



TAMILNADU FOREST DEPARTMENT
MANAGEMENT PLAN OF THERTHANGAL BIRD SANCTUARY,
RAMANATHAPURAM DISTRICT

(PERIOD: 2023-2024 to 2032-2033)



PREPARED BY

THE WILDLIFE WARDEN
RAMANATHAPURAM WIDLIFE DIVISION
RAMANATHAPURAM – 623 503

INTRODUCTION

Therthangal Bird Sanctuary is a unique mosaic wetland ecosystem located close to Gulf of Mannar on the Central Asian flyway, a regular route for the migratory birds that comes from Iran, Afghanistan and Pakistan. The Therthangal Bird Sanctuary about 48 species of birds of which about 5 are near threatened species. This wetland acts as a breeding ground for several Resident/Resident-Migrant species of waterfowl. The habitats in this wetland not only favor bird population. This sanctuary has to be preserved as it is a gift of nature to the humanity. Various activities like habitat management, eco development, eco tourism, Nature Education Camps etc. have been proposed to conserve this unique ecosystem as well as create awareness among the public about the usefulness and inevitability of such ecosystem. The proposed Management Plan has come up in good way which serves the purpose of protection and conservation & development of Therthangal Bird Sanctuary. I believe this Management Plan will be effective not only for conservation of Therthangal Bird Sanctuary, but also for the development of the villages situated around the sanctuary.

Wildlife Warden,
Wildlife Division,
Ramanathapuram

THE EXECUTIVE SUMMARY

The Therthangal Bird Sanctuary is spread over a total area of 0.2929 Square Kilometers. It is bestowed with extraordinary scenic beauty and landscape. The sanctuary is home for many important endemic and near threatened species including the Painted stork, Black-headed ibis, Spot-billed pelican, Oriental darter and Pallied harrier among others. The sanctuary also harbours rich biodiversity particularly among the lower vertebrate groups such as amphibians and reptiles (herpatofauna) as well as invertebrates. This sanctuary is also rich in avifauna. This management plan is aimed at conserving this natural resource and to develop such facilities that will enhance the non-consumptive utilization of the sanctuary such as eco-tourism, education and research. The objectives of management can be briefly summarized below:

1. To conserve and protect the habitat, so that endangered and endemic flora and fauna inhabiting the area are adequately protected and propagated.
2. To maintain and wherever necessary restore the physical integrity of the area in addition to restoring the degraded portion of the sanctuary.
3. To create awareness among the people in general and the children in particular about nature and wildlife with particular emphasis on the ecological role of the sanctuary area.
4. To maintain and develop tourism for recreation, education and scientific exploration without affecting the sensitive ecosystem adversely.
5. To reduce the dependence of the people on forest based resources in the zone of influence, with sensitivity to cultural and economic well being of the communities, through eco-development activities
6. To provide for capacity building for efficient management of the sanctuary through better training of staff and infrastructure.
7. To promote scientific and ecological research or studies that will help the sanctuary management in assessing the physical and biological resources, planning for conservation of these resources and monitoring the health of the habitat.

The major problems facing the sanctuary management which adversely affect the achievement of these objectives include inadequate staff, lack of basic infrastructural facilities and limited funding. Despite the richness of the shola forests and natural beauty, the facilities for eco-tourism are grossly inadequate. The efforts of education and awareness generation have been less than adequate.

The present management plan has been compiled following the manual for planning wildlife management in protected areas and managed forests by Wildlife Institute of India.

It comprises of three parts; Part One dealing with four chapters: Chapter 1- Introduction to the area, Chapter 2- Background information & attributes, Chapter 3- History of management & present practices and Chapter 4- The Protected Area & the interface Land use situation. Part Two deals with the rest of the seven Chapters namely: Chapter 5- Plan objectives and problems, Chapter 6- The Strategies, Chapter 7- Tourism, interpretation and Conservation Education, Chapter 8- Eco-development, Chapter 9- Research, Monitoring & Training, Chapter 10- Organization and Administration and Chapter 11- The Budget. Part three comprises of various Annexures and control forms pertaining to the management of the sanctuary.

In Chapter 6 (The Strategies), the sanctuary has been divided into three zones, namely, core zone, tourism zone and buffer zone and strategies have been identified for these zones. Theme plans have been developed for the sanctuary area for protection from poaching, fire protection, soil and moisture conservation and water management, birds' health surveillance, man-animal coexistence and development of infrastructure and communication.

The Chapters 7, 8 & 9 that deal with Tourism, Eco-development and Research and Monitoring have proposed various measures for conducting these activities. Chapter-10 deals with the present and proposed staff that would be required for effective management of the sanctuary. Chapter-11 deals with the budget that would be required both at central and state level for fulfilling these activities.

ACKNOWLEDGMENT

I express my sincere gratitude to Thiru. Subash Mohapatra IFS Principal Chief Conservator of Forests and Head of Forest Force, Chennai for his keen interest and support for the compilation of the plan.

I also express my sincere gratitude to Thiru. Srinivas R. Reddy IFS, Chief Wildlife Warden & Principal Chief Conservator of Forests (Wildlife), Chennai for his valuable suggestions for compilation of the plan.

I thank Tmt. R. Padmawathe IFS, Chief Conservator of Forests and Field Director, Srivilliputhur Megamalai Tiger Reserve, Madurai, for his advice throughout the process of compilation of the plan.

I am thankful to the technical committee constructed for providing advice for drafting the management plan, Dr. S. Balachandran, Bird expert, Bombay Natural History society, Ravindran Natarajan, Bird expert, Iragukul Amritha Nature trust, Changrashekhar, Bird expert, a life member of BNHS and MNS and H Byju, Centre of Advanced Study in Marine Biology, Annamalai University.

The process of writing the Management Plan started with Thiru. K. Baskaran, Draughting Officer, Ramanathapuram Wildlife Division. The draft documents were of great help and I duly acknowledge his contribution.

I duly acknowledge the inputs from field, particularly by, Forest Range Officer, Therthangal Sanctuary and also from other field staff including the Forester, the Guards and other staff, which greatly helped in prioritizing the strategies in the management plan. I also thank my office staff for their help in preparing the management plan.

I express my sincere thanks to all local people, officers of various departments' whose ideas and suggestions in one form or another have helped in framing some of the strategies of this plan.

Wildlife Warden,
Wildlife Division,
Ramanathapuram

CONTENTS

PART - I

DESCRIPTION & EVALUATION

THE PROTECTED AREA: THE EXISTING SITUATION

Chapter No.	Particulars	Page No.
Chapter- 1: Introduction of the area		1-4
1.1	Name, Location, Constitution and Extent	1
1.2	Approach and Access	1
1.3	Statement of Significance	2
1.3.1	Locational Value	2
1.3.2	Ecological Value	2
1.3.3	Cultural Value	2
1.3.4	Economic Value	3
1.3.5	Tourism Value	3
1.3.6	Scientific Value	3
Chapter- 2: Background Information and Attributes		5-12
2.1	Boundaries	5
2.1.1	Legal boundaries	5
2.1.2	Ecological boundaries	6
2.2	Geology, Rock and Soil	8
2.3	Terrain	8
2.4	Climate	9
2.4.1	Rain fall pattern and distribution	9
2.4.2	Temperature; a summary of year-round pattern	10
2.4.3	Humidity; a summary of year-round pattern	10
2.4.4	Wind speeds, a summary of year-round pattern	10
2.4.5	Drought and its periodicity	10
2.5	Water sources	10
2.6	Range of Wildlife, Status, Distribution and Habitat	11
2.6.1	Vegetation	11
2.6.2	Animals	11
Chapter- 3: History of Management and Present Practices		13-22
3.1	General	13

3.2	Timber operations including bamboo and firewood harvest	13
3.2.1	Silvicultural Systems and tending Operations	13
3.2.2	Evenaged Systems and Unevenaged Systems	13
3.2.3	Bamboo Working	13
3.2.4	Firewood Harvest and Collection	14
3.3	Non wood forest produce (NWP) collection	14
3.4	Leases	14
3.5	Other programmes and activities	14
3.6	Forest Protection	14
3.6.1	Legal Status	14
3.6.2	Hunting	14
3.6.3	Poaching and Other Illegal Activities	14
3.6.3.1	Poaching	14
3.6.3.2	Illegal Cutting of Trees	15
3.6.3.3	Illegal removal of NWP, encroachment and other illegal activities	15
3.6.4	Live stock grazing	15
3.6.5	Wild Fires	15
3.6.6	Insect Attacks and Pathological Problems	15
3.6.7	Wildlife Health	16
3.6.8	Interagency Programmes and Problems	16
3.7	Tourism	16
3.8	Research, Monitoring and Training	16
3.8.1	Research & Monitoring	16
3.8.2	Training	17
3.9	Wildlife conservation strategies and their evaluation	17
3.10	Administrative setup	17
3.11	Communication	18
3.12	Summary of Threats to Wildlife	18
Chapter- 4: The Protected Area and Interface Land use Situation		
4.1	The Existing situation in the Zone of influence	19
4.1.1	Villages inside outside protected area, Ethnic, identities, traditions, customs, relationship between distinct groups of people, relationship with resources, habitat and area.	19

4.1.2	The state of the people's economy, vocations, land use, use of forest and non-forest based natural resources by people and seasonal patterns.	20
4.1.3	Implications of the land use and resource dependency for the conservation of PA	21
4.2	The Development Programs and Conservation Issues	21
4.2.1	An evaluation of government and non-government agencies programs for development. Implications for PA, people and ZI	22

PART - II

THE PROPOSED MANAGEMENT

Chapter- 5: The Vision, objectives, issues and problems		23-25
5.1	The Vision	23
5.2	Objectives of Management	23
5.3	Problems in Achieving objectives	24
Chapter- 6: The Strategies		26-32
6.1	Boundaries	26
6.1.1	Legal boundaries	26
6.1.2	Ecological boundary	27
6.2	Zonation	28
6.3	Zone Plans	30
6.3.1	Plan for Core zone	30
6.3.2	Plan for Buffer zone	30
6.3.3	Plan for Tourism zone	31
6.4	Theme Plans	31
6.4.1	Habitat Improvement	31
6.4.2	Strategies to overcome protection problems	32
6.4.2.1	Control of illegal fishing	32
6.4.2.2	Control of illegal grazing	32
6.4.2.3	Fire Protection	32
6.4.2.4	Creating awareness for public	32
Chapter- 7: Eco-Tourism, Interpretation and Conservation Education		33-35
7.1	General	33

7.2	Objectives	33
7.3	Issues / Problems	33
7.4	The Strategies	34
7.4.1	Identification of a Zone	34
7.4.2	Infrastructure Development	34
7.4.3	Regulations, Monitoring and Evaluation	35
Chapter- 8: Eco Development		36-40
8.1	Objectives	36
8.2	Specific Issues	36
8.3	Broad strategies	37
8.4	Village Level Site Specific Strategies	37
8.5	Monitoring and Evaluation	39
Chapter- 9: Research, Monitoring and Training		41-47
9.1	Research and Monitoring	41
9.2	Monitoring	42
9.3	Training	45
9.3.1	On the job training	46
9.3.2	Formal training courses	46
9.3.3	Establishing a learning Centre	47
Chapter- 10: Organization and Administration		48
10.1	Structure and Responsibilities	48
10.2	Staff Amenities	48
Chapter- 11: The Budget		49-59
11.1	The Plan Budget	49
11.1.1	Financial Forecasting	49
11.1.2	Summary of Works	49
11.1.3	Fund Flow	59
Chapter- 12: The Schedule of Operation and Miscellaneous Regulations		60-61
12.1	The Schedule	60
12.2	Record of Deviations and Implemented Targets	60
12.3	Record of Employment Potential	60
12.4	Control Forms	60
12.5	Maintenance of Compartment Histories	61
12.6	A Pocket Field Guide for Plan Implementation	61

	Abbreviation used	62
	Reference	63

	Part III	
	Appendices and Maps	
Annexure No	Content	Page No
Annexure I	Order of Government of Tamil Nadu	68
Annexure IA	Field Measurement book extract of Therthangalk Tank	70
Annexure II (a & b)	List of tanks and ponds within 2 KM around Therthangalbirds sanctuary	71
Annexure III (a, & b)	Rainfall	72
Annexure IV(a, & b)	Monthly Average Temperature and Relative Humidity, Ramanathapuram District	74
Annexure V	Flora of Therthangal Bird Sanctuary	76
Annexure VI	Annotated Checklist of Birds in Therthangal birds Sanctuary	78
Annexure VII	Check List of Mammals, Amphibians and Reptiles in Therthangal Bird Sanctuary	83
Annexure VIII	Minutes of Meeting and report of meeting conducted by forest staff with local villagers around the Therthangal Bird Sanctuary	84
Annexure IX	Eco-sensitivity zone notification Gazette	86

List of Maps

Map No	Content	Page. No
1	Location Map of Therthangal bird sanctuary	104
(a)	Location Map of Therthangal Bird Sanctuary over the Survey of India Topo Sheet of 1: 50,000 Scale	104
2	Legal Boundary Map	105
3	Ecological Boundary around the bird sanctuary	105
4	Eco Sensitive Zone of Therthangal Bird Sanctuary	106

1. INTRODUCTION OF THE AREA

Name, Location, Constitution and Extent of Area

Therthangal Birds Sanctuary located at N 09°27.499' Latitude and E 078 ° 45.536' Longitude, is part of Therthangal Village of Ramanathapuram Taluk, in Ramanathapuram District of Tamil Nadu. Location of the sanctuary is illustrated in **Map 1**.

In the past on the occasion of Nainarkovil festival (Naganathar Temple) a temple Chariot from Ramanathapuram was dragged to Nainarkovil village with the help of elephants. The elephant which dragged the chariot got stuck in the slush of clayey soil near Therthangal village. Therefore, the Gods or the temple chariot had to stay for a few days and hence since then the village came to be known as 'Therthangal' – 'a place where the chariot had stayed'.

The Therthangal tank was declared as a bird sanctuary in the year 2010, with an estimated area of 29.29.5 ha in Therthangal village. It is notified as a sanctuary with the meaning and scopes of Section 18 (1) of Wildlife Protection Act 1972, through the G.O Ms. No 220/W6, Environment and Forest Department (FRV) dated 15.12.2010 (**Annexure I**).

The proceedings on settlement of rights under section 19 to 25 of the Wildlife Protection Act 1972 is yet to be completed by the District Collector, Ramanathapuram. Besides the final notification and declaration of the sanctuary under section 26-A remains to be done. These will be pursued during the current plan period.

The sanctuary is managed as a single unit and there are no ranges or sections delineated within. Most notable feature of the sanctuary area is the prominent growth of Babul (*Acacia nilotica*) trees. The sanctuary can be identified as one compact seasonally perennial water body in the Survey of India toposheet 1:50,000 NO: 58 K/15. The Field Measurement Book extract showing the boundary of the tank is given in **Annexure 1A**.

Approach and Access

The sanctuary is approachable by road; it is 130 kms away from Madurai. The nearest town is Ramanathapuram at 15 km distance from the bird sanctuary on Ramanathapuram to Nainarkovil road and also connected by East coast road and Madurai- Rameswaram National Highway. Nearest railway station is Ramanathapuram, which is 15 kms away and the nearest airport is Madurai.

The Statement of Significance

The values of Therthangal Bird Sanctuary are related to biodiversity richness, economic benefits, culture, catchment, human ecology, aesthetic significance and potential for scientific studies.

Locational value

Therthangal Birds Sanctuary being part of the Madurai – Ramanathapuram Tank Country bestowed with numerous rainfed irrigation tanks, occupies the apex position in providing ideal nesting grounds for the winter migratory heronry species and colonial water birds.

Ecological value

The sanctuary offers conducive breeding and feeding grounds for the birds especially the migratory ones, of which the most preferred nesting sites being the Babul trees (*Acacia nilotica*) planted extensively by the Forest Department under social forestry scheme.

Cultural value

Traditionally, people living in villages around Therthangal wetland (bird sanctuary) have realized the significance of water birds, especially the bird droppings (guano), which they found to be more effective as a natural fertilizer, for their agricultural yield, over chemical pesticides. Hence, they were known to aggressively protect the birds and can be used in wise use of wetland, through participatory methods and educational awareness.

Therthangal villagers have understood the importance of their wetland, functional significance of the birds which visit (migrants) or are residents in the sanctuary, from a very long time. A noteworthy aspect is, the bird dropping enriched water, which they have used effectively in agriculture. Hence, it is this interaction and long perseverance of the local people that has managed to sustain the wetland. This aspect must be used efficiently for the wise use of this wetland and preserving its ecological status.

Traditionally, the villagers have protected birds as they have realized the importance of bird droppings in agriculture and thus their economy. Sentiments associated with bird protection have been observed across all class and caste barriers in the village. Within the immediate periphery of the sanctuary, there is an old Amman temple used for worshipping by the villagers. A small temple dedicated to human being deity, was also observed in the vicinity of the sanctuary.

Economic value

The sanctuary, that includes the earthen embankments, bunds and the resultant seasonally water holding marshy lake is equally beneficial for the birds as well as the villagers. Excess water that is stored during rainy season within the bunds is later utilized for agricultural purposes. The sanctuary acts as a store space for an efficient flood control, flood storage mechanism. It acts as a sediment control ground that prevents stream carried silt and urban residues from being divulged into the agricultural lands. The sanctuary is a control measure for the naturally occurring soil erosion. It is also acts as a natural system of nutrient removal from agricultural runoff and waste water systems.

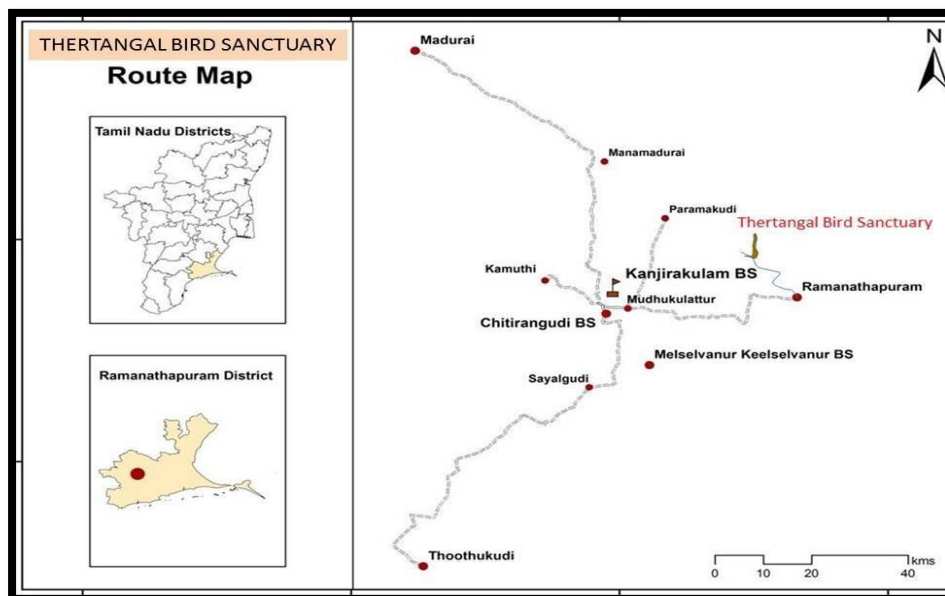
Tourism value

The sanctuary offers immense opportunity for eco-tourism based bird watching. Birds that are difficult to site elsewhere are known to come close to human habitations thereby making Therthangal an abode of bird watchers and ornithologists.

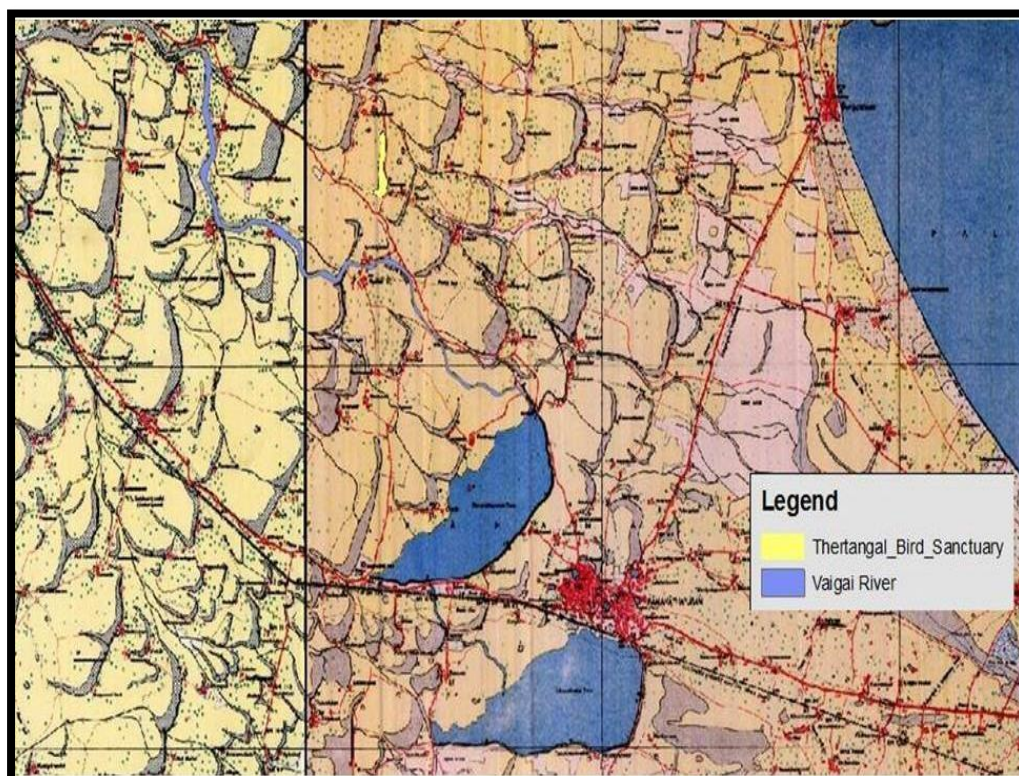
Scientific value

The sanctuary offers excellent possibilities for scientific research in Birds and their habitat. It offers unique opportunities for research, education and nature interpretation.

MAP No. - 1. LOCATION MAP OF THERTHANGAL BIRD SANCTUARY



**MAP NO. 1(a): LOCATION MAP OF THERTHANGAL BIRD SANCTUARY
SUPERIMPOSED ON THE SURVEY OF INDIA TOPO SHEET OF 1: 50,000 SCALE**



2. BACKGROUND INFORMATION AND ATTRIBUTES

Boundaries

The sanctuary boundaries can be defined as two kinds, legal and ecological. Legal boundaries of the sanctuary are defined in terms of physically identifiable survey stones. Ecological boundaries are defined in terms of the ecological continuum that the sanctuary forms as individual nesting site for birds and also in association with other similar or less important tanks adjoining the sanctuary that provide feeding and nesting grounds for the birds.

Legal boundaries

The boundary description, provided in the G.O (**Annexure 1**) is given as follows,

North: Starting from northern side of S.No. 7 and eastern side of S.No.5 of V.No. 76 Therthangal village and runs towards north-East on the southern sides of S.No.3 116 of V.No. 76 Therthangal villages.

East: Thence the boundary runs generally towards south along the western sides of S.F.Nos.112, 111, 109, 92, 91, 90 and 81 of V.No. 76 Therthangal village and southern side of S.No. 89 and also runs western side of S.Nos.89,79,78, and 65 of V.No. 76 Therthangalvillage.

South: Thence the boundary runs towards west along the northern sides of S.No. 64, 21 of V.No. 76 Therthangalvillage.

West: Thence the boundary runs generly towards north along the western side of the S.No. 20, 15, 14, 13, 12, 11, 10, 9 and northern side of S.Nos. 9. Western side of S.No. 9 and southern and eastern sides of S.No.8 eastern, northern sides of S.No. 7 and joins the starting point.

