

## CHAPTER – I

### DETAILS OF THE SANCTUARY AREA

#### 1. Introduction of the Area

Tirunelveli district is blessed with many irrigation tanks. Most of these tanks store the rain water or dam water and then this water is used for irrigation purpose. In Koonthankulam village of Nanguneri Taluk, two tanks namely Koonthankulam and Kadankulam. Every year thousands of migratory & resident birds visits Koonthankulam Sanctuary. These birds are protected by the villagers of Koonthankulam village for the past five generations.

These wetland-Terrestrial birds nest not only inside the tanks but also in the backyard trees of houses in the village lands and in other village ponds. In 1994, this wetland complex area was declared as Koonthankulam Bird Sanctuary and then onwards Forest Department started paying more attention towards the protection of Wetland-Terrestrial birds and improvement of its habitat. For effective management of the area, a detailed Management Plan for this sanctuary is prepared with a view to develop this tropical fresh water wetland complex to its full potential as one of the finest bird sanctuaries in the country.



#### 1.1. Name

The sanctuary is called as ‘KOONTHANKULAM BIRD SANCTUARY’. It consists of two adjacent freshwater wetlands that act as buffer irrigation tanks for the water released from Manimuttar Dam, which is a part of Thamiraparani Canal System. The bird sanctuary, covering an area of 129.33 hectares is located at Koonthankulam Village on the Tirunelveli-Thisayanvilai Road in the Nanguneri Taluk of Tirunelveli District in Tamil Nadu.

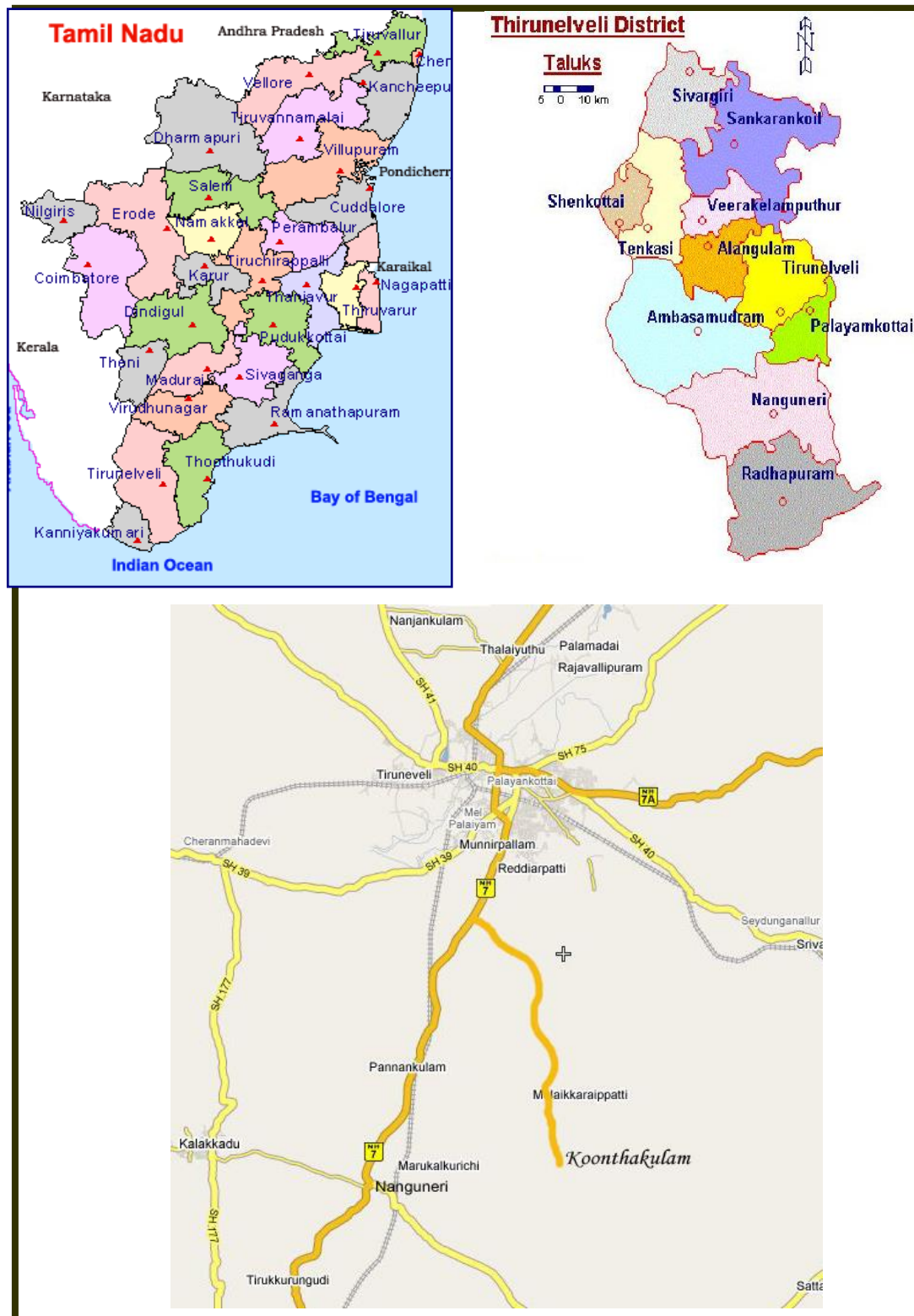
The wetland complex was constituted as a sanctuary vide G. O. Ms. No. 301 Environment and Forest (FRV) Department dated on 30.11.94 for the purpose of protection, and development of wildlife and its environment with effect from the date of publication of the notification in the Tamil Nadu Government Gazette.

## 1.2. Location

The latitudinal and longitudinal extent of the sanctuary is as follows

Latitudinal extent : 8° 29' N to 8° 30' 15" N

Longitudinal extent : 77° 45' E to 77° 51' 30" E.



**Fig.1. Location of the Koonthakulam Bird Sanctuary**

### 1.3. Constitution and Extent

This sanctuary consists of two buffer irrigation tanks namely Koonthankulam tank (71.02 Ha.) and Kadankulam tank (58.31.0 Ha.). These two tanks are covering a total extent of 129.33 Ha has been declared as “Koonthankulam Bird Sanctuary” under sub section (1) of section 18 of the wildlife (Protection) Act 1972 (Central Act 53 of 1972) vide G.O.Ms. No. 301 Environment & Forests (FR V) Department dated 13.11.1994.

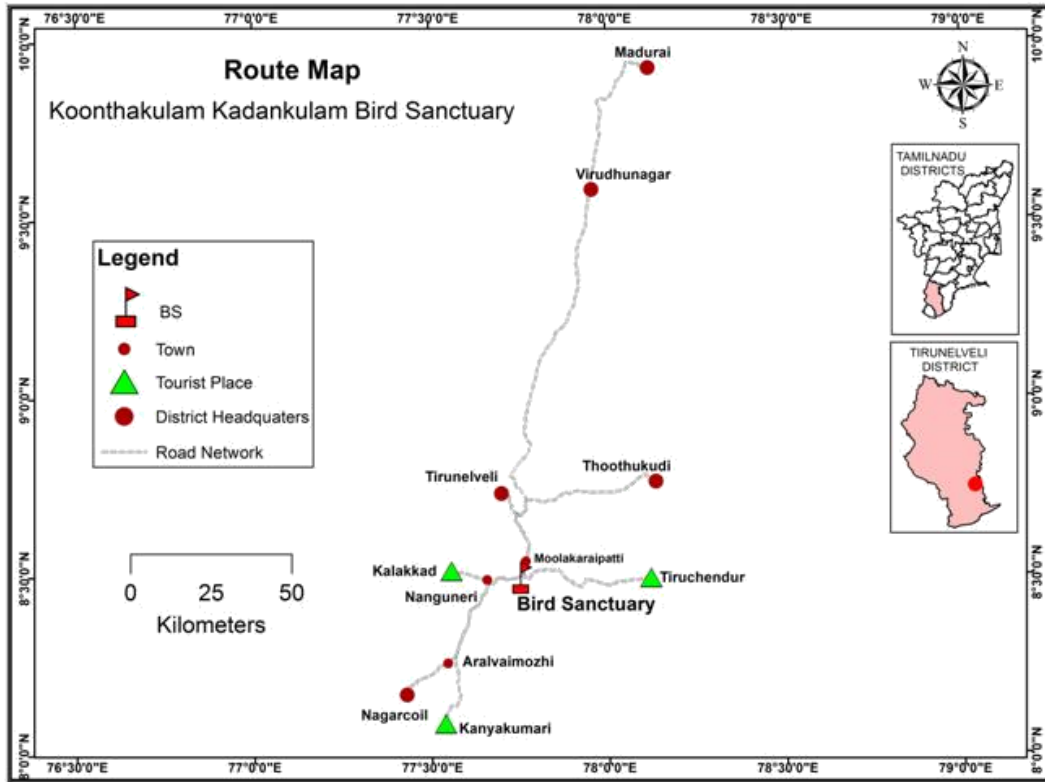


**Fig.2 Map of Koonthankulam and Kadankulam Tanks**

### 1.4. Approach and Excess

Being situated on the Tirunelveli – Thisayanvilai Road, is easily accessible by road. Tirunelveli is about 35 kms from the bird sanctuary by road. The nearest railway station is Nanguneri, which is 19 kms away. There are no roads inside the sanctuary but the area being very small it is accessible by foot along the bund on one side of the Koonthankulam wetland and on the other side is the village road leading to Moolakaraipatti. The two water bodies, Koonthankulam and Kadankulam are separated by private paddy fields.

- Nearest Airport - Thoothukudi (70 Km.)
- Nearest Railway Station - Nanguneri (19 Km.)
- By Road Tirunelveli - 35 Km.



**Fig.3.Route map of Koonthankulam bird sanctuary**

## **1.5. Accommodation**

The nearest town in the vicinity of the sanctuary is Tirunelveli, which has all facilities for Hotel accommodation and Transport services. Government Circuit House is available at Tirunelveli. For officers and keen bird watchers, there is also a small 2 suite Forest Rest House constructed by the Forest Department in the vicinity of the Sanctuary.

## **1.6. Statement of Significance**

It is an important protected area known for the congregation of migratory and local aquatic birds. It consists of two irrigation tanks Koonthankulam (71.02 ha) and Kadankulam (58.31 ha) attracting important birds like Grey pelican, Painted stork, Larger flamingo, Bar headed goose, Open bill stork, Black Ibis and other common species like Egrets, Cormorants, Herons, etc.

The Koonthankulam wetlands, being linked to the Manimuthar irrigation canal, receive regular water supply for cultivation of paddy by the local farmers. Many large aquatic birds, especially the Painted Stork and Grey Pelicans have been annually nesting around Koonthankulam village for a long period.

In Koonthankulam and Surrounding areas 30 species of water birds and 66 species of terrestrial birds are breeding. Koonthankulam bird sanctuary is a century old heronry with a recorded history. It is also the only traditional colony of the Spot-billed Pelican, which appears to have been in existence for well over a century. Tamil Nadu is the only state where all the three ibis species nest together and all the three species have been recorded at Koonthankulam. Currently after the extension of breeding area of birds from the village habitations to nest on partially submerged *Acacia* stands in the village tank close by, Koonthankulam now has 15 nesting species. At Koonthankulam, birds used to nest traditionally on trees growing amidst habitation even before 1903. The number of nesting species and also the number of birds visiting Koonthankulam have increased since the main breeding site was shifted to the tank close by. In terms of numbers, Koonthankulam is the fourth most populous heronry of the state (Subramanya, 2005).

Nesting of birds commenced inside the wetlands only after *Acacia nilotica* trees were grown in the shallow areas of the Koonthankulam tank by the Tirunelveli Social



Forestry Division of the Tamil Nadu Forest Department. As the trees started growing, more and more birds started visiting and nesting and this resulted in attracting wildlife tourism. Being situated on the Tirunelveli to Thisayanvilai Road the sanctuary, the sanctuary attracts large number

of visitors during the summer vacation. This period coincides with the active breeding season of many of the large aquatic birds and is a major tourist attraction.

It is significant that the local people are interested in protecting the sanctuary. The role of the local eco-friendly villagers is of exemplary order which needs to be appreciated. Koonthankulam is a revenue village having total house holds of about 950 families. The major occupation is agriculture and



labour work. Most of the villagers are not very economically well-off but they have very strong social bonding and close healthy interactions. The people of entire village cooperate in protecting the birds. The birds and local villagers live in a total symbiotic relationship. The birds feel so protected in this village that they make their nest on the roof of houses or trees near by. And this is happening every year.

All the villagers are having a strong belief that birds coming into their village brings good fortune to the villagers other than the direct benefit received from enough droppings of the birds – ‘guano’ which makes their agricultural lands fertile and increases the yield by many folds. But, initiation of this symbiosis began actually

because of the *Acacia nilotica* trees of the existing plantation which have been used as nesting trees and the presence of water and fishes as food, all of which is a favorable combination. Koonthankulam heronry is known to be zealously protected by the villagers. Also, when the *Acacia* (Karuvellam) stand in the tank was scheduled to be cut down at Koonthankulam, the villagers protested and prevented such a move. Similarly, a prolonged stay of birds in the village is considered as an indication of a good cropping season (Subramanya, 2005).

Both the water storage tanks i.e. Koonthankulam & Kadankulam gets water from Tamiraparani canal system through Manimuttar Dam in a routine periodical turn. These tanks come in 3<sup>rd</sup> reach of the canal system and water is released every alternate year in case of proper monsoon and if water level of dam is above 85-90 ft. The reason for water release above certain level is that, the Sanctuary tanks are at much higher elevation than the main canal and water reaches the tank, only when there is enough pressure which is noted with water level above 85-90 ft by past trials. The depth of the tanks is also not very deep.

The locality is situated in rain shadow zone of Tamilnadu, therefore water availability in these tanks is not perennial and is unpredictable. Sufficient water storage and perennial character can ensure the sustainability of the bird sanctuary, otherwise reduction in arrival of birds cannot be overruled. And it so happened during 2012 & 2013 that, flagship species have not visited the tank after their preliminary visit which was noted during Aug-Sep because of monsoon failure as well as no water release from Manimuttar dam. Only local and non-nesting birds have visited the Sanctuary for 2 years now, which highlights the issue in the Sanctuary. Efforts have been taken to get a G.O issued for water release to the Sanctuary every year irrespective of reach which should be followed up. And that will be a reality only if there is proper monsoon and dam water is of required level.

If the water scarcity due to monsoon failure and supply of water from dam is addressed, every year arrival of bird can be ensured and this sanctuary will continue to attract thousands of birds, bird watchers and nature lovers.

## **CHAPTER II**

### **BACKGROUND INFORMATION AND ATTRIBUTES**

#### **2.1 Boundaries**

##### **(I) Survey Number 62 and 64 of Koonthankulam Village.**

**North:** Northern boundary runs along the Southern and Eastern side of the SF No. 63, Southern side of SF Nos 26 and 27 of 42, Koonthankulam Village.

**East:** Eastern boundary runs along the Western side of SF Nos 61, 65, 66, 69, 70, 71, 72, 73 and 146 of 42 Koonthankulam Village.

**South:** The Southern boundary runs along the northern side of the SF Nos 147 and 161 of 42 Koonthankulam Village.

**West:** Western boundaries runs along the eastern side of SF Nos 324 Southern side of SF No 328, Southern and Eastern side of SF Nos 272, 271, 270, 269, 268, 267, 266, 262 and 263, 242 Koonthankulam Village.

##### **(II) Survey Number 157 of Koonthankulam Village and SF No 254 of Kadankulam Village.**

**North:** Northern boundary runs along the Southern side of SF Nos 156, 155, 154, 139, 138, 137, 136, 134, 133, 132, 131, 130 of 42 Koonthankulam Village. Southern side of SF No 40 southern and eastern side of SF No 41 of 42 Koonthankulam Village. Southern side of SF No 300, 299, 298 and 290 of 41 Kadankulam Village.

**East:** Eastern boundary runs along the western side of SF Nos 289A, 288, 287, 286, 285, 284, 271 and 267 of 41 Kadankulam Village.

**South:** Southern boundary runs along the Northern side of SF Nos 260, 259, 258, 250, 251, 252, 253 of 41 Kadankulam Village.



**West:** The western boundary runs along the Southern and Eastern sides of SF No 158 eastern side 160 and 161 of 42 Koonthankulam Village.

## **2.2. Geology Rock and Soil**

The area is covered with unclassified crystalline rock of igneous origin, which has subsequently changed to metamorphic rock. Granitoid gneiss forms the parent rock, red soil covers the area. However, tanks area has black coloured loamy-clay soil. The soil in the tank is deep. There are of two types, Black Cotton Soil and Sandy Soil. Result of soil analysis are recorded in Table No. 11.

## **2.3. Terrain**

The terrain is flat with a gentle slope from the north of the sanctuary towards south. The altitude of the area is about 60 MSL.

The altitude from the Dam to the Sanctuary tank through feeder canal is at higher elevation which requires higher water storage and release.

The altitude of the sanctuary tank is higher than that of the feeder canal from Dam and therefore mechanism for storage of water at a higher level and release to the tank has to be done. The topography of Koonthankulam is generally flat, located at an elevation of 60 m MSL. The Sanctuary represents an inland type of wetland. Such kinds of wetlands are most common on floodplains along rivers and streams (riparian wetlands), in this case Tamirabarani river. As it is an inland wetland; it does not show the presence of structures like beach/shoreline/sand dune/ mud flats, etc. The sanctuary encompasses floodplain and agricultural ecosystems. This wetland is part of a wetland complex. The tanks nearby that form a part of the complex include Ariyakulam, Hanumanpudukulam, Silayam, Kannan kulam, Man kulam, Padakkam, Kudankulam, Eduppal kulam, Arumuganeri and Kadambankulam. Agriculture is the main land-use around the sanctuary and the predominant vegetation recorded is *Acacia nilotica*. The sanctuary falls under Eastern Ghats And Tamil Nadu Uplands (8.1) category as defined by ICAR.

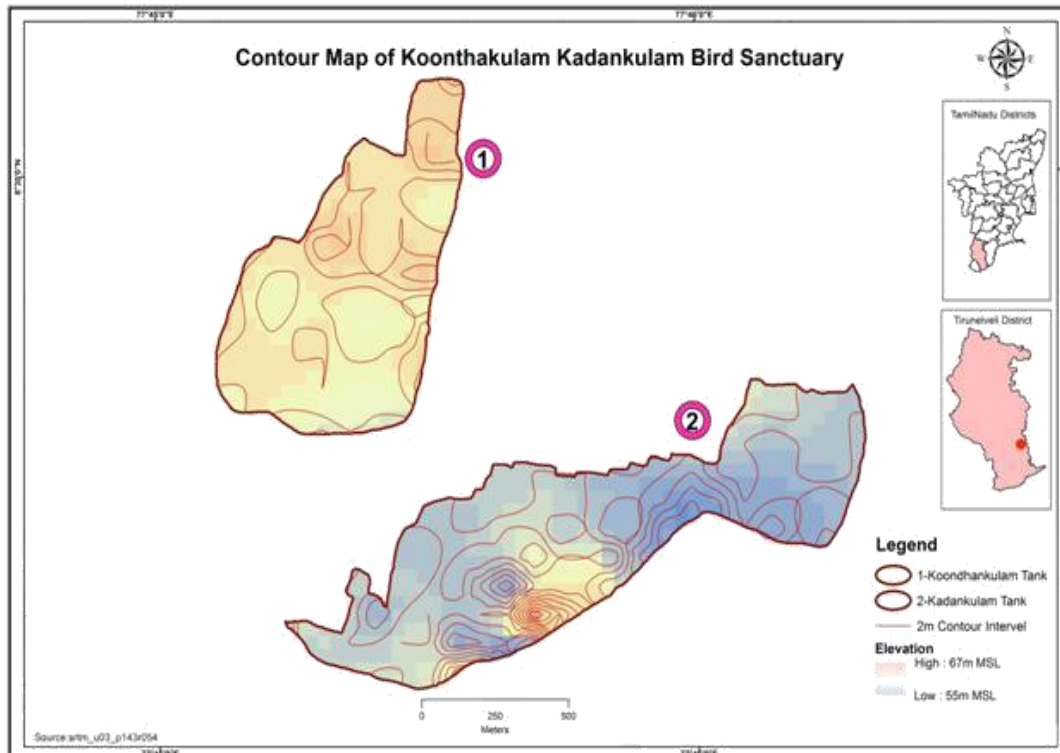


Fig.4. Contour Map of Koonthakulam Bird Sanctuary

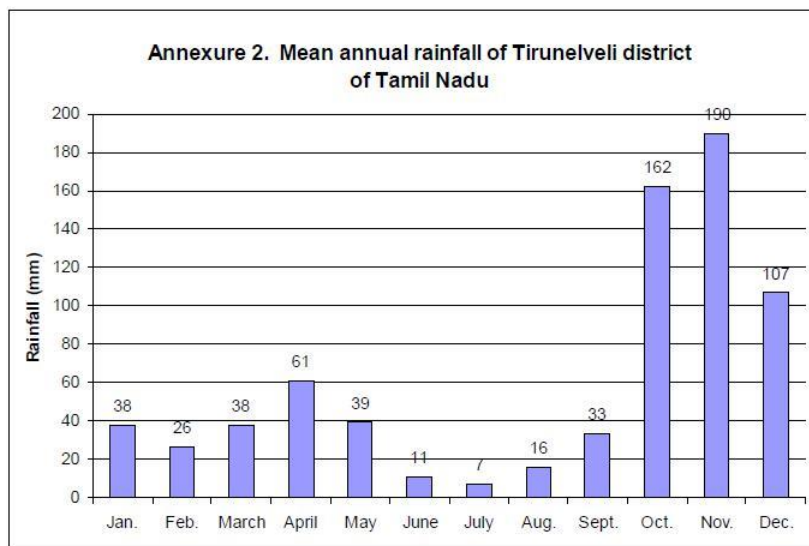
## 2.4. Climate

The climate generally is hot and dry. The sanctuary is located in tropical dry climatic zone of India. The hot months are from March to July with maximum temperature ranging from 30.7° C to 38.1°C. The cold months are November to January. North-East monsoon is between October and December. The period from May to June is generally hot and dry. The average minimum and maximum temperature are **22.9°C** and **33.5°C** respectively. The weather is quite hot in May and June and the maximum temperature sometimes reaches 45°C.

