 Skill Development and Training

- Eco Guide training in Bird and identification of major flora and fauna
- Training for skill development for self employment.
- Exposure visits of JFMPC members and staffs.

#### 9.4.1.4 Alternative for Biomass

- Installing alternate fuel source such as bio-gas plants and fuel efficient chullahs.
- Provision for LPG at subsidised rate
- Production of fuel and fodder from nurseries and field bunds, etc

#### 9.4.1.5 Agricultural Developmental Works

- Plantation of fruit species.
- Promoting organic farming.
- Providing agricultural equipments at subsidised rate, etc
- Integrated part and Disease management.
- Integrated nutrient management.

## 9.5 Monitoring and Evaluation

The JFMPCs should have in-built monitoring and evaluation mechanism so as to ascertain the progress in the right direction and also to keep the ongoing activities in the right track through timely corrective measures. Monitoring team should be comprised of Protected Area personnel, representatives from Joint forest management and protection committee and member of related NGOs. Monitoring formats should be prepared regularly and submitted for regular checking. The progress of the activities will be evaluated on the basis of set indicators. Broadly the monitoring indicators could be:

**Ecological:** Bird numbers and species, water quantity and quality, water depth, area under invasive species.

**Socio-economical:** Dependency of people on the wetland, access to basic amenities, alternate sources of income.

**Institutional:** Working of the JFMPCs, conflict resolution mechanisms, involvement of line agencies, adhering to mutual agreements. Proper monitoring and Evaluation is very important for sustainable functioning of Joint forest management and protection committee.

Community participation is very important for successful and sustainable management of these two bird sanctuaries.

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## Chapter 10: Research, Monitoring and Training

Research, monitoring and training has had a very low priority in Nagi and Nakti Dam Bird sanctuary. There is not even baseline data related to N&NDBS. To improve the aquatic ecosystem and conserve its values and services, scientific research and monitoring should be a regular feature. Efficient monitoring practices need to be formulated and put in place. The research and monitoring activity should cover the various aspects of wetland conservation, viz., water quality, water depth, soil quality, biodiversity values of flora and fauna including important bird species, impacts of siltation etc. Social monitoring also needs to be done to assess the socioeconomic conditions of the local communities and their dependency on the wetland as well as their participation in wetland conservation.

Research and monitoring will be done through consultancy with universities, institutes and contractual arrangements. Because of very small area of these two bird sanctuaries there is no need of any separate research and monitoring wing for N&NDBS.

Population dynamics of birds and aquatic flora and fauna, migratory routes and seasonal migration of birds will be the main thrust area of research and monitoring.

### 10.1 Objectives

- i. To make the management strategies more practical and scientific.

- ii. To develop interest in research in Nagi and Nakti Dam Bird sanctuary among different researchers especially researchers of nearby institutes and universities.

## 10.2 Topics of Research

There are the following topics of research but such important research topics which may be modified or new topics may be undertaken based on need or due to any unforeseen issue.

- i. Microbial ecology of lentic/lotic.
- ii. Communicable disease specially bird flu and health monitoring in both migratory and resident birds and nearby poultry birds .
- iii. Ecotourism strategy.
- iv. Impact of human activities on Nagi and Nakti Dam Bird sanctuary.
- v. Carrying capacity of the Nagi and Nakti Dam Bird sanctuary for migratory birds.
- vi. Impact of water level on biodiversity especially Birds.
- vii. Migration and seasonal movement of birds
- viii. Socio- economic study of local communities and their dependency on the wetland.
- ix. Preparation of checklist of butterflies.

These topic of research is not exhaustive but indicative. Other research activities may also be taken based on need of these two bird sanctuary.

### 10.3 Monitoring

Monitoring through a consistent set of measure would be periodically carried out. Monitoring of biodiversity habitat, weeds, environment, wildlife health, soil quality, water quality and social aspects will be done on regular basis.

#### 10.3.1 Biodiversity monitoring

- Monitoring of aquatic flora
- Monitoring of weeds
- Monitoring of aquatic fauna
- Monitoring of water bird diversity
- Monitoring of butterflies and other insects

#### 10.3.2 Environmental monitoring

- Water quality – physical, chemical and biological properties on regular basis twice in year may before & after rainy season.
- Soil quality once is 3-5 years
- Bathymetry – Bathymetric profile of the reservoir and bathymetric map will be prepared.

#### 10.3.3 Habitat Monitoring

Regular habitat monitoring will be done for long term protection and conservation of biodiversity.

Study of regular satellite imageries of sanctuary with catchment area will be done to monitor habitat.

#### 10.3.4 Wildlife health Monitoring

Wildlife health monitoring of migratory birds, resident birds and nearby cattle, poultry from nearby villages will be carried on regular basis.

#### 10.3.5 Social Monitoring

- Socio- economic conditions of dependent community and nearby villages
- Biomass extraction from these two sanctuaries and value addition as well as possible alternatives.

### **10.4 Training and capacity building**

Expertise for training and capacity building in various fields of scientific study, monitoring and research are available within the country. Short term training programmes will be held for various target groups including field staff managers and decision makers, local NGOs and community groups. Training on bird count, vegetation identification, rescue and aid of birds, etc. can be provided. A cadre of trained technical staff should be developed for trend analysis of water bird populations in relation to habitat features. Specific training programmes will be developed in collaboration with research institute/organisations for assessment of bird migration and understanding the constraints in their pathways. Protocols for water bird census should employ the scientific methodology emphasizing visual

census, line transect method, counting nests in colonies and block methods.

Research and training along with monitoring will play a major role in forward looking approach for N&NDBS.

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**Chapter 11: Organisation and administration**

**11.1 Structure and responsibilities**

Both these sanctuaries are under administrative control of APCCF-Cum-CWLW, Bihar. Direct administrative and management activities are carried out by the Jamui Forest Division. There is no exclusive staff for Nagi and Nakti Dam Bird sanctuary. Territorial staffs of Jhajha beat and Borwa beat of Jhajha Forest Range performs the duty of Nagi and Nakti Dam Bird sanctuary respectively.

There is a need of properly organized administrative setup for Nagi and Nakti Dam Bird sanctuary which will work under Jamui Forest Division. A new range for N&NDBS will be constituted with its head quarter at Jhajha.



Table 11.1: No of proposed posts for Permanent Staff

S. No	Name of Post	Proposed No of Posts
1	Range Forest Officer	1
2	Forester (Beat Officer)	2
3	Forest Guard	5

Table 11.2: No of proposed posts for Contractual Staff

S. No	Name of Post	No of Posts
1	Ecotourism Manager	1
2	Watcher	6
3	Boat Man	4
4	Helper	2
5	Driver	1
6	Computer Operator	1
7	Range Assistant	1

These contractual staffs will be local as far as possible.

### 11.2 Financial implications of dedicated staff

Approximately annual expenditure on proposed permanent staff and contractual staffs will be ₹ 23.2 lac and ₹ 15.36 lac respectively. So, total expenditure on human resource will be ₹ 38.6 lac per annum initially.

Financial proposal for dedicated staff for Nagi and Nakti Dam Bird Sanctuary has been given in Annexure-VIII.

### 11.3 Staff amenities

Amenities for Range Officer will be developed at existing forest campus of Jhajha. There will be a joint staff campus for both Nagi and Nakti Dam Bird Sanctuary. The location of this campus will be in between these two sanctuaries. In this campus amenities for staff welfare will also be developed.

Better and dedicated human resource will certainly lead to better and scientific management of these two bird sanctuaries.

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