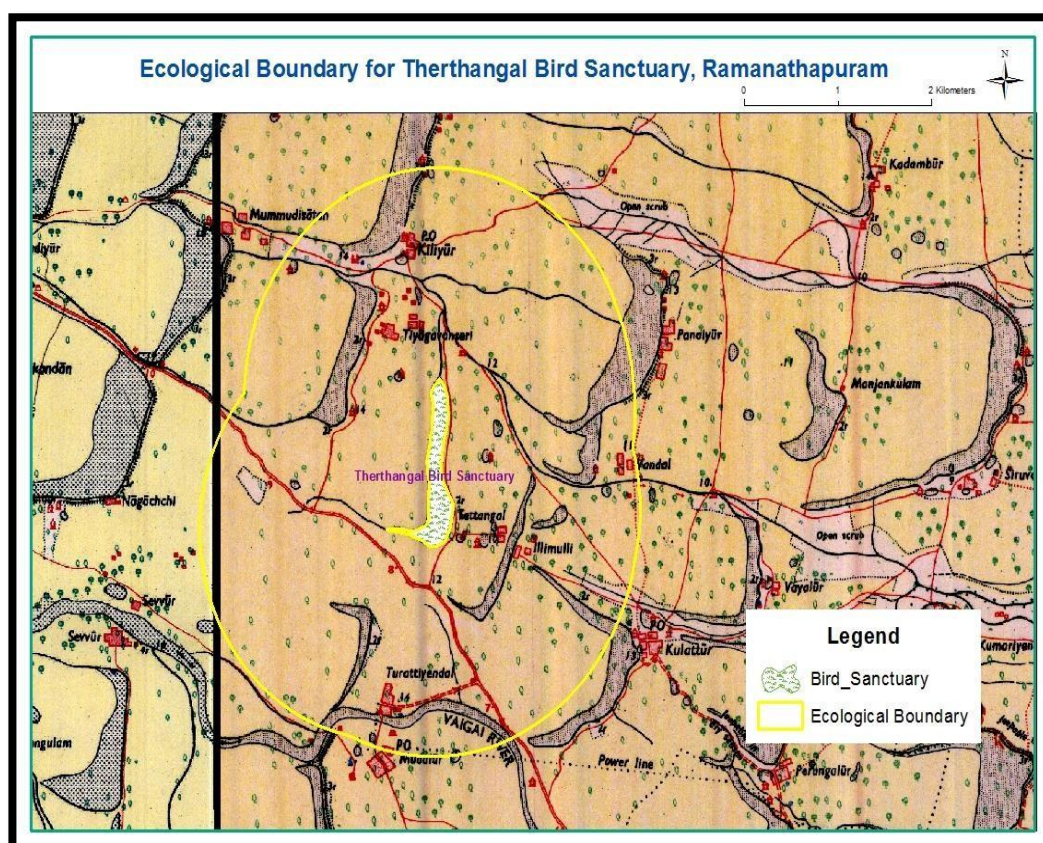
MAP No. 2: LEGAL BOUNDARY MAP OF THERTHANGAL BIRD SANCTUARY**Ecological boundaries**

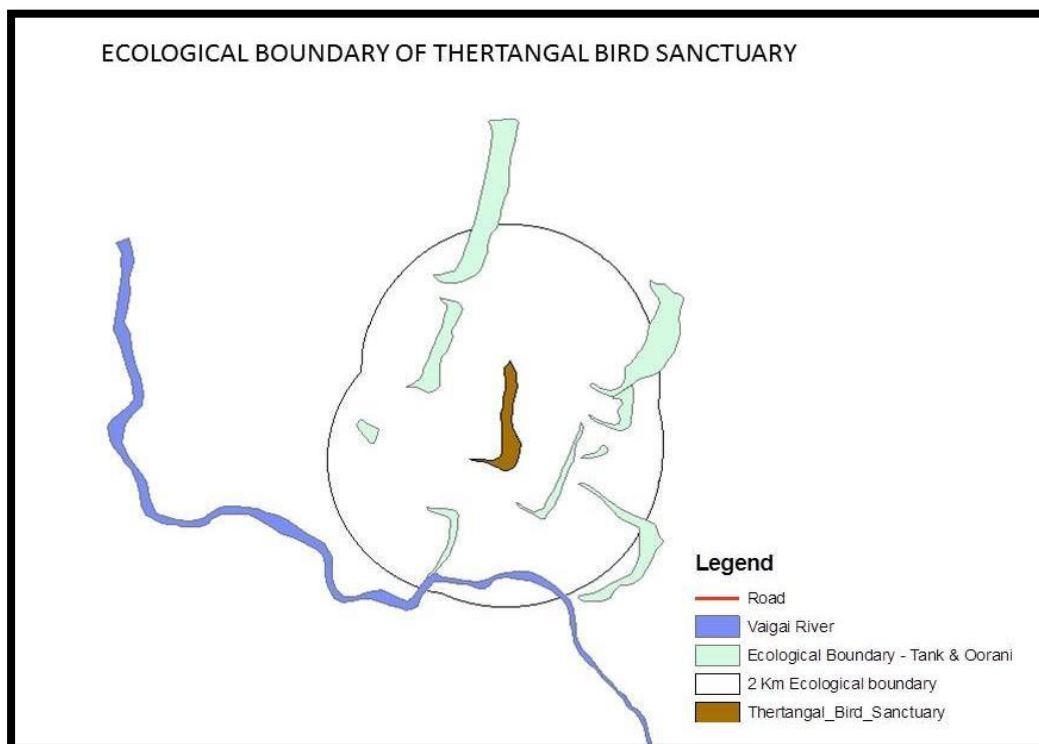
Man-made boundaries are of least concern for the birds as they fly across nations and oceans to reach the sanctuary that has been declared so to conserve the natural breeding and feeding place for winter migratory birds from far and wide. These traditional nesting grounds, even though is the home for a considerable number of these much delightful feathered visitors, not all of them are restricted to the sanctuary or its immediate surroundings for food and nesting materials. One reason for being so is the yearly diminishing water-level and the limited availability of food and nesting material to cater to a large number of birds. The resultant search of food and materials lead to the natural stretch of the legal boundaries of the sanctuary, forcing to define an ecological boundary. Adjoining village tanks and ponds, locally known as 'Kanmois' and 'Ooranis', they are providing an ecologically continuous ecosystem for the healthy survival of the birds. A study carried out around the sanctuary within a radius of two kms from the sanctuary as part of the management plan preparation for potential feeding grounds and areas that offer nesting materials provided the following list of village tanks and ponds [**Annexure II (a) & (b)**], which could be considered as an ecological continuation of the Therthangal Birds Sanctuary (**Map 3**).

There are 7 Kanmois and 7 Ooranis found in the ecological boundary of which Therthangal and Pandiyurkanmoi are the only perennial kanmoi found in the region. The Thiugavancherikanmoi was recently improved with a grant from 100 days employment scheme. Another adjacent kanmoi is Illimullikanmoi at a distance of 1.5 k.m. The kanmoi is vegetated only with *Prosopis* and birds nests are seen as low as one meter from the ground. Nesting is seen in very little numbers in other smaller kanmois' as well. Apart from the above Kanmois there are 7 small ponds called Ooranis found within the ecological boundary.

It is to be noted that, The Ecological boundary will not have any legal sanctity. It is only a management entity and classification to take up management interventions. There would be no restriction or regulation what so ever over the existing rights, activities and ongoing practices. The 2 Km boundary around the sanctuary is an imaginary boundary, which also nearly encircles the proposed eco-sensitive zone.

MAP NO. - 3. ECOLOGICAL BOUNDARY AROUND THE BIRD SANCTUAR





Geology, rock and soil

The sanctuary falls in an area geologically considered as pediment of recent origin. Though fluvial processes have resulted in the present morphological features of the area, human interference has greatly altered the natural conditions of erosion. Gneisses underlying the alluvium largely deposited by the Vaigai River are very deep seated. Calcium carbonate underlines the soil strata, leading to bore wells yielding brackish water.

The area has black soil with excellent water retentivity. As one digs deep, the soil retains its colour but tends to be clayey in nature. They are generally alkaline soils. The district soil Atlas classifies the soil of the region as TypicUstipsamments and VerticHaplustalfs + Ustropepts capable of supporting Palmyra, Coconut and pulses respectively. The soil productivity map in the atlas classifies TypicUstipsamments to be of extremely poor productivity whereas that of VerticHaplustalfs + Ustropepts to be of good productivity.

Terrain

Therthangal Birds Sanctuary is situated in a plain country of elevation of 30m to 100m. The sanctuary is a flat piece of seasonally water holding community tank. It is in general 1m to 3m deep from the tank embankments. Between the embankments and the vegetated area there is approximately a 30 meter wide water holding region, deepened and maintained by Forest Department and Tamil Nadu PWD. Agricultural lands surround the

sanctuary and mark the northern boundary of the sanctuary. There is no striking altitudinal difference as far as the horizons towards all directions from the sanctuary. The only obstacle for one's clear vision is the small community forests grown over the earthen embankments of adjoining village tanks and Palmyra trees surrounded by open *Prosopis* growth. From a visual observation, it is very evident that, the tank is built according to the contour alignment. An aerial view of the sanctuary gives a crescent or fish tail shape. The kanmoi starts at a western point where a channel from the Vaigai flows into the kanmoi through an aqua duct (**Map 2**). Total length of the embankment is around 3.25 kms. There are 5 sluices that drain water to the agriculture lands. Excess water is let out during flood conditions through a sluice gate, towards Therthangal village (**Map 2**).

Climate

Due to the unique and unfortunate relative position of this country side in the dry south east sheltered by the cardamom hills from the south west monsoon, of the main track of the advancing Bay of Bengal branch and to a larger extent losing the full effect of any cyclones of the retreating monsoon by reason of its position in relation to the Cauvery delta bulge and Ceylon, this area receives very low rainfall. The area can be classified as a semi-arid desert for all practical purposes.

Three distinct seasons are experienced in the sanctuary area. The winter starts from November and lasts till middle of February. After that, summer season starts and it continues up to the middle of June. This is followed by scanty rains up to September and thereafter it is followed by monsoon rain up to first fortnight of December.

2.4.1 Rainfall pattern and distribution

The area receives an average rainfall, varying between 503 mm to 1000 mm annually. Most of the water collected in the tank is from the North East monsoon. The period from mid-February to whole of August receives practically minimum rain fall, though occasional showers might result due to local climatic manifestations. A period of 10 years starting from 2012 to 2021 [**Annexure III (b) - Graph 1**] shows two peaks of rainfall availability in the region, in the month of May and October. Moreover, summer season receives minimum rainfall in the sanctuary.

Temperature; a summary of year-round pattern

The data is available for Ramanathapuram which is the nearest town the nearest town and taluk and district headquarters to the sanctuary. Although it is evident from field experience that the sanctuary experiences temperatures higher than the district capital, non-availability of data made the management plan team to utilize the data from the district capital for all practical purposes of climatic estimations. Mean Monthly temperature (*Graph 2*) and humidity data of the district capital are provided in [*Annexure IV (a & b)*]. July registers the highest maximum temperature of 35.55 °C whereas May registers the highest minimum temperature of 26.3°C.

Humidity; a summary of year-round pattern

Relative humidity remains 89% and 56% for all the months except January for which the numbers are 86.1% and 54.2%.

Wind Speed: a summary of year-round pattern

Average wind speed of the sanctuary areas is recorded between 3.40 to 30.00 km/h.

Drought and its periodicity

Rainfall, ground water availability, reservoir levels and crop condition determine the nature and extent of drought in the state. Tamilnadu has eight drought-prone districts covering 8, 33, 997 km or about 64 percent of the total area of the state. The southern zone of the Tamilnadu is under the rain shadow region having prolonged dry climate. Drought occurs frequently in Tamilnadu in the districts viz., Ramanathapuram, Sivagangai, Thiruvallur and Coimbatore. Red, black and alluvial soil types are predominant in Tamilnadu districts, but sandy soils in the south-eastern part of the state are prone to chronic droughts. About 30 percent of annual rainfall is recorded in the south-west monsoon and 50 percent is contributed by the north-east monsoon through cyclonic activity. Therthangal bird's sanctuary areas have droughts in summer season in every year. Drought in Ramanathapuram district is common due to the inadequate rain fall. Drought also creates the problem of unemployment of villagers residing around the sanctuary.

Water sources

The sanctuary is mostly rain fed. It is housed in a traditional irrigation tank fed by a distributary channel of Vaigai. Water flow is restricted to the few months of rainfall and if and only if considerable water flows through Gundar, the Sanctuary receives any water. Water, if collected to its full capacity is sufficient enough for the following 7 months. The

water source is mainly used for agricultural purposes and it attracts water birds as well. The sanctuary has no ponds dug so far, hence present management plan recommends the formation of new ponds inside the tank wherever required. These ponds if dug would provide slight longevity to the water holding of the tank. The ponds provide extended water availability for a month more after the north east monsoon months. One overhead tank has been constructed near the sanctuary on 1993 by the panchayat and drinking water is being provided to the villagers.

Range of Wildlife, Status, Distribution and Habitat

The sanctuary is a near homogenous tank like structure with dense overgrowth of *Prosopis* (Seema Karuvel) and intermittent plantations of *Acacia nilotica*. The North West part of the wetland retains a bare amount of water even during summer. Wetland with submerged trees has evolved into a natural habitat for a wide array of plants and provides shelter for birds and other animals.

Vegetation

The sanctuary vegetation is mostly Tropical Dry Deciduous type & thorny scrub jungle. It is dominated by Babul (*Acacia nilotica*) along with *Prosopis juliflora* and the grasses such as *Cynodon dactylon* and *Eremopogon faveolatus*. The irrigation land and the outside tank areas have a variety of grasses and medicinal plants viz., *Adhatodavasica*, *Sesbaniagrandiflora*, *Aloe indica*, *Phyllanthusemblica*, *Phaseolus roxburgii*, *Citrus medica*, *Moringa oleifera*, *Cynodon dactylon*, *Pongamia glabra* and *Azadirachta indica*. Besides, trees like *Tamarindus indica*, *Ficus* spp., *Thespesia populnea*, *Albizia amara*, and *Palmyra* (*Borassus flabellifer*) are also found. A Babul plantation was raised in 1986 by social forestry division. The invasive *Prosopis* is slowly infesting upon much of the sanctuary area, retarding the growth of Babuls. The tank bund and the area outside of the tank have tamarind, Neem and Palmyra trees. Medicinal plants such as *Ocimum sanctum*, *Phyllanthus amarus* also grow in the area. Check list of flora is provided in **Annexure V**.

Animals

The sanctuary offers ideal habitat for winter migratory birds with considerable diversity in nesting and feeding behavior for breeding and feeding. It is one of the preferred nesting sites for heronry species and colonial birds migrating to South India. The feathered visitors flock the sanctuary from October to February. The wetland is irregular in depth and retains water for 3 to 5 months if rain is normal. Local names of a few fishes Jilebikendai, Kendai, Keluthi and Ayirai etc. Separate lists of amphibians, mammals, reptiles and

carnivores are not available as efforts to such end have never been initiated in this sanctuary. More than 4 near threatened species such as Spot billed Pelican, Painted stork, Black-headed ibis, Oriental Darter, 9 water birds such as common teal, Pin tail, Garganey, Green Shank, Common sand piper, Green sand piper, Little ring plover, Little stint, Red shank and 68 common birds are already documented. Nine species of birds are known to breed in the Therthangal BS and they are: the Spotbilled Pelican, Little Cormorant, Little Egret, Grey Heron, Purple Heron, Black crowned Night Heron, Painted Stork, Black headed Ibis and Black Ibis.

Apart from avifauna the sanctuary supports variety of snakes which includes both poisonous and non-poisonous nature. The Commonly seen are Common vine snakes, rat snakes, cobras and Keelbacks.

Other animals commonly seen around the sanctuary are Jackals, Mongoose and Hares etc.

Category wise check list of fauna including Avi-fauna are provided in **Annexure VI** and the list of mammals, Amphibians and Reptiles is given in **Annexure VII**.

CHAPTER-III

3. HISTORY OF MANAGEMENT AND PRESENT PRACTICES

3.1. General

Therthangal Birds Sanctuary that forms a part of the Therthangal Kanmoi is named after the Therthangal village. The exact year or period of construction of the Kanmoi is not available. The importance of the tank as a bird habitat was identified in the year 2009, since then protection used to be provided to the birds that nest in the tank. It is evident that birds took advantage of the village tank that was constructed for the purpose of irrigating agricultural fields. The villagers are supportive to protect the birds as the water enriched (Guano) with the droppings of these birds was of considerable fertility value to the adjoining agricultural fields. Villagers of Therthangal are traditionally protective about the birds. Understanding the importance of the area, Tamil Nadu Forest Department declared it as a birds' sanctuary in the year 2010. The sanctuary is managed scientifically under the consistent and clear interests of Tamil Nadu Forest Department. The sanctuary is under the administrative and protection charges of the Wildlife Warden, Gulf of Mannar Marine National Park, Ramanathapuram. Currently the sanctuary is under the field control of Range Forest Officer, Ramanathapuram Range. This is the 3rd management plan of Therthangal bird sanctuary.

Timber operations including bamboo and firewood harvest

Silvicultural Systems and Tending Operations

No silvicultural or tending operation was practiced in this area except protection from felling.

Evenaged Systems and Unevenaged Systems

The bird sanctuary is conserved in-situ. No other forestry activity is done except restoration of vegetation. The vegetation is open canopied thorn scrub forest with unevenaged system.

Bamboo Working

Bamboo species not found in this Bird Sanctuary, So no bamboo working practiced in this Bird Sanctuary area.

Firewood Harvest and Collection

Villagers from Kanjirankulam, Etticheri and Thoore carry out illegal collections of firewood. However no prescription for firewood collection exists.

Non wood forest produces (NPW) collection

There is lot of demand for fuel wood for cooking and other uses in the year of droughts when there is little or no agricultural waste to burn and fuel wood demand spurts up. No minor forest produces collection is permitted from the sanctuary area.

Leases

No leases have been granted in the Sanctuary area as it does not contain any important mineral.

Other Programmes and activities

Except Central and State Sponsored Scheme, no other programmes and activities have been carried out in this Sanctuary.

Forest Protection

Legal status

The Therthangal bird's sanctuary was declared in the year of 2010 with an estimated area of 29.29.5 Ha and it has been notified as a sanctuary in G.O.M.s. No. 220/E&F (FR-V) dated 15-12- 2010. It is located in Therthangal Village. It is notified as a sanctuary within the meaning and scope of Section 18 (1) of Wildlife Protection Act 1972.

Hunting

At present, no hunting activities reported. The illegal activities are being monitored vigilantly both within the sanctuary and also in the ecological boundary of the bird sanctuary. There are exclusively four watchers who are involved in full time protection of the Sanctuary.

Poaching and Other Illegal Activities

Poaching

No poaching activities are noticed. But adequate caution has been taken to prevent illegal fishing.

Illegal Cutting of Trees

The sanctuary is devoid of highly valuable timber species or secondary timber species except for babul tress. Therefore, there is no issue with regard to felling of trees. However, lopping for fodder is found to exist.

3.6.3.3. Illegal removal of NWP encroachment and other illegal activities

The villagers collect Babul pods for their cattle.

Livestock grazing

The sanctuary does not possess any great resources for supporting grazing except for babul, *Prosopis*, grasses and other herbs. However, the resource surrounding the sanctuary itself is devoid of any vegetation suitable for grazing, the sanctuary is under the pressure of being utilized for grazing. There is constant pressure of livestock grazing from cattle and goats. After arriving at a consensus with the local community, measures to control and permanently check grazing are recommended.

Table 1: Villages and the livestock presence

Village name	Cattle	Goat/Sheep	Poultry	Total livestock around the BS
Therthangal	80	1000	540	1620
Thiyagavancheri	60	850	600	1510
Illimulli	25	280	380	685
Total	165	2130	1520	3815

Wild and Man-Made Fires

So far, no wild or anthropogenic fires are reported in the sanctuary area.

Insect attacks and Pathological problems

Acacia leucophilea plant affected by *Anomalococcus indicus* insect and *Acacia planiferons* plant affected by *O.tarandus* insect recorded. Pathological attacks recorded in Bird sanctuary caused by Rust fungi (*Ravenlia acacia* & *Ravenilia evansii*)

Wildlife Health

There has been no incidence of occurrence of bird flu in the past in and around the sanctuary.

Inter agency programmes and problems

As such there is problem of unemployment in the areas particularly for the youth. There are no major developmental programmes running except Government initiatives through Panchayats and agriculture labour work being made available by private farmers.

Tourism

The tourists can visit the sanctuary without paying any fee and the sanctuary is open throughout the year. Tourism is high in the month of Dec-Jan and low in the month of May-Sep. The best time to visit the Sanctuary is December-January.

(a). Existing Facilities

The sanctuary has no facilities to promote eco-tourism. The infrastructure is very poor and there is no special bus exclusively to the village but buses which ply between Ramanathapuram and Nainarkovil have a stop at the entry point or the approach road to the Therthangal village. It is not a part of eco-tourism programme. The Sanctuary does not have basic amenities for the visitors.

(b). Focus: Policies

The focus on eco-tourism in Therthangal Bird Sanctuary is largely to make it a regional learning centre and a place for educating students, rural youth and villagers. It is endeavor to make it a regional attraction towards avian fauna conservation. A team of youth may be trained as eco-tourism guides to enable guided avian tourism to be in place and also to provide additional income to the locals. The major focus towards eco-tourism in Therthangal would be to attract the school and college students to create awareness about avian fauna conservation and its importance. Since the sanctuary does not fall in any of the tourism network, it would be difficult to attract the visitors from far flung places.

Research Monitoring and Training

Research and Monitoring

The forest department sometimes engages with the academic institutions like colleges for carrying out research studies. The sanctuary offers wide opportunities for ornithologists in studying various aspects of birds' life. Efforts may be made to promote local

research organizations, colleges and universities interested in undertaking habitat, floral or faunal studies in the sanctuary. Possible assistance by all means may be extended to such organizations.

Table 2: List of Research Publications

S.No	Research Publication
1	Sen et al., (2021) COVID-19 Forced Lockdown: Nature's Strategy to Rejuvenate Itself World J Environ Biosci, 10 (2): 9-17

Regular monitoring on the arrival and diversity of birds is being done on daily basis by the in-house Bird watchers engaged in the Sanctuary. Scientific and Systematic monitoring like, pollution, water quality etc., except for disease monitoring is not carried out in the sanctuary. In any good season when the tank is inundated due to good rains, the water would be retained for not more than six months and rest of the year the sanctuary is dry.

Training

Training to staff is being given every year regarding bird identification and population estimation. Besides training is given to field staff on importance of wetlands and its ecosystem.

Wildlife conservation strategies and their evaluation

This working plan recommended the area to be managed exclusively for the conservation and development of wildlife. After the constitution of the sanctuary the focus of management has been protection by establishing anti-poaching camps, and habitat improvement interventions such as soil and moisture conservation measures, de-silting of tanks, Tree planting with taller seedlings and Fruit bearing seedlings etc.

Administrative setup

The administrative control of Therthangal Bird Sanctuary is with the Wildlife Warden, Gulf of Mannar Marine National Park. Under the Wildlife warden's control, Forest Range Officer, Ramanathapuram exercises field control. A forester and a forest guard have the immediate protection responsibility of the sanctuary. Four daily wages Bird watchers are also posted for field assistance and protection. At present there is no separate management team exclusively responsible for the sanctuary

Communication

The present forest watcher employed may be equipped with a smart phone, which can be served as a dedicated and secure communication means between the headquarters and the sanctuary. Such a smart phones can also be useful for field patrolling as well as recording the incidents with GPS points. Walkie-talkie is important for communication for frontline staffs and Range office during disaster. So, providing a walkie-talkie is necessary for every range office and those who are patrolling in and around the bird sanctuary.

Field details with GPS points are being updated in special created WhatsApp group during their patrolling. It is helpful to know the field status frequently.

Summary of Threats to Wildlife

- Potential threat of poaching
- Grazing
- Conflict among communities in adjacent villages claiming for rights in the tank/sanctuary
- Invasion by invasive alien species
- Increased interference in sanctuary management
- Poor knowledge of wild animal biology among sanctuary staff
- Consistent drought conditions
- Lack of clear boundary demarcation
- Lack of resident forest department staff
- Lack of communication network
- Chronic shortage of funds

CHAPTER-IV

4. THE PROTECTED AREA AND INTERFACE LAND USE SITUATION

The Existing situation in the Zone of influence

The people living around the sanctuary do not use this area directly. People around the protected area are more cooperative since they are not dependent on the protected area. Because of the year-round irrigation facilities, farming is the major occupation. Farmers benefit from these birds since they feed on insects in these fields and control the pest population. But usage of chemical fertilizers and pesticides by farmers to protect the agricultural crop may influence the population of insects and other amphibians and fishes. These are the feeding grounds of some migratory birds. The after-effects are not yet studied. But these activities have no influence on the population of migratory birds as per the census. Even then, farmers may be educated and encouraged in using bio-fertilizers and other less harmful pesticides.

Villages inside outside protected area, Ethnic, identities, traditions, customs, relationship between distinct groups of people, relationship with resources, habitat and area.

There is one Revenue village adjacent to the sanctuary. The total human population of which is 555 and corresponding cattle population including cows, Bull, goats and sheep comes to 3815 (Table. 6). Most of the people depend upon Rain fed agriculture while the rest earn their livelihood as daily wage labourers. The village people belong to Agamudiayar, Yathaver, Asari, Pallan and Sakilian communities. The ethnic identity thus being varied, tradition and customs also vary accordingly. There is no major rift between communities and them mostly live-in harmony with existing socio-political scenario (Refer Table. 1-6).

Traditionally, Therthangal villagers have protected birds as they have realized the importance of bird droppings in agriculture and their economy. Sentiments associated with bird protection have been observed across all class and caste barriers in the village. Within the immediate periphery of the sanctuary, there is a used for worshipping by the villagers.

The state of the people's economy, vocations, land use, use of forest and non-forest based natural resources by people and seasonal patterns.

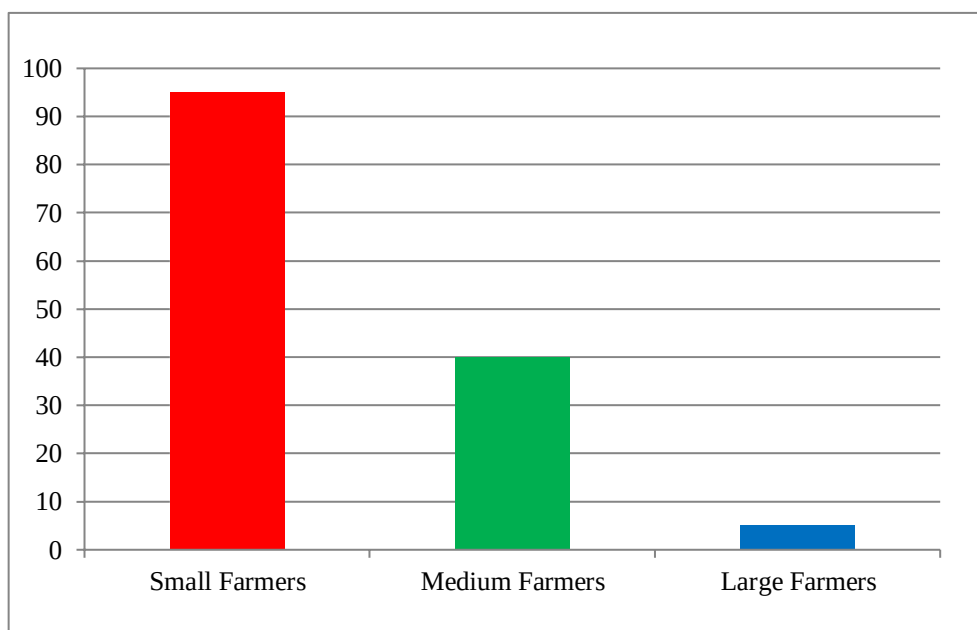
Agriculture is the primary land-use type around the bird sanctuary. The total area under agriculture is 228.79 Ha. While an area of 120.64 Ha is under rain-fed irrigation during the monsoons and nearly 74.08 Ha of land is cultivated using tank irrigation during the non-monsoon period. Use of groundwater for irrigation is not viable due to brackish conditions. The patterns are supportive of the overall historical profile of the landscape.