The period from November to January is the coolest part of the year with the mean daily maximum temperature of about 30 to 31 degree Celsius in the interior parts. The mean daily minimum in these months is about 22 to 23 degree Celsius in the district in general. The relative humidity in general, during the year, is between 55 and 65 percent, except during the northeast monsoon season, when it is over 65 per cent. Wind pattern is generally light to moderate in strength. Between May and September winds are mainly north westerly or westerly while from October to February winds are mainly north easterly or northerly.

### 2.4.1. Rainfall Pattern and Distribution

This area receives rainfall mainly from the North-East monsoon between September and December. The average annual rainfall of this area varies from 750 mm to 850 mm. The Sanctuary receives rain under the influence of both southwest and northeast monsoons. The northeast monsoon chiefly contributes to the rainfall in the district. During the southwest monsoon season, rainfall is more in the western parts of the district. November is generally the rainiest month.



**Fig.5. Rainfall Pattern in Koonthankulam Bird Sanctuary**

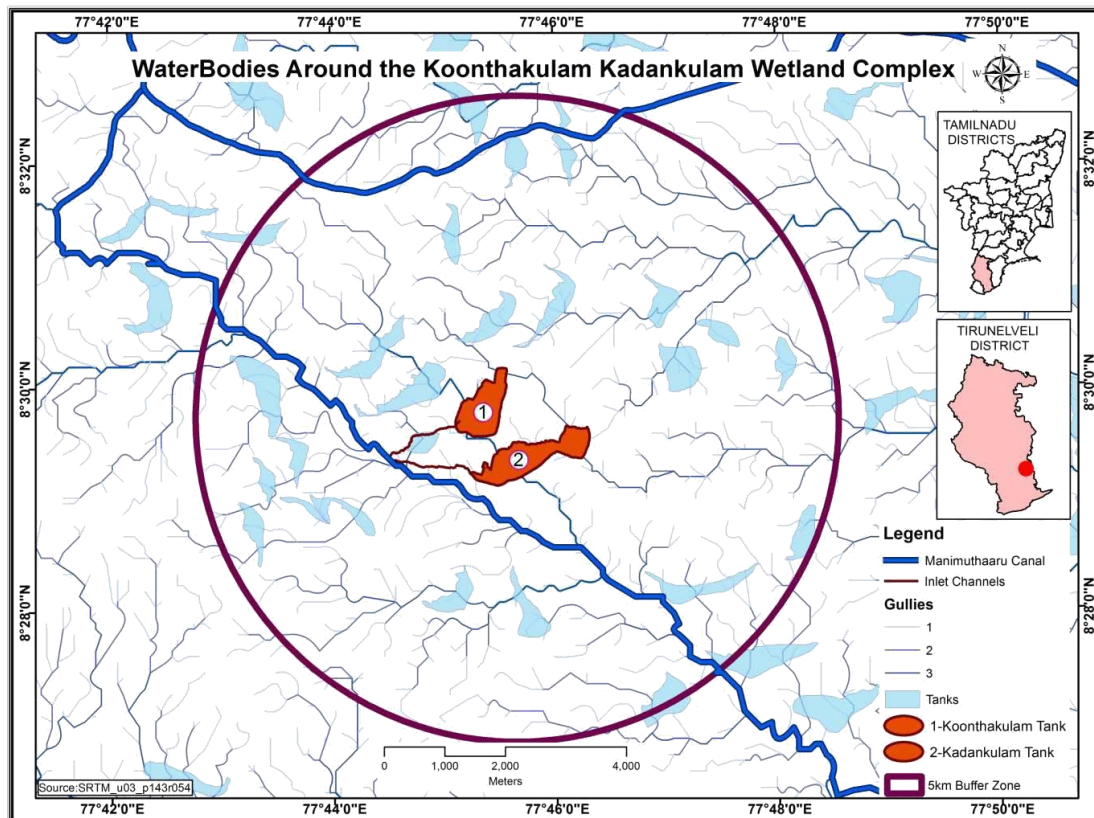
### 2.4.2. Temperature

This area experiences the hottest period from March to July. The average maximum temperature of the whole year is about 34<sup>0</sup> C and the average minimum temperature is 30.7<sup>0</sup>C. During the peak summer season, the maximum temperature reaches 38.1<sup>0</sup>C.

### 2.5. Water Sources

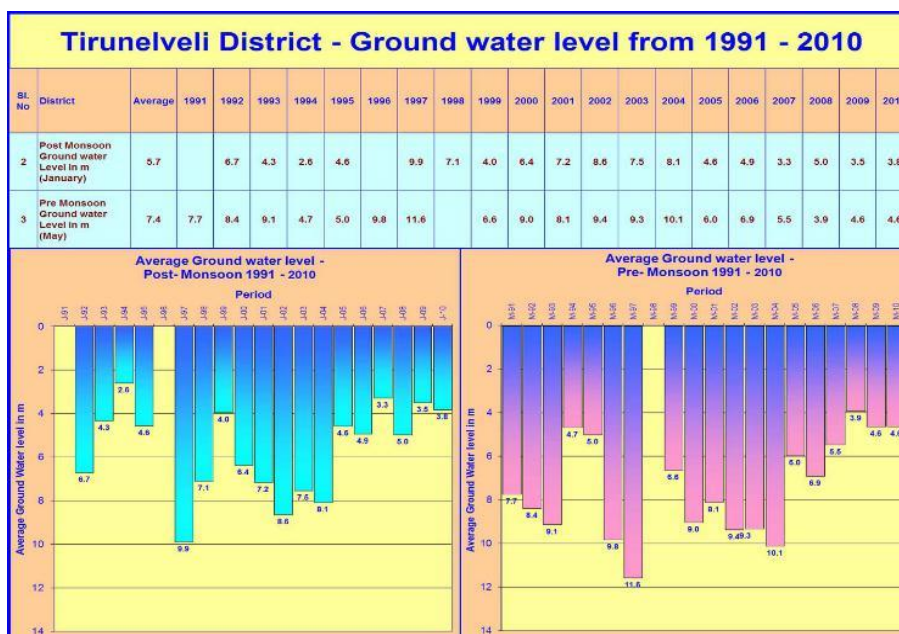
The Koonthankulam wetlands, being linked to the Manimuthar irrigation canal, receive regular water supply for cultivation of paddy by the local farmers. It was under the control of Public Works Department, after the declaration of the tanks as Koonthankulam Bird Sanctuary it is now under the control of Forest Department. The

water stored in the tanks is used for irrigating the adjoining agricultural lands. The tanks receive regular water supply (once in two years) from the Manimuttar Irrigation Canal System in addition to the rainwater available from the monsoon.



**Fig.6. Water bodies in and around Koonthakulam Bird Sanctuary**

**Groundwater-** Ground water quality of phreatic aquifers in Tirunelveli district, in general, is colorless, odorless and slightly alkaline in nature. The quality of formation water in the fractured aquifer varies from place to place. Electrical conductivity in major parts of the district is less than 2000  $\mu\text{S}/\text{cm}$  at 25°C. The quality of groundwater in porous formation shows variations with depth. According to Central Ground Water Board report, the ground water is suitable for drinking and domestic uses in respect of all constituents except in few places which have higher concentration of  $\text{NO}_3$  than the BIS permissible limit.



**Fig.7. Ground water level in Koonthankulam Bird Sanctuary**

### 2.5.1. Status of Feeding Channel

The Koonthankulam wetland was historically carved out as an irrigation tank, at the lower reaches of a cascade that is typified by a southward drainage and is comprised of the following wetlands: Ambalakulam, Ariyarkulam, Aayarkulam, Aramneri, Kannankulam to eventually end in Koonthankulam. Unlike other wetlands of the state, the discharge along the cascade is not limited to structured outlets but is largely as an outflow of the surplus. The Koonthankulam Bird Sanctuary hence functions as a final capture tank as well as a sink of the wetlands of the cascade. This unique functionality of the system has rendered a rather stable character to Koonthankulam both in terms of water holding and productivity, thereby contributing to the role of the wetland as a heronry. This system however has not been operational for the following reasons: lower levels of rainfall over the last few years, lack of maintenance of the upper reach wetlands and the extraction of higher volumes of water for cultivating the hybrids. It is however to be stated that while the landscape has always had the practice of cultivating paddy, rainfed longer duration varieties were cultivated in the past as opposed to the hybrid short duration paddy varieties that are currently being cultivated.

Kadankulam tank is fed by a branch of the Manimuthar canal after the Karungal moderator, which feeds the Vijayanarayanam wetland. Hence while the overall inflow to both the wetlands through the Manimuthar system is from the same south westerly direction, the channels are distinct. In addition to the two systems that supply water to KBS, the third source is the monsoon, notably the North-East monsoon. As per the news reports it is also proposed to connect the Koonthankulam and Kaadankulam tanks, with the 73-km-long flood carrier channel being dug to take the surplus water of the Tamirabharani, Karumaeniyar and Nambiyar to dry areas of Nanguneri, Thisaiyanvilai, Radhapuram and Saattaankulam with the help of Public Works Department, which is executing the flood carrier channel project.



**Fig.8. Forage tanks of Koonthankulam bird sanctuary**

## 2.6. Range of Wildlife, Status, Distribution and Habitat

### 2.6. Flora

The Koonthankulam Bird Sanctuary consists of open wetlands and agricultural area; hence as such no wooded forest is present here. Other trees observed in this area include *Azadirachta indica*, *Ficus religiosa*, *Tamarindus indica*, *Terminalia catappa*, *Pongamia pinnata*, etc. Aquatic vegetation includes many species of sedges (*Cyperus*), *Aponogeton*, *Pistia*, etc. *Biophytum poterioides* is an uncommon herb found in the sanctuary. The *Acacia nilotica* plantation spanning 35 ha in Koonthankulam is the main breeding ground for aquatic birds and for heronry. Growth of *Prosopis juliflora* is seen in some areas. The main wooded vegetation of the sanctuary consists of *Acacia nilotica* plantation in Koonthankulam wetland that was raised under the Social Forestry scheme during the year 1980 (35.50 ha).

*Apart from woody vegetation, these wetlands have several species of aquatic vegetation that are a great attraction to many resident as well as migratory aquatic birds that visit this sanctuary and fortunately, no aquatic weeds are found here.*

Check list of flora is furnished in Annexure.I

### 2.7 Fauna:

Koonthankulam Bird Sanctuary is abound with mammals like Mongoose, Palm civet, Black naped Hare, water snakes, Cobra, Sand boa, lizards and Frogs etc.,

Apart from some major vertebrate species found here which are found in and around the tanks, there are also a number of micro and macro organisms present in the water which is fed on by birds.

#### a. Common Mongoose (*Herpestesedwardsi*)



It's commonly found in the open scrub, cultivated land and rocky patches. The occurrence of over 23 numbers of the species is reported from the sanctuary area (Wild life Census data 2018)

## **b. Black Naped Hare (*Lepus nigricollis*)**

In Koonthankulam Bird Sanctuary, the black-napped hares are commonly sighted in open areas. Presently there are more than 76 wild hares in the sanctuary.

### **2.8. Habitat:**

#### **2.8.1 *Acacia nilotica* plantation**

*Acacia nilotica* extending over an area of 35.50 ha was raised on the western side of the sanctuary by Social Forestry Division during 1993. The *Acacia* trees in the tank serves not only as nesting sites for the breeding birds, but also as roosting ground for the non-breeding birds early in the season and safe perches for the growing young.



#### **2.8.2 Mounds**

Nearly twenty mounds were created in the Koonthankulam tank. It was observed that while some mounds were covered with *Acacia nilotica*, few mounds were infested with *Prosopis juliflora*. The mounds are used as breeding sites for a number of species that nest on the ground. Grasses growing naturally on these mounds and mud patches provide suitable habitat for ducks like Bar headed Goose, comb duck, black winged stilt, common teals, Garganey and pintails.



#### **2.8.3. Deep open water**

It attracts diving aquatic birds such as coots, cormorants, grebes, Pelicans and some ducks which dive for bottom-dwelling animals or aquatic vegetation. The southern side of the wetland is a low lying area which retains water up till the month of March when almost the whole of the sanctuary dries up. Bar-headed geese were observed even



in the month of March using the patch of water in the sanctuary in the southern and south-eastern part of the sanctuary. A small meandering channel has been dug out by the Forest Department connecting these low lying areas of the sanctuary extending from the southern end to the middle of the wetland. A square dug out pond was observed in the middle of the sanctuary.

#### **2.8.4. Dead tree trunks**

Nearly hundreds of dead trees trunks were present throughout the wetland. They are ideal perches for birds like herons, cormorants, darters and pelicans.

#### **2.8.5. Shallow water**

Shallow water areas are rich feeding areas for invertebrate feeders such as spoonbills, ibis, stilts and sandpipers.

#### **2.8.6. Open grasslands**

Open areas covered with grasses in wetlands are used by birds like Pond Heron, Egrets, Black Ibis and Spoonbills for foraging. Terrestrial birds like yellow wattled lapwing, Red Wattled Lapwing, Black winged Stilt, Black drongo, Ashik ground Sparrow lark, Stone curlew, Golden Oriole, Pied Wagtail, White-browed fantail, Magpie robin, Blue-tailed bee-eater were also observed at the sanctuary.

### **2.9. Bird Diversity**



Koonthankulam is one of the oldest known heronries in India, having existed for over 100 years more. The Sanctuary is visited by large number and variety of resident and migratory water bird species. The migratory birds start arriving in the sanctuary at the time

of North-East Monsoon. The globally threatened Spot-billed Pelican breeds here, along with other birds. In the early 1990s, about 1000 Spot-billed Pelicans were recorded while in 2003 only about 452 Spot-billed Pelican were recorded breeding. Besides the Spot-billed Pelican, Painted Stork breeds in the village trees in large numbers, sometimes on the trees inside the tanks habitation. Greater Flamingoes also build nest mounds here, though breeding has not been confirmed. Other birds recorded here include Asian Openbill Stork, Oriental White Ibis, Black Ibis, Glossy Ibis, Eurasian Spoonbill, Little Cormorant, Pond Heron, Grey Heron, Black-crowned Night Heron, Darter, Little Egret, Cattle Egret, Bar-headed Goose, Northern Pintail, Shoveller, Little Grebe, Common Coot, White-breasted Waterhen, Indian Moorhen, Purple Moorhen and various species of waders.

This Important bird area site is also famous for its vast flocks of Glossy Ibis. Other faunal species observed here include Common Palm Civet, and Jungle cat. The detailed list of avifauna is furnished in Annexure

Records state that, as for as migratory birds coming from Siberia, they have been visiting the wetlands for food and shelter even before these trees were planted because migratory birds that come from abroad do not nest here. The neighbouring agricultural lands too provide food and shelter for these birds.

According to Dr. Robert B Grubh, one of the leading Ornithologists, most of the birds that nest in Koonthankulam Bird Sanctuary are resident birds of India that are only local migrants and do not travel outside the country. Many international tourists come to see these nesting birds because they are not seen anywhere else in the world.

More than 105 species of birds have been recorded at this sanctuary. A list of birds visiting in the sanctuary along with the numbers recorded in the Sanctuary is given in Annexure



## Significant decrease/increase in arrival of birds in a year over the previous year

Year	Total number of birds
2011	48550-52650
2012	7800-8400
2013	15550-15600
2014	64500 -65500
2015	77500-78600
2016	92465-93500
2017	NIL Due to failure of monsoon
2018	65470-72890

### 2.9.1. Gut Analysis

Gut analysis of certain species was done during to find out the feeding pattern of these birds. The results are as follows:-

1. Cattle egret - Insects, grasshoppers, blue bottle flies, frogs, beetles and ants.
2. Pond heron - Fish, crab, insects, small coleoptera, earthworms and frogs.
3. Cormorant - Largely fishes (of 3types only)
4. Grey heron - Fish, water insects, frog & snakes.
5. Little egret - Frog, insects, bugs, fish, crickets and some worms.
6. Darter - Only fish
7. White ibis - Crustaceans, small molluscs, small fish and insects in the mud.
8. Open-billed stork - Frog, snails, crabs, large insects and fish.
9. Spoon bill - Vegetable matter, tadpoles, frog, molluscs, beetles and small insects.
10. Night heron - Aquatic insects, frog, fish, crab and worms.
11. Garganey - Vegetable matter, algae, grains.

As per reports, open-bill stork feed mainly on molluscs, common teals on paddy grain and soil- borne insects, shoveller on water- borne insects and fish and snake bird largely on fish. Hardly any vegetable food is taken except by open-bills and teals. It has also been observed that birds feed in the Koonthankulam tanks mostly in the beginning

of the season. Usually these fill up in October when birds begin arriving. However, as more and more birds arrive their droppings turn the water turbid. Moreover, food supply in the sanctuary is not adequate for the large congregation of birds. Thus they fly out to other tanks and nearby paddy fields. Most birds leave early in the morning at around 6.00 AM and return by 6.00 PM. In between birds may make 2-3 trips to their nests to feed their young chicks. Night heron which is nocturnal in habit only flies out in late evenings to return back early in the morning. This is especially true during the end of season when the bird sanctuary dries up.

## 2.10. Flagship Species

The flagship species for Koonthankulam Bird Sanctuary are the Painted Stork, Spot-billed Pelican, Comb Duck and Bar Headed Goose.

### Grey Pelican

‘Koolakkada’ as it is called in Tamil, the Pelican is one of the flagship species for Koonthankulam Bird Sanctuary. The wetland is a traditional site for these birds for breeding. Plenty of these large-bodied birds flock the sanctuary and breed here. Their conspicuous large bill with dull-purple pouch is used for swallowing large fishes. The length ranges up to 60 inches, with a size comparable to that of a Vulture. The wings and tail are greyish in colour and hence the name, Grey Pelican. There are bluish-grey spots in their



expandable pouch, so the name Spot-billed Pelican. Pelicans are locally migratory or resident; nests along with other birds like Cormorant, egrets as mixed colonies. The nest size is 60-75 cm and roughly circular in structure. Paddy straw, sodden wetland weeds, Large trees like are preferred for nesting, like Palm trees (in lowest horizontal leaves), Mango, *Pithecellobium*; also pilfer materials from neighbouring birds’ nest. They lay 3 – 4 eggs. Pelicans fly either in characteristic V-shaped echelons or in long straggly ribbons with a wide front. They feed mainly on fishes (sometimes can gulp a

500 gm fish) from the surface shoals. Adult birds utter throaty grunts and clap bills; the environment is usually noisy with groaning and yelping of the hungry young ones.

## **Painted Stork**

‘Chengaal Naarai’ is the name for Painted Stork in Tamil, which translates into ‘reddish legged stork’. The heavy yellow bill resembles a (palmyra root) sprout. This colourful bird with its long legs and neck can grow up to a height of 80 cm high (with elongated neck). Plumage is white, closely barred with metallic greenish black above,



with a black band across breast; delicate rose-pink near the tail. Young ones are pale brown and lacks pectoral band. This stork is resident and breeding in Koonthankulam. They breed from November to March in southern India. It forms heronry along with

other large birds; hunt by wading in shallow water. The birds slowly amble and plough the mud. A continuous harsh grating or scraping noise by half-grown nestlings when begging food is common in the heronry. Flight silhouette is slightly hunchbacked, neck out stretched and long legs trailing straight behind. In drought years, breeding may be skipped altogether.