It is of interest to learn that the BS or the wetland was used as village common for cultivation and grazing by local people. Local communities would use the subsistence mode of cultivation, focusing on growing paddy, cotton, minor millets, pulses and associated vegetables and spices in these patches, while the sparsely growing dense trees would function as the heronry. The association of local communities to the birds has therefore not only been one of reverence but is deeply connected to the livelihoods and coping mechanisms. Local folklore of the landscape has narratives wherein the arrival of birds is equated with good fortune; while a change in their arrival patterns is compared to a home being deserted.

The major crop cultivated is rainfed- paddy (short duration) during the period of October to December. Minor crop such as minor millets, chilly and pulses are cultivated when there is not enough water to irrigate paddy. Weeding is done twice or thrice from seedling till harvest stage and no chemicals are used for weeding. In Therthangal number of families holding large farms is very low (5), whereas there are around 95 small scale farmers owning 1 or 2 acres and 40 medium scale farmers.

There are around 12 households involved in country brick making industry which is in small scale. Apart from above there are around 17 families involved in making charcoal as a business venture.

.

Chart Showing the Type of Farmers in Therthangal Village

4.1.3. Implications of the land use and resource dependency for the conservation of Protected Area

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 program planned to improve local livelihoods may lose relevance rather suddenly when the household decides to sell their land to a commercial enterprise.

There have been no systematic studies on the land use land cover change around Therthangal BS over a given time frame. However, by way of secondary information and field realities, it is interesting to reveal that, no discernable change in land use or land cover has occurred around the Sanctuary, except for development along the western periphery. Extent of land under permanent fallow remains static.

The Development Programs and Conservation Issues

A few developmental works have been taken up in and around the sanctuary by the Tamil Nadu Forest Department which is quite insignificant for the villagers in the process of their economic upliftment. Most of the works are implemented through Panchayat funds.

The interplay of market forces has its impact on the subsistence economy of the local people. Taking the poor condition of the people living inside the sanctuary area certain

external market forces have come in to prominence. For cultivation of Brinjal, tomato, the cultivators have been encouraged by outside market forces providing loan facilities to purchase hybrid seeds, insecticide and Chemical fertilizers. There has been good development in dairy sector around the sanctuary by way of loan of hybrid breeds of cows, opening of milk points for purchase of milk from the farmers. Also, the people are encouraged to rear more cattle.

An evaluation of government and non-government agencies programs for development. Implications for PA, people and ZI

Since specialized field staff may not be adequate, help of other institutions like BNHS, SACON, NGOs and Universities will be sought. A gap analysis has to be performed to find out the areas in which the basic data is lacking. As a subsequent step, a research priority matrix has to be prepared. Management should provide the necessary financial and logistic help to the institutions or individuals who are interested in carrying out research works in the fields that are a priority for the sanctuary.

PART - II

CHAPTER-V PROPOSED MANAGEMENT

5. The Vision, Objectives and problems

Vision

‘Develop and maintain Therthangal Bird Sanctuary as a well-managed wetland ecosystem harbouring avifaunal diversity within the wetland complexes of Tamil Nadu and acts as an important centre for conservation education and ecotourism with the active involvement of local communities and other stakeholders.’

Objectives of Management

The objectives drafted with a long-term perspective of creating a healthy and conducive environment for the visiting birds are as follows,

- To improve and ensure ideal wetland habitat for the avian fauna
- To ensure prolonged and requisite quantum of water availability in the tank to the extent possible
- To ensure better management inputs to the satellite wetlands around Therthangal tank making an ideal continuum of habitat
- To evolve a systematic practice of scientific monitoring of population
- To create awareness and education towards conservation of avian fauna
- To ensure minimal disturbance and greater protection to the birds.
- To ensure better protection to the sanctuary by way of proper boundary consolidation and settlement of rights
- To ensure final notification of the Bird sanctuary under Section 26-A
- To promote Therthangal Bird Sanctuary as a center for conservation education, research and ecotourism
- To manage Therthangal Bird Sanctuary with active participation of local villagers and ensure alternate livelihood benefits through management.

Problems in achieving the objectives

The problems in achieving the above-mentioned objectives are listed below;

- a) The most important problem faced by this sanctuary is the prevailing drought conditions owing to reduced rainfall in the region as well as in the catchments of Vaigai reservoir from where water has to flow in to the sanctuary.
- b) Multiple control of the tank that houses the sanctuary by various departments poses critical challenges to effective management.
- c) The inlet channel walls are weak and are prone to be wrecked during rainy season by agriculturists on the banks of the channel thereby not letting the entire water flow into the tank.
- d) Natural regeneration is hampered to a great extent by lack of water and soil moisture and grazing.
- e) Lack of accessible sources of water also reduces the viability of carrying out artificial regeneration activities.
- f) *Prosopis* grows extensively in and around the sanctuary in a considerable manner thereby reducing the water holding capacity of the tank and also soil quality of the area.
- g) Siltation in the inlet channels and tank bed is another reason for reduced water holding.
- h) Lack of systematic monitoring and apprehension among the villagers about the sanctuary as a protected area veil any incidents of poaching.
- i) The Sanctuary area is not surveyed yet and therefore demarcation has also not happened yet on the ground.
- j) Summer months worsens water scarcity forcing villagers to encroach into the sanctuary to defecate, thereby reducing the plausibility of the place for tourism. Possibilities of human induced pathogens being transmitted to the birds remain high, increasing risk of detrimental effects on the avian health.
- k) To encourage eco-tourism in the sanctuary, sufficient accommodation facilities are not available. Maintenance of the existing facilities also suffers due to lack of adequate funds. Non-availability of guides and an additional vehicle make conducting guided tourism impossible.

- l) Though several research programs have been carried out in the past, documentation and compilation of the results are lacking. Most projects by the research institutions do not have practical utility for the sanctuary management. Lack of coordination between the forest department and the research institutions thus leads to research programs that are impractical and the sanctuary is seen treated as just another study site for the researchers.
- m) Lack of basic training in wildlife management, remoteness of the place of posting and insufficiency of basic amenities and infrastructure, proper orientation and motivation are some of the factors responsible for low output of the staff.
- n) Due to chronic shortage of funds, sanctuary's protective infrastructure is poor. Creation of essential accommodation facilities suffers due to the same reason.

CHAPTER-VI

6. THE STRATEGIES

The Therthangal Bird Sanctuary is a Union tank falling within the highly well inter-connected and mutually dependent water systems in the Ramanathapuram district. Ramanathapuram being a water scarce region because of the scanty rainfall, managing the wetland in such a water stressed landscape is a big challenge. The Therthangal Bird Sanctuary in the past has been playing a vital role in attracting the winter migratory birds for meeting their requirements of nesting, feeding, breeding and roosting. Therefore, the broader strategies in managing the wetland would be

- i. Creating an environment to attract the migratory birds by way of ensuring the availability of water
- ii. Retaining water for prolonged period of the migratory season
- iii. Improving the habitats for birds so as to ensure conducive environment for their breeding
- iv. To elicit community participation in conservation and management of the bird sanctuary
- v. To create awareness among the stakeholder community of the region and educate regarding the importance of conservation of avian
- vi. To scientifically manage the sanctuary through scientific research and monitoring

Boundaries

The sanctuary boundaries can be defined as two kinds, legal and ecological. Legal boundaries of the sanctuary are defined in terms of physically identifiable survey stones. Ecological boundaries are defined in terms of the ecological continuum that the sanctuary forms as individual nesting site for birds and also in association with other similar or less important tanks adjoining the sanctuary that provide feeding and nesting grounds for the birds.

Legal Boundaries

The boundaries of Therthangal Birds Sanctuary, though very clearly defined in the boundary description, have not been demarcated properly on the ground leading to confusion. The confusion yet to be rectified prevails regarding the Northern and western Boundary of the Sanctuary along the area adjoining the Patta lands.

Ecological Boundary

Man-made boundaries are of least concern for the birds as they fly across nations and oceans to reach the sanctuary that has been declared so to conserve the natural breeding and feeding place for winter migratory birds from far and wide. These traditional nesting grounds, even though is the home for a considerable number of these much delightful feathered visitors, not all of them are restricted to the sanctuary or its immediate surroundings for food and nesting materials. One reason for this being so is the yearly diminishing water-level and the limited availability of food and nesting material to cater to a large number of birds. The resultant search for food and materials lead to the natural stretch of the legal boundaries of the sanctuary, necessitating defining an ecological boundary. Adjoining village tanks and ponds, locally known as ‘Kanmois’ and ‘Ooranis’, provide an ecologically continuous ecosystem for the healthy survival of the birds. A study carried out around the sanctuary within a radius of two kms from the sanctuary as part of the management plan preparation for potential feeding grounds and areas that offer nesting materials arrived at a list of village tanks and ponds [**Annexure II (a) & (b)**], which could be considered as an ecological continuation of the Therthangal Birds Sanctuary (**Map 3**).

There are seven Kanmois and seven Ooranis found in the ecological boundary of which Pandiyurkanmoi is the only perennial kanmoi found in the region. Field observation revealed numerous nests and egg shells in ecological boundaries areas. The kanmoi is vegetated only with *Prosopis* and birds’ nests are seen as low as one meter from the ground. Nesting was seen in very little numbers in other smaller kanmois’ as well.

A radius of 2 km is identified as humdrum distance from the sanctuary for identifying and locating other kanmois and ooranis that would perhaps serve as source of food and nesting materials for the visiting birds. This may be considered as the immediate ecological boundary for all practical purposes. Refer **Annexure II a & b** and **Map 3**. The kanmois and ooranis within this region may be considered as one ecological continuum of Therthangal Bird Sanctuary.

It is to be noted that, The Ecological boundary will not have any legal sanctity. It is only a managerial entity and classification to take up management interventions. There would be no restriction or regulation what so ever over the existing rights, activities and ongoing practices. The 2 Km boundary around the sanctuary is an imaginary boundary, which also nearly encircles the proposed eco-sensitive zone.

Measures may be devised to ensure protection and availability of food for birds that visit these kanmois and ooranis. Few suggestions are:

- i. Educative lectures and camps on the importance of visiting avian fauna for local population may be organized.
- ii. Display boards indicating possible visiting birds and their importance of them may be installed at each of these kanmois and ooranis.
- iii. Awareness materials such as stickers, posters, pamphlets, handouts, guide booklets may be supplied to these villages too.
- iv. A core team of youngsters may be organized as bird protection force to ensure local protection.
- v. A team of youth may be trained as eco-tourism guides, to enable guided Avian tourism, which would also provide additional income to the locals.
- vi. Incentives and awards may be declared to individuals committed to protection, providing crucial information on poaching and those who are doing commendable deeds in order to enhance bird habitat and bird diversity.
- vii. Regular patrolling for enforcement organized by the department may cover these villages and surrounding kanmois too.

Zonation

For effective management of the sanctuary, the area has been divided into three major zones viz., core zone, buffer zone and tourism zone. The existing zones are revised based on logical ease of management.

Core Zone

The entire sanctuary except the embankment or the tank bund is the core zone. The deep water spread areas and the tank foreshore areas which form the feeding, roosting and nesting ground for the birds may be classified under the core zone. This zone would be the rigorous manipulation zone for the purpose of habitat improvement.

Buffer Zone

The tank bund or the embankment and area surrounding 2.0 km buffer area around the sanctuary boundary will be considered as buffer zone. It will include the village and parts of adjoining kanmois. This zone is categorized in such a manner that it is in synchronous and encircles the Eco-sensitive zone proposal submitted for approval for the Bird Sanctuary.

Besides, the buffer zone except for area falling in the Bird Sanctuary notification does not have any legal sanctity and is classified for managerial intervention and planning. Therefore, all the existing right, claims, activities and practices would continue without any hindrance

Tourism Zone

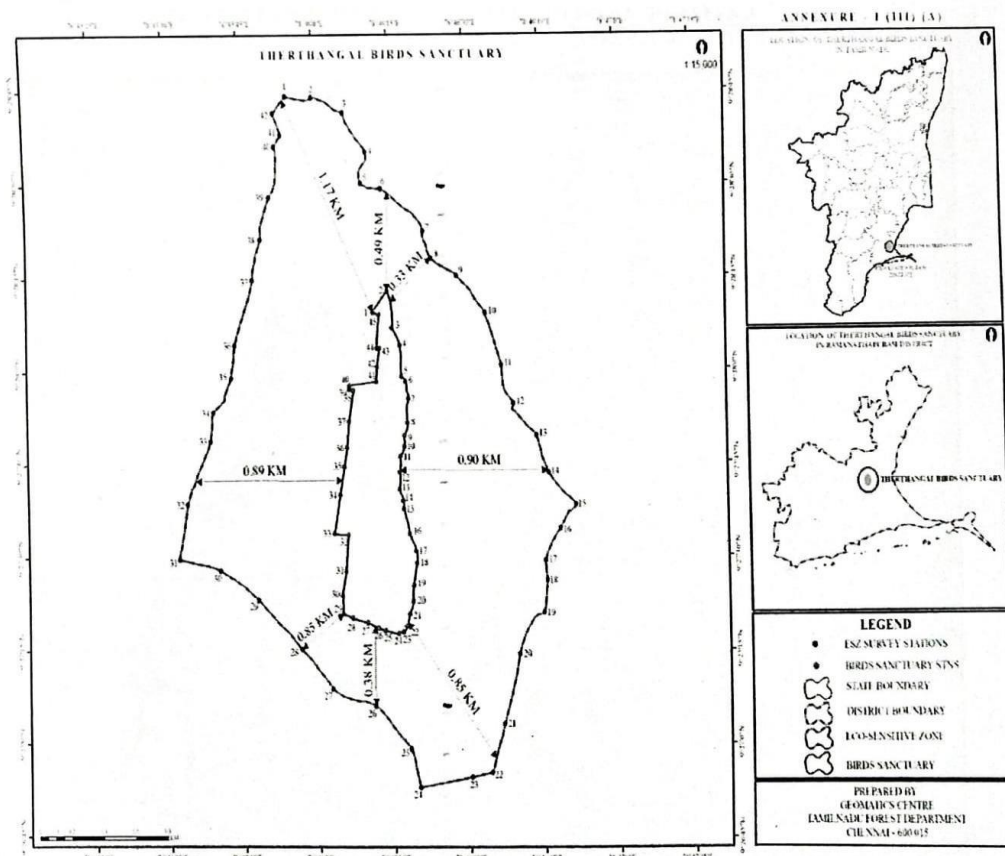
This zone consists of the main water holding region (up to 100 m from the embankment), bunds, inlet channel, roads and the mud track that is used as short cut between the village and Mudukulathur town. The zone is overlapping with the buffer zone.

Eco Sensitive Zone:

Eco sensitive zone of the Therthangal is notified on 09/07/2018, for more details check **Annexure IX**

MAP 4: Eco Sensitive Zone of Therthangal Bird Sanctuary

LOCATION MAP OF THERTHANGAL BIRD SANCTUARY AND ITS ECO-SENSITIVE ZONE ALONG WITH LATITUDE AND LONGITUDE OF PROMINENT LOCATIONS



Zone Plan

Plan for Core Zone

The entire sanctuary except the embankment or the tank bund is the core zone. The deep water spread areas and the tank foreshore areas which form the feeding, roosting and nesting ground for the birds may be classified under the core zone. This zone would be the rigorous manipulation zone for the purpose of habitat improvement.

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 uprootal of prosopis plants and planting of Acacia saplings, apart from monitoring activities will be permitted.

Plan for Buffer Zone

The tank bund or the embankment and area surrounding 2.0 km buffer area around the sanctuary boundary will be considered as buffer zone. It will include the village and parts of adjoining kanmois. This zone is categorized in such a manner that it is in synchronous and encircles the Eco-sensitive zone proposal submitted for approval for the Bird Sanctuary. Besides, the buffer zone except for area falling in the Bird Sanctuary notification does not have any legal sanctity and is classified for managerial intervention and planning. Therefore, all the existing right, claims, activities and practices would continue without any hindrance

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 and embankments.

3. Inlet channel connecting the seasonal river 'Vaigai' to the 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 to desilt the tank will be devised so as to increase open surface of water and to reduce too much variation in depth.

Grasses will be planted on slopes of bunds facing towards tank. Local varieties such as *Cynodon dactylon* and *Eremopogan fevealatus* may be preferred.

Plan for Tourism Zone

This zone consists of the main water holding region (up to 100 m from the embankment), bunds, inlet channel, roads and the mud track that is used as short cut between the village and Mudukulathur town. The zone is overlapping with the buffer zone.

Activities permitted

1. Restricted and Regulated Movement of tourists without jeopardizing the conservation concern of the sanctuary may be permitted.
2. Concrete / wooden benches may be provided to visitors to sit and watch the birds from various locations on the bund.
3. Bund management may be carried out after arriving at consensus with PWD officials.
4. Bunds, adjoining available open land and buffers of the main road may be planted with *Syzygiumcumini*, *Ficus species*, *Mangiferaindica*, *Thespeiapopulnea*, *Azadirachtaindica* and *Dendrolalamusstrictus* etc.
5. One to two new watch towers may be erected in the tank boundary of the sanctuary to facilitate Wild Life photographers.
6. Habit of using toilet for day-to-day ablutions may be promoted through awareness programs jointly organized with Health Department. The non-hygienic habit of using sanctuary as defecation grounds may slowly be weaned away.

Theme Plans

The following strategies are proposed for meeting the objectives of management.

Habitat Improvement

Habitat improvement will be based on the following considerations.

1. Protecting area against biotic degradation.

2. Improving the habitat for birds and other fauna.
3. Conserving, protecting and increasing the bio diversity.
4. Planting of *Acacia nilotica* during November and December.
5. The trees presently being used by birds for nesting should be protected from flood water.
6. Tree planting with suitable species should be taken up to ensure the future availability of good nesting sites. The barren patches in the area because of alkaline soil need be planted with trees after suitably treating the soil. Exotic weeds found in this area need to be replaced with fruit species and species suitable for roosting.
7. Measures for controlling predators like stray dogs, to be taken up by catching and translocating them to elsewhere.
9. Creation of new baby ponds to make sure that availability of water.
10. Deepening and desilting of wetlands will improve the quality of habitat.

Strategies to overcome protection problems

Control of illegal fishing

Fishing is totally banned within the sanctuary area.

Control of illegal grazing

Since the sanctuary is surrounded by villages and irrigated fields, in summer when there is very low inflow of water, cattle are driven inside the sanctuary for illegal grazing. To control this protected by APW at respective places.

Fire Protection

Since the area is marshy throughout the year, there are no incidents of fire in the sanctuary.

Creating awareness for Public

To spread the message of conservation of wildlife, publicity material like brochures, handbills should be prepared and distributed freely among the tourists, general public, school children and the people surrounding villages to create awareness regarding the importance of conserving wildlife.

CHAPTER-VII**7. ECO-TOURISM, INTERPRETATION AND CONSERVATION
EDUCATION****General**

Eco-tourism is defined as purposeful travel to natural areas to understand the cultural and natural history of environment, taking care not to alter the integrity of the eco-system, while producing economic opportunities that make conservation of natural resources beneficial to the local people. In a nutshell a tourism programme, which is nature based, ecologically sustainable, where education and interpretation are the major components and where local people are benefited, can be called eco-tourism. Therthangal Bird Sanctuary with its wealth of bird life is one of the most captivating places in Tamil Nadu. Hence, this sanctuary possesses good eco-tourism opportunity. With properly oriented and supportive staff and necessary funds this place can be transformed into a viable eco-tourism spot.

Objectives

- To ensure the participation of local communities in eco-tourism as guides and interpreters.
- To facilitate low impact ecotourism to benefit the local livelihood
- To develop Therthangal as attractive ecotourism site.
- To provide conservation education about avian fauna to visitors.

Issues/Problems

Following are the constraints identified in achieving the objectives.

- The present staff strength is not sufficient to manage tourism. Even the available staffs lack orientation and proper training.
- There is shortage of qualified and trained eco-guides who can cater to the needs of foreign tourists in particular.
- Limited accommodation facilities, lack of decent cateries and uncertain transport facilities are the major deterrents for the visitors.
- Despite the available potential there is no attractive package of engagements offered to the visitors.
- Lack of frequent public transport system is another impediment to be addressed.
- The remoteness of location and not falling within the tourism network.

The Strategies

Following are the strategies available with the sanctuary to encourage tourism

- The rural enticement and serenity of the sanctuary.
- Excellent chances of sighting vibrant bird life in the sanctuary during Bird visiting season.
- Excellent water spread in the monsoon offers plenty of scope for boating for close watch of Birds.
- Availability of many educated youth, who can be groomed as eco-guides.

Identification of the Zone

Though tourism zone is identified and delineated in the previous chapter, the areas falling under the zone are listed below for reference.

- The main road and the mud track that leads from the village to Ramanathapuram town.
- Earthen bund and the main water holding region (upto 100-150 m).
- The village and the buffer zone

Infrastructure Development

The sanctuary lacks basic infrastructure for the visitors who come to the sanctuary. Though the visitation is poor to the sanctuary, but in years to come with anticipation of good monsoon and in turn the arrival of birds the visitation is expected to increase. Following are some of the infrastructure facilities which needs to be created for the sanctuary,

1. A walk way path along the Bund of the tank. Since the area is made of black soil, it is inconvenient to walk along the bund. Hence it would be worthwhile to make a foot path over the bund. 2-3 Km stretch of walk way path may be provided of stone pavement with revetment walls along the bund so that there is no slip of the bund.
2. Along the pathway or walk way shelter sheds with seating arrangements may be made for visitors to take shelter and rest. This could be designed at intermittent distance of every 500 meters.

3. The sanctuary already has no watch tower at present. One new watch tower in the southern region and eastern most portion of the tank may be provided so as to facilitate sighting.
4. The visitors need to be provided with basic amenities like restrooms, drinking water facilities etc.,
5. A parking area needs to be allocated at the entrance to the village so that in future, congestion of vehicles during season may be avoided.
6. An interpretation center, either at the Sanctuary itself or at Ramanathapuram could cater to both Therthangal and Therthangal Bird Sanctuaries.

Regulations, Monitoring and Evaluation

The main objective of eco-tourism is that the benefits will flow to the local communities. Since the management plan prescribes for strengthening of the eco-development and formally functioning of the Eco-Development Committees, the responsibility of conducting eco-tourism may also be entrusted with these committees.

CHAPTER-VIII**8.ECO DEVELOPMENT**

The Therthangal village largely surrounds the sanctuary. The irrigation tanks supply water to ryots of Therthangal village. The villagers have their patta lands and other related activities near the The main objective of eco-tourism is that the benefits will flow to the local communities. Since, the management plan prescribes for strengthening of the Eco-development Committee and formally functioning of the Eco-Development Committees, the responsibility of conducting eco-tourism may also be entrusted with these committees. Sanctuary apart from sending their cattle to the sanctuary for grazing. These villagers have exercised their rights over the tank for the collection of water, fuel, small timber, medicinal plants, soil, green manure, cutting of *Prosopis* for fuel etc from time immemorial for their own use. After declaration of the birds sanctuary, the villagers have to necessarily sacrifice the customary usage of resources from the sanctuary area, especially for the conservation of birds. Hence it became the primary responsibility of the managers to compensate their loss apart from making them as friends of nature, so that the objective of conservation is achieved. Eco-development is not only for improving the habitat conditions of the sanctuary but also for meeting the local people's needs to some extent.

Objectives

1. To mitigate biotic pressure and to reduce the resource dependency of local communities on the sanctuary.
2. To improve the Bird Sanctuary by soliciting co-operation of the local communities in order to enhance conservation efforts in the Sanctuary.
3. To generate alternate livelihood option for the local communities.
4. To build effective local institutions for proper implementation of eco-developmental activities through participatory approach.

Specific Issues

1. Illegal cattle grazing in sanctuary.
2. Scarcity of water in the villages.
3. Lack of alternative livelihood options.
4. Low agricultural productivity.

5. Lack of effective community institutions.
6. Inadequately trained and overburdened staff.
7. Inadequate funds.

Broad Strategies

1. Raising farm forestry on grazing land, revenue and private land to get fuel and fodder.
2. Enhance irrigation potential for productive agriculture.
3. Supply of agricultural inputs on subsidy.
4. Promotion of eco –tourism.
5. Promotion of traditional knowledge on handicrafts, herbal medicine and pharmacy.
6. Supplying raw materials for traditional handicraft and artisans.
7. Improve marketing linkage.
8. Creation of employment opportunities.
9. Awareness education.
10. Capacity building of all the stakeholders
11. Health camps for people and their domestic animals.
12. Building of effective local institutions.

Village level site specific strategies

The Eco development here aims at conserving Biodiversity by addressing both the impact of local people on the PA and the impact of PA on local fisher populations. It demands collaboration between Forest department, local communities, Scientific Institutions and Non-governmental Organizations. To achieve Socio-economic development in the villages, it is essential to improve the current practices and also develop ecologically sustainable & economically viable package of alternatives that are acceptable to people, self-sustaining, compatible with the sustainable use of resources and are very helpful in minimizing the pressure on the bird sanctuary. For successful eco development, willing participation of the local public and mutual trust between Managers and people are the vital elements in the process.

Therthangal Bird Sanctuary Management Plan is finalized by consultation with local villagers carried out by forest staffs. Report of Public consultation of Therthangal Bird Sanctuary is given in **Annexure VIII**.

The guidelines prepared by the Ministry of Environment and Forests describes Eco development as a package of Program that will demonstrate the concern of the forest department for the socio-economic development of the fringe PA dependent population leading to promotion of cooperation of the villagers in the conservation and the Management of wildlife EDC is the most important local Institution to achieve this objective.

1. The EDC will be formed for the village consisting of about 150-200 households. The Ranger will convene a general meeting of all households. The Quorum will be aimed at identifying fully, partially and non-dependent populations.
2. After explaining the duties and responsibilities, the Ranger will constitute an EDC within the frame work of the following rules and regulations.
3. Every household living in the chosen area is entitled to become a member of the EDC. Any two members could represent the household at least one of them being a women.
4. The Forester concerned, shall be the Ex-officio Member Secretary of the EDC.
5. Each EDC shall have an Executive Committee, tenure of which shall be one year.
6. The composition of the Executive Committee shall be as follows.
 - i) Not more than 6 elected representatives from EDC half of them being women as members.
 - ii) Forester Concerned - Member Secretary
 - iii) Forest Guard concerned - Member
 - iv) One Representative of local NGO (Not Mandatory) - Member
7. The Executive Committee will elect its own Chairperson who shall also be the Chairperson of the EDC.
8. Ranger, Forester, Forest guard & Representatives from NGO shall have voting rights to avoid the influence of external forces in the functioning of EDC.

Monitoring and Evaluation

Approval by the Eco-

development Officer:

The Wild Life Warden, Gulf of Mannar National Park shall be the Eco-Development Officer. Upon the receipt of the proposal from the secretary of the EDC, the EDO may accord recognition to it after due examination of its merit. Only such recognized Committees are entitled to operate under these rules.

Duties and Responsibilities of the EDC

- i) A General body meeting of the EDC shall be held once in every 4 months to review the activities and functioning of the Executive Committee. All members are required to attend the meeting.
- ii) The members of the EDC individually and collectively shall
 - a) Ensure protection against Entry, Grazing, Fuel wood collection, pollution etc., in the bird sanctuary.
 - b) Make other Villagers aware of the importance of Birds in Agriculture, Pest control, Eco-tourism etc.,
 - c) Assist the Forest department functionaries in carrying out sanctuary development works in accordance with the approved activities

Duties and Responsibilities of the Executing Committee

- The Committee will be Constituted at the Commencement and at the end of every term with Range officer concerned acting as a Returning officer or Forester if so authorized by him for filling the quota of elected members.
- ii) The Executive Committee shall meet at least once a month or often as need be.
 - iii) The Member secretary shall be responsible for convening the meetings and maintaining the records of Proceedings. He shall send one copy of the proceedings to the Range Officer to keep him informed and obtain necessary guidance.
 - iv) The EDO or the Range officer may give directions from time to time for smooth and proper functioning of the Committee, which will be binding on the Committee.
 - v) If any member of EDC is found indulging in acts against Forest laws or sound principles of conservation of Bird Sanctuary, such member may be removed from EDC taking in to consideration, the recommendations of the Executive Committee.

An appeal in this regard would be with the EDO. The EDO for sufficient reasons to be recorded in writing may supersede an Executive Committee or the EDC and his decision would be final.

Role of the Range Officer

- i. The Range Officer concerned will have the freedom to attend the EDC, General Body and Executive Committee meetings to participate in the discussions and to render advice.
- ii. ii) Range Officer shall ensure that the meetings are conducted according to prescribed norms.

Education and Interpretation

These activities include conducting nature education camps, awareness campaigns, workshops, seminars, etc. School and college students may be given preference for attending the nature education camps followed by nature clubs and other genuinely interested groups. Necessary financial allotments may be made to support the modernization of the village school and also to promote nature education in the school. Conduct of paid nature education camps for interested groups can be entrusted to the Eco-development Committees. Nature education camps may consist of the following activities viz.

- Lecture on nature and wildlife conservation by identified resource persons
- Video and slide shows on conservation education and
- Voluntary labour from the participants for maintaining the cleanliness of the sanctuary.

CHAPTER-IX

9. RESEARCH, MONITORING AND TRAINING

Research and Monitoring

In order to improve the status of the wetland good scientific research and monitoring protocol needs to be put in place in the wetland. The research and monitoring activity should look into the various aspects of reliable baseline data collection, water quality, biodiversity values, and siltation and its impact, abundance of various species, ecosystem response monitoring and evaluation, consistent documentation, archiving and referral system and interaction with national and international forums for collaboration on technology transfer.

The Therthangal Bird Sanctuary (TBS) has no in house research being conducted. However certain Research Scholars do approach the Wildlife Office for grant of permission for conducting research works largely as a part of completion of Thesis or M.Sc. project report. The sanctuary offers wide opportunities for ornithologists in studying birds and various aspects of birds' life. Efforts may be made to promote local research organizations, colleges and universities interested in undertaking habitat, floral or faunal studies in the sanctuary.

Since specialized field staff may not be adequate, help of other institutions like BNHS, SACON, NGOs and Universities will be sought. A gap analysis has to be performed to find out the areas in which basic data is lacking. As a subsequent step, a research priority matrix has to be prepared. Management should provide the necessary financial and logistic help to the institutions or individuals who are interested in carrying out research works in the fields that are a priority for the Sanctuary.

Prioritization of Research

Tamilnadu has a large number of renowned research institutions, which may be requested to conduct research and help forest department in the management of Sanctuary in a more scientific manner. Some of the research areas, which are more relevant to this wetland and could help in generating baseline data, which can be well utilized, are as follows:

1. Study to update and generate data on impact of wetland degradation on migratory and resident bird species found in the CBS.

2. Studies on integrations of wetland complexes in the vicinity of the Sanctuary, since Therthangal is a small protected area and larger area of birds foraging and resting lies outside the Sanctuary too.
3. Studies on population trends and migratory pattern both spatially and temporal and studies on factors affecting the migratory pattern locally and regionally
4. Valuation studies on the ecosystem services provided by the sanctuary.

Research Topics

The following topics can be considered for research in the sanctuary, priority wise:

- i) Evaluation of lesser known and functionally important species.
- ii) An examination of the microbial ecology of lotic and lentic aquatic environments.
- iii) Studies on floral diversity and regeneration.
- iv) Monitoring of communicable diseases and health in migratory birds and surrounding commercial poultry.
- v) Assessing the effect of fire occurrence and fire prevention activities on species distribution and habitat.
- vi) An assessment of bird diversity in the sanctuary.
- vii) Habitat degradation and infestation of exotic weeds.
- viii) Migration and seasonal movement patterns of birds.
- ix) Impact of seasonal flood on bio-diversity.
- x) Monitoring prey population in the forage grounds.

Monitoring

The department should regularly monitor the water and the soil quality, the status of aquatic vegetation and water-bird diversity. Forest department conducts water-bird count every year in the winters when migration is at its peak.

Habitat monitoring, which includes study of faunal diversity, need to be undertaken regularly. It is prescribed to have permanent protocols for the monitoring of the habitat and key faunal elements. Where ever possible and needed, help and support from various institutions and organizations should be requested to carry out these programs.

Techniques and methodologies used in monitoring different events will be utilized efficiently. This will involve different stages from actual field work to record keeping. The value of the current monitoring activities for management will be assessed and documented. The activities to be monitored are given below.

Biodiversity Monitoring

Forest department with the help of few organizations working in the area conducts water bird count every year in the month of December - January. Being a Bird Sanctuary, migratory water birds should be monitored every year to understand the population trend of migratory water birds. Monitoring of breeding of different resident species and impact of wetland degradation on bird species is also needed to be done.

Monitoring of bird's population and their health

- Line transect method is statistically used in the sanctuary.
- Time of census will be in January every year as all the birds are equally distributed all over the sanctuary due to availability of water everywhere.
- Study on biology and behavior of birds will be carried out with the help of scientists in BNHS or such other research organizations working on avian fauna.
- The bird's census will be done twice in a year, once in summer and another after rainy season.

Habitat Monitoring

TBS has a mosaic of habitats that is responsible for a rich avifauna. There is a need to monitor these habitats for long-term protection and conservation of various groups of flora and fauna in the Sanctuary. Permanent plots may be laid out in the bund areas and islands, which form the terrestrial habitat in the Sanctuary. These will then be monitored regularly for vegetation, which would help in detecting change and so help in studying succession.

Monitoring of wetland habitat may also be carried out through interpretation of satellite imageries. The spatial study has helped us to present the status of the Sanctuary and its surrounding landscape for the present year. Regular study of the satellite imageries will provide useful information regarding the dynamic changes in the river course, siltation, change in habitat and the surrounding landscape.

Vegetation Monitoring:

- Growth and abundance of trees, shrubs, grasses which are palatable for herbivores and which provide cover and shelter will also be monitored.
- Estimation of ground cover percentage to be made every year after rainy season.
- Monitoring on Tree cover and its regeneration rate will be carried out every alternate year.
- Photographic record provides all-time series of habitat factors undergoing change. Every year photographs should be taken from a particular vantage point.

Environmental Monitoring

Water and Soil Quality

The sanctuary receives larger portion of water from the rainfall and has limited or no chances of receiving discharges what so ever from any of the industries or factories etc. therefore the need for rigorous monitoring is not warranted. However, as part of monitoring exercise the water and soil have to be tested to have information on the quality of the same. The samples have to be analyzed at a standard water quality testing lab for the following parameters: Temperature, Conductivity, Ph, DO, Salinity, Turbidity, Ammonia, and Phosphorous.

Bathymetry

It is prescribed that a bathymetric exercise may be carried out every two years to know about the siltation profile of the reservoir in future. The department may consider procuring an electronic echo-sounder for regular and easy bathymetry of the reservoir or such exercises could be outsourced to research institutions. Besides promoting research projects under such heads to various research scholars of various institutions would also be a viable option.

Wildlife Health Monitoring

There is a need to regularly monitor the health of the resident fauna including the migratory birds visiting the sanctuary. The blood samples of the migratory birds should be checked regularly for any kind of disease threat especially bird-flu. On the onset of every winter a joint monitoring team (along with the Veterinary Departments) should conduct a systematic disease surveillance to detect any possibilities of bird-flu in the region. Cattle Egrets are a potential target species in this matter.

9.3 Training

Training to staff is being given every year regarding bird identification and population estimation. Besides training is given to field staff on importance of wetlands and its ecosystem.

Training is a very important tool for capacity building and improving the professionalism of the staff. The staff, while carrying on their normal duties, also needs to develop an understanding of various issues related to management at a professional level. Capacity building in this regard can best be achieved through trainings designed for this purpose.

Improving the knowledge and capacity of staff has several benefits. It helps them to carry out their duty with an increased understanding and awareness and hence with increased dedication. It gives them more confidence in their work. This helps them to deal with various stakeholder groups, such as local people and tourists, with more confidence. Improved skills and knowledge will improve their productivity and quality of output. Some areas where training will benefit the staff are as follows:

- i. Knowledge and identification of bird species found in the sanctuary, Habits of species, biology and ecology of important species
- ii. Elementary knowledge of reptile, amphibians, lepidoptera species found in the sanctuary
- iii. Knowledge and identification of plants, including medicinal plants found in the area
- iv. Wetland ecology, interdependence of plant and animal species
- v. Monitoring methods, population estimation methods
- vi. Anti-poaching skills and documentation of offence cases
- vii. Conflict resolution skills for dealing with local people
- viii. Weapon training
- ix. Use of instruments such as compass, binoculars, digital camera, GPS
- x. GPS skills
- xi. Computer literacy

Field staff will be given small projects on which they should collect information from the field such as information on bird or plant species. Training should also be imparted

to local people, particularly eco-guides and tour operators with the intention of upgrading their skills for tourism.

Some important training subjects are:

- i. Wildlife (Protection) Act, 1972
- ii. Skills of dealing with tourists
- iii. Interpretational skills
- iv. Skills on identification of bird species
- v. Basic wetland ecology.

Professional organizations should be involved in developing and conducting training programs. Officers of the department should also be involved in training programs.

On the job training

Inadequate frontline staff has always been a limiting factor for sending them on training courses outside the protected area. Therefore, on the job training in the areas already identified will be conducted for them.

Formal training courses

Wildlife Institute of India runs many refresher courses and workshops in different PAs all over the Country. This should be taken advantage of and officers from the PAs sent regularly to attend these courses. Following are some of the courses conducted by the Wildlife Institute of India.

Table 3: Some courses conducted by the Wildlife Institute of India, Dehradun

S.No	Name of Course	Duration	Eligibility
1.	Post graduate diploma course in wildlife management	9 months	DCF & ACF
2.	Certificate course in wildlife management	3 months	RFO
3.	Wildlife management training	3 months	FR & FG
4.	Wireless operation and weapon training at police academy.	-	FR & FG

5.	Tourism management, receptionist, Interpretation.	-	ACF & RFO
6.	Wildlife health, chemical immobilization, power fencing	-	RFO & FR
7.	Capsule course in wildlife	7-15 days	CCF & CF
8.	Remote sensing at IIRS-Dehradun	10 months	DCF & ACF

Establishing a Learning Centre

Several of our offence cases, fail in courts of law due to improper recording, inadequate processing and wrong interpretation of legal provisions. Prosecution capabilities of the staff are required to be strengthened. A few sample cases of both success and failure can be selected by the officers of the Forest Department and with the assistance of a Legal Advisor, discussed with other lower staff periodically, so that a set of guidelines are prepared as to how a case is to be dealt with. Week training by legal experts will be adding more advantage to staffs.

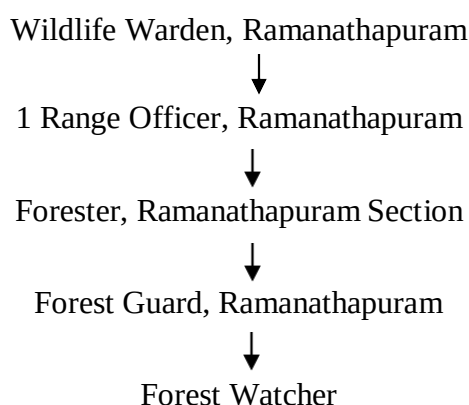
CHAPTER-X

10. ORGANIZATION AND ADMINISTRATION

10.1 Structure and responsibilities

Presently the sanctuary is under the overall Jurisdiction of the Wildlife Warden, Gulf of Mannar Marine National Park. Range Officer, Ramnad is tasked with control and management of the Bird Sanctuary and he is assisted by one Forester, Ramnad and one Forest Guard. The present setup will continue to function until the anti-poaching watchers are engaged on temporary basis from the Sanctuary village itself. Besides a Forest Watcher will be additionally required to assist the Forest Guard, since the Forest Guard, Ramanathapuram is also having Mangrove forests to be protected.

Existing Administrative setup



10.2. Staff amenities

Basic amenities like quarters for Forest Guard and Forest Watcher exists in the Chitrangudi Village itself. All seasonal staff is to be provided with 2 pairs of khaki or camouflage uniform in a year. Accessories like torch, batteries, water bottle, lathi, hunter shoes and walky-talky with solar chargers to a squad will be supplied.

CHAPTER-XI

11.THE BUDGET

The Plan Budget**Financial Forecasting:**

The financial implications of the Management Plan for the period 2023-2024 to 2032-2033 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 Budgetary requirement for the proposed activities is given below in phased manner (annual) in the chapter.

Summary of Works:**i. Deepening of tank**

Therthangal Bird Sanctuary is one of the renowned tanks in Ramanathapuram with a very unique history. The local people have been protecting the Sanctuary for centuries because they have realized 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. Therthangal 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.

ii. Desilting and Cleaning of the channels

Water from the Vaigai River through a channel comes into Therthangal tank. Hence the channels carrying water from Vaigai River to Therthangal need to be desilted to enable Therthangal tank to be filled up during north east monsoon.

iii. Uprootal / removal of *Prosopis*, *Ipomeacarnea*, etc.,

The tank is partly rainfed and partly fed by feeder channels. There is lot of evapo-transpirational loss of water due to the presence of *Prosopis* found inside the tanks. *Ipomeacarnea* is a fast invader and will replace other native vegetation from

the site. Hence, the invasive species should be removed in order to prevent loss of water and destruction of habitat.

iv. Planting of *Acacia nilotica*

Acacia nilotica is the main species on which the birds roost in the Therthangal 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., Tree guards or fencing the entire block need to be provided to prevent damage. If only all these components and the amount indicated are given in entirety a successful plantation can be raised which would serve as a habitat to the birds.

v. Planting taller seedlings in 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 and vegetation except for the *Prosopis juliflora*. Planting taller seedlings would create a microclimate conducive for birds.

vi. Creation of Ponds

The sanctuary falls within the arid zone and the tank is being used for irrigation purpose as well. Though there is a general conservation feeling among the villagers towards avian fauna conservation but when it comes to livelihood of the villagers then agriculture takes the upper hand. Thereby during the post rainy season the water is drawn from the tank for irrigating the agriculture fields. Thus the water storage is hindered from prolonging upto May – June. Therefore in order to retain water within the tank for a prolonged period, small ponds are essential so that they are below the level of sluice gates so that the water is not drained out. This would render prolonged stay of the winter migratory birds and in turn helps in breeding.

vii. Creation of Mounds / Islands

The sanctuary being an earthen tank, does not provide great diversity in terms of the habitat types like 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.

viii. Releasing fish fingerlings

Fingerlings must be released in the tank annually to ensure steady food supply

for the birds coming to the Sanctuary.

ix. 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 March. This will help us study the trends in bird arrival, stay, feeding and breeding.

x. Introduction of emergent plants on the edges of shore area

Emergent plants like Typha, Arundodonax, Ipomea aquatic, Hygrophilaauriculata, Polygonumglabrum, Oryzarufipogon, Saccharumsp, etc., can be introduced on the edges of shore area. Gentle slopy 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.,

xi. Conducting anti-poaching camps during the season with the help of anti-poaching watchers

Around 15000 birds visit Therthangal 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.

xii. Creation of fodder banks away from the tank

Occasional grazing is found in the sanctuary and this will have a negative impact on the dynamics of the wetland ecosystem by way of creating opening in the vegetation, soil disturbances, invasion of weeds and other alien species. Complete control of grazing will have a negative impact on the livelihood of the adjacent villagers as well as in the rapport of the department with the people. Hence, it is proposed to create fodder banks of preferred species in an area away from the tank in order to cater to the needs of the villagers while protecting the tank from grazing.

xiii. Eco awareness camps

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

xiv. Improvement of signages, boards and interpretation center

To create awareness about the importance of Wildlife and Bio-diversity conservation and to highlight the role of Therthangal Bird Sanctuary in conservation of birds, the interpretation facilities at Therthangal Birds Sanctuary have to be improved.

xv. Construction and improvement of viewpoints, watch towers

Watch towers need to be constructed and improved so as to have a better view of birds by the public and to enable efficient and better monitoring by department staff.

xvi. Improvement of visitor's facilities such as walk paths, rest sheds, toilets, drinking water facilities, benches, etc.,

Therthangal Birds Sanctuary being an important wetland, 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.

xvii. 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., needs to be purchased.

xviii. Providing fencing to prevent trespassing into Therthangal Bird Sanctuary

The Therthangal Bird Sanctuary is abutting the Therthangal 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 cattles are kept away.

xix. Research / ecosystem study and monitoring works

Periodical studies have to be undertaken during the duration of this

Management Plan in Therthangal to fill up the gaps in research and monitoring. Similarly, an inventory of vegetation including micro flora, 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. **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 watcher, 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 presentation skills to act as tourist guides. Exposure visits to other protected areas will supplement the knowledge of field staff.

xx. 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.

xxi. 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 onewhere losses are increased. Vaccination programmes, often supplemented by other disease control measures, can help control and even eliminate diseases affecting livestock.

xxii. Eco Tourism

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

MANAGEMENT PLAN OF THERTHANGAL BIRD SANCTUARY [2023-2024 to 2032-2033]

Table 4: Budget estimates for 2023-24 to 2032-2033

(Rupees in Lakhs)

S. No.	Description of Work	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-2030	2030-31	2031-32	2032-33
1	Habitat Management										
a	Raising Babul and other roosting tree Plantation	1	1.1	1.21	1.331	1.4641	1.610	1.770	1.947	2.141	2.355
b	Release of fish fingerlings to enrich the feeding ground for the birds	1.6	1.76	1.94	2.13	2.34	2.574	2.831	3.114	3.425	3.767
c	Formation of water hole inside the Sanctuary	5	5.50	6.05	6.66	7.32	8.052	8.857	9.742	10.717	11.788
d	Desilting water way for the tank (feeder channel)	7	7.70	8.47	9.32	10.25	11.275	12.402	13.642	15.007	16.507
e	Deepening of Tank to improve eco system	7	7.70	8.47	9.32	10.25	11.275	12.402	13.642	15.007	16.507
f	Providing mounds inside the tank	7	7.70	8.47	9.32	10.25	11.275	12.402	13.642	15.007	16.507
g	Clearing of invasive growth of Prosopis juliflora	8	8.80	9.68	10.65	11.71	12.881	14.169	15.586	17.144	18.859

MANAGEMENT PLAN OF THERTHANGAL BIRD SANCTUARY [2023-2024 to 2032-2033]

h	Supply of multipurpose tree species to villages in and around the sanctuary	3	3.30	3.63	3.99	4.39	4.829	5.311	5.843	6.427	7.070
i	Planting taller seedlings in and around the sanctuary	2	2.20	2.42	2.66	2.93	3.223	3.545	3.899	4.289	4.718
2	Protection										
a	Construction of New steel bird watch tower	2	0	0	0	0	0	0	0	0	0
b	Maintenance and improvement of Bird Watch Tower	10	11.00	12.10	13.31	14.64	16.104	17.714	19.485	21.434	23.577
c	Improvement of forest staff quarters	0.5	0.55	0.6	0.65	0.7	0.77	0.846	0.931	1.024	1.127
d	Purchasing Rescue Veterinary Van	30.00	-	-	-	-	-	-	-	-	
e	Fuel for Rescue Veterinary Van	0.60	0.66	0.72	0.78	0.85	0.935	1.028	1.131	1.244	1.368
f	Fencing along the peripheral boundary of the Bird sanctuary	20	-	15	10	10	8	8	7	6	5
g	Engaging birds Protection watcher	3.24	3.56	3.92	4.31	4.74	5.214	5.735	6.308	6.939	7.633

MANAGEMENT PLAN OF THERTHANGAL BIRD SANCTUARY [2023-2024 to 2032-2033]

h	Survey for boundary demarcation and laying of survey stones.	4	4.40	4.84	5.32	5.86	6.446	7.090	7.799	8.579	9.437
i	Construction of Cairns	3	3.30	3.63	3.99	4.39	4.829	5.311	5.843	6.427	7.070
j	Maintenance of sanctuary interpretations centre building	5	5.50	6.05	6.66	7.32	8.052	8.857	9.742	10.717	11.788
k	Awards to committed field staff	1	1.10	1.21	1.33	1.46	1.606	1.766	1.943	2.137	2.351
3	Awareness and Publicity										
a	Conducting nature camps to College, School students and EDC members	2	2.20	2.42	2.66	2.93	3.223	3.545	3.899	4.289	4.718
b	Awareness creation and publicity board	3	3.30	3.63	3.99	4.39	4.829	5.311	5.843	6.427	7.070
c	Maintenance of older boards	2	2.20	2.42	2.66	2.93	3.223	3.545	3.899	4.289	4.718
d	Printing publicity materials such as stickers, Pamphlets, booklets etc.,	3	3.30	3.63	3.99	4.39	4.829	5.311	5.843	6.427	7.070
e	Education and training to staff	3	3.30	3.63	3.99	4.39	4.829	5.311	5.843	6.427	7.070

MANAGEMENT PLAN OF THERTHANGAL BIRD SANCTUARY [2023-2024 to 2032-2033]

4	Eco Development Activities (Community based works)										
a	Entry Point activities community based work	12	13.20	14.52	15.97	17.57	19.327	21.259	23.385	25.724	28.296
b	EDC formation and corpus fund	25	27.50	30.25	33.28	36.60	40.26	44.286	48.714	53.586	58.944
c	Creation of fodder banks in the community lands and government paramboke lands of the village	5	5.50	6.05	6.66	7.32	8.052	8.857	9.742	10.717	11.788
d	Supply of cooking vessels for community function	1	1.10	1.21	1.33	1.46	1.606	1.766	1.943	2.137	2.351
e	Supply of school bags to school children	1.5	1.65	1.82	2.00	2.20	2.42	2.662	2.928	3.221	3.543
f	Adjoining school improvement	3	3.30	3.63	3.99	4.39	4.829	5.311	5.843	6.427	7.070
g	Micro credit for Villagers	15	15	15	15	15	15	15	15	15	15
5	Eco - Tourism										
a	Wildlife Week Celebration	1	1.10	1.21	1.33	1.46	1.606	1.766	1.943	2.137	2.351
b	Nature trails	1	1.10	1.21	1.33	1.46	1.606	1.766	1.943	2.137	2.351

MANAGEMENT PLAN OF THERTHANGAL BIRD SANCTUARY [2023-2024 to 2032-2033]

c	Providing drinking water facilities	2	2.20	2.42	2.66	2.93	3.223	3.545	3.899	4.289	4.718
d	Engaging Tourist guides/training Eco guides	1	1.10	1.21	1.33	1.46	1.606	1.766	1.943	2.137	2.351
e	Improvement of visitors facilities \ amenities, watch towers, providing exhibits, etc.,	12	13.20	14.52	15.97	17.57	19.327	21.259	23.385	25.724	28.296
f	Construction of Toilet for Visitors	4.00	-	0.50	-	0.50	-	0.50	-	0.50	-
6	Research										
a	Habitat & Ecosystem study in Therthangal Bird Sanctuary	8	8.80	9.68	10.65	11.71	12.881	14.169	15.586	17.144	18.859
b	Breeding and Migratory pattern study in Therthangal Bird Sanctuary	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
7	Village Development										
a	Cement floor for village function	2.00	-	-	-	-					
b	Supply of Horticulture saplings to families @ 20 / land owner	0.60	0.75	0.80	0.90	1.00	1.1	1.21	1.331	1.464	1.610

MANAGEMENT PLAN OF THERTHANGAL BIRD SANCTUARY [2023-2024 to 2032-2033]

c	Community Development works in Villages	3	3.30	3.63	3.99	4.39	4.829	5.311	5.843	6.427	7.070
d	Sport articles to youth of villages	3	3.30	3.63	3.99	4.39	4.829	5.311	5.843	6.427	7.070
8	Monitoring										
a	Sanctuary Monitoring committee	1	1.10	1.21	1.33	1.46	1.606	1.766	1.943	2.137	2.351
b	Census (Birds Population Estimation)	1.5	1.65	1.82	2.00	2.20	2.42	2.662	2.928	3.221	3.543
c	Engaging on Ornithologists for birds identification and for field study	3.6	3.96	4.36	4.79	5.27	5.797	6.376	7.014	7.715	8.487
	Total	242.64	201.44	235.32	250.012	272.734	294.704	322.04	350.222	382.295	416.624

11.1.3. 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 Dept. of Environment, Corporate Social Responsibility and others will be attempted to be secured and works will be implement keeping the broad strategies/prescription highlighted in this Management Plan.