### **2.11. Symbiotic Relationship**

The surplus water of the tank is let out for irrigating the agricultural fields lying just adjacent to the tank. Moreover, the water in the tank is enriched with bird droppings, also known as ‘guano’. The silt scrapped from the dried-up tank bed is also highly valued as manure for the crops. The people of Koonthankulam and surrounding villages are thus benefitted and hence, they offer protection to the birds. There is no case of poaching inside the tank and thus, the sanctuary gets benefitted.

## **2.12. Hydrology**

The 129.33 ha Koonthankulam Lake gives its name to the village, as kulam means lake in Tamil. Koonthankulam receives water from the Manimuthar canal and lies to the western side of the village. This lake and neighbouring water bodies like Kadankulam, Kadambankulam, Mangulam and Vijayanarayanam lake are a habitat for fishes and other aquatic species after the monsoons and serve as feeding ground for waterfowl. The drainage of Koonthankulam tank is south and south-easterly. At the south-west corner of the tank one sluice opening is present and at south-east corner an outlet is present. Inlet to the tank from Manimuthar canal is present on south-west corner of the tank. According to 2011 Google earth imagery the rainwater from the catchment drains in to the tank from the northern side. Kadankulam tank has two outlets in the south and one sluice opening on the south-east corner. Drainage in Kadankulam is east and south-easterly.

## **2.13. Dependence**

The villagers of the Koonthankulam sanctuary are mostly agriculturists. It appears that they have understood the ecological balance in nature and the significance of bird population for their crops. Thus the people have a long tradition of protecting the birds that come to the tank.

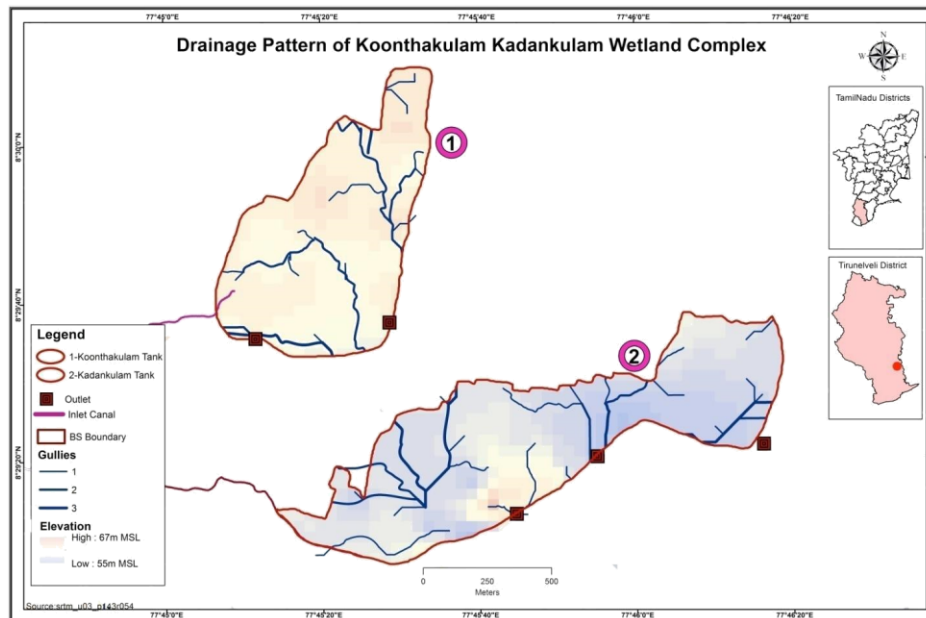
In most sanctuaries, the relationship of people with forests is that of dependency for fuel, fodder etc. However in Koonthankulam, fuel wood is not collected. Prosopis growing in and around the hamlets areas forms the common source of fuel wood for the local villagers. Grazing occurs inside the sanctuary during summer when the water recedes revealing fresh green growth of vegetation. There is no grazing during the main season when birds arrive because of the presence of water. Main dependency however is for the guano enriched which is let out of the tank into the fields periodically and which ensures high productivity of crops without the use of fertilizers. The people of Koonthankulam village are dependent on the tank for irrigation. Whenever, there is surplus water, it is drained off for irrigation. Moreover, the scraped dried up silt also serves as excellent manure for the fields.

## 2.14. Crucial Parameters of the Bird Sanctuary

Ensuring availability of water in the tank during the birds visiting season and availability of food in and around the tanks of Koonthankulam and also the agricultural lands for birds are the crucial parameters of the Bird Sanctuary.

## 2.15. Drainage Pattern

Thamirabarani, Nambiar, Chittar and Karamanar are the important rivers draining the district. Tamirabarani flows through the district. Nambiyar River originates in the eastern slopes of the Western Ghats near Nellikalmottai about 9.6 km west of Tirukkurugundi village at an altitude of about 1060 m above MSL. Chittar originates near Courtallam and flows through Tenkasi and confluences with Tamraparani. The hilly terrains have resulted in number of falls in the district. The drainage pattern in general is dendritic. In addition, there are eight dams for irrigation and power generation purposes. The chief irrigation sources in the area are the tanks, reservoirs and followed by wells and bore wells.



**Fig 9. Drainage patterns of Koonthankulam and Kandankulam BS**

## **2.16. Limiting Factors and Conservation Issues**

In addition to water stress, dwindling wetland area and loss of natural habitats are major limiting factors for biodiversity and ecological integrity of this sanctuary. Water shortage due to low rainfall pushes wetland flora and fauna to their limits of endurance. Conversion of the wetlands for other purposes, and rapid proliferation of invasive vegetation. Widely prevalent commercial fish farming in the freshwater wetlands of the sanctuary accelerates destruction of natural wetland habitats and biodiversity of fishes.

Public cooperation and participation in conservation of this site can be expected to increase with the speedy implementation of the management plan which will result in the following factors: i. The number of heronry birds would increase and their droppings would enrich the irrigation water. For farmers who find it difficult to obtain organic manure, this will be a boon. (ii).With increase in wildlife tourism in this area, the local restaurants, hotels, shops, vehicle hirers, etc. would be greatly benefited. Employment opportunities too would be increased directly and indirectly. The training programme to be conducted by the Sanctuary Authority would also help the local motivated young people to become informed guides for tourists who require assistance.

There are some misconceptions, created especially by encroachers in the vicinity, that the birds are destroyers of their crop. A systematic awareness programme to demonstrate the benefits of birds and the sanctuary, to the local people would remove this wrong notion.

However, one may expect some unrest from encroachers who have occupied the land areas that are part of the wetlands for farming, for commercial purposes or for dwelling places. It is a serious conservation issue not only for ecological integrity of the reserve, but also for the socio-economic welfare of the general public because of the dwindling of the water bodies. This issue needs to be handled judiciously.

The need for developing and executing a sound management plan towards long term conservation of the tropical freshwater wetlands of this sanctuary is emergent because of the rapid pace of deterioration and damage to these wetlands even before the local people have had an opportunity to realize the indispensability and full potential of these wetlands for their own prosperity and posterity.



## **CHAPTER III**

### **HISTORY OF MANAGEMENT AND PRESENT PRACTICES**

#### **3.1. General**

Koonthankulam Bird Sanctuary is the largest breeding water-bird reserve in Southern Tamilnadu, located in Tirunelveli District. It has the distinction of being a bird refuge that has received protection from the local people since five generations. This is a community protected Sanctuary because people are very protective of birds and co-exist with them during migratory season. In 1994, this wetland complex area was declared as Koonthankulam Bird Sanctuary and then onwards Forest Department started paying more attention for the protection and for the improvement of the wetland- Terrestrial birds and their habitat.

Koonthankulam wetlands are a safe haven for migratory and resident wetland- Terrestrial birds of the bio-geographic region. These wetlands are buffer irrigation reservoirs for paddy cultivations and receive water supply from Manimuthar Irrigation system on alternative years. More than 105 species of regular Wetland and Terrestrial birds, both resident and migratory can be observed every year like Larger Flamingo, Grey Pelican, Painted Storks, Ibis, Pintail, Comb Duck, Sand pipers, etc.,

There is a need for strictly adhering to norms regarding effluent discharge is absent now and also the need for rain water harvesting in the surrounding villages to make them less dependent on these tanks.

There is also a need to promote healthy and pesticide-free organic agricultural practices since the surrounding fields are visited by birds.

#### **3.2. Infrastructure Facilities available**

The following infrastructure facilities and visitor amenities are available in Koonthankulam Birds Sanctuary:

- Rest house with 2 rooms for officers and tourists was constructed in 1998.
- Toilets nearby tanks (2 each for men and women)
- Watch tower

- Sitting benches
- Pergola
- Sunshade with cement benches
- Interpretation centre
- Clean Drinking water facilities
- Birds Display boards

### **3.3. Holistic approach to intervention**

Koonthankulam Bird Sanctuary is the largest breeding water-birds reserve in Southern Tamilnadu and enjoys a legendary status, with references in popular media as well as historical texts and documents. Thousands of migratory birds visit from October to March.

The management intervention so far carried out has not only focused on conservation within the tanks. Satellites tanks falling within 5 km limits of the sanctuary have been proposed to be eco-restored to not only enhance habitats for birds but also to improve water availability for the local community. The anti poaching watchers and temporary workers engaged for protection of the sanctuary are from the adjoining villages. Eco awareness camps for school children, college students as well as adults have been regularly conducted.

### **3.4. Domestic Livestock Grazing**

The wetlands generally remain dry for at least three to four months in a year. During this dry season, occasional grazing of domestic livestock from the neighboring villages in an around the tank is absorbed. Livestock grazing is not permitted in the sanctuary and offences are booked. But, still this continues as a menace because of availability of fodder during the dry season.



There begins a conflict; when the conflict of livelihood and birds come into picture, livelihood becomes the top priority of the local population. Though, these cattle are found during non-migratory season but still, this definitely has an impact on local bird population.

### **3.5. Invasive Alien Species**

The prominent invasive species *Prosopis juliflora* which is found only in northern western side of the sanctuary tank and also patches of *prosopis* are found along the bunds. The prominent invasive species *Prosopis juliflora* plants are scattered in and around of Koonthankulam village. During the breeding season the painted storks were seen nesting only on the top of Prosopis trees.

### **3.6. Protection**

#### **3.6.1. Legal Status**

The Koonthankulam wetlands were declared as a bird sanctuary under 18 (i) of the Wildlife Protection Act 1972 in G. O. Ms. No. 301, Environment and Forests (FRV) Department dated 30.11.94 with effect from the date of publication in the State Gazette. The Forest Department cannot exercise absolute control over the water as it is used for irrigation and regulated by Public Works Department. The final notification proposal was sent to District Collector, Tirunelveli for Tirunelveli District Gazette publication vide C.No.3495/D/2017 dated 22.06.2017.

#### **3.6.2. Hunting**

Hunting in the sanctuary has been prohibited from the date of declaration of the sanctuary. The local villagers too, do not permit any form of hunting or harassment to these birds.

### **3.6.3. Illegal Activities**

No illegal cutting of trees is noticed in the sanctuary, since the fuel-wood needs of the villagers are met with from the Prosopis grown outside.

### **3.6.4. Poaching**

No poaching of birds recorded or noted in and around the sanctuary.

### **3.6.5. Leases**

The Koonthankulam tank used to be leased out for fishing by the Koonthankulam and Kadankulam Panchayat before these wetlands were declared as bird sanctuary. At present there is no practice of lease in the sanctuary.

Removal of soil is usually noted in older social forestry plantation areas in Tirunelveli district but such incidents are not noted in Sanctuary tank beds.

### **3.6.6. Encroachment**

Boundaries are clear on 3 sides. But, it is urgently required to carry out Survey and Demarcation with the help of Revenue officials and carry out bund formation works or fencing works on the village side boundary which has patta land, where there are chances of encroachment. Illegal fishing in the tank is often done by the people.

### **3.6.7. Wild Fires**

No, fire occurred in this sanctuary.

### **3.6.8 Wildlife Health**

As such no pathological out breaks has been observed in Sanctuary birds till now. However, the abandoned and fallen down hatchlings are treated in the bird cages in Sanctuary campus separately to restore their health and growth by Forest Staffs.

## **3.7. Zonation**

The zone is a specific management category and is not necessarily marked on the ground. Three zones can be outlined in the sanctuary for management purposes. Each of these zones has its own peculiar problems and hence different strategies are

required to tackle those problems. The tourism zone consists of the tourism complex which includes the facilities on the bund and other tourism development infrastructure in the sanctuary. This zone is the only zone which is meant for use by the visitors. The visitors are regulated as required for avoiding disturbance to birds.

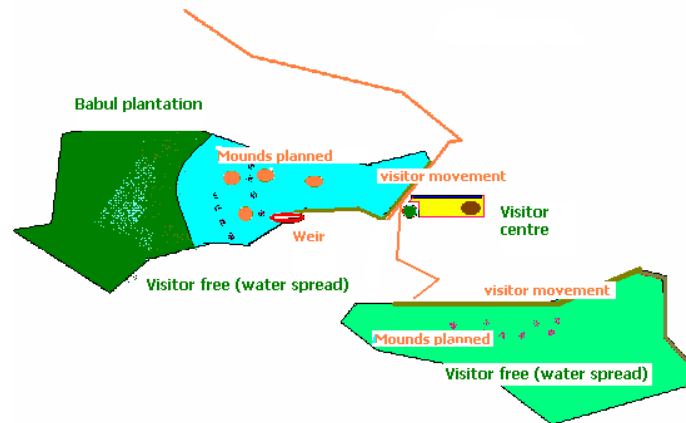


Fig.10. Zonation Maps of Koonthankulam Bird Sanctuary

For this purpose, proper zonation will be made in the Sanctuary so that, the birds and their habitat remains undisturbed making this sanctuary a viable bird refuge in the years to come.

The zonations planned were;

1. Core Zone
2. Buffer Zone
3. Tourism zone

### 3.7.1. Core Zone

The sanctuary area not falling under Buffer Zone and Tourism Zone (for both Koonthankulam and Kadankulam), is to be set apart as a core zone which is totally inviolable area. This is basically the tank area with *Acacia nilotica* trees in Koonthankulam and the water spread area in Kadankulam. Only selected accredited research personnel and the management personnel of the sanctuary who have a legitimate reason to enter these areas on exceptional occasions are to be permitted.

### **3.7.2. Buffer zone**

A radius of 0.34 to 1.50 Kms outside the core zone constitutes the buffer area or Eco Sensitive Zone. In this zone certain developmental activities can be undertaken in line with the requirements of the local population, tourists etc., without affecting the other activities of the management for the benefit of waterfowl and other birds species and their habitats.

### **3.7.3 Tourism Zone**

In this area visitors would be permitted to move about freely without, causing any form of disturbance to the birds and wildlife. This zone consists of 4 acre land acquired near the village temple near the Koonthankulam bund. Pergolas, utilities, interpretation space, Rest house, etc have been created for visitors in this zone but these facilities need further up-gradation and maintenance.

There is also a small children's park adjoining visitor's centre. This park is under the control of Panchayat but lacks maintenance since many years. This can be taken over by the Koonthankulam Bird Sanctuary and maintained well. It could be looked after through VFC by charging a nominal amount for entry.

Additional open land required for Sanctuary management would be part of the agricultural land lying between two tanks, linking them and thereby creating a corridor between 2 tanks which would provide easy access to both the tanks and help in bird watching as well as protection.

### **3.7.4. Status and Issues**

This is the area all along the existing bund on South Eastern boundary of Koonthankulam and Southern boundary of Kadankulam tank. Koonthankulam tank area has bird watch towers, sheltered seaters, etc. Here, visitors could watch the birds using their binoculars or scopes and cameras or use the spotting scopes and binoculars provided by the management for a nominal fee. Shouting, making noise, playing music or any other form of disturbance is not permitted here.

Since many birds take shelter near the bunds. It is essential to restrict the movement of the tourists to this bund and to a short footpath on the northwestern end of the wetland that continues from the southern end of the ‘corridor’ which connects the two wetlands.

A corridor linking the Koonthankulam and Kadankulam wetlands, which is presently separated by a short stretch of privately owned paddy fields is necessary. This corridor would enable visitors and management personnel to move between the wetlands without having to walk through private paddy fields or having to take a long route through the main road from outside. They could be taken on long term lease if the cost of purchasing land is high. This corridor is to be developed by acquiring at least 5 meters of land on either side of the canal that links the wetlands at the closest point between the two wetlands (Fig.3). Where this corridor ends at Kadankulam wetland a wide foot path has to be made along the north western boundary of this wetland until it reaches the beginning of the western end of the wetland bund. The road that presently runs along the Koonthankulam bund shall be left open, to facilitate movement of vehicles.

There has to be a bird watch tower, resting pergola/ camp, and sanitation facilities near Kadankulam tank too.

### 3.7.5. Land Use

There is no village inside the sanctuary. However, the sanctuary is surrounded by 13 villages & hamlets within 2 km. distance from the sanctuary. The name of the villages & hamlets are:

<b>East</b>	<b>North</b>	<b>West</b>	<b>South</b>
1.Koonthankulam	4.Arumuganeri	7. Tilattam	11.Mankulam
2. Kadankulam	5.Ayarkulam	8. Nochikulam	12.Padakkam
3. Kundankulam	6.Ariyakulam	9. Tennavaneri	13.Kalavur
		10.Hanumarpudukulam	

The major occupation of the villagers is farming and agricultural labour. Paddy is the main crop of this area. The people to a great extent are dependent on the water from the Koonthankulam–Kadankulam tanks for irrigation of their agricultural lands. Local people believe that, by continuing to protect the wetlands, they will have the following benefits;

- i. Regular supply of water for irrigation.
- ii. Water enriched with bird droppings that give them greater yield without using harmful synthetic fertilizers.
- iii. The silt that flow from the wetland bottom during monsoon flush water release is itself a fertilizer which helps increase the yield multifold because of nutrients from the bird droppings –‘guano’.
- iv. The tourists who would visit the area in larger numbers after the sanctuary is developed with tourist facilities would give VFC and villagers additional revenue.
- v. The village would become famous because of the tourist attraction; the sanctuary would receive in the coming years.

### **3.7.5.1. Land Use History**

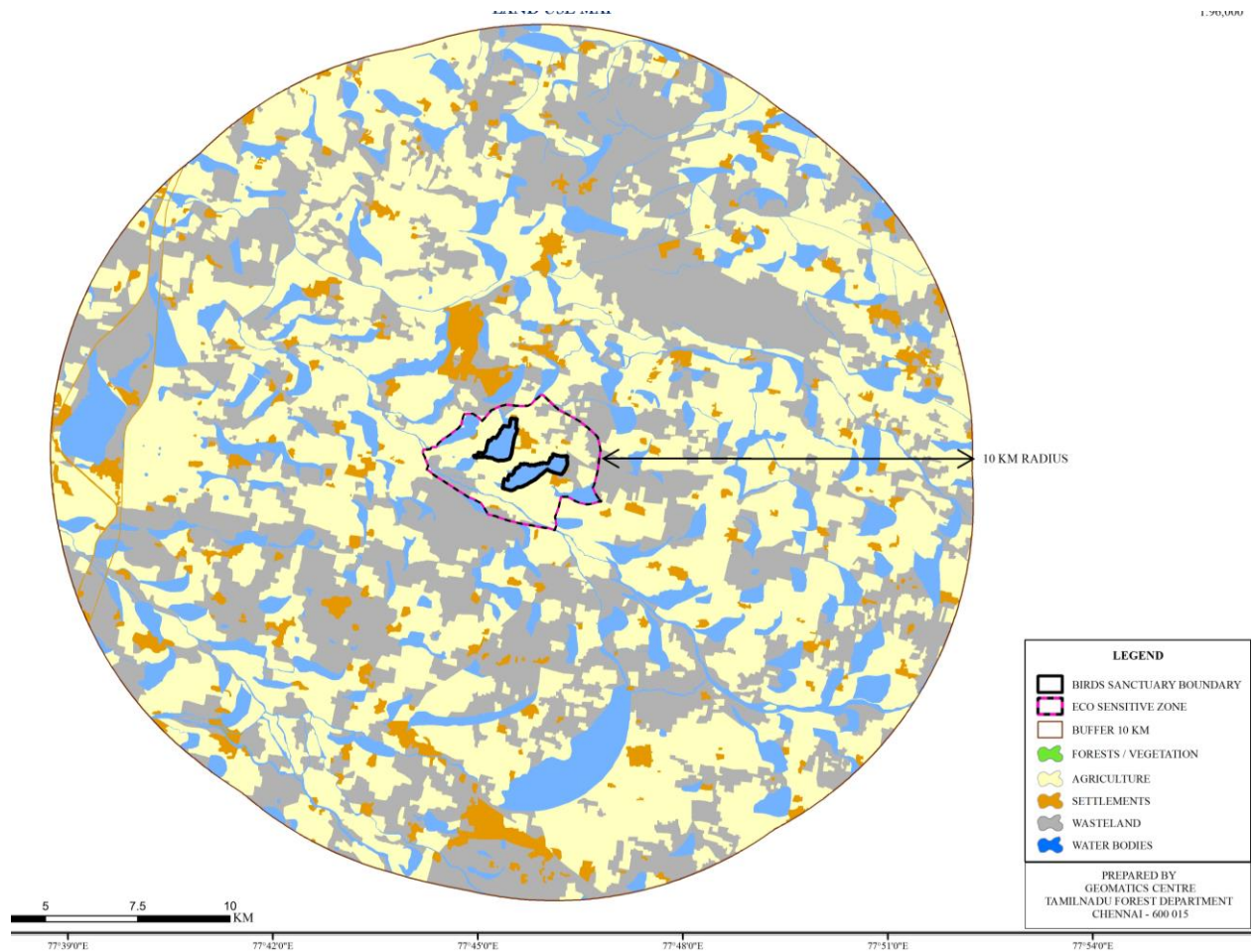
The study of *Land Use and Land Cover Change* (popularly referred to as the LUCC process) is known to have a significant bearing on the management of protected entities such as Bird Sanctuaries. This is especially relevant for identifying the proximate and distal anthropogenic pressures on the habitat and its resources, notably water. It is also a critical issue in involving local communities in conservation efforts – for instance a programme planned to improve local livelihoods may lose relevance rather suddenly when the household decides to sell their land to a commercial enterprise.