CHAPTER-XII

12. The Schedule of Operations and Miscellaneous Regulations

The Schedule

The schedule of operations drives management interventions in a series of ordered annual tasks. It details the annual physical targets and corresponding financial allocations reflected in the budget. The various prescriptions proposed in the management plan have been given in detail in the respective chapters. On the basis of these prescriptions the annual plan of operation could be prepared by the Wildlife Warden, Wildlife Division, Ramanathapuram for which budgetary provisions can be made and on approval item of works can then be carried out. According to budget provision, preparation of advance plan of every year will facilitate making of budget provisions and sustainable planning as per requirement of Management Plan. The items of work that cannot be completed in a particular year due to lack of budget provision or late receipt of budget could be carried forward in the next year's plan of operation.

Record of Deviations and Implemented Targets

The record of deviations from the Management plan prescriptions needs to be maintained. At the time of revision of the management plan these deviations need to be referred to especially on matters which relate to strategy in the field. The record of deviation statements are usually not maintained properly. The management should ensure that the deviation statements maintained properly as per prescription of management plan.

The Record of Employment Potential

It is important to know the man-days created in a financial year for different works. This not only gives the employment generated by bird sanctuary but also gives the expenditure incurred against each theme/work in a given month and accordingly the total wage component sized during the year. The concerned wildlife Range Officer should thus maintain a register for such labour generation in different schemes.

Control Forms

Principal control forms constitute with sub-unit together. All follow in their appropriate order. At the end of each financial year all the control forms are to be posted. To facilitate in posting of information, each range should maintain register. Now a day when computers are available at the range level, then this task of updating information in control form is much easier.

Maintenance of Compartment Histories

Maintenance of compartment history is a well-defined practice in the management of forests. Unfortunately, this practice is not being given due importance in management of wildlife and is found lacking in most cases. The compartment history is an important document and should be maintained.

A Pocket Field Guide for Plan Implementation

Give the Pocket Field Guide to all rangers and forester, they follow the Field guide instruction while implement the plan.

Abbreviation used

ACFs	Assistant Conservator of Forests
CF	Conservator of Forests
CSS	Centrally Sponsored Scheme
CSMCRI	Central Salt Marine Chemical Research Institute
DFO	District Forest Officer
DO	Dissolved Oxygen
EDC	Eco-development Committee
EDO	Eco Development Officer
G.O	Government order
GIS	Geographical Information System
GOMMNP	Gulf of Mannar Marine National Park
GPS	Global Positioning System
IDWH	Integrated Development of Wildlife Habitat
IUCN	International Union for Conservation of Nature
MSNP	Management of Sanctuary and National Park
NEMS	North East Monsoon
NGO	Non-Government Organization
NEC	Nature Education Camp
PWD	Public work department
TWAD	Tamil Nadu Water and Drainage Department
WII	Wildlife Institute of India
WLW	Wildlife Warden

REFERENCES

- Ali, S. and S. D. Ripley. (1969). *Handbook of the birds of India and Pakistan*. Oxford University Press, Bombay.
- Ali, S. and S. D. Ripley. (1983). *Handbook of the birds of India and Pakistan*. Compact Ed., Oxford University Press, New Delhi.
- An Introduction and User's Guide to Wetland Restoration, Creation, and Enhancement- Developed by the Interagency Workgroup on Wetland Restoration: National Oceanic and Atmospheric Administration, Environmental Protection Agency, Army Corps of Engineers, Fish and Wildlife Service, and Natural Resources Conservation Service 2003
- Anon. (1988) Wetland Conservation, Wetlands & Waterfowl Newsletter. 1: 37-48
- Anon. (1990). A directory of wetlands in India. Ministry of Environment and Forests, Government of India.
- Anon. (1994). Wetland classification system. Scientific note. RSAM/SAC/RSAG/MWRD/WLM/TN/02/94. SACRAMENTALITY. pp: 9.
- Asian Wetland Bureau, (1991). Action Program for the conservation of wetland in South and West Asia, Proceedings of International Conference, Karachi. pp: 1.
- Bentham, G. and J. D. Hooker. (1862-1883). *Genera Plantarum*. Vols 1-3. London.
- Bhadri, R. B., R. B. Singh and B. L. Desai. (1961). *Water plants*, New Delhi
- Biswas, K. and C. C. Calder. (1936). *Hand book of common water and marsh plants of India and Burma*, Calcutta (revised Ed.1954)
- Chatterjee, A (2008) *Wetland Management Planning. A Guide for site managers*, Phillips, B. & D. Stroud (Eds.), WWF, Wetlands International, IUCN & Ramsar Convention, 76 pp
- Choudhury, S.S. (2006) Participatory protected area management: A case study of Tal Chappar Wildlife Sanctuary Churu (Rajasthan), *The Indian Forester* 132 (10): 1373-1375
- Citizen's Guide to the Control of Invasive Plants in Wetland and Riparian Areas- U.S. Forest Service Chesapeake Bay Program Forestry Work Group, Pennsylvania Department of Conservation and Natural Resources Wild Resources Conservation Fund, Maryland's Chesapeake Bay Trust, (2003)
- Cromie, R.L., R. Lee, R.J. Delahay, J. L. Newth, M.F. O'Brien, H.A. Fairlamb, J.P. Reeves & D.A. Stroud. (2012). *Ramsar Wetland Disease Manual: Guidelines for Assessment*,

Monitoring and Management of Animal Disease in Wetlands. Ramsar Technical Report
No. Ramsar Convention Secretariat, Gland, Switzerland.

Consultation with local villagers by frontline staff.

Devaraj, P. (1999). Plant Indicators - Principles and concepts. *Ecol. Env. And Cons.* 5(2):
137- 140.

Erwin, R. M., Laubhan, M. K., Cornely, J. E., and Bradshaw, D. M., Managing Wetlands for
Waterbirds: How Managers Can Make a Difference in Improving Habitat to Support a
North American Bird Conservation Plan In: R. Bonney, D.N. Pashley, R. Cooper, and L.
Niles (eds.). *Strategies for Bird Conservation: The Partners in Flight Planning Process.*
Ithaca, NY: Cornell Laboratory of Ornithology. p. 1-13.

Garg, J. K. (1998). *Wetlands of India*, SAC (ISRO), Ahmadabad, pp: 239

Gaston, A.J.(1973). Methods for estimating bird population *J. Bombay Nat. Hist. Soc.*
72(2):272-281

George, M. R. (1964). Limnological investigations on pond plankton, macrofauna and
chemical constituents of water and their bearing on fish production. Unpublished Ph.D.
thesis, University of Calcutta,

Greenberg, E. A., S. L. Clesseri., A. D. Eaton. (1992). Standard methods for the examination
of water and waste water, 18th edition, American Public Health Association.

Gole, P. (1989) Management of bird sanctuaries: Wetland habitats, Wetlands and Waterfowl
Conservation in Asia. IWRB/AWB: 65-73

Habitat: Conservation Summaries for Strategy Habitats Strategy Habitat: Wetlands. Oregon
Conservation Strategy, February (2006).

Jayaram, K.C. (1981). Freshwater fishes of India. A hand book-Zoological Survey of India,
Calcutta.

Jayaram. K. C. (1999). Freshwater fishes of the Indian region. Narendra Publishing House.
New Delhi.

Jhingran, V. G. (1491). Fishes and fisheries of India (3rdEdn). Hindustan Publishing
Corporation, Delhi.

Kachroo, P. (1983). *Aquatic biology in India*, Dehra Dun

- Keddy, A. P. (2000). Wetland Ecology - Principles and Conservation, Cambridge University Press. pp: 1-32.
- Krull, N. (1970). Aquatic plant-macro invertebrate associations and waterfowl. *Journal of Wildlife Management*, 34 (4): 707-718.
- Kulshreshtha, M. and M. Gopal. (1982). Decomposition of freshwater wetlands vegetation, Parts 1 and 2. In: Wetlands Ecology and Management. Eds. M. Gopal., E. Turner., R.G. Wetzel and D.E. Whigham. Indian Institute of Ecology and International Scientific Publications.
- Kushlan, J. A. (1978). Feeding ecology of wading birds. Wading birds, *Natl. Audubon Soc. Res. Rep.* 7: 249-297.
- Macan, T. T. (1963). Freshwater ecology, Longmans Green and Co., Ltd., 48, Grosvenor Street, London, W. I.
- Mani, M. S. (1971). Insects. National BookTrust, New Delhi
- Menon, A. G. K. (1987). The fauna of India and adjacent countries, Pisces 4. Teleostei-Cobitoidea, Part I, Homalopteridae. Zoological Survey of India, Calcutta.
- Menon, A. G. K. (1992). The fauna of India and adjacent countries, Pisces 4. Teleostei-Cobitoidea, Part 2, Cobitidae. Zoological Survey of India, Madras.
- Menon, A. G. K. (1999). Checklist- Freshwater fishes of India, Zoological Survey of India, Occ. Pap. No. 175, pp: 366.
- Odum, E. P. (1971). Fundamentals Of Ecology. W. B. Saunders Company, USA.
- Online Consultation Meeting held with Bird Experts.
- Perennou, C. (1989). Southern wintering range of some water birds. *J. Bombay Nat. Hist. Soc.* 86(2): 247-248.
- Ramalingam, K. and R. Jayaraman. (1985). A note on the hydroecological features of a pond on a plankton bloom day. *Geoblos News Report-4*: 92-94.
- Ramsar Convention Secretariat, (2010). Inventory, assessment, and monitoring: an Integrated Framework for wetland inventory, assessment, and monitoring. Ramsar handbooks for the wise use of wetlands, 4th edition, vol. 13. Ramsar Convention Secretariat, Gland, Switzerland

- Ramsar Convention Secretariat, (2010). Participatory skills: Establishing and strengthening local communities' and indigenous people's participation in the management of wetlands. Ramsar handbooks for the wise use of wetlands, 4th edition, vol. 7. Ramsar Convention Secretariat, Gland, Switzerland
- Ramsar Convention Secretariat, (2010). Water-related guidance: an Integrated Framework for the Convention's water-related guidance. Ramsar handbooks for the wise use of wetlands, 4th edition, vol.
- Ramsar Convention Secretariat, Gland, Switzerland and Ramsar Convention Secretariat, (2010); Water allocation and management: Guidelines for the allocation and management of water for maintaining the ecological functions of wetlands. Ramsar handbooks for the wise use of wetlands, 4th edition, vol. 10. Ramsar Convention Secretariat, Gland, Switzerland.
- Robert E. Stewart, Jr. Technical Aspects of Wetlands as Bird Habitat, National Water Summary on Wetland Resources United States Geological Survey Water Supply Paper 2425.
- Patel, C. D., P. K. Patel and S. A. Chavan. (1990). Man-made wetland: A new perspective. Paper presented at the seminar on Wetland Ecology and Management - at Keoladeo National Park, Bharatpur. (Feb. 23-25).
- SAC. (1991). Manuel for mapping of wetland and shoreline change using satellite data. pp: 63.
- Sampath, K. (1993). Ecological evaluation of irrigation tanks in the ThiruvanamallaiSambuvarayar, south district of Tamil Nadu. In: Bird conservation: Strategies for the Nineties and beyond, A. Varghese, S. Sridhar, and A. K. Chakaravarthy (eds.), Ornithological society of India. Bangalore. pp 142-144.
- Sinha. P. C. and R. Mohanty. (2002). Wetland - Management Policy and Law. pp: 51-62. Kenosha Publishers. New Delhi.
- Sridharan, U. and V. S. Vijayan. (1990). Ecology and management of resident water fowl in Keoladeo National Park, Bharatpur. Paper presented at the seminar on Wetland Ecology and Management. -at Keoladeo National Park, Bharatpur. (Feb. 23-25).
- Subramanyam, K. (1962). Aquatic Angiosperms. New Delhi.

- Sundararaju, R., Thirunavukrasu, V. and Balachandran, S. (2010) Status of waterbirds in Tamilnadu wetlands, Tamilnadu Forest Department
- Talwar, P. K. and A.G. Jhingran. (1991). Inland fishes of India and Adjacent Countries. Oxford and IBH Publishing Co, New Delhi.
- Tamilnadu Forest Department, Tamilnadu Biodiversity conservation and Greening Project (2013-14) Wetland Action Plan: Kanjirankulam Bird Sanctuary. Technical Report
- Trisal, C. L. (1990). Distribution, production and role of macrophytes in some wetland ecosystem of India. Paper presented at the seminar on Wetland Ecology and Management - at Keoladeo National Park, Bharatpur. (Feb. 23-25).
- Trisal, C .L. (1993). Conservation of wetland in India and international treaties. *In. proc. Int. symp.on wetland and waterfowl conservation in south and west Asia*, Karachi, Pakistan. M. Moser, and J. Van Vessen (Eds.), Asian wetland Bureau, Kuala Lumpur, Malaysia, pp: 41-49.
- Trivedi, R. K. and P. K. Goel. (1984). Chemical and biological methods for water pollution studies.
- Vijayan, V. S. (1986). On conserving the bird fauna of Indian Wetlands. *Proc. Indian AcadSci.* (Suppl) 91-101.
- Water notes- Wetlands as waterbird habitat. Water and Rivers Commission WN5 January (2000), Natural Heritage Trust, Government of Western Australia.
- Welch. P. S. (1948). Limnological methods. Mc Grawhill Book Co., New York.
- Wetland Habitat Management for Wildlife- Ohio division of wildlife.
- Wetlands of India - A Directory. (1990). Ministry of Environment and Forests. Government of India.
- Wetzel, R. G. (1975). Limnology. , W. B. Saunders & Co. Philadelphia.
- Wetzel, R. G. (1983). Limnology. I1 Ed. Saunders College. New York. pp: 559
- WWF. (1987). Wetlands conservation and the Ramser Convention, WWW, pp: 6,

ANNEXURE - I

ORDER OF GOVERNMENT OF TAMIL NADU



ABSTRACT

Forest - Wildlife - Formation of Therthangal Tank Birds Sanctuary - Under Section 18(1) of Wildlife (Protection) Act, 1972 - Orders Issued.

ENVIRONMENT AND FORESTS (FR 5) DEPARTMENT

G.O.Ms.No.220

Dated: 15.12.2010

Read:

From the Principal Chief Conservator of Forests and Chief Wildlife Warden letter No.WL5/51306/10, dated 8.10.2010.

ORDER

The notification appended to this order shall be published both in English and Tamil in the next issue of the Tamil Nadu Government Gazette and in Tamil in the District Gazette of the Ramanathapuram District.

2. The Tamil Development and Religious Endowments Department is requested to send immediately a Tamil Translation of the notification to the Works Manager, Government Central Press, Chennai for publication in the Tamil Nadu Government Gazette and in the District Gazette of Ramanathapuram.

3. The Works Manager, Government Central Press, Chennai is requested to send 20 copies of the Gazette notification to the Government, Principal Chief Conservator of Forests, and to the Principal Chief Conservator of Forests and Chief Wildlife Warden and to the Collector of Ramanathapuram District as soon as the notification is published.

(BY ORDER OF THE GOVERNOR)

V. IRAI ANBU

SECRETARY TO GOVERNMENT

To
The Works Manager, Government Central Press, Chennai-79.
The Principal Chief Conservator of Forests, Chennai-15
The Principal Chief Conservator of Forests & Chief Wildlife Warden, Chennai-15.
The Tamil Development, Culture and Religious Endowment Department, Chennai-9.
The Secretary to Government of India,
Ministry of Environment and Forests,
Paryavaran Bhavan, CGO Complex, Lodhi Road, New Delhi-110 003.
The District Collector, Ramanathapuram.

/FORWARDED BY ORDER/

with C.No.9/2010/2010 dt. 12.12.10.

SECTION OFFICER

py to w.f.w. Rmnd. for information and n/a.



04562-252158

CF, Virudhunagar

0 16:53

APPENDIX

DRAFT NOTIFICATION

In exercise of the powers conferred by sub-section (1) of section 18 of the Wildlife (Protection) Act, 1972(Central Act 53 of 1972), the Governor of Tamil Nadu hereby declares the intention of the Government of Tamil Nadu to constitute the area, the boundaries of which are specified in the Schedule below which is considered by the Government of Tamil Nadu to be of adequate ecological, faunal, floral, geomorphological, natural and zoological significance for the purpose of protecting, propagating and developing wildlife and its environment, to be a Sanctuary.

Schedule.

1. Name of the District : Ramanathapuram
2. Name of the Taluk : Paramakudi
3. Name of the Village : No.76, Therthangal
4. Survey numbers with area : Area S.No.6. (29.29.5.Hectares)
5. Name of the Sanctuary : Therthangal Birds Sanctuary

Boundaries

- North: Starting from northern side of S.No. 7 and eastern side of S.No. 5 of Village No. 76 Therthangal village and runs towards North-East on the southern sides of S.No. 3, 116 of V. No. 76 Therthangal village
- East: Thence the boundary runs generally towards south along the western sides of S.F.No.s 112, 111, 109, 92, 91, 90 and 89 of Village No. 76 Therthangal village and southern side of S.No. 89 and also runs western side of S.Nos. 88,79,78 and 65 of Village No. 76 Therthangal village.
- South: Thence the boundary runs towards West along the northern side of S.No. 64, 21 of V.No. 76 Therthangal village
- West: Thence the boundary runs generally towards north along the western side of the S.No. 20,15, 14, 13, 12, 11,10, 9 and northern side of S.No. 9, western side of S.No. 9 and southern and eastern sides of S.No. 8, eastern, northern sides of S.No. 7 and joins the starting point.

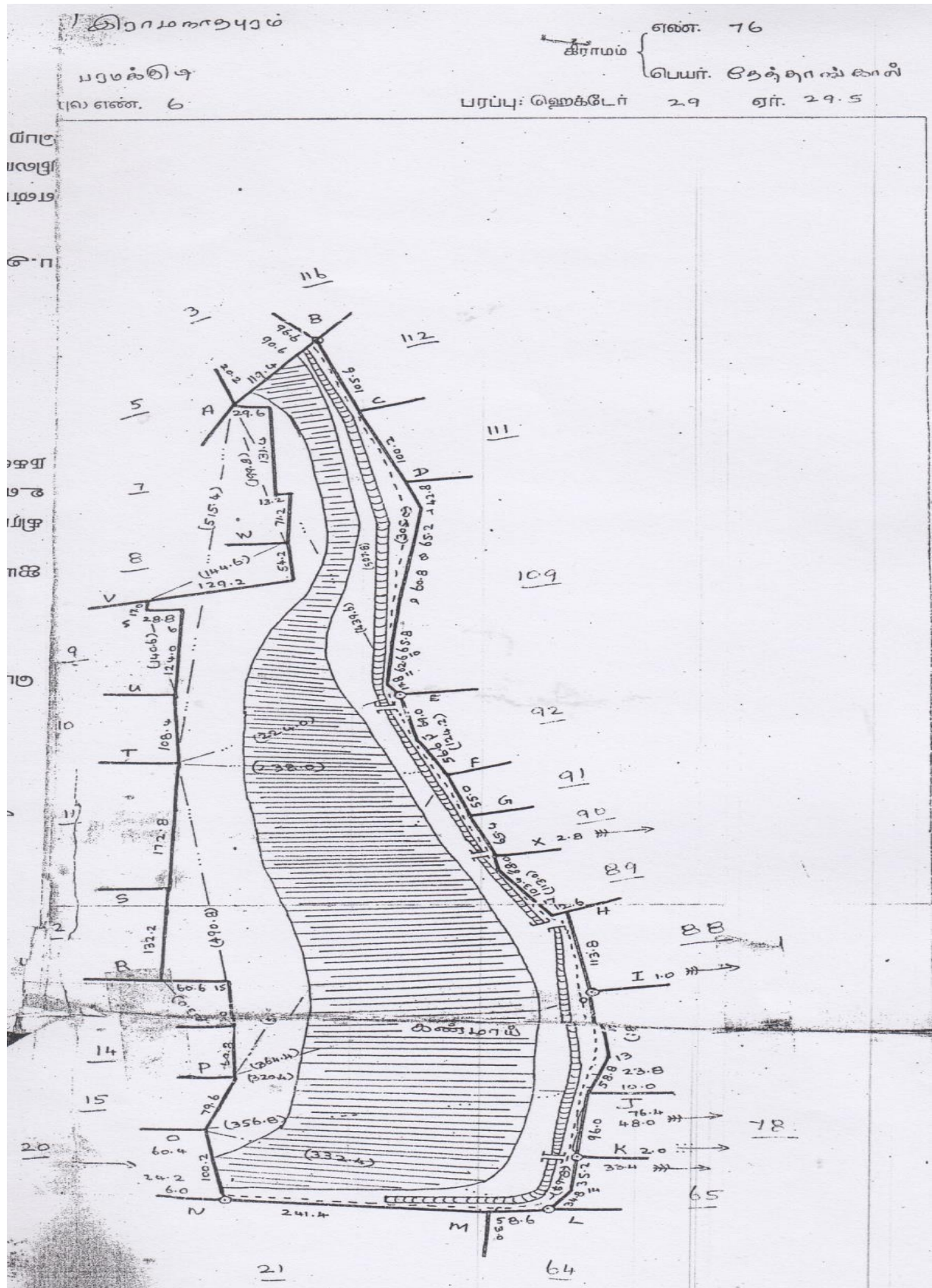
V. IRAI ANBU
SECRETARY TO GOVERNMENT

/True copy/


SECTION OFFICER

ANNEXURE 1A

FIELD MEASUREMENT BOOK EXTRACT OF THERTHANGAL TANK



ANNEXURE II (a & b)

LIST OF TANKS AND PONDS WITHIN 2 KM AROUND THERTHANGAL BIRD
SANCTUARY

II (a) – Tanks (Locally called Kanmois’)

Sl. No	Name	Remarks
1	KiliyurKanmoi	Prosopis only occupied
2	IllimulliKanmoi	Prosopis invaded
3	Vandal Kanmoi	Prosopis invaded
4	PandiyurKanmoi	Prosopis invaded
5	ThyagavancheriKanmoi	Prosopis invaded
6	TurattiyendalKanmoi	Prosopis invaded
7	KulatturKanmoi	Prosopis invaded

II (b) - Ponds – Locally called Oorani’s

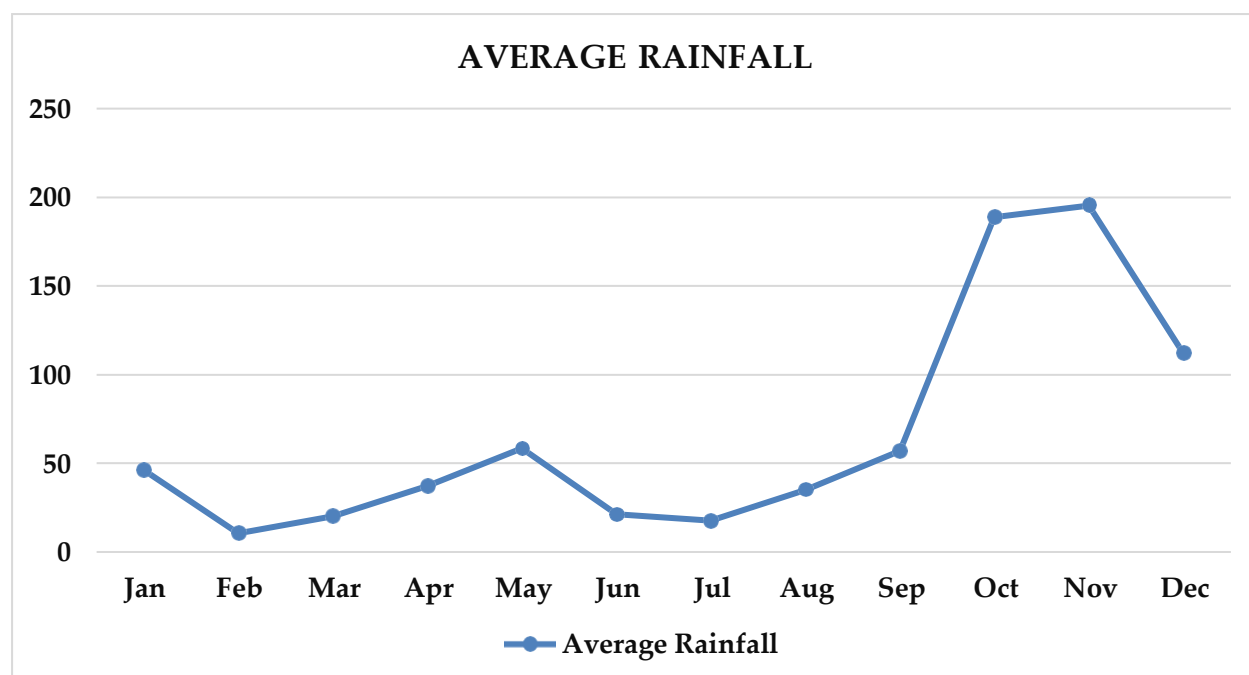
S. No	Name	Remarks
1	VinayakarkovilOorani	Muddy water
2	AyyanarkovilOorani	Muddy water
3	MadathuOorani	Drinking Water
4	IlimulliOorani	Muddy water
5	Illimulisutukatuoorani	Muddy water
6	ThegavancheriKakathopuOorani	Muddy water
7	KiliyurOorani	Muddy water

MANAGEMENT PLAN OF THERTHANGAL BIRD SANCTUARY [2023 -2024 to 2032--2033]

ANNEXURE III (a&b) – RAINFALL (IN MM)

III (a) - Monthly Average Rainfall from 2012 to 2021

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Total
2012	8.63	1.37	6.81	38.13	7.58	0	19.56	20.13	46.96	330.8	56.56	62.01	54.41
2013	35.31	63.71	62.39	14.74	11.29	6.38	8.93	38.22	14.3	87.65	138.09	136.9	51.49
2014	39.18	17.15	0	0	167.52	0	0	32.41	59.64	315.52	235.03	80.69	118.39
2015	1.95	4.9	20.67	162.24	141.87	2.32	33.8	60.39	58.55	140.71	302.09	184.5	92.83
2016	0.56	1.89	0.59	5.68	91.38	8.82	18.03	15.23	32.59	40.79	92.25	40.83	29.05
2017	72.77	5.58	31.86	0	23.92	35.87	13.64	68.49	69.14	61.82	163.83	53.02	54.54
2018	1.01	0.59	18.08	26.11	53.82	15.51	12.69	23.01	45.86	221.14	217.91	28.07	55.31
2019	0	0.44	0	8.18	3.35	0	11.77	43.32	83.91	384.41	188.34	189.79	101.5
2020	7.02	6.26	0.91	26.91	42.85	49.05	26.61	23.19	79.06	97.32	187.61	298.46	70.43
2021	248.74	2.71	0	15.10	38.86	29.68	12.22	24.63	77.81	206.32	370.87	44.15	100.72
Average Rainfall	46.13	10.46	20.19	37.13	58.24	21.09	17.47	34.90	56.79	188.64	195.26	111.84	72.86

III (b) - Graph I: Monthly Average Rainfall from 2012 to 2021 (In mm)**III (c) – Number of Rainy days in every season**

Sl. No	Season	Months	Rainfall	
			Normal (mm)	Number of Rainy days
1	Winter	January and February	67.4	5
2	Summer	March, April and May	122.6	11
3	South West Monsoon	June, July, August and September	135.4	12
4	North East Monsoon	October, November and December	501.6	34
	Total		827.0	62

ANNEXURE IV (a & b)

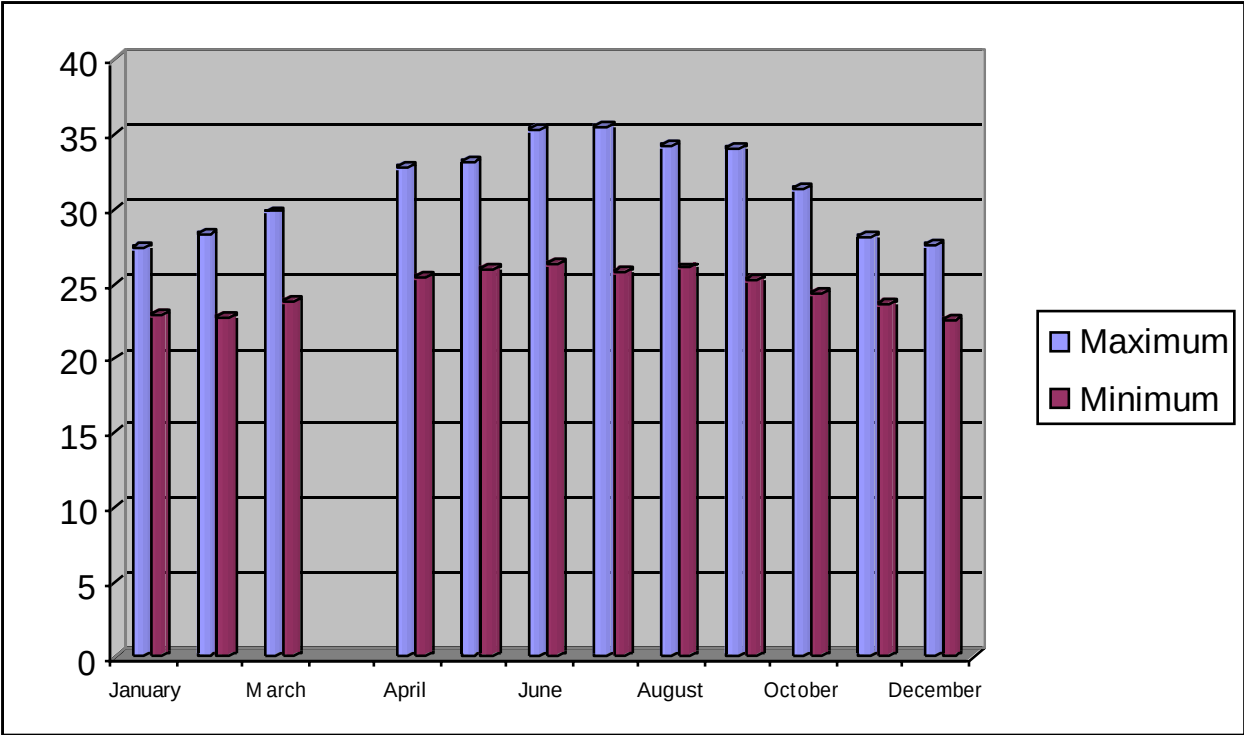
MONTHLY AVERAGE TEMPERATURE AND RELATIVE HUMIDITY

RAMANATHAPURAM DISTRICT

IV (a) – Table

Month	Temperature °C		Relative Humidity %
	Minimum	Maximum	
January	27.45	22.80	79.36
February	28.33	22.69	77.06
March	29.8	23.8	76.83
April	32.8	25.32	80.94
May	33.20	25.89	51.48
June	35.34	26.30	47.51
July	35.55	25.78	61.51
August	34.28	26.03	60.84
September	34.04	25.15	68.42
October	31.41	24.24	65.05
November	28.08	23.58	52.26
December	27.53	22.44	76.40

IV (b) - Graph – II : Monthly Average Temperature



ANNEXURE V

FLORA OF THERTHANGAL BIRD SANCTUARY

S. No	Family	Species	Tamil Name	IUCN Status
1	Amaranthaceae	<i>Achyranthes aspera</i> L.	Nayurivi	Not Evaluated
2	Arecaceae	<i>Borassus flabellifer</i> L.	Panai	Endangered
3	Asclepiadaceae	<i>Calotropis gigantea</i> (L.) R.Br.	Erukku	Not Evaluated
4	Caesalpiniaceae	<i>Senna auriculata</i> (L.) Roxb.	Avaram, Avaarai	Not Evaluated
5	Caesalpiniaceae	<i>Tamarindus indica</i> L.	Puliyamaram	Least Concern
6	Capparidaceae	<i>Cleome viscosa</i> L.	Nai kadugu, Nai vaelai	Not Evaluated
7	Combretaceae	<i>Terminalia catappa</i> L.	Natvadumai, NaattuBadaam	Least Concern
8	Convolvulaceae	<i>Ipomoea carnea</i> Jacq.	Neivelikatamanakku	Not Evaluated
9	Euphorbiaceae	<i>Phyllanthus reticulatus</i> Poir.	Inkipazham	Least Concern
10	Euphorbiaceae	<i>Euphorbia hirta</i> L.	Ammanpacharisi	Not Evaluated
11	Euphorbiaceae	<i>Tragia involucreata</i> L.	Chenthatti, Kaanjori	Not Evaluated
12	Euphorbiaceae	<i>Phyllanthus amarus</i> Schum. & Thonn.	Kizha-nelli	Not Evaluated
13	Euphorbiaceae	<i>Chrozophora rotleri</i> (Geiseler) Juss.	Suruavarti	Not Evaluated
14	Fabaceae	<i>Tephrosia purpurea</i> (L.) Pers.	Kozhinji, Kollukaaivaelai	Not Evaluated
15	Fabaceae	<i>Pongamia pinnata</i> (L.) Pierre	Punga maram	Least Concern
16	Malvaceae	<i>Abutilon indicum</i> (L.) Sweet	Thuthi, Nalla thuthi	Not Evaluated
17	Martyniaceae	<i>Martynia annua</i> L.	ThaelKodukku	Not

MANAGEMENT PLAN OF THERTHANGAL BIRD SANCTUARY [2023-2024 to 2032-2033]

				Evaluated
18	Meliaceae	<i>Azadirachta indica</i> A. Juss.	Vaembu, Vaepam	Least Concern
19	Mimosaceae	<i>Prosopis juliflora</i> (Sw.) Dc.	Seemakkaruvai	Not Evaluated
20	Mimosaceae	<i>Acacia leucophloea</i> (Roxb.) Willd.	Velvelam	Least Concern
21	Mimosaceae	<i>Acacia nilotica</i> (L.) Willd. ex Del.	Karuvelam	Least Concern
22	Mimosaceae	<i>Acacia planifrons</i> Wight & Arn.	Kodaivelam, Udai maram	Not Evaluated
23	Molluginaceae	<i>Glinusoppositifolius</i> (L.) A. DC.	ThuraaPoondur	Least Concern
24	Poaceae	<i>Eragrostisviscosa</i> (Retz.) Trin.	IraguKadhal Pul	Not Evaluated
25	Poaceae	<i>Cynodondactylon</i> (L.) Pers.	Arugam pullu	Not Evaluated
26	Poaceae	<i>Perotis indica</i> (L.) Kuntze	Narivalpullu	Not Evaluated
27	Rubiaceae	<i>Morindapubescens</i> J.E. Smith	Manjanatti	Not Evaluated
28	Scrophulariaceae	<i>Scoparia dulcis</i> L.	Sarakkotthini	Not Evaluated
29	Solanaceae	<i>Datura innoxia</i> Mill.	Oomatthai	Not Evaluated
30	Verbenaceae	<i>Phyla nodiflora</i> (L.) Greene	Poduthalai	Least Concern

ANNEXURE VI

ANNOTATED CHECKLIST OF BIRDS IN THERTHANGAL BIRD SANCTUARY

Common name	Scientific name	Conservation Status	Status in Sanctuary	Migratory Status
Grebes	Podicipedidae			
Little Grebe	<i>Tachybaptus ruficollis</i>	Least Concern	C	R, B
Pelicans	Pelecanidae			
Spot-billed Pelican	<i>Pelecanus philippensis</i>	Near Threatened	C	R,B
Cormorants	Phalacrocoracidae			
Little Cormorant	<i>Microcarboniger</i>	Least Concern	C	R,B
Great Cormorant	<i>Phalacrocorax carbo</i>	Least Concern		
Darters	Anhingidae			
Oriental Darter	<i>Anhinga melanogaster</i>	Near Threatened	U	R,B
Hérons, Egrets & Bitterns	Ardeidae			
Little Egret	<i>Egretta garzetta</i>	Least Concern	C	R,B
Grey Heron	<i>Ardea cinerea</i>	Least Concern	C	R,B
Purple Heron	<i>Ardea purpurea</i>	Least Concern	U	R
Great Egret	<i>Ardea alba</i>	Least Concern	U	R,B # M
Intermediate Egret	<i>Ardea intermedia</i>	Least Concern	U	R,B
Cattle Egret	<i>Bubulcus ibis</i>	Least Concern	C	R,B
Indian Pond-Heron	<i>Ardeolagrayii</i>	Least Concern	C	R,B
Storks	Ciconiidae			
Painted Stork	<i>Mycteria leucocephala</i>	Near Threatened	C	R,B
Asian Open bil	<i>Anastomus oscitans</i>	Least Concern	C	R,B
Ibises & Spoonbills	Threskiornithidae			
Black-headed Ibis	<i>Threskiornis melanocephalus</i>	Near Threatened	C	R,B
Glossy Ibis	<i>Plegadis falcinellus</i>	Least Concern	U	R,M
Eurasian Spoonbill	<i>Platalea leucorodia</i>	Least Concern	C	R

MANAGEMENT PLAN OF THERTHANGAL BIRD SANCTUARY [2023-2024 to 2032-2033]

Geese & Ducks	Anatidae			
Green-Winged Teal	<i>Anas crecca</i>	Least Concern	U	M
Garganey	<i>Spatula querquedula</i>	Least Concern	C	M
Hawks, Eagles, Buzzards, Vultures, Kites, Harriers	Accipitridae			
Black Kite	<i>Milvus migrans</i>	Least Concern	U	R,B
Brahminy Kite	<i>Haliasturindus</i>	Least Concern	U	R,B
Shikra	<i>Accipiter badius</i>	Least Concern	C	R,B
Pheasants, Partridges, Quails	Phasianidae			
Grey Francolin	<i>Ortygornis pondicerianus</i>	Least Concern	M	R,B
Indian Peafowl	<i>Pavo cristatus</i>	Least Concern	C	R,B
Rails, Crakes, Moorhens, Coots	Rallidae			
White-breasted Waterhen	<i>Amaurornis phoenicurus</i>	Least Concern	C	R,B
Eurasian Coot	<i>Fulica atra</i>	Least Concern	U	R
Lapwings	Charadriidae	Least Concern		
Red-wattled Lapwing	<i>Vanellus indicus</i>	Least Concern	C	R,B
Sandpipers, Stints, Snipes, Godwits & Curlews	Scolopacidae			
Common Snipe	<i>Gallinago gallinago</i>	Least Concern	U	M
Common Greenshank	<i>Tringanebularia</i>	Least Concern	R	M
Stilts	Recurvirostridae			
Black-winged Stilt	<i>Himantopus himantopus</i>	Least Concern	C	R #M
Pigeons & Doves	Columbidae			
Spotted Dove	<i>Spilopelia chinensis</i>	Least Concern	C	R,B
Eurasian Collared-	<i>Streptopeliadecaocto</i>	Least Concern	C	R,B

MANAGEMENT PLAN OF THERTHANGAL BIRD SANCTUARY [2023-2024 to 2032-2033]

Dove				
Parakeets	Psittacidae			
Rose-ringed Parakeet	<i>Psittaculakrameri</i>	Least Concern	C	R,B
Cuckoos & Coucals	Cuculidae			
Pied Cuckoo	<i>Clamatorjacobinus</i>	Least Concern	U	R,B
Asian Koel	<i>Eudynamysscolopacea</i>	Least Concern	C	R,B
Greater Coucal	<i>Centropus sinensis</i>	Least Concern	C	R,B
Barn Owls	Tytonidae			
Barn Owl	<i>Tyto alba</i>	Least Concern	U	R,B
Owls	Strigidae			
Spotted Owlet	<i>Athene brama</i>	Least Concern	C	R,B
Swifts	Apodidae			
Asian Palm-Swift	<i>Cypsiurusbalasiensis</i>	Least Concern	M	R,B
Kingfishers	Alcedinidae			
Common Kingfisher	<i>Alcedo atthis</i>	Least Concern	U	R,B
White-breasted Kingfisher	<i>Halcyon smyrnensis</i>	Least Concern	C	R,B
Bee-eaters	Meropidae			
Asian Green Bee-eater	<i>Meropsorientalis</i>	Least Concern	C	R,B
Blue-tailed Bee-eater	<i>Meropsphilippinus</i>	Least Concern	C	M
Rollers	Coraciidae			
Indian Roller	<i>Coracias benghalensis</i>	Least Concern	C	R,B
Hoopoes	Upupidae			
Common Hoopoe	<i>Upupa epops</i>	Least Concern	C	R,B
Woodpeckers	Picidae			
Black-rumped Flameback	<i>Dinopiumbenghalense</i>	Least Concern	C	R,B
Swallows & Martins	Hirundinidae			
Barn Swallow	<i>Hirundo rustica</i>	Least Concern	C	M

MANAGEMENT PLAN OF THERTHANGAL BIRD SANCTUARY [2023-2024 to 2032-2033]

Pipits	Motacillidae			
Paddyfield Pipit	<i>Anthusrufulus</i>	Least Concern	C	R,B
Bulbuls	Pycnonotidae			
Red-vented Bulbul	<i>Pycnonotuscafer</i>	Least Concern	C	R,B
Ioras	Irenidae			
Common Iora	<i>Aegithina tiphia</i>	Least Concern	U	R
Shrikes	Laniidae			
Brown Shrike	<i>Lanius cristatus</i>	Least Concern	C	M #P
Thrushes, Robins,	Turdinae			
Indian Robin	<i>Saxicoloidesfulicata</i>	Least Concern	C	R,B
Babblers	Timaliinae			
Yellow-billed Babbler	<i>Turdoidesaffinis</i>	Least Concern	C	R,B
Prinias, Warblers	Sylviinae			
Jungle Prinia	<i>Prinia sylvatica</i>	Least Concern	C	R,B
Ashy Prinia	<i>Priniasocialis</i>	Least Concern	C	R,B
Common Tailorbird	<i>Orthotomussutorius</i>	Least Concern	C	R
Cisticola	Sylviinae			
Zitting cisticola	<i>Cisticola juncidis</i>	Least Concern	U	R
Flycatchers	Muscicapinae			
Indian Paradise- Flycatcher	<i>Terpsiphone paradisi</i>	Least Concern	C	M
Sunbirds	Nectariniidae			
Purple-rumped Sunbird	<i>Nectariniazeylonica</i>	Least Concern	C	R
Purple Sunbird	<i>Nectarinia asiatica</i>	Least Concern	C	R
Munias (Estrildid Finches)	Estrildidae			
Indian Silverbill	<i>Lonchuramalabarica</i>	Least Concern	C	R
Scaly breasted Munia	<i>Lonchurapunctulata</i>	Least Concern	U	R
Tricolored Munia	<i>Lonchuramalacca</i>	Least Concern	U	R

MANAGEMENT PLAN OF THERTHANGAL BIRD SANCTUARY [2023-2024 to 2032-2033]

Sparrows	Passerinae			
House Sparrow	<i>Passer domesticus</i>	Least Concern	C	R
Weavers	Ploceinae			
Baya Weaver	<i>Ploceus philippinus</i>	Least Concern	U	R
Starlings & Mynas	Sturnidae			
Common Myna	<i>Acridotheres tristis</i>	Least Concern	M	R,B
Orioles	Oriolidae			
Eurasian Golden Oriole	<i>Oriolus oriolus</i>	Least Concern	U	M
Drongos	Dicruridae			
Black Drongo	<i>Dicrurus macrocercus</i>	Least Concern	C	R
Woodswallows	Artamidae			
Ashy Woodswallow	<i>Artamus leucorhynchus</i>	Least Concern	U	R
Crows, Treepies	Corvidae			
Rufous Treepie	<i>Dendrocitta vagabunda</i>	Least Concern	C	R
House Crow	<i>Corvus splendens</i>	Least Concern	M	R,B
Large-billed Crow	<i>Corvus macrorhynchos</i>	Least Concern	C	R,B

RB= Resident and breeding,

R= Resident but breeding not noticed in this area,

SM= Local or short distant migrants,

W= Wintering Migrants,

C=common.

UC =uncommon,

Ra= Rare,

V=vagrant

RB= Resident and breeding, R= Resident but breeding not noticed in this area, SM= Local or short distant migrants, W= Wintering Migrants, C=common. UC =uncommon, Ra= Rare,

V=vagrant

Source: Dr. Balachandar, BNHS.

Key: Status in Sanctuary

ANNEXURE – VII

CHECK LIST OF MAMMALS, AMPHIBIANS AND REPTILES IN THERTHANGAL
BIRD SANCTUARY

S. No.	Common name	Scientific name	IUCN Status
Mammals			
1	Indian Grey Mongoose	<i>Herpestesedwardsii</i>	LC
2	Indian Palm Squirrel	<i>Funambulus palmarum</i>	LC
Reptiles			
1	Spotted Indian Gecko	<i>Hemidactylus brookii</i>	LC
2	Garden lizard	<i>Calotes versicolor</i>	LC
3	Monitor lizard	<i>Varanus bengalensis</i>	NT
4	Olive Keelback water snake	<i>Atretiumschistosum</i>	LC
5	Checkered Keelback	<i>Xenochrophis piscator</i>	LC
6	Long Nosed Tree Snake	<i>Ahaetulla nasuta</i>	LC
7	Indian Cobra	<i>Naja naja</i>	LC
Amphibians			
1	Common Indian Toad	<i>Duttaphrynusmelanostictus</i>	LC

*NT – NEAR THRETNED

*VU – VULNERABLE

* LC – LEAST CONCERN

Annexure VIII

**Minutes of Meeting and report of meeting conducted by forest staff with local villagers
around the Therthangal Bird Sanctuary**

**Public consultation for finalization of Therthangal
Bird Sanctuary Management Plan**

Consultation with people residing in vicinity of the sanctuary is conducted. The demands and requirements of the local peoples are incorporated in the management plan under eco-development component. The local people expressed that having healthy water region will be beneficial for villagers and birds also. The villagers are interested in developing the Bird Sanctuary as eco-tourism spot with advanced facilities such as Audio Visual Interpretation centre, Bird watching instruments etc., apart from that the school students were actively involved in different activities such as Wetland Day Celebration, Bird census, Forest day celebration, Environment day celebration, etc.,. The school infrastructure also be developed through support of Bird Sanctuary Authority under Eco-development component. Thus the requirement of the villagers and other stakeholders taken into consultation. Some of the photographic documentation shown below.





Submitted by,

சென்ட்ரல்
14.6.23

உதவி வனப்பாதுகாவலர் (பயிற்சி)
வன உயிரினச்சரகம்,
இராமநாதபுரம்.

Annexure IX

Eco-sensitivity zone gazette of Therthangal Bird Sanctuary

[भाग II—खण्ड 3(ii)]

भारत का राजपत्र : असाधारण

23

3. पर्यटन महायोजना सहित आंचलिक महायोजना की तैयारी की स्थिति।
4. भू-अभिलेखों की स्पष्ट वृत्तियों के सुधार के लिए निबटाए गए मामलों का सार (पारिस्थितिकी संवेदी जोन वार)। विवरण उपाबंध के रूप में संलग्न करें।
5. पर्यावरण प्रभाव मूल्यांकन अधिसूचना, 2006 के अधीन आने वाली गतिविधियों से संबंधित संवीक्षा किए गए मामलों का सार। (विवरण एक पृथक उपाबंध के रूप में संलग्न करें)।
6. पर्यावरण प्रभाव मूल्यांकन अधिसूचना, 2006 के अधीन न आने वाली गतिविधियों से संबंधित संवीक्षा किए गए मामलों का सार। (विवरण एक पृथक उपाबंध के रूप में संलग्न करें)।
7. पर्यावरण (संरक्षण) अधिनियम, 1986 की धारा 19 के अधीन दर्ज की गई शिकायतों का सार।
8. कोई अन्य महत्वपूर्ण मामला।

MINISTRY OF ENVIRONMENT, FOREST AND CLIMATE CHANGE

NOTIFICATION

New Delhi, the 17th December, 2019

S.O. 4499(E).—WHEREAS, a draft notification was published in the Gazette of India, Extraordinary, *vide* notification of the Government of India in the Ministry of Environment, Forest and Climate Change number S.O. 3262 (E), dated the 5th July, 2018, inviting objections and suggestions from all persons likely to be affected thereby within the period of sixty days from the date on which copies of the Gazette containing the said notification were made available to the public;

AND WHEREAS, copies of the Gazette containing the said draft notification were made available to the public on the 5th July, 2018;

AND WHEREAS, no objections and suggestions were received from persons and stakeholders in response to the draft notification;

AND WHEREAS, the Therthangal Bird Sanctuary otherwise known as "Therthangal Kanmai" is located in Nainarkoil taluk and a part of Therthangal village in Ramanathapuram district about 12 kilometres from Ramnad main town of southern Tamil Nadu. The Sanctuary is a resident for several species of migratory, resident birds and plants. Therthangal Bird Sanctuary lies between Latitude 09°27.499' N Latitude 078°45.536' E Longitude in the Ramanathapuram District of Tamil Nadu and extends over an area of 0.29295 square kilometre (29.295 ha). The Sanctuary was declared as Therthangal Bird Sanctuary *vide* G.O W6/220/E&F (FR.V) dated the 15th December, 2010 and notified as a Bird Sanctuary within the meaning and scope of sub-section (1) of section 18 of the Wildlife (Protection) Act, 1972;

AND WHEREAS, varieties of migratory birds arrive from various parts of the world for feeding and nesting purpose in the Sanctuary. About 15000 birds belonging to 42 species have been listed during the season and the important birds include white ibis, black ibis, open-billed stork, egrets, mynas, teals, ducks, darters, herons, pelicans, etc. The Bird Sanctuary has richness of near threatened species such as pelican, painted stork, Eurasian spoon bill, white ibis, darter, flamingo and water birds such as common coot, pin tail, garganey, egrets, cormorants, black winged stilt, kingfisher, common myna, brahmīnī kite, spotted owl, etc;

AND WHEREAS, the Sanctuary offers ideal habitat for winter migratory birds with considerable diversity in nesting and feeding behaviour for breeding and feeding. It is one of the preferred nesting sites for heronry species and colonial birds migrating to South India. The feathered visitors flock the Sanctuary from October to February. The wetland is irregular in depth and retains water for 3 to 5 months, if rain is normal. Envisaging successful management measures will attract more breeding species and wintering species to enhance the diversity which in turn will attract more tourists, birdwatchers and students. The best time to visit the Sanctuary for bird watching is November-January when bird population and species diversity is at the highest;

AND WHEREAS, the Sanctuary is basically an irrigation tank that is used for storing water for agriculture recharged by the northeast monsoons from October till January. The tank remains completely dry from March to August.