**The following section details some of the most critical demographic aspects of the landscape:**

- The route to the sanctuary is through Koonthankulam village. Major land use around the bird sanctuary is agriculture. However, it is to be noted that agriculture both rain-fed as well canal fed is highly seasonal depending on monsoon intensity as well as release of water from Manimuthar dam. Hence, here the phenomenon of agricultural vulnerability is observed. Villagers here seem to be practicing experimental cropping in search of crops most suited to the existing conditions. Banana plantation, cultivation of vegetables like broad bean, lady finger, and ash gourd is observed in the eastern and north eastern side of the sanctuary.
- As the agriculture practiced around the sanctuary is mainly seasonal large patches of temporary fallow lands are observed around the sanctuary. Cattle grazing is observed in these lands feeding on extensive growth of grasses.
- In terms of change in land use over a period of time around the sanctuary, a loss in agricultural land has been observed due to inadequate rainfall. This has resulted in high rate of migration of villagers to work as labourers in nearby towns. In terms of infrastructure development, schools and some artificial ponds have been constructed in villages around the bird sanctuary.
- A borewell has been created by the Forest Department for the villagers in Koonthankulam village and villagers draw water from this well twice a day.
- Coconut plantation is seen on the south-western and north-western side of the sanctuary. A Palmyra grove is present on the southern direction of the sanctuary.
- A temple is located on the left side of the entrance to the sanctuary outside the eastern boundary of the sanctuary.

- There is economic disparity in the villages around the sanctuary. On one hand large, two storied houses were seen while on the other small thatched houses are noted in the villages around the sanctuary.
- A power distribution line runs outside the south-western to western side of the sanctuary from Kudankulam power plant.



**Fig. 11. Land use Map around the sanctuary in the year in 10 Km radius**

### 3.7.5.2. Agriculture

There is no unique land use type within the sanctuary; however the buffer zone is composed of agricultural fields. Specific land use type around the sanctuary is agriculture. Traditionally the wetland was an irrigation tank that supplied water to nearby agriculture fields.

The six villages around the bird sanctuary completely depend on Koonthankulam and Kadankulam tank for cultivation. The total area agriculture is 1407 acres of which

1032 acres is under cultivation. While all the area cultivated is under rain fed irrigation only 50 or less than 50 percent of it is under tank irrigation except in Kadankulam and Aramaneri villages. To a small extent cultivation is done using bore well by large scale farmers. The area under agriculture is high in Kadambankulam and Koonthankulam village while it is less than 100 acres in Murugankudiyiruppu, Aramaneri and Silayam villages.

**Table No.1.Cropping pattern around the sanctuary**

Village name	Major crops	Minor Crops	Season of sowing	Season harvest(Month)	Weeding(Month)
<b>Koonthankulam</b>	Paddy	Groundnut,	1.Paddy Oct-Nov	Feb-Mar	Nov-Dec(Every 2 weeks)
			2. Groundnut: Feb	Feb-Mar	2.Every 15 to 20weeks)
			3.Cotton-Feb	April-May	days after sowing
			4. Banana-Oct	July-Aug (10 month)	
<b>Murugan kudi Iruppu</b>	Paddy	Groundnut, Cotton			
					1.Nov-Dec (Every 2 weeks)
<b>Kadambankulam</b>	Paddy	Groundnut, Cotton, Banana	1.Paddy: Oct-Nov	1.Feb-Mar	2.Every 15 to 20 days after sowing
			2.Groundnut: Feb	2.Apr-May	
			3.Cotton: Feb	3.Apr-Aug	
			4.Vegetables: Feb	4.Jul-Aug (10 month)	3.Mar-Apr
			5.Grams: Feb		4.Every 3 to 4 weeks
					After a month of Sowing
<b>Aramaneri</b>	Paddy	Cotton, Banana	1.Paddy: Oct-Nov	1.Feb-Mar	1.Nov-Dec
			1.Paddy: Oct-Nov	1.Feb-Mar	1.Nov-Dec (Every 2 weeks)
			2.Groundnut: Feb	2.Apr-May	2.Every 15 to 20 days after sowing
<b>Kadan kulam</b>	Paddy		3.Cotton: Feb	3.Apr-Aug	days after sowing

					3.Mar-Apr
		Vegetables		4.Jul-Aug (10 month)	4.Every 3 to 4 weeks
		Gram	4.Banana: Oct	month)	
			5.Grams: Feb		

**Table No.2. Use of fertilizers and pesticides for agriculture around Koonthankulam Bird Sanctuary**

Village	Pesticides usage	Fertilizers usage
Koonthankulam	1. Monocrotophos, 2. DDT	1. Potash 2.Urea 3. Nitrogen complex 4.Organic fertilizers (cattle dung)
Murugan kudi iruppu	Nil	Nil 1. Potash 2.Urea
Kadaman kulam	DDT (kuranai)	3. Nitrogen complex 4. Organic fertilizers (cattle dung)
Aramaneri	DDT (kuranai)	1. Potash 2.Urea 3. Nitrogen complex 4. Organic fertilizers (cattle dung)
Kadan kulam	DDT (kuranai)	1. Potash 2.Urea 3. Nitrogen complex, 4. Organic fertilizers (cattle dung)
Silayam	1. DDT (kuranai) 2. Monocrotophos	1. Potash 2.Urea 3. Nitrogen complex 4. Organic fertilizers (cattle dung)

Fishing is not practiced as a livelihood option in the villages around the sanctuary. However, opportunistic fishing is carried out using nets and Catla, Tilapia and Viral are the preferred species to be harvested.

### **3.7.5.3. Cultural Aspects of Wetland use**

There are small temples and few churches present in all villages and people worship everyday and they celebrate festivals occasionally. On the eastern boundary of the BS, to the left of the entrance there is a temple dedicated to Lord Santhanakrishnan. Another small temple is located within the sanctuary dedicated to local deity which is visited by the local villagers with prior permission from the local field staff of the department. Painted stork and Spot billed pelican are the dominant species of the wetland.

### **3.7.5.4. Community Conservation of Koonthankulam Bird Sanctuary**

Koonthankulam village gets its name from the Koonthankulam tank as 'Kulam' means a lake in Tamil. The villagers consider these birds as harbingers of rain, prosperity and a good harvest. The bird droppings, called guano is rich in nutrients and provides a good source of manure in the fields. Villagers of all age-groups are involved in conservation of the birds. The children in the village are trained to monitor and report bird casualties to the elders, thereafter any person found guilty is punished. Once a villager was found guilty of killing a fledgling and as a punishment his head was shaved and he was paraded on a donkey with the bird tied around his neck. Birds also nest in trees in the villages and there have been instances when birds fall out of their nests the villagers make efforts to put them back in their nests or nurse them back to recovery.

The *Acacia* trees, which now serve as a habitat for the birds, were planted under the Social Forestry Scheme by the Forest Department. Later in 1993, FD tried to auction off these trees for fuel wood which was stopped by the villagers. Later in 1994, this place was declared a sanctuary and a village committee was formed to look after the birds. The Koonthankulam villagers also do not burst crackers during Diwali to avoid disturbance to the birds.

### **3.7.5.5. Natural Resource Dependency**

Though agriculture is the main source of livelihood around the bird sanctuary, cattle rearing also supports livelihood of the villagers during lean period of agriculture. Total livestock population is 6858 around the bird sanctuary including 1151 cattle, 4709 goat/sheep and 1008 poultry. The livestock population is high in both Koonthankulam

and Kadankulam villages. As the consequence more than 500 acres of land is under grazing in these two villages. In Kadambankulam poultry rearing is higher in comparison to other villages. Total livestock population around the bird sanctuary is highest in Koothankulam village and lowest in Murugan kudiirupu as the overall human population in this village is low. In Koonthankulam livestock rearing mainly supports the dairy product business run by families while in other villages it is mainly for meat production. Livestock grazing is mainly in agricultural fields and nearby wastelands. Paddy straw is also used as fodder.

**Table No.3.Total livestock population in villages around the Bird Sanctuary**

Village	Total livestock	Cattle	Goat/Sheep	Poultry	Grazing area (acres)
	around the BS				
KoothaKulam	3900	800	3000	100	500
MuruganKudi-iruppu	22	6	6	10	0
Kadambankulam	948	105	163	680	619
Aramaneri	123	10	20	93	13
KadanKulam	1820	200	1500	120	-
Silayam	55	30	20	5	120
<b>Total</b>	<b>6868</b>	<b>1151</b>	<b>4709</b>	<b>1008</b>	<b>1252</b>

### 3.7.5.6. Socio Economic Status

The number of below poverty line (BPL) households is highest in Koonthankulam and Kadankulam village in comparison to other villages. These BPL households do not own land for cultivation. The source of income for households comes from working on others farm land and migrating to nearby towns as labour and construction workers. Agriculture, Beedi industry, NREGA, Building construction, Electricians, Milk seller, Wood cutting, Bank employers, daily wages are the other income generating options to sustain the livelihood in the villages around the bird sanctuary. In Kadankulam village the highest average annual income is Rs. 100,000. In Kadankulam 120 acres of land is under both rainfed and canal irrigation, while nearly 100 acres of land are irrigated using bore and wells as the village has a better economic

status. The other villagers earn Rs 20,000 to 60,000 per annum depending on the rainfall for that year. The borewell owners on the contrary say that there is not enough water despite using bore wells for cultivation. Owing to all the above problems sadly Kadambankulam villagers earn an average of only Rs. 25000 per year.

Establishment of educational infrastructure and Self help groups are the initiatives taken by the government to develop the villages around the bird sanctuary. Koonthankulam, Kadambankulam, Kadankulam and Silayam have schools and Anganwadi which are working towards educating the children. There are 5 SHG groups in Kadankulam where women collect money amongst themselves as savings and get loan. This scheme helps them to sustain their families. There is one VFC (village forest committee) in Koothankulam which is not functional. In Kadankulam one public health centre is present which works only once a week. Thus for emergency health problems no proper facility is available.

**Table No.4.Ongoing measures of conservation**

<b>Nature of work</b>	<b>Output</b>
Creation of artificial mounds and dug out ponds	Which are used by birds as a resting grounds and Foraging
Planting of trees on the elevated bund	Serves as a natural fence for the sanctuary and attracts terrestrial birds.
Weed removal	Creating ideal habitat for birds
Visitors amenities	Enhancing tourist facilities
Awareness has been created among visiting public and local people by providing informative signage and	Educating the visitors
boards and by conducting eco awareness camps	
Engaging anti-poaching watchers	Prevent illegal activities and protection of birds
Regular counting and monitoring of birds	Conserve the bird Sanctuary

### **3.8. Research, Monitoring and Training**

No systematic research activities have been taken up in the sanctuary during previous years and monitoring activities have been limited to listing of bird species visiting the sanctuary.

No training programme is conducted in the sanctuary at present regarding birds. The Institute for



Restoration of Natural Environment (IRNE), headed by Dr. Robert B. Grubb, has proposed to take a long-term plan to under-take a comprehensive ecological study of this wetland complex with a view to offer scientific data that are necessary for efficient management practices by the Forest Department.

While, in the current year, lot of monitoring, bird abundance survey, monthly species count, mortality survey, vegetation survey, etc is being conducted under TBGP scheme, not only in Sanctuary tanks but also in other wetland bird habitats of Tirunelveli district. Under the same scheme, a comprehensive ‘Wetland Management Plan’ has been written in co-ordination with Care Earth Trust, Chennai. Trainings have also been conducted from Forest Guard to DFO level under the same scheme regarding management of wetland areas including tours to different wetlands of Tamilnadu to the staff.

Synchronized Census/bird count was also conducted during Feb 2019 in all wetland habitats of the state coordinated by Wildlife Warden, Nagapattinam.

### **3.9. Administrative Setup**

The Koonthankulam Bird Sanctuary is under the administrative control of the District Forest Officer, Tirunelveli. The sanctuary comes under the jurisdiction of the Forest Range Officer, Tirunelveli (Tirunelveli Division) who reports to the District Forest Officer.

### **3.10. Communication**

The sanctuary being situated on the Tirunelveli–Thisayanvilai main road is connected by road. The Forest Department has one wireless base set at the Sanctuary and wireless operating system is available at the office of the District Forest Officer (DFO) in Tirunelveli.

All the staff and officers are connected through mobile network and telephones are available at the office and residence of the District Forest Officer. The numbers of all concerned staff and officers are given to VFC President, Panchayat President and regular volunteers in the village.



## CHAPTER-IV

### DEVELOPMENT PROGRAMS AND CONSERVATION ISSUES

#### 4.1. SWOT analysis

A **SWOT analysis** (alternatively SWOT matrix) is a structured planning method used to evaluate the strengths, weaknesses, opportunities and threats involved in a project or in a business venture.

##### 4.1.1. Strength

- Renowned and one of the oldest heronries in existence
- 30 aquatic birds and around 66 terrestrial birds are known to nest in Koonthankulam and surrounding feeder tanks.
- Attracts Indian and Foreign tourists and ornithologists
- Migratory, Resident and Local migratory birds visit the Sanctuary
- People's support in conservation – prevention of poaching, no people's movement during bird season.

##### 4.1.2. Weaknesses

- Water becomes a scarce resource whenever monsoon fails
- Conversion of paddy fields and other agricultural lands into sites and plots leading to decreasing feeding grounds.

##### 4.1.3. Opportunities

- Local community can be actively involved in conservation and eco development.
- By roping in community participation, there is scope for a successful eco tourism programme.

##### 4.1.4. Threats

- The surrounding waste lands in the vicinity are increasingly being converted into plots and sites, thus decreasing the feed availability for the avifauna.
- Monsoons are very unpredictable and water has become a scarce resource whenever monsoon fails.

#### 4.1.1. Critical Review and Result of Past Intervention

30 Ha <i>Acacia nilotica</i> species planting in Koonthankulam Tank.	Enhance the habitat for aquatic birds and terrestrial birds
Digging of small ponds and formation of mounds and islands and planting of grasses	Improvement in water holding capacity of the tanks
Feeder channels to the tank and waterholes within the tank have been deepened and desilted.	Improvement in water holding capacity of the tanks
Regular counting and monitoring of bird population from month of October –June.	Conserve the bird sanctuary
Fingerlings have been released in the tank	Ensure sufficient food availability to birds
Visitor amenities viz., drinking water facility, paving of walk path on the bund with slabs, sitting benches have been provided.	Enhancing tourist facilities
Existing Rest House, toilets and watch towers have been improved	Enhancing tourist facilities
Awareness has been created among visiting public and local people by providing informative signage and boards and by conducting eco awareness camps.	Educating the visitors
Engaging anti poaching watchers	Prevent illegal activities and protection of birds
Existing infrastructure like staff quarters and rest house has been improved.	Basic infrastructure has improved
The road connecting Moolakaraipatti to Koonthankulam has also been repaired.	Improved access to the sanctuary
Training has also been provided to the guides in the sanctuary	Creating public awareness and educating the public about importance of the bird sanctuary

#### 4.1.6. Challenges and Way Forward

Both the water storage tanks i.e. Koonthankulam & Kadankulam gets water from Tamiraparani canal system through Manimuttar Dam in a routine periodical turn. These tanks come in 3<sup>rd</sup> reach of the canal system and water is released every alternate year in case of proper monsoon and if water level of dam is above 85-90 ft.

Efforts have been taken to get the G.O issued for water release to the Sanctuary every year irrespective of reach which should be followed up. And that will be a reality only if there is proper monsoon and dam water is of required level.

If the water issue is handled, every year arrival of birds is for sure and there is no doubt that, this bird sanctuary will continue to attract thousands of birds, bird watchers and students.

The increasing trend of conversion of agricultural lands into plots and not practicing agriculture is a challenge ahead.

Feed availability is a limitation within the sanctuary which makes birds go to other nearby tanks. Thus the ecological boundary extends beyond the legal boundary of the sanctuary and sometimes birds fall prey to poachers when feeding outside.

There is a lack of research and data backup for aiding management and inventory of species is yet to be updated. Inter and intra species relationships, ecological niche of each species, feeding and breeding ecology, checklist of species especially invertebrates and their role in the food web, specific habitat requirements, significance of periodical fillings and drying of the lakes, pollution or other effects of industries and tourism, etc are some other studies required. The great bio-diversity displayed in a compact area gives scope for these and many other scientific studies which needs to be taken up.

The local community participation has to be roped in for better conservation and eco development. It requires coordinated effort by the Forest Department to gain the confidence of the local public and make community participation a reality.

The Forest Department employs bird watchers from the local population who have over the years gathered up a wealth of information. However the subordinate staff and watchers require periodical training in wildlife which is especially required to record the data collected and also to act as nature interpretation and educational guides to spread ecological awareness among tourists.

## **PART-II**

### **CHAPTER V**

#### **PLAN OBJECTIVES AND PROBLEMS**

##### **5.1 Vision**

Conservation of Koonthankulam Bird Sanctuary and adjoining wetlands as a participatory model involving local communities to protect and support Avi-faunal richness and diversity.

##### **5.2 Mission**

To develop and manage the Koonthankulam Bird Sanctuary for breeding and nesting of both resident and migratory birds besides providing opportunities for community based conservation efforts and source for education and awareness.

##### **5.3. Objectives of Management**

The Koonthankulam Birds Sanctuary is an irrigation tank which is a seasonal tank and provides habitat to many migratory and resident birds. In fact Koonthankulam has perhaps the largest mixed congregation of birds which visit the lake for breeding, nesting and roosting purposes. The sanctuary attracts large number of visitors from India and foreign during October to May.

###### **Objectives:-**

1. To maintain the integrity of the wetland and ensure hydrology of the area.
2. To provide habitat ameliorative measures for meeting the ecological requirement of avi-fauna
3. To provide adequate protection measure to avi-fauna especially during the critical period.
4. To engage local communities to garner the support for conservation efforts in the sanctuary through various interventions.
5. To promote regulated and sustainable low impact eco-tourism.
6. To enhance eco-awareness and education of primary and secondary stakeholders visiting the sanctuary.
7. To enhance skill and knowledge of personnel and local community for improved management.
8. To encourage focused research activities to strengthened current scientific management of the sanctuary including monitoring.

#### 5.4. Problems in achieving the objectives and suggested strategies

Sl. No	Objectives	Problems in achieving objectives	Strategies to achieve Objectives
1	To maintain the integrity of the wetland and ensure hydrology of the area.	Water Scarcity  Strengthening the bund  De-silting tanks & channel  Maintenance of sluice  Creation of nesting site	Water from Manimuthar dam through pipeline along the channel.  Strengthening bund of Koonthankulam and Kadankulam tanks.  Desilting the tanks of Koonthankulam and Kadankulam tanks.  Maintenance of Sluice the tanks Koonthankulam and Kadankulam tanks.  Creation of mounds, baby ponds, planting taller seedlings.
2	To provide habitat ameliorative measures for meeting the ecological requirement of avi-fauna.	Perching tree  Electric line passing in the near about of the sanctuary  Disease	Existing <i>Acacia nilotica</i> trees are broken due to more number of nesting. So, planting more number of Babul in Koonthankulam and Kadankulam tanks.  During breeding season in the month of November to April, the often young ones occasionally adult birds get crashed electric line. Electric line can be laid underground.  Prevention and early detection of incidence of epidemics to avifauna.
3	To provide adequate protection measure to avi-fauna especially during the critical period.	Hunting, Illicit felling, Grazing etc.,	Regular monitoring in tanks especially breeding season by anti-poaching teams comprising field staff and Anti-poaching watchers.
4	To engage local communities to garner the support for conservation efforts in the sanctuary through various interventions.	Dependence of local people on the bird's habitat.	Strengthen the existing Village Forest Committee (VFC), and establish new committed VFCs, Village Forest Councils wherever needed and people participation in

			conservation by education, motivation and improvement of their livelihood.
5	To promote regulated and sustainable low impact eco-tourism.	Lack of Transport facility  Lack of amenity for tourists	To attract the people to visit the sanctuary road and transport facilities in essential.  Drinking water is essential for tourists.  One watch tower is to be constructed in Kadankulam tank.
6	To enhance eco-awareness and education of primary and secondary stakeholders visiting the sanctuary.	Lack of awareness on importance of residential and migratory birds.	Conducting awareness programmes to nearby villagers, visiting public and school children; Involving them in conservation of birds.
7	To enhance skill and knowledge of personnel and local community for improved management.	Inadequate capacity of field staff.	Equip the field staff with recent advanced field techniques identification of birds and improved habitat management practices.
8	To encourage focused research activities to strengthened current scientific management of the sanctuary including monitoring of birds.	Lack of research findings for deciding management interventions.	Monitoring of Residential and Migratory birds inside the tanks and outside the tanks through census.  Monitoring of ground nesting birds in and surrounding tanks.

## CHAPTER- VI

### FUTURE STRATEGIES

#### 6.1 Strategies

Managing wetlands in water-stressed landscapes is a major challenge.

The strategies to be followed are:

- ❖ Ensuring availability of water throughout the year in the tanks.
- ❖ Restoration and conservation of habitats.
- ❖ Ensuring the participation of local peoples in the management and conservation of Koonthankulam Bird Sanctuary.
- ❖ Developing Koonthankulam Bird Sanctuary as a center for environmental and nature education.
- ❖ Wetland disease management; prevention and early detection of incidence of epidemics to avifauna and other wildlife in the sanctuary.
- ❖ Frequent monitoring, research and evaluation of the wetland ecosystem and its components.

#### 6.1.2. Zonation

The zone is a specific management category and is not necessarily marked on the ground. Three zones can be outlined in the sanctuary for management purposes. Each of these zones has its own peculiar problems and hence different strategies are required to tackle those problems. The tourism zone consists of the tourism complex which includes the facilities on the bund and other tourism development infrastructure in the sanctuary. This zone is the only zone which is meant for use by the visitors and where some regulations are followed, as required for avoiding disturbance to birds.

In order to tackle this, proper zonation will be made in the Sanctuary so that, the birds and their habitat remains undisturbed areas for making this sanctuary a viable bird refuge in the years to come.

The zonation plan is

1. Core Zone
2. Buffer Zone
3. Tourism zone

#### **6.1.2.1. Core zone**

The rest of the sanctuary area which was not mentioned in the above two zones (for both Koonthankulam and Kadankulam), is to be set apart as a core zone which is totally inviolable area. This is basically the tank area with *Acacia nilotica* trees in Koonthankulam and the water spread area in Kadankulam. Only selected accredited research personnel and the management personnel of the sanctuary who have a legitimate reason to enter these areas on exceptional occasions are to be permitted.

##### **Activities prescribed in the Core Zone**

1. Total protection against all forms of biotic interferences will be ensured.
2. Only scientific studies and research activities with proper sanction without destructive sampling techniques will be permitted.
3. The core zone will be free from forestry operations other than Habitat improvement works. Similarly, grazing, fuel wood collection and NWFP collection are prohibited.
4. Only regular habitat Improvement/protection works like maintenance and digging of water holes, soil and moisture conservation works, creation of mound and islets, total uprooting of prosopis plants and planting of Acacia saplings, apart from monitoring activities will be permitted.

#### **6.1.2.2. Buffer zone**

A radius of 5 kilometers outside the core zone constitutes the buffer area. In this zone certain developmental activities can be undertaken in line with the requirements of the local population, tourists etc., without affecting the other activities of the management for the benefit of waterfowl and other birds species and their habitats.



### **Activities prescribed in Buffer Zone**

1. Fuel wood requirements of local population will be met from this zone at present but efforts may be made to gradually wean them away from such dependency from the core zone.
2. Portions of this zone will be opened for tourism, like the areas on the bunds.
3. Inlet channel connecting the Tamirabarani canal to Koonthankulam sanctuary will be given a suitable gradient either by desilting or by deepening at selected places.
4. Inlet channel will be monitored to prevent possible draining of water by agriculturists to the fields on either side of the channel.
5. A plan and methodology for de-silting the tank will be devised so as to increase open surface of water and to reduce too much variation in depth.
6. Grasses will be planted on slopes of bunds facing towards tank. Local varieties such as *Cynodon dactylon* and *Eremopogan fevealatus* may be preferred.
7. Educative lectures by conducting camps for local population will be organized on the importance of visiting avian fauna.
8. Display boards indicating possible visiting birds and the importance of them will be installed.

### **6.1.2.3. Tourism Zone**

In this area visitors would be permitted to move about freely without, causing any form of disturbance to the birds and wildlife. This zone consists of 4 acre land acquired near the village temple near the Koonthankulam bund. Pergolas, utilities, interpretation space, Rest house, etc have been created for visitors in this zone but these facilities need further up-gradation and maintenance.

There is also a small children's park adjoining visitor's centre. This park is under the control of Panchayat but lacks maintenance since many years. This can be taken over by the Koonthankulam Bird Sanctuary and maintained well. It could be looked after through VFC by charging a nominal amount for entry.

Additional open land required for Sanctuary management would be part of the agricultural land lying between two tanks, linking them and thereby creating a corridor

between 2 tanks which would provide easy access to both the tanks and help in bird watching as well as protection.

### **Activities prescribed in the Tourism Zone**

1. Restricted and regulated movement of tourists without jeopardizing the conservation concern of the sanctuary will be permitted.
2. Concrete / wooden benches will be provided to visitors to sit and watch the birds from various locations on the bund.
3. Bund management will be carried out after arriving at consensus with PWD officials.
4. Bunds, adjoining available open land and buffers of the main road will be planted with *Syzygium cumini*, *Ficus species*, *Thespesia populnea*, *Azadirachta indica* and *Dendrolalamus strictus etc.*
5. One new watch tower will be erected in the tank of Kadankulam boundary of the sanctuary to facilitate Wildlife photographers.
6. Habit of using toilet for day to day ablutions will be promoted through awareness programmes jointly organized with Health department. The non-hygienic habit of using sanctuary grounds as defecation grounds will slowly be weaned away.

## **6.2 Harmonization**

The efforts of the department in the past have been successful in conserving the birds and their habitat. Likewise, the strategies listed out for various components have to be meticulously practiced. Moreover, community participation and eco tourism have to be given priority for long term solution.

## **6.3 Management of Admitted Rights**

There are no admitted rights in the legal notification of sanctuary.

## **6.4 Human Disturbances and its Effect on Management**

The direct disturbance would be in the form of cattle grazing which again is occasional. This can be solved by tightening protection and by working out mechanism for establishing a fodder bank away from the lake. Tourists are allowed only on the tank

bund and not allowed to venture into the lake and as such there is no direct disturbance to the birds.

## **6.5 Strategies for Water Level Manipulation and Control**

### **Strategies for Ensuring Availability of water**

The most critical component for the restoration and conservation of Koonthankulam Bird Sanctuary is to ensure that the integrity of the wetland is protected through assured inflow and retention of water in the wetland.

#### **1. Management of Koonthankulam Bird Sanctuary as a part of a wetland complex.**

Wetland clusters of these diverse permanence types comprise a wetland complex. Members of the complex, even if distant from each other, are often hydrologically connected by surface or ground water. Organisms move among members of the wetland complex seeking food, water, and cover. Koonthankulam Bird Sanctuary is part of a wetland complex hence; it needs to be managed accordingly. The distinctly eastward drainage is the most characteristic feature of the drainage pattern of the Indian Peninsula. Almost all rivers take their origin at the very edge of the peninsula within site of the Arabian Sea and flow right across the full width of the continent before joining the Bay of Bengal. This predominantly easterly drainage is believed to be the result of the easterly tilt given to the peninsula as a result of the uplift of the Western margin. The present day Western Ghats in fact represents the precipitous edge of an uplifted plateau.

#### **Critical points of concern to understand and plan the hydrological system of Koonthankulam wetland:**

- Koonthankulam & Kadankulam gets water from Tamiraparani canal system through Manimuttar Dam in a routine periodical turn.
- The tanks come in 3<sup>rd</sup> reach of the canal system and water is released every alternate year in case of proper monsoon and if water level of dam is above 85-90 ft.

- The reason for water release above certain level is that, the Sanctuary tanks are at much higher elevation than the main canal and water reaches the tank, only when there is enough pressure which is noted with water level above 85-90 ft by past trials. The depth of the tanks is also not very deep.
- Sufficient water storage and perennial character can ensure the sustainability of the bird sanctuary, otherwise reduction in arrival of birds cannot be overruled. And it so happened during 2012 & 2013 that, flagship species did visit the tank after their preliminary visit which was noted during Aug-Sep because of monsoon failure as well as no water release from Manimuttar dam.
- Efforts have been taken to get the G.O issued for water release to the Sanctuary every year irrespective of reach which should be followed up. And that will be a reality only if there is proper monsoon and dam water is of required level.
- If the water issue will be handled, every year arrival of birds is for sure and there is no doubt that, this bird sanctuary will continue to attract thousands of birds, bird watchers and students.

## **CHAPTER – VII**

### **PROTECTION PLAN**

Koonthankulam bird sanctuary is surrounded by 13 villages on 4 sides of the tank. The villagers depend on the tank mainly for irrigation purpose for the agriculture fields. Besides they also rely for small scale needs of firewood and grazing on the sanctuary. The sanctuary as such does not have any protection wall or fencing to ensure strict protection. Following is the protection plan devised for enhancing protection to the sanctuary.

#### **7.1. Protection strategies and action plan**

##### **7.1.1 Boundary Demarcation**

This sanctuary consists of two buffer irrigation tanks namely Koonthankulam tank (71.02 Ha.) and Kadankulam tank (58.31.0 Ha.). These two tanks are covering a total extent of 129.33 Ha declared as **Koonthankulam Bird Sanctuary**. The area needs to be demarcated as there is no demarcation done on ground. There is always a threat of certain activities happening along or on the bund of tank, which could be tackled only with demarcation. Besides the tank is surrounded by patta lands where there is no delineation of boundaries. This activity would ensure total protection to the land area of the sanctuary.

##### **7.1.2. Watch tower**

There is one watch tower presently available in Koonthankulam tank for bird monitoring & visitors in centre region of the tank and one more watch tower is to be constructed in Kadankulam Tank. Both the watch towers may be equipped with spotting scopes and binoculars.

##### **7.1.3. Fencing**

Complete fencing all along the boundary of the sanctuary will be explored and carried out during the current plan period so as to maintain the sanctity of the area and also to enable better monitoring of the area and to regularize activities as per plan.

##### **7.1.4. Intelligence Gathering**

For local informers to gather intelligence, payment of rewards to the informers may be considered.

### **7.1.5. Promotion Materials**

Pamphlets and wall posters showing the importance of the birds in our daily life have to be printed and depicted in all villages around the sanctuary. Warning posters depicting the Wildlife Protection Act (1972) regarding the punishment for harming birds have to be pasted in all these villages.

### **7.1.6. Patrolling of Peripheral habitats**

In Koonthankulam Bird Sanctuary is having 8 tanks falling within the 2 km radius. These areas may be allocated among the existing anti-poaching watchers or the bird watchers for ensuring protection to the migratory birds which flock to these peripheral habitats. Routine perambulation of these areas is necessary to enforce Wildlife Protection Act.

### **7.1.10 Advisory Committee**

The Advisory committee as envisaged under section 33 B of the Wildlife (Protection) Act, 1972 shall be constituted for a holistic management of the Birds Sanctuary and to ensure people's participation in Biodiversity Conservation.

## **CHAPTER-VIII**

### **MANAGEMENT INTERVENTION**

Koonthankulam wetland is one of the unique bird sanctuaries being the largest breeding ground and feeding reservoir in the southern Tamil Nadu. Therefore, the sanctuary has to be given highest priority in protection and conservation by providing sufficient manpower of the Forest Department and also with the joint co-operation of the local villagers aiming at habitat improvement of the sanctuary.

Further initiatives in research, education, database creation, training and skill up-gradation along with proper budget allocation for infrastructure development is essential to keep the management system of the sanctuary on par with the standards of other protected wetlands of the world. Tourism and public relation system of the sanctuary needs to be improved and given more emphasis.

#### **8.1. Protection**

The primary duties of the protection staff would comprise;

- a. Guarding the entire perimeter of both the wetlands for preventing attempts of encroachment.
- b. Preventing illicit removal of plants or plant parts from the sanctuary
- c. Preventing illicit trapping or killing of birds
- d. Preventing fishing, fish-farming or any other forms of aqua-culture, wetland poultry, grazing etc.
- e. Preventing disturbance to birds and their habitats by visitors or others.
- f. Regular patrolling of the water bodies and paddy fields in the vicinity of the sanctuary, up to a radius of at least 5 Kilometers, for possible poaching or other forms of disturbance to the aquatic birds by the general public. This can be done by intermittent visits and by gathering information from trusted sources.

##### **8.1.1. Related Issues & Possible Solutions**

The existing habitat of the birds has to be given protection by proper demarcation of the sanctuary by erecting chain link or barbed wire fencing using concrete or stone cairns as support towards the Northern and Eastern side. This fencing shall be reinforced with live fencing such as certain varieties of bamboo with medium thickness along with

other fruit bearing and roosting trees. Native bushes shall also be planted at certain intervals to act as bird hide.

Besides providing physical protection, it is also necessary to create awareness towards conservation amongst the local people. Though, they are very protective about birds, but during the pinch period and when it comes to compromising their livelihood, for the sake of conservation of birds arises the conflict. It is difficult to protect wildlife and their habitat without the active support of the local people. In order to create such awareness among the people it is necessary to hold regular meetings with the representatives of the local people. Awareness camps shall also be conducted for the local people to explain the importance of the birds and the sanctuary.

Drinking water crisis of the local people has already been addressed by the forest department but to take care of the water needs of the cattle, an artificial water pool could be made at one of the corners of the tanks. Already there are two such ponds in Koonthankulam built by the department for bathing purpose on the outer end of the bund. This still has been spoken by villagers as one of the good efforts by the department.

The existing staff strength of the sanctuary now consists of two Forest Guards and two temporary Bird Watchers. This is not sufficient for protecting the area and managing the tourist influx in the near future. A biologist specialized in ornithology needs to be posted in the Sanctuary to keep record of the birds, to advise management personnel on technical issues of habitat management and to educate the public about birds and the park's conservation agenda.

### **8.1.2. Improvement and Management**

Koonthankulam Bird Sanctuary shall have the following habitat components and shall be managed as such. There shall be neither artificial introduction of new species, nor stocking the waters. Also, fishes are not to be introduced by seeding of farm fish and no aquatic plants are to be artificially introduced to the wetland.

#### **Measures to be taken**

##### **8.1.2.1. Efforts to Ensure Release of Water Every Year**

Currently, there is release of water once in every two years from Manimuttar dam and that too happens only in years of proper monsoon. Efforts have been taken in pursuing the matter with the district administration for issuing G.O for the release of water to Koonthankulam every year. But, that will be fruitful, only if there is proper



monsoon. Creation of artificial source or water channel from Indian Naval Base Kattabomman at Vijayanarayanam could also be considered. Existing water channel has to be desilted every year without fail.

#### **8.1.2.2. Well-defined Shoreline**

A well defined shoreline habitat with and without emergent wetland vegetation is important for a wide variety of wetland fauna. The invertebrate fauna that proliferate in such shoreline habitats are a great attraction for many shorebirds such as plovers, sandpipers and snipes, many of which are migrants.

Several other species of wetland-Terrestrial birds such as Ducks, Herons, Egrets, Storks and Ibises too find the shores ideal for feeding or resting or for both. Many young fishes too feed and take shelter among the emergent vegetation of the shore-line habitat.

#### **Action**

1. It is necessary to safeguard the shoreline by not scooping any soil from here while undertaking desilting and deepening work in the wetlands. It is necessary to maintain gradual sloping of the shoreline.
2. Emergent vegetation (half-submerged shore plants) such as *Sagittaria* spp., *Scirpus* spp. And certain other varieties of Cyperaceae, *Polygonum* Sp., *Colocasia* Spp., *Aponogeton* spp., *Potamogeton* spp., and *Cryptocoryne* spp. shall be allowed to come up naturally and exotic wetland vegetation shall not be allowed to come up here. Even if exotics take root on their own, they shall be removed manually as soon as located –exotics like *Ipomoea cornea* would cause the death of the wetland if allowed to get established. Institutions having experienced fresh- water wetland ecologists must be consulted for maintaining the wetland flora. *Prosopis juliflora* emerging in smaller pockets should be removed every year without fail.

#### **8.1.2.3. Shallow Zones with rooted plants**

Useful indigenous rooted plants with floating leave include a few species of water lilies (*Nymphae spp*) and *Ipomoea aquatica*. The leaves provide sunshade and shelter to fish and other small organisms and also provide fodder for birds. Their leaves are used by certain aquatic and semi-aquatic fauna. Some birds such as the Jacana and certain other small shorebirds walk on these floating leaves while foraging on aquatic

fauna. Lotus has the destructive habit of aggressively colonizing the shallow areas and thereby causing rapid deterioration of water quality and physical habitat. Lotus also hastens silting. It is also one of the aquatic plants that is very difficult to control. However, regular de-silting would control this, beyond manageable limits.

*Hydrilla* (Tamil: *Changili paasi*) is a major example of rooted plants with submerged leaves. Other common useful species are *Otelia* spp. *Valisnaria* spp., *Chara* spp., *Nitella*, etc. These are favourite habitats for several aquatic fauna and also serve as food for some wetland -Terrestrial birds.

For improvement of habitat of other tanks of the Koonthankulam wetland complex it is advised to plant Date palms and other Palms along the bund which will provide shade during the different times of the day and reduce surface evaporation.

#### **Action**

No artificial planting shall be done in this zone.

Regular desilting to be done and saucer shape of the tank to be maintained.

#### **8.1.2.4. Free floating vegetation zone**

These include *Nymphoides* spp. *Ceretophyllum* spp. *Lemna*, *Azolla*, *Pistia* and *Trapa*. The roots of these vegetation float freely in the water and are not anchored. These are excellent food for aquatic invertebrates and fish and also for wetland Terrestrial birds and also as shelter or as breeding habitat. *Trapa* yields water chestnut which is edible and hence a favourite of many birds.

#### **Action:**

No artificial planting will be done in this zone.

Regular desilting and maintaining saucer shape of the tank to restrict their extent to the natural levels.

#### **8.1.2.5. Open water areas**

These are favorite sites for diving birds such as coot and pochards, for fish-eagles and kingfishers, those plunge into the water for fishing. Since open water is

necessary for many aquatic birds it shall be made available through appropriate management practices.

### **Action**

Open sheets of water without floating vegetation are already available at many locations at deeper sites. More such habitats can be developed while scooping the bottom soil for making mounds and wide moats at both the wetland sites. Presently such areas are being created with zonation for different kinds of birds.

#### **8.1.2.6. Islets/mounds**

Small mounds, mudflats and islets with and without vegetation attract a wide variety of wetland Terrestrial birds. Birds such as ducks, geese, herons, egrets, storks and ibises find these islets and mounds convenient to take rest without fearing the land predators, such islets, when located close to the wildlife viewing side of the shore (bund), would provide excellent opportunity for visitors to view birds, and some time even a turtle or other life forms, at close quarters. These mounds also form attractive nesting sites for the large Flamingos; if not raised too high above the water level.