As the Sanctuary is an irrigation tank, there is no natural forest within the Sanctuary. Babul (*Acacia nilotica*) plantations were raised by the Forest Department. The other major flora in the tank bunds and foreshore are Nayurivi (*Achyranthes aspera* L.), Panai (*Borassus flabellifer* L.), Erukku (*Calotropis gigantea* L.) R. Br.), Avaram Avaarai (*Senna auriculata* L.) Roxb.), Puliya maram (*Tamarindus indica* L.), Nai kadugu, Nai vaelai (*Cleome viscosa* L.), Natvadumai, Naattu Badaam (*Terminalia catappa* L.), Neivelikatamanakku (*Ipomoea carnea* Jacq.), Rail poondur (*Croton bonplandianum* Baill.), etc;

AND WHEREAS, the Sanctuary being a irrigation tank has very less faunal species (except Avifauna) which include Indian grey mongoose (*Herpestes edwardsii*), Indian palm squirrel (*Funambulus palmarum*), jackal (*Canis aureus*), black-naped hare (*Lepus nigricollis*) and bandicoot rat (*Bandicota bengalensis*). The Sanctuary has good diversity of birds e.g. little grebe (*Tachybaptus ruficollis*), spot-billed pelican (*Pelecanus philippensis*), little cormorant (*Phalacrocorax niger*), great cormorant (*Phalacrocorax carbo*), darter (*Anhinga melanogaster*), little egret (*Egretta garzetta*), grey heron (*Ardea cinerea*), etc;

AND WHEREAS, the Sanctuary has many species of butterflies, reptiles and amphibians. Example of reptiles include House gecko (*Hemidactylus frenatus*), spotted Indian gecko (*Hemidactylus brookii*), garden lizard (*Calotes versicolor*), green lizard (*Calotes calotes*), monitor lizard (*Varanus bengalensis*), common Indian skink (*Europhis carinata*), etc; example of amphibians are common Indian toad (*Duttaphrynus melanostictus*), ornate narrow mouthed frog (*Microhyla ornata*), common skittering frog (*Euphlyctis cyanophlyctis*), etc. The Sanctuary has important rare and threatened species. The rare species includes great cormorant (*Phalacrocorax carbo*), purple heron (*Ardea cinerea*), comb duck (*Sarkidiornis melanotos*), northern shoveller (*Anas clypeata*), common teal (*Abas crecca*), common redshank (*Tringa setanus*), and common greenshank (*Tringa nebularia*). The threatened species present in the Sanctuary are spot-billed pelican (*Pelecanus philippensis*) and painted stork (*Mycteria leucocephala*), etc;

AND WHEREAS, Therthangal wetland is located in the Nainar Kovil block of Ramanathapuram district. Therthangal is the only village located in the vicinity of the sanctuary and is under the jurisdiction of Therthangal Panchayat. The total population of the village consists of 432 males and 424 females. There are 157 households in Therthangal village and nearly half of the total households were observed to be below poverty line;

AND WHEREAS, The landscape is mainly agrarian and the economy of the village is primarily dependent on agriculture. However, water stress and prolonged periods of drought has driven the villagers to pursue other sources of livelihood like working as porters (coolies). As a consequence, high rate of migration has also been observed in the surrounding areas in tune with the profile of the district. Livestock rearing such as goats, sheep, cow and poultry also supports the economy of the village. The village has 26 cattle, 387 goats/sheep and 222 poultry, approximately. Few villagers are also engaged in manufacturing charcoal to supplement their income during the lean season of agriculture;

AND WHEREAS, it is necessary to conserve and protect the area, the extent and boundaries of Therthangal Bird Sanctuary which are specified in paragraph 1 as Eco-sensitive Zone from ecological, environmental and biodiversity point of view and to prohibit industries or class of industries and their operations and processes in the said Eco-sensitive Zone;

NOW, THEREFORE, in exercise of the powers conferred by sub-section (1) and clauses (v) and (xiv) of sub-section (2) and sub-section (3) of section 3 of the Environment (Protection) Act, 1986 (29 of 1986) (hereafter in this notification referred to as the Environment Act) read with sub-rule (3) of rule 5 of the Environment (Protection) Rules, 1986, the Central Government hereby notifies an area to an extent varying from 0.3 kilometres to 1.17 kilometres around the boundary of Therthangal Bird Sanctuary, in Ramanathapuram district in the State of Tamil Nadu as the Therthangal Bird Sanctuary Eco-sensitive Zone (hereafter in this notification referred to as the Eco-sensitive Zone) details of which are as under, namely: -

1. **Extent and boundaries of Eco-sensitive Zone.** - (1) The Eco-sensitive Zone shall be to an extent of 0.3 kilometres to 1.17 kilometres around the boundary of Therthangal Bird Sanctuary and the area of the Eco-sensitive Zone is 4.5718 square kilometres.
 - (2) The boundary description of Therthangal Bird Sanctuary and its Eco-sensitive Zone is appended in **Annexure-I**
 - (3) The maps of the Therthangal Bird Sanctuary demarcating Eco-sensitive Zone along with boundary details and latitudes and longitudes are appended as **Annexure-IIA, Annexure-IIB, Annexure-IIC and Annexure-IID**.
 - (4) Lists of geo-coordinates of the boundary of Therthangal Bird Sanctuary and Eco-sensitive Zone are given in Table A and Table B of **Annexure-III**.
 - (5) The list of villages falling in the Eco-sensitive Zone along with their geo co-ordinates at prominent points is appended as **Annexure-IV**.
2. **Zonal Master Plan for Eco-sensitive Zone.** - (1) The State Government shall, for the purposes of the Eco-sensitive Zone prepare a Zonal Master Plan within a period of two years from the date of publication of this notification in the Official Gazette, in consultation with local people and adhering to the stipulations given in this notification for approval of the competent authority of State.

- (2) The Zonal Master Plan for the Eco-sensitive Zone shall be prepared by the State Government in such manner as is specified in this notification and also in consonance with the relevant Central and State laws and the guidelines issued by the Central Government, if any.
 - (3) The Zonal Master Plan shall be prepared in consultation with the following Departments of the State Government, for integrating the ecological and environmental considerations into the said plan:-
 - (i) Environment;
 - (ii) Forest and Wildlife;
 - (iii) Agriculture;
 - (iv) Revenue;
 - (v) Urban Development;
 - (vi) Tourism;
 - (vii) Rural Development;
 - (viii) Irrigation and Flood Control;
 - (ix) Municipal;
 - (x) Panjayati Raj;
 - (xi) Public Works Department;
 - (xii) Highways; and
 - (xiii) Tamil Nadu State Pollution Control Board.
 - (4) The Zonal Master Plan shall not impose any restriction on the approved existing land use, infrastructure and activities, unless so specified in this notification and the Zonal Master Plan shall factor in improvement of all infrastructure and activities to be more efficient and eco-friendly.
 - (5) The Zonal Master Plan shall provide for restoration of denuded areas, conservation of existing water bodies, management of catchment areas, watershed management, groundwater management, soil and moisture conservation, needs of local community and such other aspects of the ecology and environment that need attention.
 - (6) The Zonal Master Plan shall demarcate all the existing worshipping places, villages and urban settlements, types and kinds of forests, agricultural areas, fertile lands, green area, such as, parks and like places, horticultural areas, orchards, lakes and other water bodies with supporting maps giving details of existing and proposed land use features.
 - (7) The Zonal Master Plan shall regulate development in Eco-sensitive Zone and adhere to prohibited and regulated activities listed in the Table in paragraph 4 and also ensure and promote eco-friendly development for security of local communities' livelihood.
 - (8) The Zonal Master Plan shall be co-terminus with the Regional Development Plan.
 - (9) The Zonal Master Plan so approved shall be the reference document for the Monitoring Committee for carrying out its functions of monitoring in accordance with the provisions of this notification.
- 3. Measures to be taken by the State Government.-** The State Government shall take the following measures for giving effect to the provisions of this notification, namely:-
- (1) **Land use:-** (a) Forests, horticulture areas, agricultural areas, parks and open spaces earmarked for recreational purposes in the Eco-sensitive Zone shall not be used or converted into areas for commercial or residential or industrial activities:
 Provided that the conversion of agricultural and other lands, for the purpose other than that specified at part (a) above, within the Eco-sensitive Zone may be permitted on the recommendation of the Monitoring Committee, and with the prior approval of the competent authority under Regional Town Planning Act and other rules and regulations of Central Government or State Government as applicable and *vide* provisions of this Notification, to meet the residential needs of the local residents and for activities such as:-
 - (i) widening and strengthening of existing roads and construction of new roads;
 - (ii) construction and renovation of infrastructure and civic amenities;
 - (iii) small scale industries not causing pollution;

(iv) cottage industries including village industries; convenience stores and local amenities supporting eco-tourism including home stay; and

(v) promoted activities given under paragraph 4:

Provided further that no use of tribal land shall be permitted for commercial and industrial development activities without the prior approval of the competent authority under Regional Town Planning Act and other rules and regulations of the State Government and without compliance of the provisions of Article 244 of the Constitution or the law for the time being in force, including the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 (2 of 2007):

Provided also that any error appearing in the land records within the Eco-sensitive Zone shall be corrected by the State Government, after obtaining the views of Monitoring Committee, once in each case and the correction of said error shall be intimated to the Central Government in the Ministry of Environment, Forest and Climate Change:

Provided also that the correction of error shall not include change of land use in any case except as provided under this sub-paragraph.

(b) Efforts shall be made to reforest the unused or unproductive agricultural areas with afforestation and habitat restoration activities.

(2) **Natural water bodies.**—The catchment areas of all natural springs shall be identified and plans for their conservation and rejuvenation shall be incorporated in the Zonal Master Plan and the guidelines shall be drawn up by the State Government in such a manner as to prohibit development activities at or near these areas which are detrimental to such areas.

(3) **Tourism or Eco-tourism.**— (a) All new eco-tourism activities or expansion of existing tourism activities within the Eco-sensitive Zone shall be as per the Tourism Master Plan for the Eco-sensitive Zone.

(b) The Eco-Tourism Master Plan shall be prepared by the State Department of Tourism in consultation with State Departments of Environment and Forests.

(c) The Tourism Master Plan shall form a component of the Zonal Master Plan.

(d) The Tourism Master Plan shall be drawn based on the study of carrying capacity of the Eco-sensitive Zone.

(e) The activities of eco-tourism shall be regulated as under, namely:—

(i) new construction of hotels and resorts shall not be allowed within one kilometre from the boundary of the protected area or upto the extent of the Eco-sensitive Zone whichever is nearer:

Provided that beyond the distance of one kilometre from the boundary of the protected area till the extent of the Eco-sensitive Zone, the establishment of new hotels and resorts shall be allowed only in pre-defined and designated areas for eco-tourism facilities as per Tourism Master Plan;

(ii) all new tourism activities or expansion of existing tourism activities within the Eco-sensitive Zone shall be in accordance with the guidelines issued by the Central Government in the Ministry of Environment, Forest and Climate Change and the eco-tourism guidelines issued by National Tiger Conservation Authority (as amended from time to time) with emphasis on eco-tourism, eco-education and eco-development;

- (iii) until the Zonal Master Plan is approved, development for tourism and expansion of existing tourism activities shall be permitted by the concerned regulatory authorities based on the actual site specific scrutiny and recommendation of the Monitoring Committee and no new hotel, resort or commercial establishment construction shall be permitted within Eco-sensitive Zone area.
- (4) **Natural heritage.**- All sites of valuable natural heritage in the Eco-sensitive Zone, such as the gene pool reserve areas, rock formations, waterfalls, springs, gorges, groves, caves, points, walks, rides, cliffs, etc. shall be identified and a heritage conservation plan shall be drawn up for their preservation and conservation as a part of the Zonal Master Plan.
- (5) **Man-made heritage sites.**- Buildings, structures, artefacts, areas and precincts of historical, architectural, aesthetic, and cultural significance shall be identified in the Eco-sensitive Zone and heritage conservation plan for their conservation shall be prepared as part of the Zonal Master Plan.
- (6) **Noise pollution.** - Prevention and control of noise pollution in the Eco-sensitive Zone shall be complied in accordance with the provisions of the Noise Pollution (Regulation and Control) Rules, 2000 under the Environment Act.
- (7) **Air pollution.**- Prevention and control of air pollution in the Eco-sensitive Zone shall be compiled in accordance with the provisions of the Air (Prevention and Control of Pollution) Act, 1981 (14 of 1981) and the rules made thereunder.
- (8) **Discharge of effluents.**- Discharge of treated effluent in Eco-sensitive Zone shall be in accordance with the provisions of the General Standards for Discharge of Environmental Pollutants covered under the Environment Act and the rules made thereunder or standards stipulated by State Government whichever is more stringent.
- (9) **Solid wastes.**- Disposal and Management of solid wastes shall be as under:-
- (a) the solid waste disposal and management in the Eco-sensitive Zone shall be carried out in accordance with the Solid Waste Management Rules, 2016, published by the Government of India in the Ministry of Environment, Forest and Climate Change *vide* notification number S.O. 1357 (E), dated the 8th April, 2016; the inorganic material may be disposed in an environmental acceptable manner at site identified outside the Eco-sensitive Zone;
 - (b) safe and Environmentally Sound Management (ESM) of Solid wastes in conformity with the existing rules and regulations using identified technologies may be allowed within Eco-sensitive Zone.
- (10) **Bio-Medical Waste.**- Bio Medical Waste Management shall be as under:-
- (a) the Bio-Medical Waste disposal in the Eco-sensitive Zone shall be carried out in accordance with the Bio-Medical Waste Management Rules, 2016 published by the Government of India in the Ministry of Environment, Forest and Climate Change *vide* notification number G.S.R 343 (E), dated the 28th March, 2016.
 - (b) safe and Environmentally Sound Management of Bio-Medical Wastes in conformity with the existing rules and regulations using identified technologies may be allowed within the Eco-sensitive Zone.
- (11) **Plastic waste management.**- The plastic waste management in the Eco-sensitive Zone shall be carried out as per the provisions of the Plastic Waste Management Rules, 2016, published by the Government of India in the Ministry of Environment, Forest and Climate Change *vide* notification number G.S.R. 340(E), dated the 18th March, 2016, as amended from time to time.
- (12) **Construction and demolition waste management.**- The construction and demolition waste management in the Eco-sensitive Zone shall be carried out as per the provisions of the Construction and Demolition Waste Management Rules, 2016 published by the Government of India in the Ministry of Environment, Forest and Climate Change *vide* notification number G.S.R. 317(E), dated the 29th March, 2016, as amended from time to time.
- (13) **E-waste.**- The e - waste management in the Eco-sensitive Zone shall be carried out as per the provisions of the E-Waste Management Rules, 2016, published by the Government of India in the Ministry of Environment, Forest and Climate Change, as amended from time to time.

- (14) **Vehicular traffic.**— The vehicular movement of traffic shall be regulated in a habitat friendly manner and specific provisions in this regard shall be incorporated in the Zonal Master Plan and till such time as the Zonal Master plan is prepared and approved by the Competent Authority in the State Government, the Monitoring Committee shall monitor compliance of vehicular movement under the relevant Acts and the rules and regulations made thereunder.
- (15) **Vehicular pollution.**— Prevention and control of vehicular pollution shall be in compliance with applicable laws and efforts shall be made for use of cleaner fuels.
- (16) **Industrial units.**— (i) On or after the publication of this notification in the Official Gazette, no new polluting industries shall be permitted to be set up within the Eco-sensitive Zone.
- (ii) Only non-polluting industries shall be allowed within Eco-sensitive Zone as per the classification of Industries in the guidelines issued by the Central Pollution Control Board in February, 2016, unless so specified in this notification, and in addition, the non-polluting cottage industries shall be promoted.
- (17) **Protection of hill slopes.**— The protection of hill slopes shall be as under:—
- (a) the Zonal Master Plan shall indicate areas on hill slopes where no construction shall be permitted;
- (b) construction shall not be permitted on existing steep hill slopes or slopes with a high degree of erosion.
4. **List of activities prohibited or to be regulated within Eco-sensitive Zone.**— All activities in the Eco-sensitive Zone shall be governed by the provisions of the Environment Act and the rules made thereunder including the Coastal Regulation Zone, 2011 and the Environmental Impact Assessment Notification, 2006 and other applicable laws including the Forest (Conservation) Act, 1980 (69 of 1980), the Indian Forest Act, 1927 (16 of 1927), the Wildlife (Protection) Act, 1972 (53 of 1972), and amendments made thereto and be regulated in the manner specified in the Table below, namely:—

TABLE

S. No. (1)	Activity (2)	Description (3)
A. Prohibited Activities		
1.	Commercial mining, stone quarrying and crushing units.	(a) All new and existing mining (minor and major minerals), stone quarrying and crushing units are prohibited with immediate effect except for meeting the domestic needs of bona fide local residents including digging of earth for construction or repair of houses and for manufacture of country tiles or bricks for housing and for personal consumption;
		(b) The mining operations shall be carried out in accordance with the order of the Hon'ble Supreme Court dated the 4 th August, 2006 in the matter of T.N. Godavarman Thirumulpad Vs. UOI in W.P.(C) No.202 of 1995 and dated the 21 st April, 2014 in the matter of Goa Foundation Vs. UOI in W.P.(C) No.435 of 2012.
2.	Setting of industries causing pollution (Water, Air, Soil, Noise, etc.).	New industries and expansion of existing polluting industries in the Eco-sensitive Zone shall not be permitted: Provided that non-polluting industries shall be allowed within Eco-sensitive Zone as per classification of Industries in the guidelines issued by the Central Pollution Control Board in February, 2016, unless otherwise specified in this notification and in addition the non-polluting cottage industries shall be promoted.
3.	Establishment of major hydro-electric project.	Prohibited (except as otherwise provided) as per the applicable laws.
4.	Use or production or processing of any hazardous substances.	Prohibited (except as otherwise provided) as per the applicable laws.
5.	Discharge of untreated effluents in natural water bodies or land area.	Prohibited (except as otherwise provided) as per the applicable laws.

6.	Setting up of new saw mills.	New or expansion of existing saw mills shall not be permitted within the Eco-sensitive Zone.
7.	Setting up of brick kilns.	Prohibited (except as otherwise provided) as per the applicable laws.
B. Regulated Activities		
8.	Commercial establishment of hotels and resorts.	No new commercial hotels and resorts shall be permitted within one kilometer of the boundary of the protected area or upto the extent of Eco-sensitive Zone, whichever is nearer, except for small temporary structures for eco-tourism activities: Provided that, beyond one kilometer from the boundary of the protected area or upto the extent of Eco-sensitive Zone whichever is nearer, all new tourist activities or expansion of existing activities shall be in conformity with the Tourism Master Plan and guidelines as applicable.
9.	Construction activities.	(a) New commercial construction of any kind shall not be permitted within one kilometer from the boundary of the protected area or upto extent of the Eco-sensitive Zone, whichever is nearer: Provided that, local people shall be permitted to undertake construction in their land for their use including the activities mentioned in sub-paragraph (1) of paragraph 3 as per building bye-laws to meet the residential needs of the local residents. Provided further that the construction activity related to small scale industries not causing pollution shall be regulated and kept at the minimum, with the prior permission from the competent authority as per applicable rules and regulations, if any. (b) Beyond one kilometer it shall be regulated as per the Zonal Master Plan.
10.	Small scale non polluting industries.	Non polluting industries as per classification of industries issued by the Central Pollution Control Board in February, 2016 and non-hazardous, small-scale and service industry, agriculture, floriculture, horticulture or agro-based industry producing products from indigenous materials from the Eco-sensitive Zone shall be permitted by the competent Authority.
11.	Felling of trees.	(a) There shall be no felling of trees in the forest or Government or revenue or private lands without prior permission of the Competent Authority in the State Government. (b) The felling of trees shall be regulated in accordance with the provisions of the concerned Central or State Act and the rules made thereunder.
12.	Collection of Forest produce or Non-Timber Forest produce.	Regulated as per the applicable laws.
13.	Establishment of large-scale commercial livestock and poultry farms by firms, corporate and companies.	Regulated (except as otherwise provided) as per the applicable laws except for meeting local needs.
14.	Erection of electrical and communication towers and laying of cables and other infrastructures.	Regulated under applicable laws (underground cabling may be promoted).

15.	Infrastructure including civic amenities.	Taking measures of mitigation as per the applicable laws, rules and regulations available guidelines.
16.	Widening and strengthening of existing roads and construction of new roads.	Taking measures of mitigation as per the applicable laws, rules and regulation and available guidelines.
17.	Undertaking other activities related to tourism like flying over the Eco-sensitive Zone area by hot air balloon, helicopter, drones, Microlites, etc.	Regulated as per the applicable laws.
18.	Protection of hill slopes and river banks.	Regulated as per the applicable laws.
19.	Movement of vehicular traffic at night.	Regulated for commercial purpose under applicable laws.
20.	Ongoing agriculture and horticulture practices by local communities along with dairies, dairy farming, aquaculture and fisheries.	Permitted as per the applicable laws for use of locals.
21.	Discharge of treated waste water or effluents in natural water bodies or land area.	The discharge of treated waste water or effluents shall be avoided to enter into the water bodies and efforts shall be made for recycle and reuse of treated waste water. Otherwise the discharge of treated waste water or effluent shall be regulated as per the applicable laws.
22.	Commercial extraction of surface and ground water.	Regulated as per the applicable laws.
23.	Open Well, Bore Well, etc. for agriculture or other usage.	Regulated and the activity should be strictly monitored by the appropriate authority.
24.	Solid waste management.	Regulated as per the applicable laws.
25.	Introduction of exotic species.	Regulated as per the applicable laws.
26.	Eco-tourism.	Regulated as per the applicable laws.
27.	Use of polythene bags.	Regulated as per the applicable laws.
28.	Commercial sign boards and hoardings.	Regulated as per the applicable laws.
29.	Use of Fire Crackers.	Regulated as per the applicable laws.
30.	Charcoal Burning.	Regulated as per the applicable laws.
C. Promoted Activities		
31.	Rain water harvesting.	Shall be actively promoted.
32.	Organic farming.	Shall be actively promoted.
33.	Adoption of green technology for all activities.	Shall be actively promoted.
34.	Cottage industries including village artisans, etc.	Shall be actively promoted.
35.	Use of renewable energy and fuels.	Bio-gas, solar light, etc. shall be actively promoted.
36.	Agro-Forestry.	Shall be actively promoted.
37.	Plantation of Horticulture and Herbals.	Shall be actively promoted.
38.	Use of eco-friendly transport.	Shall be actively promoted.
39.	Skill Development.	Shall be actively promoted.
40.	Restoration of degraded land/ forests/ habitat.	Shall be actively promoted.
41.	Environmental awareness.	Shall be actively promoted.

5. **Monitoring Committee for Monitoring the Eco-sensitive Zone Notification.**- For effective monitoring of the provisions of this notification under sub-section (3) of section 3 of the Environment (Protection) Act, 1986, the Central Government hereby constitutes a Monitoring Committee, comprising of the following, namely:-

SN	Constituent of the Monitoring Committee	Designation
(1.)	The District Collector, Ramanathapuram	Chairman, ex officio;
(2.)	A representative of Non-government Organization working in the field of wildlife conservation to be nominated by State Government	Member;
(3.)	An expert in Biodiversity nominated by the State Government	Member;
(4.)	An expert in Ecology and Environment to be nominated by the State Government	Member;
(5.)	A representative from State Public Works Department	Member;
(6.)	A representative from State Pollution Control Board	Member;
(7.)	Wildlife Warden, Gulf of Mannar Marine National Park, Ramanathapuram	Member-Secretary.

6. **Terms of reference.** - (1) The Monitoring Committee shall monitor the compliance of the provisions of this notification.

- (2) The tenure of the Monitoring committee shall be for three years or till the re-constitution of the new Committee by the State Government and subsequently the Monitoring Committee shall be constituted by the State Government.
- (3) The activities that are covered in the Schedule to the notification of the Government of India in the erstwhile Ministry of Environment and Forests number S.O. 1533 (E), dated the 14th September, 2006, and are falling in the Eco-sensitive Zone, except for the prohibited activities as specified in the Table under paragraph 4 thereof, shall be scrutinised by the Monitoring Committee based on the actual site-specific conditions and referred to the Central Government in the Ministry of Environment, Forest and Climate Change for prior environmental clearances under the provisions of the said notification.
- (4) The activities that are not covered in the Schedule to the notification of the Government of India in the erstwhile Ministry of Environment and Forest number S.O. 1533 (E), dated the 14th September, 2006 and are falling in the Eco-sensitive Zone, except for the prohibited activities as specified in the Table under paragraph 4 thereof, shall be scrutinised by the Monitoring Committee based on the actual site-specific conditions and referred to the concerned regulatory authorities.
- (5) The Member-Secretary of the Monitoring Committee or the concerned Deputy Commissioner(s) shall be competent to file complaints under section 19 of the Environment Act, against any person who contravenes the provisions of this notification.
- (6) The Monitoring Committee may invite representatives or experts from concerned Departments, representatives from industry associations or concerned stakeholders to assist in its deliberations depending on the requirements on issue to issue basis.
- (7) The Monitoring Committee shall submit the annual action taken report of its activities as on the 31st March of every year by the 30th June of that year to the Chief Wildlife Warden in the State as per proforma appended at Annexure-V.
- (8) The Central Government in the Ministry of Environment, Forest and Climate Change may give such directions, as it deems fit, to the Monitoring Committee for effective discharge of its functions.

7. The Central Government and State Government may specify additional measures, if any, for giving effect to provisions of this notification.

8. The provisions of this notification shall be subject to the orders, if any passed or to be passed by the Hon'ble Supreme Court of India or the High Court or the National Green Tribunal.

[F. No. 25/09/2018-ESZ]

Dr. SATISH C. GARKOTI, Scientist 'G'

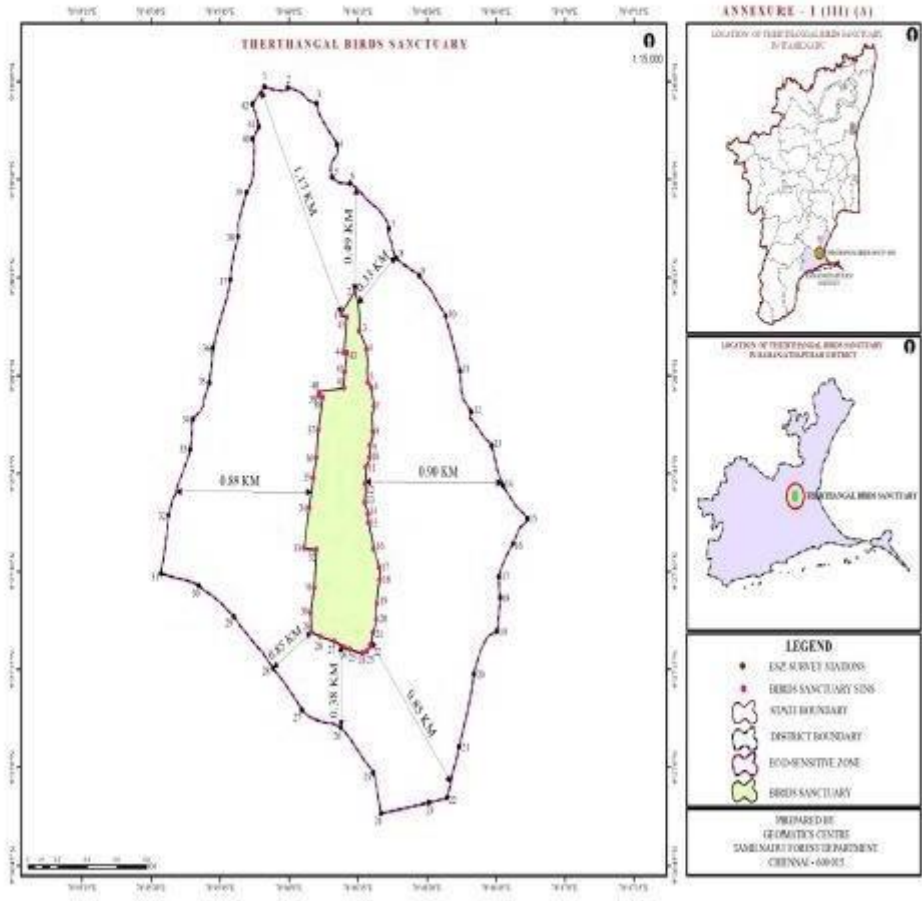
ANNEXURE-I

BOUNDARY DESCRIPTION OF THE ECOSENSITIVE ZONE OF THERTHANGAL BIRD SANCTUARY IN THE STATE OF TAMIL NADU

North	The boundary of the Eco—Sensitive Zone starts at a distance of 0.6 Km from the Sanctuary boundary a point intercepting on the Thiyagavancheri – Kiliyur village Road.
North East	Thence the boundary precedes southeast wards along the Kiliyur – Kulathur village road, in south eastern direction.
East	Thence the boundary starts from the point of bifurcation of Illimuli approach road from Kiliyur – Kulathur village road and proceeds southwards along the Ramnad – Illimuli village approach road till it touches the bund of the Illimuli Kanmoi.
South East	The boundary travels along the bund of Illimuli Kanmoi southwards. Further proceeds southwest direction to touch a point on the southernmost tip on the bund of Illimuli Kanmoi and then to a point on Ramnad - Nainarkovil State Highway.
South	Starts from the point on Ramnad - Nainarkovil State Highway which is 500 m. away from the Therthangal village approach road interception point on Ramnad - Nainarkovil State Highway. Thence the boundary proceeds westwards along the Ramnad – Nainarkovil state highway.
South West	Starts at a point of interception of Kiliyur village approach road on Ramnad – Nainarkovil state highway.
West	Thence the boundary travels northwards along the Kiliyur village approach road and then parallel and along the bund of Thiyagavancheri Kanmoi bund.
North West	The boundary travels along the Kiliyur village approach road until reaches the start point.