### **Action**

Initially a few Islets and mounds were present. As per the requirement for different kind of birds like that of shallow, deep water, foot-mound and mound nesting more mounds were made during 2012-13 and 2013-14. This is done by combining desilting and deepening work to save time and money. The soil being scooped during the desilting and deepening operation is heaped at the desired sites into islets and mounds as per needs. Nesting mounds for the flamingo is also made in such a manner that the surface remains uneven with parts of the mound left partially submerged. Baby ponds with very shallow water storage are also created. Bunds can also be planted (enriched) with *Saccharum spontaneum* (Naanal) and Vettiver grasses.

#### **8.1.2.7. Water-resistant trees inside the wetlands**

Koonthankulam wetland has *Acacia nilotica* trees which provide nesting sites for hundreds of nesting heronry birds. Since these trees are located inside the waterlogged areas of the wetland, birds find them attractive for safety reasons. However, there is the

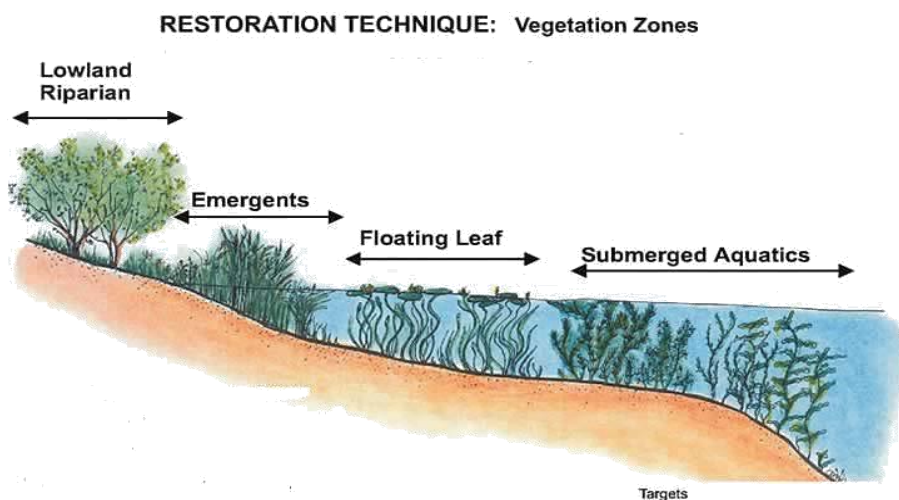
need to add more trees here in order to replace old and dying ones. The trees those are available at Kadankulam are small, the larger ones those have been reportedly harvested under the Social Forestry scheme, needs to be replanted in a systematic manner.

**Action**

Gap planting of nesting trees could not be done. However fruit bearing trees can be planted all along the bund and at the non-bund boundary areas.

Few more trees shall be planted by gap planting method, inside the water spread areas of both the wetlands for shelter and nesting of birds. Planting of various indigenous trees (in consultation with experts) may also be done on the bunds of both the wetlands. In addition to trees, tall shrubs shall be planted along wildlife viewing areas as live bird-hides.

Tree species to be selected for planting on the mounds within the wetlands shall be able to withstand water logging for prolonged periods. It is further recommended that deep and wide moats be made around the patches of trees that are growing or to be grown within the water-spread area of the sanctuary as a precautionary measure against disturbance from people and land predators.



**Fig 12. Vegetation Zone**

- Improve emergent vegetation
- Improve submergent vegetation
- Increase high quality riparian vegetation
- Reduce carp biomass
- Increase areas of primary production
- Improve forage for aquatic and terrestrial species
- Add structural elements to improve near shore habitats

#### 8.1.2.8. Managing siltation

Extensive silting over the years has raised the bottom of the Koonthankulam wetlands. This has lowered their water holding capacity and hence the life of this wetland sanctuary. As such it also affects the survival of fish and other aquatic fauna and flora in this sanctuary.

Silt formation is caused by the following major factors:

- (i) Rain water washing down the exposed and unformed sloping sides of the wetlands that causes soil erosion and brings in sediments and
- (ii) Water along with silt that flows into the wetlands through the Manimuthar Irrigation Canal.

Although non-existent at present, excessive proliferation of aquatic vegetation can become a serious problem affecting the ecological integrity of the sanctuary in the future, through trapping of silt and also through the sheer quantity of their biomass. When such a situation arises, removal of excessive vegetation, either native or exotic, would become a very important management practice. Judging from the type of aquatic flora available in this area, such vegetation could include water hyacinth, lotus, *Salvinia*, *Ipomoea cornea*, *Hydrilla* and some other submerged, floating-leafed or emergent vegetation.

Exotics like *Ipomea cornea* should not be allowed to come up and be actively removed by manual uprootal. Similarly *Eichornia* should never be allowed to come up as it colonises fast and cover the whole surface which will lead to habitat destruction. They shall be aggressively removed. Managing silting is main work and includes prevention and mitigation.

#### Action

At present desilting work is carried out only in the feeder canal from manimuthar leading to Sanctuary tank, while no desilting has been done in the tank area.

Desilting by dredging is necessary at some of locations where the wetland has been excessively silted and has become very shallow. This can be done more effectively

in the dry seasons when the shallow beds start drying. However, this procedure must be carried out only under special circumstances and under close supervision by the management personnel. Uncontrolled dredging of bottom soil could profoundly affect the benthic (bottom) flora and fauna, thereby affecting the ecological system. However, in areas where the silt is excessive, it would be advantageous to remove such deposits without going too deep which exposes the non-hydric soil.

Soil being dredged during desilting in the above manner shall be used for preparing mounds and islets as discussed under 'Islets and Mounds'.

#### ii) Strengthening the Soil Embankments

Strengthening of the soil embankments of the wetland, has to be done wherever necessary and possibly with masonry retaining wall, especially at the immediate water intake points. This is to be urgently done in Kadankulam tank, where precious water in the wetland has to be let off at times in order to prevent it from entering the village.

#### iii) Improving Soil Binding Capability

Improving soil binding capability of the exposed dry ground above the high water mark can be done by, covering the exposed and semi-exposed areas with indigenous perennial herbs and shrubs that grow in this region. Already many such plant species are available in and around the adjacent open lands.

#### iv) Planting indigenous emergent vegetation on shoreline above the average water level

#### v) Controlling Excessive Vegetation (for the future, if found)

Manual and mechanical removal of such Vegetation is the most desirable method for such small wetlands. Although it could be an expensive effort at the first attempt (if proliferation of such vegetation were left unchecked for a prolonged period), it can be easily managed with minimum expenditure if done annually. Bulldozers shall not be used to remove such weed.

Exotics such as *Ipomoea cornea* being highly aggressive woody emergent need to be fully eradicated from the wetland, by manual removal. Use of chemicals, being

harmful to the eco-system, shall never be contemplated for control of aquatic weed of any type.

#### **8.1.2.9. Permitting removal of bird manure**

The large number of aquatic birds that dwell in the sanctuary, especially those nesting on the trees inside water, deposit large quantities of droppings into the water. While a large portion of it gets mixed in the water and provides natural manure for the crops, the rest of it settles down and gets trapped in the silt.

The local people have been traditionally removing this silt enriched with bird manure for their horticultural needs. The villagers have mentioned the availability of bird-manure-laden silt from the sanctuary as one of the major benefits from this sanctuary.

It is recommended that the local villagers be permitted (under supervision) to remove certain amount of this manure-laden silt every year during the dry months from some of the pre-selected patches of the wetland bed as per the needs of the management.

While the farmers will be happy to remove this manure-laden silt, it would help the sanctuary Management to;

- a. Get rid of unwanted excess bird manure which causes eutrophication.
- b. Maintain the pond at desired depths, than department spending money on desilting the tank frequently.
- c. Maintain good relations with the local people without any compromising principles of sanctuary management. But this activity shall be carefully regulated and monitored by the management in order to prevent depletion of aquatic flora and hydric soil through extensive scraping of the bottom soil.

#### **8.1.2.10. Managing seasonal flooding and drying**

Since flooding and drying are natural phenomenon in most tropical freshwater wetlands, it is inadvisable to prevent occurrence of these at Koonthankulam. Many aquatic vegetation, and even fish and other fauna thrive well when exposed to such seasonal phenomena of flooding and drying.

The role of the Management in such situations is to ensure that flooding or drying does not go to the extent of affecting the ecological integrity of the wetland through elimination of highly localized flora and fauna, during prolonged dry periods, or death of trees within the sanctuary through prolonged flooding if any must be prevented. *As far as Koonthankulam is concerned, the problem to be addressed is prolonged drought rather than prolonged flooding.*

#### **Action**

Action shall be taken to ensure that some deeper pools continue to hold water at all seasons, even during years of excessive drought. This would aid the survival of several species of aquatic fauna, particularly fish. This can be done in a cost- effective manner as part of the action plan that deals with desilting and preparation of mounds, islets and moats.

Moats are necessary to act as a water barrier, around the nesting trees within the sanctuary when water level drops to the level of exposing the ground below the trees, enabling people and wild predators to disturb the breeding birds. Moats should be about 20 metres wide and 1.5 metres below the bottom of the wetland and should be elliptical, covering all sides of the nesting trees.

The soil scooped out for making the moat on the outer side of the tree groves can be used for preparing the proposed perimeter road, the soil scooped out for making the moat on the viewer's side of the trees (groves) should be used for preparing islets, mounds and mudflats.

Water dries up from the sanctuary's wetlands completely or nearly so at least once a year even during normal monsoons. When this happens the wetTerrestrial birds fly away but the indigenous fish populations that form a major component of this wetland ecosystem die out. Even when water fills up once again, through the rain, the sanctuary has to wait for fresh recruits from the Manimuthar Reservoir through the irrigation canal.



This delays availability of fish to birds those feed on fish. By making a few deep pools within Kadankulam and Koonthankulam wetlands, it will be possible to save some fish during normal annual drought periods.

#### **8.1.2.11. Managing changes in water quality**

Water being the medium of life of all wetland vegetation and most wetland fauna, water quality is a major factor that decides the optimal levels of occurrence of such life forms. A tropical freshwater wetland will remain healthy, only as long as the water is not polluted. Water quality of a wetland, harmful or otherwise, is either inherited or acquired. In case of Koonthankulam the water quality is affected by;

- a. pesticide-contaminated rain water flowing into the wetlands from the paddy fields (on the upper sides) and
- b. excessive bird droppings falling from bird nests a top trees during the peak nesting season.

#### **Action**

- i) Farmers of upper reaches shall be advised to minimize the use of chemical pesticides that have harmful effect on the natural environment. The sanctuary management shall include this form of education as part of its education programme.
- ii) The management shall permit annual removal of silt laden with bird dropping during the dry season after the breeding birds have left in area.

#### **8.1.2.12. Ensuring water supply to the wetland**

#### **Establishing Institutional and Departmental Collaborations with State Departments**

Of critical importance to the management of the Koonthankulam BS is ensuring continued availability and retention of water within the wetland. In view of the fact that the domain of managing water resources rests with the State Department of Public Works and the Tamilnadu Water and Drainage Board, it is imperative that vertical integration of functioning amongst the key departments is forged. As on date, it is on the

mode of responding to inter-departmental requests and concerns. Specific recommendations include:

Establishing arrangements with the TWAD Board and WRO – PWD to restore and revive the historical channel from the Manimuthar Canal above the Karungulam moderator to ensure assured inflow of water into the wetland. Further, periodic maintenance operations of the wetlands can be streamlined into the proposed actions and interventions of the TNFD so that the integrity of the wetland is not compromised. It is reported by the local communities that the Nanguneri wetland, when protected and maintained well, contributes to ground water recharge, and thereby irrigation using wells would be possible. This, although seemingly irrelevant, has a strong bearing on the issue of water stress in the landscape.

The area surrounding the KBS is the 3<sup>rd</sup> and 4<sup>th</sup> reach of the Manimuthar canal discharge where the minimum quantum of release is 80 ft. Likewise, collaborations need to be forged with the State Tourism Department to initiate the eco tourism programme and the Agricultural Engineering and Agriculture Department to revisit the ongoing interventions of providing inputs and subsidies to local agriculture. Means by which rainfed, organic farming that is low on usage of water with protective mechanisms of crop insurance and assured prices need to be explored. Establishing a local weather forecasting system would also be helpful to the people in and around Koonthankulam. Incentives to revive traditional means of resource use, when incentivized, would pave a pathway for minimizing the stress of the landscape.

The collaboration needs to recognize that Koonthankulam Bird Sanctuary is one of the ten critical breeding habitats of Terrestrial birds in Tamilnadu and hence has a rather high conservation value. The arrangement also needs to recognize that wetlands are extremely fragile and vulnerable. In the event of long and recurrent durations of dry-periods and absence of surface water, wetlands tend to flip to being terrestrial systems, following which, recovery and restoration is not possible.

The seasons when Koonthankulam and Kaadankulam tanks have adequate water, owing to the southwest and northeast monsoons or the water released from the Manimuthar Dam, nearly forty species of birds including Painted stork, Flamingo, Bar-headed goose, Spot billed pelican, Eurasian spoonbill, Ibis, Darter, etc. can be seen at Koonthankulam. However monsoon failure affects farmers as well as birds. K.

Subramanian of Koonthankulam suggests that the government should consider connecting the Koonthankulam and Kaadankulam tanks, the two major water bodies providing food and shelter to the birds, with the 73-km-long flood carrier channel being dug to take the surplus water of the Tamirabharani, Karunaeniyar and Nambiyar to dry areas of Nanguneri, Thisaiyanvilai, Radhapuram and Saattaankulam on an outlay of Rs.369 crore. Since the two water bodies are located just six km away from the flood carrier channel is under excavation, the government can consider this suggestion. However, the Public Works Department, which is executing the flood carrier channel project, says that it would readily to connect Koonthankulam and Kaadankulam if the government directed. (source: <http://www.thehindu.com>)

A combined approach of maintaining the Bird Sanctuaries and the adjoining feeder wetlands through periodic maintenance works is recommended. It has been observed that all the feeder wetlands are silted and overrun with invasive weeds, as also the embankments and sluices are in a state of repair and /or disuse. It is hence important that the intervention begin with the repair of the embankments and sluices of the feeder wetlands, removal of the invasive overgrowth of flora, deepening at the lowest points of water capture, followed by the desilting and maintenance of the channels and finally to intervene in the bird sanctuary.

Since both the wetlands of this sanctuary will continue to be used for irrigation, the sanctuary management shall, through the cooperation of PWD authorities, ensure regular supply of water to the wetland. Wild life advisory board meetings with the Collector as Chairman and District Forest Officer as Member Secretary may be used to achieve this objective. Special efforts are necessary in the process to ensure supply of Manimuttar Canal water every year at-least to the extent of sustaining the birds.

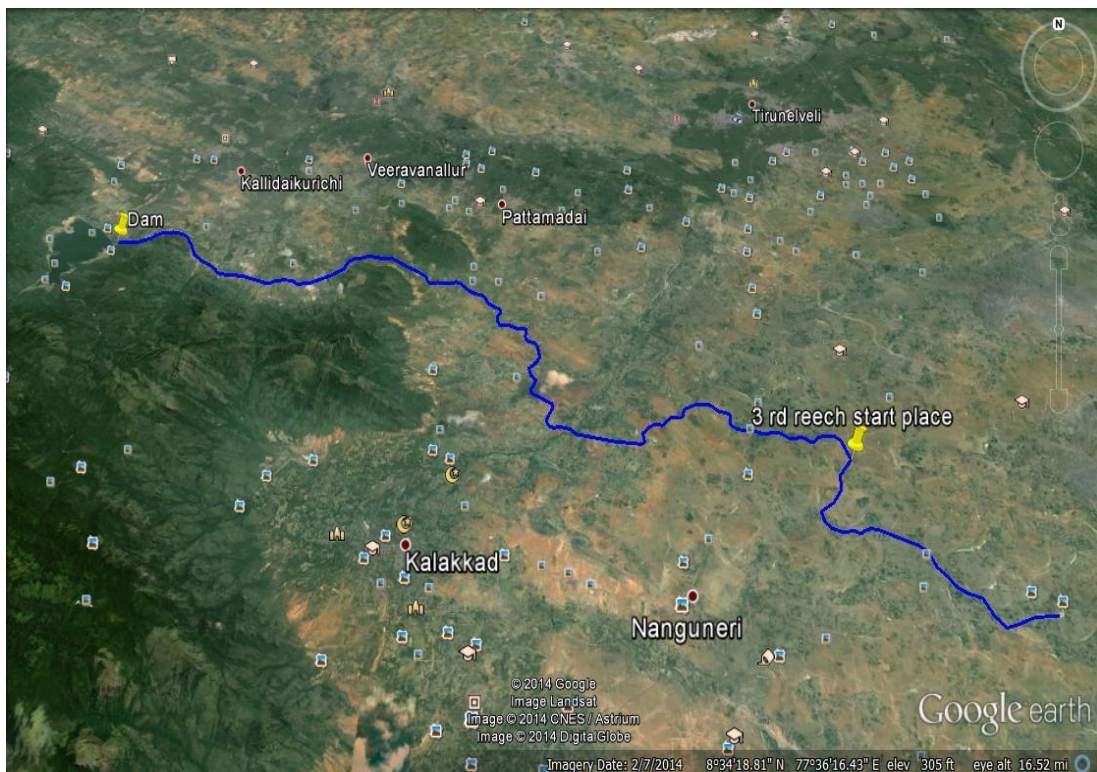
Since water supply to this sanctuary is extremely erratic – depending entirely on the vagaries of the monsoon and the limited water supply available from the Manimuttar Irrigation system (only once every two years), water from Tamaraparni river could be considered as a potential source. But this venture has problems like need for high investment for laying long distance pipeline through many village; also posing potential threat of illegal tapping of water en route and new demands for water for irrigation by the

villages surrounding the Sanctuary. Nevertheless it is an option that needs deeper study and consideration owing to the recent water crisis in the Sanctuary.

### **8.1.2.13. Standing on permanent water solution in Koonthankulam**

#### **Bringing water from Manimuthar Dam to Koonthankulam Sanctuary through pipeline along the canal bank length- 55.10 Km**

The point from which water will be taken from Manimuthar is higher than Koonthankulam tank by about 50 meters which will permit water to flow from the dam to Koonthankulam by gravity. However, the distance between Manimuthar to Koonthankulam is about 55.10 Km.



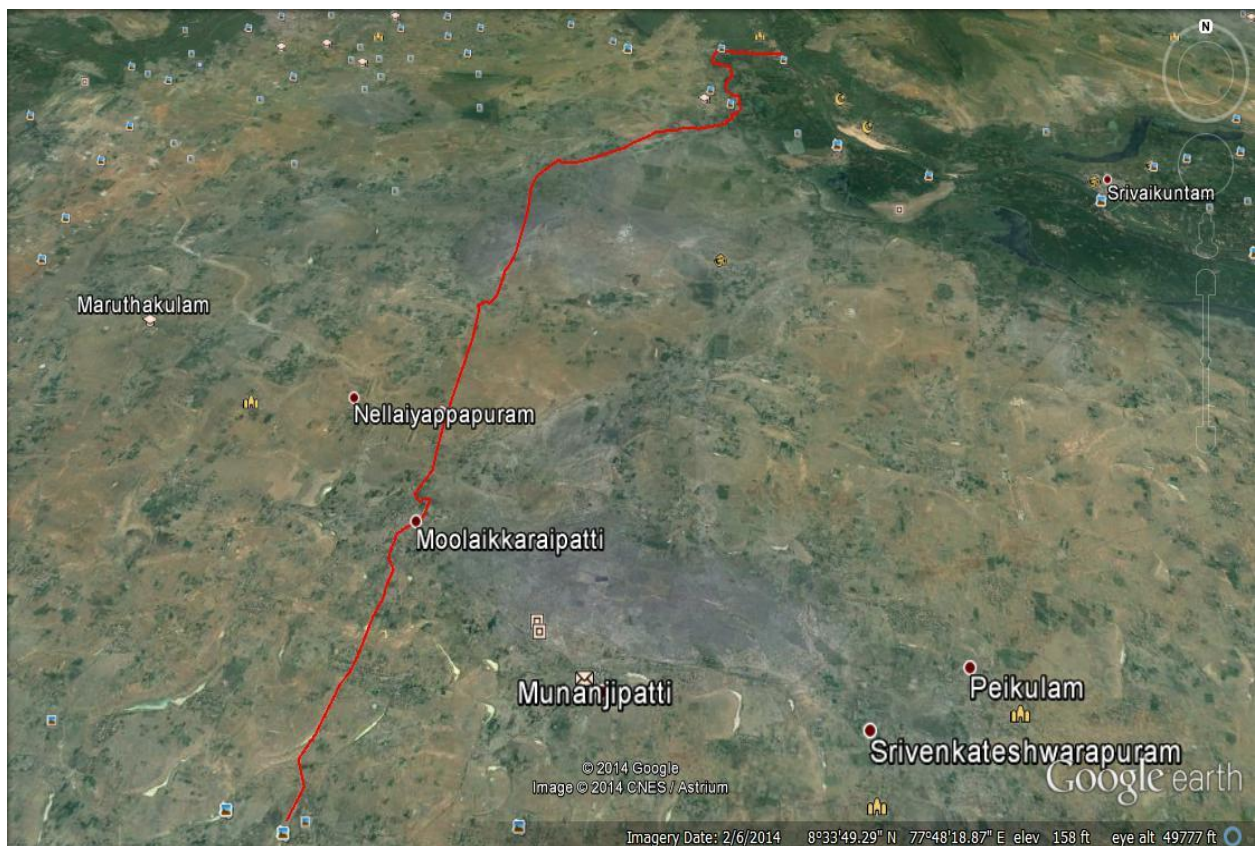
**Fig.13.Map of Manimuthar Dam to Koonthankulam bird sanctuary**

#### **Bringing water from Tamirabarani River MuthalanKurichi to Koonthankulam Sanctuary: 28.19 Km**

The distance between two points is about 28 Km, but however gravity does not permit conveyance of water unless is pumped because of the point of delivery is higher than that of intake point by about 40 meters. Hence necessary pump stations will have to be created along with the pumps with electrical connection and there will be regular electrical charges to be paid along with the regular maintenance of pump room, pipeline and pump operators will have to be appointed on a regular basis. However since the

distance between Tamirabarani River at Muthanlankurichi to Koonthankulam is about 28.19 Km

However the TWAD Board will be the competent authority to provide accurate estimate and also to execute the work. Even if water is brought in to the tank through pipeline, if water is stored above sluice level, there is every chance that the water will be demanded by the farmers for future irrigation needs. So in order to overcome this future problem sufficient dead storage below the sluice level should be created. So, that there will be always water below the sluice level in sufficient quantity for the birds even a times in water stress. If a permanent water source is available, the sanctuary will attract more number and species birds which will then become a year round sanctuary for different types of migratory birds. The farmers will also benefit by having a pool of water below sluice level because this will help recharge of underground water, which will help the farmers in irrigation by well.



**Fig.14.Map of Muthalankurichi to Koonthankulam bird sanctuary**

#### **8.1.2.14. Installation of power cables within 1 km radius of the Sanctuary**

A power line from Kudankulam power plant runs near the western boundary of the sanctuary though power transmission has not started yet. Many villagers around the bird sanctuary have reported the mortality of large waterbirds due to electrocution. Hence, it can be speculated once power transmission begins from the Kudankulam powerplant it would be highly hazardous for the birds visiting the sanctuary. Hence it is suggested to ensure enhanced insulation of the power lines in the vicinity of the sanctuary with the assistance of Tamil Nadu Electricity Board.

#### **8.1.2.15. Need for closer interaction with the stakeholders**

A major conservation significance of this sanctuary is that there are no immediate open threats to its existence, being indispensable for cultivation of paddy by the local villagers, events would directly/ indirectly affect the life and physical integrity of the wetland including encroachment, non availability of water during critical breeding periods for birds, etc. This can be handled by regular meetings, interactions with villagers especially farmers. By attending to their irrigation needs, most of the problems could be solved. An agreement about the quantity of water to be released from the tanks depending on water level in the tanks must be brought out on papers through the forum of VFC to avoid possible conflict in water-sharing.

Basically, ensuring availability of water in the tanks throughout the year, babul gap plantation, planting of fruit yielding and perching trees along the boundary, fencing all along the boundary area, improving infrastructure and taking measure to improve the socio economic condition of the villagers may ensure the continuity of the migrating birds in a large numbers every year and the bird sanctuary may flourish still in a larger way. All these activities have to be combined with periodical awareness programmes to villagers and students involving volunteers/bird watchers.

## CHAPTER IX

# ECOTOURISM, INTERPRETATION & CONSERVATION EDUCATION

### 9.1 Eco Tourism

Eco tourism is defined as responsible travel to natural areas that conserve the environment and improves the well being of local people. Eco tourism in Koonthankulam Bird Sanctuary is basically for bird watchers and naturalists, whose requirements are very minimal with respect to facilities unlike other natural forest areas.

Most of the people who turn out for eco tourism in Koonthankulam are those who would support the cause of the wetland when the need arises. Therefore the management shall provide them as much information, and a good birding experience to make their visit a memorable one. Facilities to be provided includes well-laid walking trails all along the bund, trained personnel as guides, sun shelters, drinking water points and public conveniences where ever necessary, etc.

Accordingly, the bird sanctuary has well laid bund track for more than a km for bird watching. This track has been provided with sun shelters, benches, etc. There is a tall bird watch tower large enough to accommodate about 100 people in all the floors at a time. Department has Spotting scopes, binoculars, etc to be provided to bird enthusiasts and students.

The Koonthankulam Bird Sanctuary has a great tourism potential. An average about 25,000 to 30,000 Indian tourists and 200 foreign tourists have been visiting the sanctuary every year. The record of the number of tourists visiting the sanctuary has been maintained at Koonthankulam by the Forest Department's Bird Watcher. At present no entry fee is being collected from the tourists visiting this sanctuary. There is also a 2 small room forest rest house to be used by officers on inspection or bird watching, which is also sometimes given to enthusiastic and regular bird watchers, Scientists, Researchers, etc.

## **9.2. The Strategies**

Ecotourism must be vigorously planned and managed to successfully deliver its key ecological and social objectives. This requires:

- (a) Specialized marketing to attract travelers primarily interested in visiting natural areas.
- (b) Management skills, particularly related to handling visitors in protected areas.
- (c) Guiding and interpretation services, preferably provided and managed by local inhabitants, focusing on natural history and sustainable development issues.
- (d) Government policies that earmark fees from tourism to generate funds for both conservation of wild lands and sustainable development of local communities and indigenous people.
- (e) Focused attention on local peoples, who must be given the right of prior informed consent, full participation and, if they so decide, the opportunity and training to engage in this sustainable development option.

## **9.3 Intervention**

Koonthankulam is one of the southern most important bird sanctuaries in India. Thus it attracts many ornithologists from India and abroad as well as tourists of local and foreign. The main tourist season is from October to May, the time when the tank is filled with water coinciding with the time when there are maximum number of birds found here. In Koonthankulam Sanctuary some basic eco tourism facilities have been developed and which needs to be upgraded. Bird watching is a great hobby which is associated with photography and takes lot of time of a bird lover. Hence, the objective of Eco Tourism in Koonthankulam Bird Sanctuary is to;

- Provide and maintain basic facilities for bird watching like well laid tracks, sun shades, hide-outs, watch towers of different sizes, sanitation facilities, resting facilities, etc



- To provide with facilities for full time study of different birds and their seasonal cycles necessary for proper documentation, etc
- To allow for scientific research, study, interpretation and education
- To provide facilities for wide spread awareness activities
- To benefit local communities through EDC/VFC and improve their socio-economic status.
- To aim at community development of associated villages through benefit sharing
- In due course of time, to put Koonthankulam on World Eco Tourism Map at global level.

#### **9.4. ISSUES/ PROBLEMS**

1. Lack of proper approach road between Moolakaraipatti and Koonthankulam which covers a distance of about 6 Km. At present it is very bad condition. There are no town bus, local transport available facility because of the condition of road.
2. Lack of proper guide for students, new bird watchers, etc
3. Lack of proper infrastructure for overnight stay and early morning bird watching, because it is about 35 kms from city and staying facilities.
4. Water crisis affects eco tourism because of the very reason that nesting birds do not arrive when there is no required water and fodder available until the hatchlings fly back with them. Hence, until a proper water regime is not brought-in, there cannot be regular eco tourism.
5. Lack of interpretation centre, amphitheatre, etc for luring bird watchers, students and general public during the off-season or non-nesting year of birds.
6. Lack of seed money to involve VFC/EDC in eco tourism and sanctuary management.

## **9.5 THE STRATEGIES**

### **9.5.1 Identification of a Zone**

In Koonthankulam Bird Sanctuary, there is Eco Tourism Zone already demarcated and it is the 4 acre land in the entrance portion of the Koonthankulam tank. The Eco Tourism Zone consists of small interpretation building, VFC meeting hall, a multipurpose room, bird watch tower, resting pergolas, sanitation facilities, forest rest house, etc. There is also a children's park under the control of Panchayat which is also in need of improvement and maintenance. But, these facilities are totally lacking in Kadankulam tank area of the sanctuary.

### **9.5.2. Infrastructure Development**

#### **9.5.2.1. Interpretation Centre**

There is a small building in the name of Interpretation centre but, as such there has been nothing done inside the building because of lack of financial allocation. If proper budget is provided, there can be a very beautiful small interpretation centre with audio-visual models in the building and in the 1<sup>st</sup> floor VFC hall, there can be a bird photography exhibition hall. This would draw people and tourists all round the year and would be an excellent awareness module for everybody. A library can also be formed and maintained.

#### **9.5.2.2. Amphitheatre**

The multipurpose hall opposite to the interpretation centre can be converted into an Amphi-theatre for screening movies on wetlands and birds and associated wildlife documentaries for students, general public and all visitors. This can be a regular affair during non-birding season, which would be a major attraction.

#### **9.5.2.3. Forest Rest House**

The existing rest house rooms can be repaired and it can be upgraded with additional rooms for encouraging regular bird watchers. There can also be a dormitory constructed for students who come for various awareness programmes and they can be allowed to camp in the Sanctuary for a different experience altogether.

#### **9.5.2.4. Children's Park**

The children's park is under the control of the Panchayat and there has been no maintenance because of lack of budget. This can be taken over by the department and added as an asset to eco tourism.

#### **9.5.2.5 Eco Shop / Canteen**

Maintaining cooking and providing food in the guest house employing sanctuary staff could not be sustained in the long run. Therefore, there can be a small canteen established by SHG belonging to VFC/EDC, which would run on profit sharing basis. There can also be a eco shop or a souvenir shop selling Sanctuary T-shirts, caps, bird photographs, mementos, key chain, etc which would be a good source of income to VFC members and would improve their economic status.

#### **9.5.2.6. Live Bird – Hides**

Planting live bird-hides in the form of tall shrubs of native fruiting and flowering types shall be done intermittently, leaving some wide gaps in between, all along the wildlife viewing area where the 1-meter high chain-link fencing has been proposed. Live bird-hide made of flowering and fruiting shrubs will help view the aquatic birds without disturbing them.

Since tall shrubs would partially obstruct visitors, many shy aquatic birds would wade or swim closer to the shore without fear, giving excellent opportunity to view them and even photograph them without causing disturbance. In addition, these flowering and fruiting shrubs would attract many nectar-feeding and frugivorous birds to the area thereby further enhancing the value of the sanctuary for the visitors. Butterflies too would be attracted to the flowers and enhance the attractiveness of the wildlife viewing area.

Sanitation facilities have been improved in Koonthankulam campus in the current year along with creating of permanent water connection.

There can also be a reception/ office at the entrance to co-ordinate all activities.

There is lack of infrastructure in Kadankulam tank area and small watchtower, sanitation facilities, pergola, etc have to be essentially created on priority basis. Apart from these efforts needs to be taken to install publicity boards about the Sanctuary from the main city and direction boards with different bird photographs can also be installed. There has been few boards installed and few in the bus stand, village, etc have been repaired in the current year and many more are to come.

*Recreation tourism shall be given low priority at Koonthankulam because the size of the sanctuary is very small. Boating, whether for recreation or for viewing birds, shall not be permitted here even for VIPs because such activities would disturb bird life at this small wetland complex. Birds can be easily viewed with the aid of the field glasses without having to go in boats. Boats may be used only for special purposes such as for management activities and for research work, under special circumstance.*

#### **9.6. Regulations, Monitoring and Evaluation**

Though the control should lie with the department, whole eco tourism activities should be managed through SHG's EDC/VFC of Koonthankulam/Kadankulam village or any other associated village SHG on rotation basis. Benefit sharing for their source of income and for community development as well as Sanctuary management shall be decided before operating the eco tourism model. The canteen, eco shops should also be run by the SHG's.

Other than this, parking charges, photography charges, video charges, guest house charges, dormitory charges of other than student group, etc can all be levied and deposited to EDC/VFC account and can be shared as per MoU.

#### **Specialized Staff (Guides)**

It is recommended that the Management provide tourist guides who are well versed in local birds, wetlands and conservation. These could be trained staff members of the Forest Department as well as volunteers and other personnel who are authorized by the Sanctuary management.

Since these persons would come in close contact with the visitors, it is very important to ensure that they strictly conform to the standards and code of conduct needed to spread excellent public image of the management.

## **Public Relations / Liasion**

### **9.6.1. Interaction with Visitors**

Proper interaction with the visitors is a prerequisite for maintaining a good image of the management in the eyes of the general public. While appropriately trained staff specially appointed for dealing directly with the visitors would handle this delicate job, all other staff and volunteers working with the sanctuary management shall have some training in this aspect so that visitors who may have even a slight encounter with any of the staff shall get a good impression about the sanctuary.

### **9.6.2. Interaction with related government agencies**

Keeping good relations with other government departments such as PWD, Fisheries, Tourism, Police and Revenue, etc without compromising underlying principles and rights, is the responsibility of the sanctuary management. Senior management staff shall consider this component crucial to the well-being of this bird sanctuary.

There shall be a continuous interaction with concerned officials, even when there is no particular urgent business at hand, so when the necessity arises, it will be like seeking the help of a friend. Since the water that flows into the sanctuary through Manimuttar canal is controlled by the PWD, it is extremely important that the management takes extra effort to understand the needs and constraints of this department and work in close consultation with them.

### **9.6.3. Liaison with local people**

For successful management of the sanctuary it is necessary to keep the local people from the adjoining villages (or stake-holders) interested and involved. Since both Koonthankulam and Kadankulam wetlands have been very much part of the culture and socio-economic life of the local people through generations, much before the Forest Department stepped in. So it is appropriate to seek and accept their reasonable points of view in all management activities where they are directly affected. However, care shall

be taken not to compromise on any general norms and matters of long-term interest to the sanctuary in particular and to the people in general.

Awareness programmes may consist of talks, audiovisuals, and distribution of pamphlets, press releases, and popular articles in news magazines, radio/TV programmes, seminars, workshops, field visits to the sanctuary etc.

Keeping the local people informed of various development activities being planned and, involving them in any major decision making where their socio-economic life is clearly involved. Giving preference to local people for some jobs and positions in the wetland, if their qualification and all other requirements are clearly competitive.

### **9.7. Eco-Development Committee**

The sanctuary lies in the middle of the village and people from a number of villages are dependent on the tank of this sanctuary for their water needs. To have an active participation of all the stakeholders, it is necessary that there is enough motivation and awareness among them about the sanctuary and its sustainable development. And as and when the sanctuary develops, the people also should develop. This is possible only through EDC formation and involving people in all the activities of Sanctuary. At present there is an EDC functioning at Koonthankulam Bird Sanctuary named 'Koonthankulam 'EDC'.

In order to promote Eco-tourism and for the collective management of sanctuary involving local stakeholders, formation of EDC/VFC is necessary.

#### **9.7.1. FORMATION OF ECO DEVELOPMENT COMMITTEE; Strategy**

There are 13 villages and hamlets within 2 km distance from the boundary of the sanctuary. The name of the villages & hamlets are:

<b>East</b>	<b>North</b>	<b>West</b>	<b>South</b>
1. Koonthankulam	4.Arumuganeri	7.Tilattam	11.Mankulam
2. Kadankulam	5.Ayarkulam	8.NoChikulam	12.Padakkam
3. Kundankulam	6.Ariyakulam	9.Tennavaneri	13.Kalavur
		10.Hanumarpudukulam	

The villagers allow their cattle for grazing during the dry season. This will disturb the birds every year. Therefore, the neighboring villagers are to be involved for managing the area by involving them in works connected with eco-development in the area and restricting their benefit flow outside the sanctuary limit. However, to involve the villagers in all the activities of the Sanctuary, will be main objective of Eco-Development of the area for the betterment of the sanctuary and conservation of birds.

To win over the people of these 13 villages in the buffer zone, every year beneficiaries can be selected from each village for the plan period. This is to be decided after detailed Participatory Rural Appraisal (PRA) exercise in each village, and also based on the fund availability; so that by the end of plan an equitable amount of eco development / economic assistance is given to all villages and which would certainly reduce the grazing pressure inside the Sanctuary.

After availing this loan and after each beneficiary paying back the loan amount (on installment basis); the same would be kept in the Forest Development Fund (To be opened in each village) and this fund will work as revolving fund.

Monitoring of all activities accounts and working of EDC/VFC has to monitor by the Department periodically. Accounts monitoring; every month by FRO and by DFO annually or as decided by the concerned authority. Internal audit can also be done. Regular meetings, sharing of thoughts, changes to be made, etc can be taken into consideration and can be implemented by simple majority voting or resolutions.

### **9.8. Eco-Guides**

The members of EDCs can be trained to perform the role of eco-guides. The training can be imparted utilizing the services of NGOs who have expertise in this field.

### **9.9. Linkage**

The department should co-ordinate with various line departments of the state government, through the district administration and to facilitate line department activities in the villages falling within the sanctuary.

### **9.10. Participatory Management**

This wetland has been and remains central to the livelihoods of communities living around it and the wetland landscape has been shaped and protected by local communities. Villagers have been observed to sell snacks and other eatables and other souvenirs at the entrance of the sanctuary in the tourist season. The EDC members should be actively involved in the planning process, implementation and evaluation. Home stay facilities and eco guides can be developed in the villages and the services can be made available for the tourists.

### **9.11. Publicity, Eco awareness and Nature Camps**

The nature camp can accommodate about 50 children and their teachers or 40 adults at a time. It is a multipurpose facility used for learning, appreciation of nature, awareness generation, common lectures or school projects.

The components that should be part of the facility are as follows:

- Lecture room (indoor presentations, projection room, and virtual field trip)
- Demonstrations / exhibits space with panels for display of birds, bird calls, other forms of life etc. Permanent and seasonal displays and Rotating galleries could also be considered.
- Observation and watch towers fully equipped with one spotting scope and binoculars.
- Information board area

Apart from well informed officers and staff of the Forest Department, the other resource persons would be eminent persons in the field of forests, wildlife & environment & NGOs.

### **9.12. Nature Trails**

At Koonthankulam Bird Sanctuary, nature trails can be conducted only on the tank bund and not inside the tank. Disturbances caused by movement of people would be detrimental to the birds inside the tank.



## **CHAPTER X**

### **RESEARCH, EDUCATION AND TRAINING**

#### **10.1 Research**

Research and education are the two important components of nature conservation which are beneficial to student and scientist community at the regional, national and international levels. It helps in excellent documentation of local birds, migratory birds, their behaviour, database creation, and studies on the effect of different limiting factors on the sanctuary.

An important benefit of Koonthankulam sanctuary is the excellent opportunity it can provide for undertaking ecological research and environment education related to tropical freshwater wetlands and wet Terrestrial birds.

Apart from helping in advancement of scientific knowledge, the knowledge to be gained from the findings of research undertaken here would help in better management of the sanctuary.

Similarly the environment education activities to be undertaken by students and other target groups would not only enhance their knowledge of the terrestrial birds and their natural environment but also help in gaining public support in protecting this sanctuary at national and international level. The management shall, therefore endeavor to facilitate education and research activities by accredited institutions and individuals to its own advantage.

While scientists (Biologist) who undertake field research may come in small numbers and that too infrequently, students would come as a large group and hence would pose different forms of needs, demands and problems and would require to be attended to, accordingly. The researchers would need to be given certain facilities that are special and are normally not extended to the visitors. The Sanctuary manager would use his / her discretion in this matter without compromising the welfare of the sanctuary.

## **10.2 Prioritization of Research**

### **10.2.1. Integration of Wetlands within the landscape matrix**

Often, studies of habitats have focused only on the individual habitat type. Further, information regarding differential use of wetland types by wetland-dependent species is lacking. Little attempt has been made to determine how the combination of various wetland or habitat types affects their respective uses by wildlife.

### **10.2.2. Regional and National Monitoring of Populations**

Breeding locations of most waterfowl have to be identified as part of the regular inventory. Inventories should be supported to determine water bird status in critical wetlands, especially for little-studied species.

### **10.2.3. Fragmentation effects**

Research is required to investigate how changing sizes and patterns of distinct wetlands affect their use by a variety of wetland Terrestrial birds.