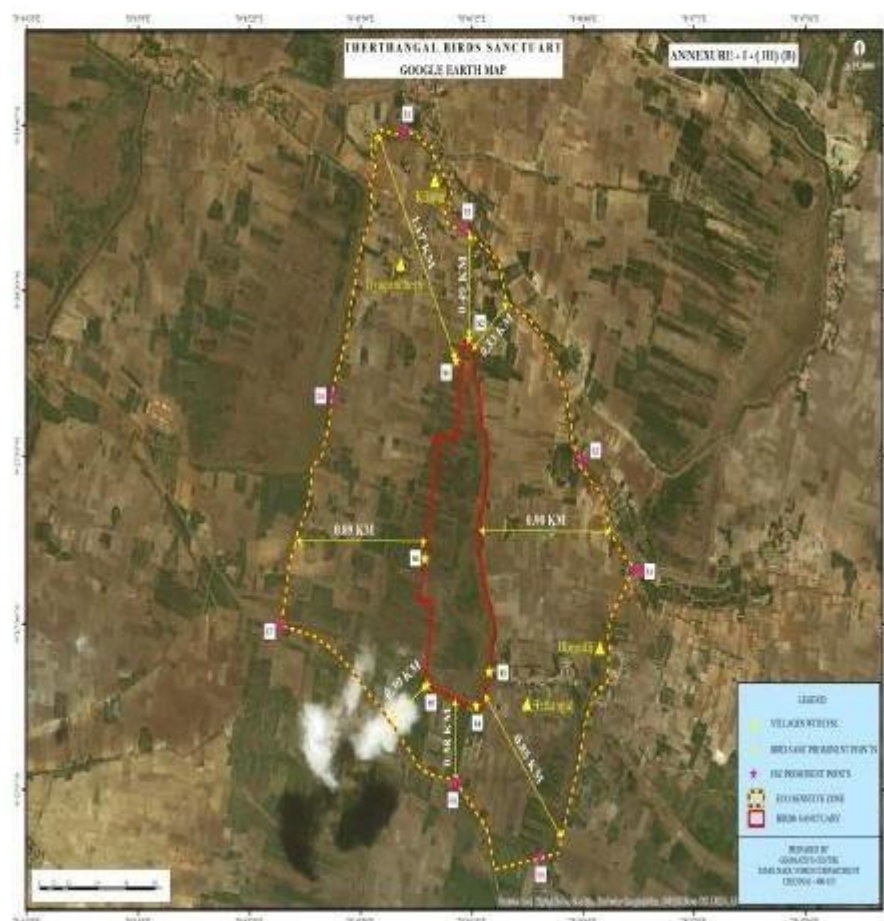
ANNEXURE- IIA

LOCATION MAP OF THERTHANGAL BIRD SANCTUARY AND ITS ECO-SENSITIVE ZONE ALONG WITH LATITUDE AND LONGITUDE OF PROMINENT LOCATIONS



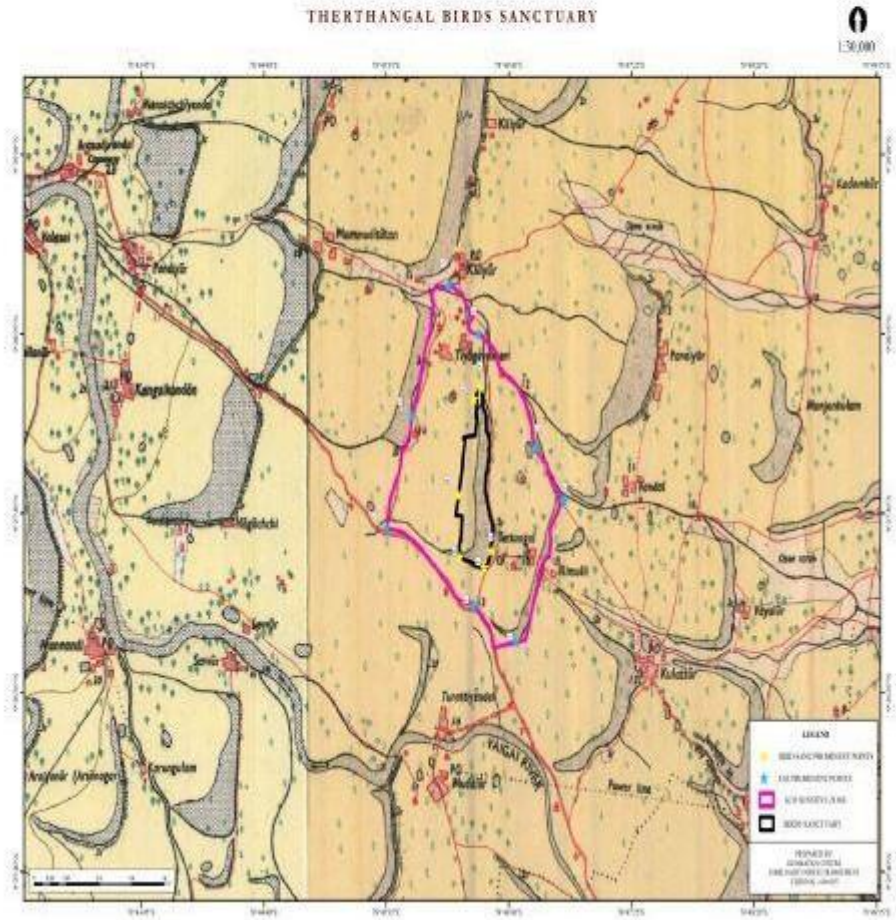
ANNEXURE-IIB

GOOGLE MAP OF ECO-SENSITIVE ZONE OF THERTHANGAL BIRD SANCTUARY ALONG WITH LATITUDE AND LONGITUDE OF PROMINENT LOCATIONS



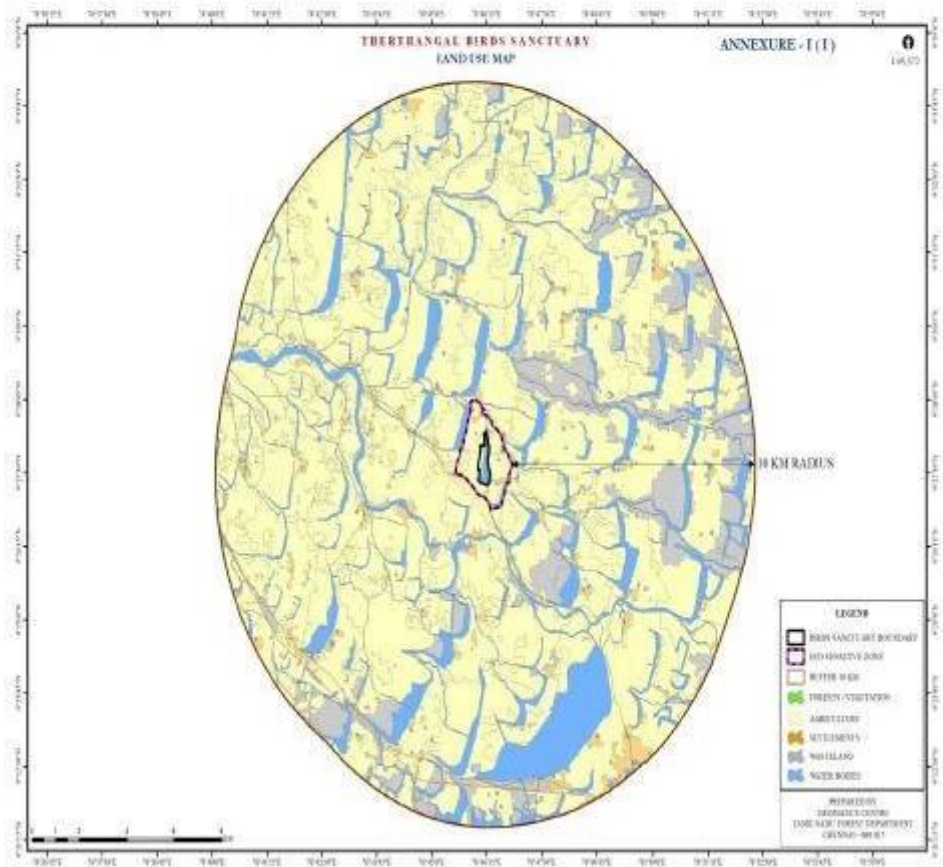
ANNEXURE-II C

MAP OF ECO-SENSITIVE ZONE OF THERTHANGAL BIRD SANCTUARY ALONG WITH LATITUDE AND LONGITUDE OF PROMINENT LOCATIONS ON SURVEY OF INDIA (SOI) TOPOSHEET



ANNEXURE-III

MAP SHOWING LANDUSE PATTERN OF ECO-SENSITIVE ZONE OF THERTHANGAL BIRD SANCTUARY AND 10 KM BUFFER ALONG WITH LATITUDE AND LONGITUDE OF PROMINENT LOCATIONS



ANNEXURE-III

TABLE A: GEO- COORDINATES OF PROMINENT LOCATIONS OF THERTHANGAL BIRD SANCTUARY

S. No.	Identification of prominent points	Location / Direction of Prominent Point	Latitude (N) DMS format	Longitude (E) DMS format
1	1 (S1)	N North Western tip of Therthangal Kanmoi	78°46'11.496"	9°28'9.3792"
2	2 (S2)	N Northern tip of Therthangal Kanmoi along the Therthangal - Tiyyavancheri road	78°46'14.3868"	9°28'12.7668"
3	3	NE	78°46'15.3156"	9°28'6.9276"
4	4	NE	78°46'16.8276"	9°28'4.0908"
5	5	NE	78°46'17.1804"	9°27'59.0148"
6	6	NE	78°46'17.9184"	9°27'58.1976"
7	7	E	78°46'18.4728"	9°27'55.3824"
8	8	E	78°46'18.1992"	9°27'51.498"
9	9	E	78°46'17.58"	9°27'49.3632"
10	10	E	78°46'17.5044"	9°27'47.5704"
11	11	E	78°46'16.7304"	9°27'46.0512"
12	12	E	78°46'16.554"	9°27'43.5024"
13	13	E	78°46'16.4532"	9°27'40.6908"
14	14	E	78°46'17.1228"	9°27'38.9088"
15	15	E	78°46'17.3028"	9°27'37.5084"
16	16	E	78°46'18.408"	9°27'33.5196"
17	17	E	78°46'19.668"	9°27'30.654"
18	18	E	78°46'19.8192"	9°27'28.8504"
19	19	E	78°46'19.1172"	9°27'25.1964"
20	20 (S3)	SE Point on Eastern bund of Therthangal Tank Near the Overhead Water Tank	78°46'18.9876"	9°27'22.7484"
21	21	SE	78°46'18.2748"	9°27'20.6964"
22	22	SE	78°46'17.6196"	9°27'18.7488"
23	23	SE	78°46'16.9428"	9°27'17.8272"
24	24 (S4)	SE South eastern Boundary of Therthangal Kanmoi where the Therthangal approach road takes deviation towards village	78°46'16.0428"	9°27'17.6256"
25	25	S	78°46'13.3932"	9°27'18.126"

38	THE GAZETTE OF INDIA : EXTRAORDINARY			[PART II—SEC. 3(ii)]
26	26	S	78°46'12.0144"	9°27'18.4716"
27	27	S	78°46'9.8688"	9°27'19.3608"
28	28	SW	78°46'6.8772"	9°27'20.1024"
29	29 (S5)	SW South Western tip of Therthangal Kanmoi along the inlet channel	78°46'4.926"	9°27'20.8044"
30	30	SW	78°46'4.8"	9°27'23.7348"
31	31	W	78°46'5.5488"	9°27'27.6084"
32	32	W	78°46'6.0204"	9°27'33.3756"
33	33	W	78°46'3.288"	9°27'33.6204"
34	34 (S6)	W Western margin of Therthangal Kanmoi	78°46'4.4904"	9°27'39.888"
35	35	W	78°46'5.3616"	9°27'44.3736"
36	36	W	78°46'5.9664"	9°27'47.5272"
37	37	W	78°46'6.42"	9°27'51.7068"
38	38	W	78°46'7.3668"	9°27'56.7108"
39	39	W	78°46'6.5676"	9°27'56.9664"
40	40	W	78°46'6.5928"	9°27'57.5028"
41	41	W	78°46'12.0324"	9°27'58.2156"
42	42	W	78°46'12.1944"	9°28'0.5844"
43	43	NW	78°46'12.702"	9°28'3.5544"
44	44	NW	78°46'12.1224"	9°28'3.5724"
45	45	NW	78°46'12.6336"	9°28'9.0192"

TABLE B: GEO-COORDINATES OF PROMINENT LOCATIONS OF ECO-SENSITIVE ZONE

S.No.	Identification of prominent points	Location / Direction of Prominent Point	Longitude	Latitude
1	1	NW	78°45'54.648"	9°28'44.31"
2	2 (E1)	N Tiyagavancheri - Kiliyur Road	78°45'59.8212"	9°28'44.076"
3	3	N	78°46'6.0276"	9°28'41.7216"
4	4	N	78°46'10.4484"	9°28'35.4036"
5	5	N	78°46'9.3972"	9°28'30.3996"
6	6 (E2)	N Kiliyur - Illimuli Road	78°46'13.3788"	9°28'29.4564"
7	7	NE	78°46'21.774"	9°28'22.5408"
8	8	NE	78°46'23.322"	9°28'18.0948"
9	9	NE	78°46'28.416"	9°28'15.3192"
10	10	NE	78°46'34.0968"	9°28'9.2064"
11	11	E	78°46'37.2792"	9°28'0.7356"

[भाग II-खण्ड 3(ii)]

भारत का राजपत्र : असाधारण

39

12	12 (E3)	E Kiliyur - Illimuli Road	78°46'39.6012"	9°27'54.5004"
13	13	E	78°46'44.1552"	9°27'49.3308"
14	14	E	78°46'46.5384"	9°27'43.2468"
15	15 (E4)	E Illimulli - Panaiyur Road	78°46'51.8628"	9°27'38.1708"
16	16	E	78°46'48.7632"	9°27'34.3152"
17	17	E	78°46'45.66"	9°27'29.196"
18	18	E	78°46'45.9444"	9°27'26.0424"
19	19	E	78°46'45.2352"	9°27'20.952"
20	20	SE	78°46'40.2132"	9°27'14.3568"
21	21	SE	78°46'37.0272"	9°27'3.2508"
22	22	SE	78°46'34.3992"	9°26'55.4532"
23	23 (E5)	SE Southern boundary of Illimuli Kanmoi along the bund	78°46'30.4068"	9°26'54.7116"
24	24	SE	78°46'20.0892"	9°26'53.052"
25	25	SE	78°46'18.3144"	9°26'59.2368"
26	26 (E6)	S Intersection point of Therthangal approach road on Ramnad - Nainarkovil road	78°46'11.3304"	9°27'6.1452"
27	27	S	78°46'2.7732"	9°27'8.9028"
28	28	S	78°45'56.5812"	9°27'15.2748"
29	29	S	78°45'47.9952"	9°27'23.1804"
30	30	SW	78°45'40.3668"	9°27'27.918"
31	31 (E7)	SW Intersection point of Tiyyagavancheri approach road on Ramnad - Nainarkovil road	78°45'32.1444"	9°27'29.7612"
32	32	SW	78°45'33.8652"	9°27'38.6244"
33	33	W	78°45'38.502"	9°27'48.6792"
34	34	W	78°45'39.1176"	9°27'53.3988"
35	35	W	78°45'42.7932"	9°27'58.9212"
36	36 (E8)	W Bund of Tiyyagavancheri Kanmoi	78°45'43.5528"	9°28'4.2204"
37	37	W	78°45'47.2284"	9°28'14.7216"
38	38	NW	78°45'48.9816"	9°28'21.3384"
39	39	NW	78°45'50.8572"	9°28'28.1136"
40	40	NW	78°45'52.1928"	9°28'36.2676"
41	41	NW	78°45'53.4744"	9°28'38.0928"
42	42	NW	78°45'52.1028"	9°28'41.5632"

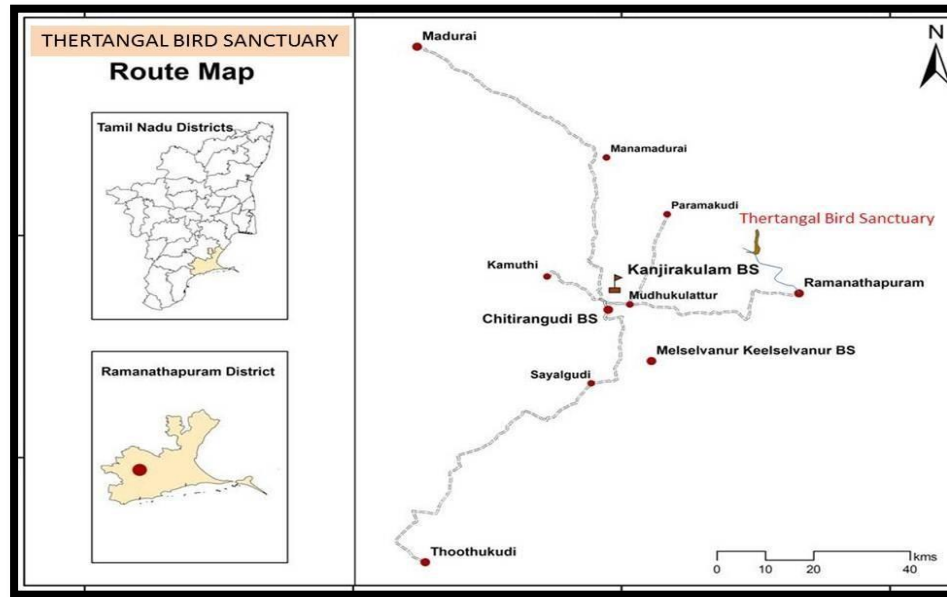
ANNEXURE-IV**LIST OF VILLAGES COMING UNDER ECO-SENSITIVE ZONE OF THERTHANGAL BIRD SANCTUARY
ALONG WITH GEO-COORDINATES**

Sl. No	Village Name	Tehsil/ Taluk	District	Latitude (DMS format)	Longitude (DMS format)
1	Therthangal	Ramanathapuram	Ramanathapuram	9°27'21.02"	78°46'29.74"
2	Tiyagancheri	Ramanathapuram	Ramanathapuram	9°28'24.43"	78°45'57.97"
3	Ilhimulli	Ramanathapuram	Ramanathapuram	9°27'22.37"	78°46'47.25"
4	Killiyur	Ramanathapuram	Ramanathapuram	9°28'38.50"	78°46'7.18"

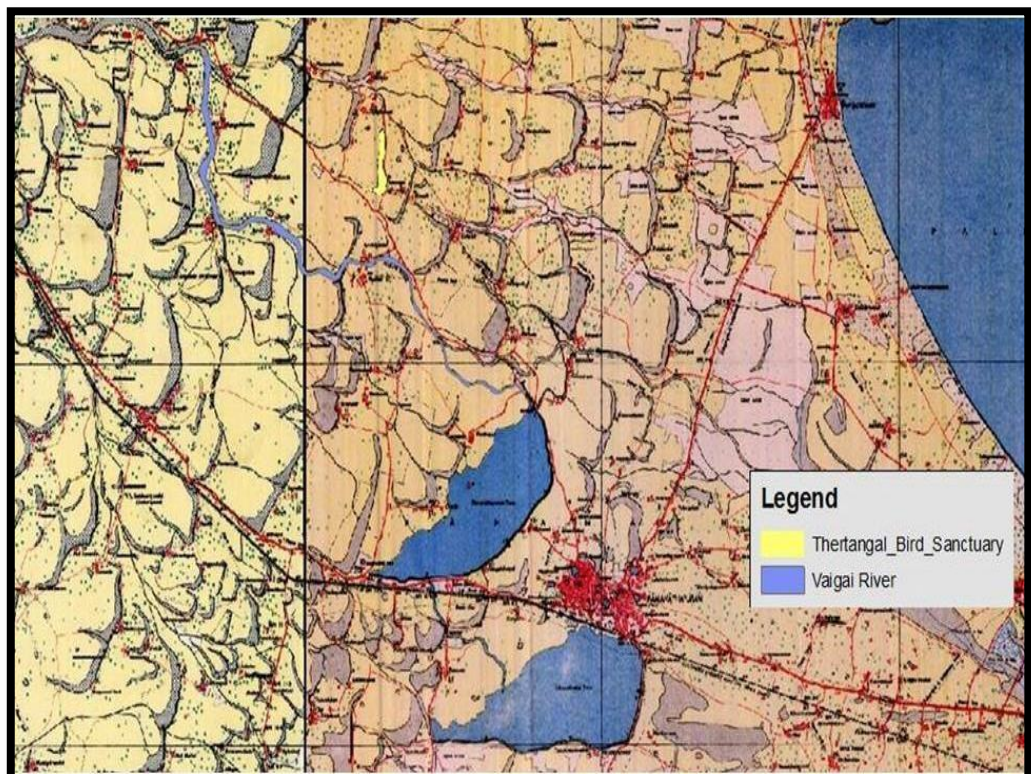
ANNEXURE-V**Performa of Action Taken Report.-**

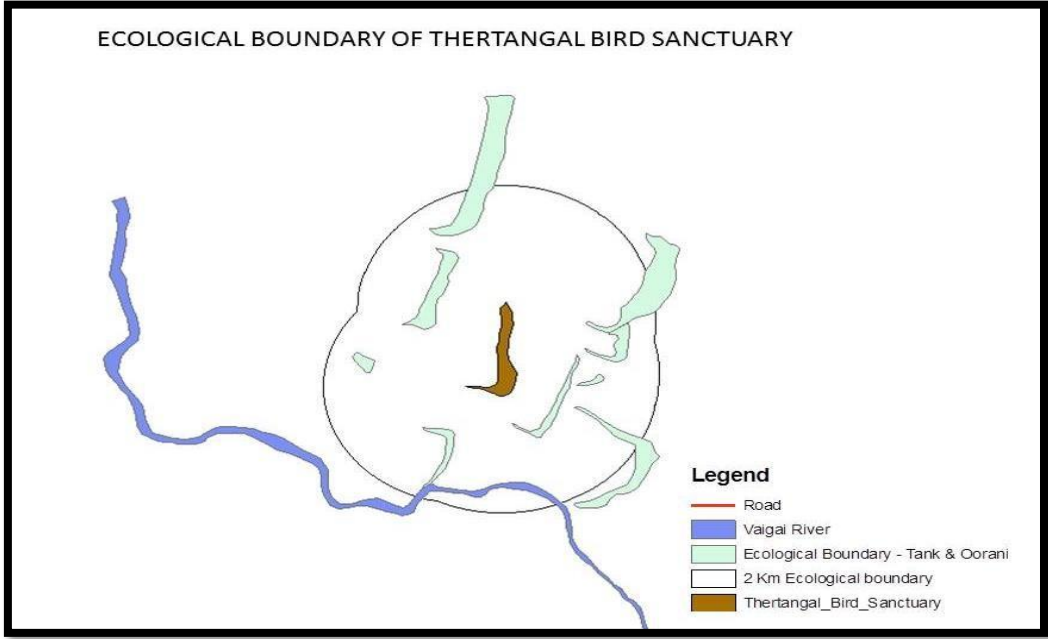
1. Number and date of meetings.
2. Minutes of the meetings: (mention noteworthy points. Attach minutes of the meeting as separate Annexure).
3. Status of preparation of Zonal Master Plan including Tourism Master Plan.
4. Summary of cases dealt with rectification of error apparent on face of land record (Eco-sensitive Zone wise). Details may be attached as Annexure.
5. Summary of cases scrutinised for activities covered under the Environment Impact Assessment Notification, 2006 (Details may be attached as separate Annexure).
6. Summary of cases scrutinised for activities not covered under the Environment Impact Assessment Notification, 2006 (Details may be attached as separate Annexure).
7. Summary of complaints lodged under section 19 of the Environment (Protection) Act, 1986.
8. Any other matter of importance.

MAP No. - 1. LOCATION MAP OF THERTHANGAL BIRD SANCTUARY



**MAP NO. 1(a): LOCATION MAP OF THERTHANGAL BIRD SANCTUARY
SUPERIMPOSED ON THE SURVEY OF INDIA TOPO SHEET OF 1: 50,000 SCALE**





MAP 4: Eco Sensitive Zone of Therthangal Bird Sanctuary

LOCATION MAP OF THERTHANGAL BIRD SANCTUARY AND ITS ECO-SENSITIVE ZONE ALONG WITH LATITUDE AND LONGITUDE OF PROMINENT LOCATIONS