### **10.2.4. Training of professionals**

Advanced training is required to understand the ecological processes in wetlands and to understand the significance of wetland complexes over a larger landscape. Geographic information systems can be used as vital tools for managers to learn the basics of ecosystem and landscape management.

### **10.2.5. Water Level Control**

If dams are in use, flooding during the nesting season must be avoided, or else birds nesting on the ground or even over water may be flooded out.

### **10.2.6. Control of pesticide use**

Pesticides in wetlands have been known to be lethal. Organochlorine pesticides are known to reduce productivity in birds including waterfowl, terns, gulls, herons or indirectly by affecting the behaviour of adults. Pesticides may also cause pathological conditions in wildlife. Chemicals kill the birds that are natural insect controls as well as kill the insects themselves, reducing the control factor and hastening an outbreak of insects that multiply much faster than the controls.

### **10.2.7. Regulation of human disturbance**

As recreational activities increase, human disturbance also increase which can exert a tremendous influence on some wetland species which require undisturbed habitat for nesting. Uncontrolled livestock grazing also could trample nests and alter vegetation.

### **10.2.8. Public Awareness Concerning Wetlands**

The public must develop an appreciation of wetlands for the many ecological, recreation, aesthetic, and public ecosystem service values that they provide. Teaching of wetland ecology should be included in school curriculum, and should be part of the outreach effort of every scientist and landscape manager. Training, workshops for wetland biologists and managers should be expanded and should include the private sector. Aqua culturists and rice farmers should be included in the educational process.

## **10.3. Monitoring and Evaluation**

Since monitoring of birds visiting the sanctuary and their habitats has to be done on a regular basis, it would be more efficient if some of the senior management personnel do learn to gather some of the basic data as a part of their job. If possible a well learned staff /research officer/ biologist can be employed for research and monitoring purpose exclusively for this sanctuary. A data sheet can be used for collection of this information systematically. For this purpose and for managing the sanctuary efficiently the sanctuary management personnel shall acquire sound knowledge of the Terrestrial birds and wetland ecosystem management principles. Some of the activities of the feature could be:-

1. Documentation of seasonal changes.
2. Documentation of terrestrial and aquatic birds population.
3. Monitoring daily max-min temperatures
4. Study of rainfall / drought impact on wetlands
5. Charting wind direction and speed
6. Downloading and interpreting data on computer.
7. Documentation of Phytoplankton and Zooplankton

The Wetlands Study Stations offer three settings for experiential learning on wetlands behavior, water quality, and the indivisible link between wetlands and habitat conservation. Some of the activities could include: Hydrological studies of water bodies, water quality test, soil test, stream invertebrate study, bird census and ornithological studies, erosion control study etc.

Some of the motivated staff of the Forest Department can also be trained in identifying birds and aquatic flora so that they could act as wildlife tourism guides. Local conservation organizations will be able to assist the management in such programmes and also in giving periodic training to junior staff of the Department on field identification of birds, etc., as it was done earlier.

Such trainings have already been initiated vide TBGP for department selected staffs; the same has to be imparted to all the interested staff. Periodical study of bird abundance, vegetation documentation in wetlands, etc are also being done under the same project in Koonthankulam Bird Sanctuary, as well as other 10 noted aquatic bird habitats in the district.

## CHAPTER – XI

### MISCELLANEOUS REGULATIONS

#### 11.1 Disease Management

Disease is a natural component of population ecology and ecosystems and is one mechanism by which population numbers are regulated. However, anthropogenic activities can often create novel disease problems or increases in prevalence and frequency of existing disease tipping a ‘balanced’ system into one where losses are increased.

Targeting the environment and land use e.g. healthy habitat management including wise use; maintaining appropriate water quality and quantity; reducing risk from pollutants and toxicants; and manipulation of habitat to reduce disease agents or their invertebrate vectors.

#### 11.2 Strategies

- Targeting the environment and land use *e.g.* healthy habitat management including wise use; maintaining appropriate water quality and quantity; reducing risk from pollutants and toxicants; and manipulation of habitat to reduce disease agents or their invertebrate vectors.
- Targeting host populations *e.g.* maintaining good nutritional status; reducing stressors; managing density of domestic animals and wildlife; reducing contact between domestic animals and wildlife (including zoning); and vaccination or veterinary treatment.
- Targeting pathogens and parasites *e.g.* managing bio-security; hygiene, disinfection and sanitation; and interrupting transmission by exploiting weaknesses in a parasite's life cycle, such as targeting intermediate hosts and/or their preferred habitat.

### 11.3 Intervention

1. The appropriate approach to disease management will depend on the characteristics of problem and, when dealing with an infectious disease, on the correct identification of hosts and vectors of infection. Management measures shall target the pathogen, host, vector, environmental factors or human activities. Ultimately, an integrated approach involving several complimentary measures involving various Stakeholders shall be aimed in managing diseases.
2. Disinfection and sanitation procedures targeting pathogens.
3. Animal car-cases represent a significant potential source of infection and require rapid and appropriate collection and disposal. Disposal options are varied and again need to be used with caution in wetland situations to reduce risks of pollution of water courses or further spread of infection.
4. Vaccination programmes, shall be implemented at regular interval.
5. Habitat modification to eliminate or reduce the risk of disease, by reducing the prevalence of disease-causing agents, vectors and/or hosts and their contact with one another, through the manipulation of wetland hydrology, vegetation and topography and alterations in host distribution and density.
6. Disease transmission through avoiding contact between infected and susceptible animals shall be implemented at the time of epidemic.
7. Complete eradication of a disease through understanding of its epidemiology, sufficient political and stakeholder support and thorough resourcing.

## CHAPTER XII

### ORGANISATION, ADMINISTRATION AND INFRASTRUCTURE

#### 12.1. Structure and Responsibilities

Koonthankulam Bird Sanctuary is under the control of Forest Range Office, Tirunelveli Range coming under the jurisdiction of District Forest Officer, Tirunelveli. The present arrangements of organization and administration will do well for future also. Hence no changes are proposed during the period of present Management Plan.

The organization structure of administration for the sanctuary is such that the District Forest Officer, Tirunelveli has the overall control of the sanctuary and will be having the following staff for the management.

##### ***Forest Range Officer***

The Forest Range Officer, Tirunelveli will have jurisdiction over this sanctuary. He will be responsible for the day to day general administration of the sanctuary and for preparation of estimates for works execution of works, supervision, etc.

##### ***Forester***

One Forester with Head Quarters at Tirunelveli will have jurisdiction over this sanctuary. He will be responsible for the protection of the sanctuary and execution of works.

##### ***Forest Guard***

Two Forest Guards will reside at Koonthankulam Village. One will be responsible for the Koonthankulam Tank and other will be responsible for Kadankulam Tank. They will be directly responsible for the protection and management of the sanctuary and will handle all emergencies.

##### ***Bird Watcher***

Two experienced persons from Koonthankulam Village are currently posted here as temporary Bird Watchers. They also handle protection of the bird sanctuary on a limited consolidated pay. Their status may be regularized and suitable pay scale be fixed.

##### ***Staff Amenities***

The residential quarters for Forest Guard is constructed in Koonthankulam Bird Sanctuary limits, while for bird watchers, they are employed from local villages only.

## CHAPTER XIII

### ECO-SENSITIVE ZONE

#### **Eco Sensitive Zone**

The National board for Wildlife in its ‘*Wildlife Conservation Strategy-2002*’ envisaged ‘*lands falling within 10 km of the boundaries of National parks and sanctuaries should be notified as eco-fragile zones under section 3 (v) of the Environment (Protection) Act and Rule 5 Sub rule (vii) & (x) of the Environment (Protection) Rules*’. With concerns over applicability of the 10 km range, the National Board for Wildlife decided ‘*delineation of eco-sensitive zones would have to be site specific and relate to regulation, rather than prohibition, of specific activities*’.

The purpose of declaring Eco-sensitive zones around National Parks and sanctuaries is to create some kind of ‘*Shock Absorber*’ for the protected areas and they would also act as a transition zone from areas of high protection to areas involving lesser protection.

#### **Monitoring Committee**

(i) In exercise of the powers conferred by the sub section (3) of Section 3 of the Environment (Protection) Act, 1986 (29 of 1986), the Central Government hereby constitutes a committee called the Monitoring Committee to monitor the compliance with the provisions of this notification.

(ii) The Monitoring Committee referred to in sub paragraph (1) shall consist of not more than ten members so as to represent the following namely;

1	District Collector, Tirunelveli	Chairman
2	District Forest officer, Tirunelveli	Member Secretary
3	Sub Collector/ Revenue Divisional Officer, Cheranmahadevi	Member
4	Regional Officer, Tamilnadu State Pollution Control Board, Tirunelveli	Member
5	Tashildar, Nanguneri	Member
6	An Ecologist (Dr. Robert Grubh)	Member
7	A representative from Town Country Planning Department	Member
8	A representative from Local NGO	Member
9	A representative from Ministry of Environment Forests and Climate Change, Government of India.	Member



## **Boundaries of Eco Sensitive Zone**

### **Area & Width of Eco-Sensitive Zone**

The Eco sensitive zone spread over a total area of **974** Ha including sanctuary area of **129.33** Ha and width of proposed eco-sensitive zone is **0.34 Km to 1.50 Km**.

**The list of villages that falls within the eco-sensitive zone are as follows**

1. Silayam
2. Mankulam,
3. Kadankulam
4. Vadakku Kadankulam
5. Koonthankulam

### **Restrictive Activities in the Eco Sensitive Zone**

The following activities in the Eco Sensitive Zone shall be regulated in the manner provided herein, namely

#### **(a) Mining and Quarrying**

Any mining and quarrying activities involving blasting or any other ground vibration techniques totally banned within 2 Km of Koonthankulam Bird Sanctuary. Within the Eco-Sensitive Zone Existing Surface sand quarry, if any regulated.

#### **(b) Felling of Trees**

Felling of any trees in within the Eco-Sensitive Zone will be subject to the prior permission from the forest department so as not to affect the shelter and nesting trees.

#### **(c) Industrial Units and Factories**

No establishment of wood based industries and any other polluting industrial units or factories within eco sensitive zone and establishment of other kind of industries regulated with prior permission and adhering to norms.

#### **(d) Noise Pollution**

Noise free traffic zone rules to be implemented in the zone area and ban on use of blasting materials or any other noise pollution causing articles.

**(e) Water**

Commercial use of natural water in the Eco-Sensitive Zone is prohibited and regulation on new bore wells in the eco sensitive zone area will be enforced.

No fishing permitted in Sanctuary tanks and it is regulated in tanks within eco sensitive zone.

**(f) Discharge of Effluents and solid waste**

Complete ban on effluent discharge and solid waste in Sanctuary tanks and no untreated effluents or solid waste, including plastics, shall be discharged in tanks coming in Eco Sensitive zone.

**(g) Faulty agricultural practices**

Use of pesticides and insecticides to be regulated, by awareness activities and by promoting organic farming.

## CHAPTER-XIV

### BUDGET

#### **Fund Flow**

The funds for carrying out the prescription of this Management Plan will be secured through centrally Sponsored /Shared Schemes of the Government of India which are likely to be continued in the XIII Plan. Support of funding that may be possible by other agencies like department of Environment, Corporate Social Responsibility and others will be attempted to be secured and works will be implemented keeping the board strategies/prescription highlighted in this Management Plan.

#### **14.1. Financial Forecasting:**

The financial implications of the Management Plan for the period 2018-2019 to 2022-2023 are as detailed in following paragraphs. The financial projections have been made for the following management prescriptions which are to be carried out during the plan period.

The Budget requirement for the proposed activities is given below in phased manner (annual) in the chapter.

#### **14.2 Summary of Prescriptions**

##### **14.2.1. Deepening of tank**

Koonthankulam Bird Sanctuary is one of the renowned bird sanctuaries in the state with a very unique history. The local people have been protecting the Sanctuary for centuries because they have realised that the bird droppings falling into the tank create a liquid guano effect. Thus the water when used to irrigate crop fields increases the agricultural productivity greatly and saves the cost of fertilizers. Koonthankulam displays one of the most concentrated populations of different species of birds in a compact area and thus it is an ornithologist's paradise. In order to increase the capacity and duration of water storage in the tank it is necessary to deepen the tank. This will in turn attracts more birds and will prolong their stay for a longer period of time.

##### **14.2.2. De-silting and cleaning of the channels**

Water from the Manimuthar Channel 3<sup>rd</sup> reach comes into Koonthankulam tank. Hence the channels carrying water from Manimuthar Channel to Koonthankulam tank need to be desilted every alternate year.

#### **14.2.4. Planting of *Acacia nilotica***

*Acacia nilotica* is the main species on which the birds roost in the Koonthankulam Bird sanctuary. Of late some trees have wilted and died and they need to be replaced. Taller seedlings can be planted and provided with inputs like farm yard manure, VAM etc.,

#### **14.2.5. Planting taller seedlings around the vicinity of the Bird Sanctuary and supply of multipurpose and fruit bearing seedlings in the ecological boundary**

The sanctuary surrounding is devoid of evergreen trees. Planting taller seedlings would create a microclimate conducive for birds.

#### **14.2.6. Creation of Mounds / Islands**

The sanctuary being a earthen pond or a tank, does not provide great diversity in terms of the habitat types likes the deep waters, shallow waters, mud flats, islands, shallow slopes etc., in order to provide variation in the habitat types so as to invite bird diversity it is essential to create such structures so as to attract bird diversity.

#### **14.2.7. Releasing Fish Fingerlings**

Fingerlings must be released in the tank annually to ensure steady food supply for the birds coming to the Sanctuary.

#### **14.2.8. Conducting periodical Bird Census**

The bird population can be monitored by conducting periodical i.e. monthly bird census for a period of six months starting from October to May. This will help us study the trends in bird arrival, bird stay, feeding and breeding.

#### **14.2.9. Introduction of Emergent Plants on the Edges of Shore Area**

Emergent plants like *Typha*, *Arundodonax*, *Ipomea aquatic*, *Hygrophila auriculata*, *Polygonum glabrum*, *Oryza rufipogon*, *Saccharum* sp, etc., can be introduced on the edges of shore area. Gentle slopes should be provided at the shores to facilitate growth of aquatic vegetation to promote the use of this area by shore birds like stilts, shanks, sandpiper, etc.,

#### **14.2.9. Conducting anti-poaching camps during the season with the help of Anti-Poaching Watchers**

Around 45,000 to 60,000 birds visited Koonthankulam Bird Sanctuary every year. These birds need to be protected from poaching. Hence, anti-poaching watchers are necessary to patrol the area and protect the birds from poaching.

#### **14.2.11. Eco Awareness Camps**

With the introduction of environmental studies as a compulsory subject in the school and college curriculum many students are willing to visit Koonthankulam Bird Sanctuary. This apart a lot of visitors are also coming to Koonthankulam Bird Sanctuary. To create the right kind of awareness regarding Wildlife and Bio-diversity conservation Eco camps must be conducted every year.

#### **14.2.12. Improvement of Signage, Boards and Interpretation Center**

To create awareness about the importance of migratory and residents birds and to highlight the role of Koonthankulam Birds Sanctuary in conservation of birds, the interpretation centre at Koonthankulam Birds Sanctuary has to be improved.

#### **14.2.13. Construction and Improvement of Viewpoints and Watch Towers**

One Watch tower need to be constructed in Kadankulam tank and improved in existing watch tower in Koonthankulam tank so as to have a better vision of birds by public and better monitoring by department staff.

#### **14.2.14.Improvement of visitors facilities such as Walk Paths, Rest Sheds, Toilets, Drinking Water Facilities, Benches, etc.,**

Koonthankulam Birds Sanctuary being an important wetland, a large number of visitors comes to see the migratory birds and to study the eco system. It is required to provide them with better staying facilities and toilets etc., so that more visitors can be attracted and the importance of sanctuary highlighted. Visitor amenities like sitting benches, shelter sheds, drinking water facility should be provided for visitors who come to watch birds and to take rest in the sanctuary.

#### **14.2.15. Purchase of Books, Journals, etc., on Water Birds, Wetlands and publicity and Printing of Brochures**

Water Birds books, journals etc. need to be purchased and the available checklist of water birds and brochures on the sanctuary needs to be reprinted. Awareness can be created by preparing publicity material and distributing among the Visitors, Public and school children. For preparing publicity material, computer, camera, projector etc., need to be purchased.

#### **14.2.16.Providing fencing to prevent trespassing into Koonthankulam Bird Sanctuary**

The Koonthankulam Birds Sanctuary is abutting the Koonthankulam village. The sanctuary is under the constant threat of grazing and hence it is proposed to create fencing around the boundary so that the livestock and cattle are kept away.

#### **14.2.17. Research / Ecosystem study and monitoring works**

Periodical studies have to be undertaken during the duration of this Management Plan. Similarly, an inventory of vegetation including micro flora, inventory / checklist of species which serve as food to the birds, population dynamics of various species of birds, inter and intra species relationship, ecological niche of each species, specific habitat requirements etc., are some of the fields of research which should be undertaken. The work is proposed to be undertaken through part time research scholars interested in wildlife, with each study for duration of one year.

#### **14.2.18. Skill Development Training and Exposure Visit to Field Staff**

Training needs to be provided to the field staff on habitat management and on birds to guide the visitors. To ensure successful implementation of wildlife management proposals, on-the-job training for 15 days needs to be given to watchers, guides and mazdoors locally by officers of Deputy Conservator of Forests rank, already trained in wildlife. The watchers have lot of knowledge and so training can be directed for training them on how to document the data collected and also on honing presentation skills to act as tourist guides. Exposure visits to other protected areas will supplement the knowledge and attitude of field staff.

#### **14.2.19. Eco Development Works**

To elicit the co-operation of people in protecting the birds, eco development activities need to be undertaken. The road abutting the sanctuary has to be repaired for easy communication of villagers.

#### **14.2.20. Vaccination of livestock around the Bird Sanctuary**

Disease is a natural component of population ecology and ecosystems and is one mechanism by which population numbers are regulated. However, anthropogenic activities can often create novel disease problems or increases in prevalence and frequency of existing disease tipping a 'balanced' system into one where losses are increased. Vaccination programmes, often supplemented by other disease control measures, can help control and even eliminate diseases affecting livestock.

#### **14.2.21. Eco Tourism**

It is proposed to develop Eco Tourism in the Koonthankulam Birds Sanctuary, Visitor Amenities, interpretations facilities, signages, information boards reading material etc., have to be provided. Eco Tourism should be taken up involving VFCs. This component would include publicity, nature camps, learning gardens, improved interpretations center, Environment education techniques, nature trails etc.,

### Summary of Prescriptions:-

1	I year maintenance
2	II year maintenance
3	Raising nursery and planting of <i>Acacia nilotica</i>
4	Plantation of <i>Acacia nilotica</i> trees
5	I year maintenance
6	Deepening the tank to create dead storage in Koothakulam
7	Deepening the tank to create dead storage in Kadankulam Tank
8	Creation of walk path around the tank bund
9	Removal of Invasive Alien species
10	Strengthening the tank bund in Kadankulam tank
11	Repairs to the sluices and other general maintenance
12	Stocking the tank with fish finger lings
13	Engaging Anti poaching watchers
14	Maintenance of existing chain link fence including replacing chain link wherever necessary in Koonthankulam Tank.
15	Formation of chain link fence in Kadankulam Tank
16	Construction of observation tower in Kadankulam Tank
	<b>Eco development activities</b>
1	Conducting eco development committee meeting
2	Bird watching huts inside of the lake
3	Improvement of Interpretation centre displaying Birds details with light and sound method
4	maintenance works in interpretation centre
5	Purchase of furniture for the bird watching shed and Office
6	Providing seating arrangement with shade
7	Construction of EcoShop/Canteen
8	Maintenance of ecoShop/canteen
9	Surveying, demarcation and Fixing boundary stones in Koonthankulam and Kadankulam Tank.
10	Maintenance of existing Rest House
	<b>Education and Research</b>
1	Engaging Biologist
2	Purchase of Binoculars
3	Erection of sign boards
4	Training to staff and villagers
5	Awareness and Publicity
6	Purchase of LCD Projector and screen
7	Purchase of Wild Life books

8	Purchase of Binocular
9	Purchase of NIKON SLR Camera
	Census
	<b>Option-I</b>
	Bringing water from Manimuthar Dam to Koonthankulam Sanctuary through pipeline along the canal bank .
	Construction of ground level water tank including pump room, cost of pump, pipeline works etc.,
	<b>Option-II</b>
	Bringing water from Tamirabarani River MuthalanKurichi to Koonthankulam Sanctuary and construction of over head tank including pumping room, cost of pump, pipeline works etc.,