



TAMIL NADU FOREST DEPARTMENT

MANAGEMENT PLAN

VADUVOOR BIRD SANCTUARY - PERIOD: 2016-17 TO 2020-21



DISTRICT FOREST OFFICER

TIRUVARUR FOREST DIVISION

Management Plan for Vaduvloor Bird Sanctuary, in Tamil Nadu.
Content

Sl. No	PARTICULARS	Page No
	PART - I	01
	CHAPTER - I	
	Introduction to the Area	
1.1	Name,	02
1.2	Location	02
1.3	Constitution	02
1.4	The extent of area	02
1.5	Approach and Access	09
1.6	The Statement of Significance	10
	CHAPTER – II	
	Background Information and Attributes	
2.1	Boundaries	11
2.2	Geology, Rock and Soil	11
2.3	Terrain	11
2.4	Climate	14
2.5	Water Source	14
2.6	Flora	14
2.7	Fauna	19
2.8	Habitat	20
2.9	Bird Diversity	21
2.10	Flagship species	22
	EXAMPLE	
2.10.a	Oriental Darter	22
2.10.b	Median Egret	22
2.11	Symbiotic Relationship	22
2.12	Hydrology	23
2.13	Drainage Pattern	26
2.14	Crucial parameters of the Birds Sanctuary	26
2.15	Dependence	32
	CHAPTER – III	
	History of Management and Present Practices	
3.1	General	36
3.2	Infrastructure facilities available	37
3.3	Holistic Approach to intervention	39
3.4	Live stock grazing	39
3.5	Invasive alien species	39

Sl. No	PARTICULARS	Page No
	EXAMPLE	
3.5.a	Prosopis juliflora	40
3.5.b	Ipomoea cornea	40
3.6	Protection	40
3.6.1	Legal Status	40
3.6.2	Hunting	40
3.6.3	Illegal Activities	40
3.6.4	Insect Pest Attacks and Pathological Problems	41
3.7	Zonation	41
3.7.1	Core Zone	41
3.7.2	Buffer Zone	41
3.7.3	Tourism Zone	42
3.7.4	Status and Issues	42
i)	Core zone	42
ii)	Buffer zone	44
a)	Traditions, Customs and Relationship with the Protected Area	44
b)	Economic Status and Occupations	44
c)	Land use	44
d)	Demographic details of the landscape	55
e)	Infrastructure developments	60
f)	Cultural aspects of wetland use / landscape	60
iii)	Eco- Tourism Zone	60
a)	Existing Facilities	60
b)	Focus : Policies	60
3.8	Research, Monitoring & Training	63
3.8.1	Research	63
3.8.2	Monitoring	63
3.8.3	Human Resources Development - Training	63
3.9	Administrative Setup	64
3.10	Communication	64
	CHAPTER – IV Development Programs and Conservation issues	
4.1	SWOT Analysis	65
4.1.1	Strengths	65
4.1.2	Weaknesses	65
4.1.3	Opportunities	65
4.1.4	Threats	66
4.1.5	Critical review and result of past intervention	66

Sl. No	PARTICULARS	Page No
4.1.6	Challenges and way forward	67
	PART -II CHAPTER -V Vision, Objectives, Issues and Problems	
5.1	Vision	71
5.2	Mission	71
5.3	Objectives of Management	71
5.4	Problems and Issues : Solutions	72
	CHAPTER – VI Future Strategies	
6.1	Strategies	75
6.2	Harmonization	75
6.3	Management of admitted rights	75
6.4	Human disturbances, its effects and management	76
6.5	Strategies for water level manipulation and control	78
	CHAPTER – VII Protection Plan	
7.1	Birds	80
7.2	Habitat	81
7.3	Watershed	84
	CHAPTER – VIII Management intervention	
8.1	Conservation and Restoration of degraded habitat	93
8.2	Management of eutrophication, Water quality, pesticides and other chemical.	98
8.3	Direct intervention	99
8.4	Intervention to improve availability of all forms of food	99
8.5	Management techniques for conservation and protection of Birds and habitat.	99
8.6	Management of water catchments areas and the channels	100
8.7	Management of seasonal flooded areas	101
8.8	Removal of Invasive species	101
8.9	Grazing Management	102
8.10	Strategies for holistic approach to integrated management of the watershed	102
8.11	Eco-development activities	103
8.12	Factors that attracts migratory Birds arrival and its management	105
8.13	Rescue and rehabilitation plan.	110
	CHAPTER – IX	

Sl. No	PARTICULARS	Page No
	Eco-tourism, Eco-development, Interpretation and Conservation Education	
9.1	The Strategies	114
9.2	Eco tourism	114
9.2.1	Principle	114
9.3	Intervention (Proposed)	114
9.3.1	Formation of Eco Development Committee's (EDC's)	117
9.3.2	Eco-Guides	117
9.4	Linkage	118
9.5	Participatory management	118
9.6	Publicity, Eco awareness and Nature Camps	118
9.7	Interpretation Centre	122
9.8	Learning Gardens	122
9.9	Environmental Education	122
9.10	Nature Trails / Walk through	123
	CHAPTER - X Research, Monitoring and Evaluation	
10.1	Research	124
10.2	Prioritization of Research - Long, short and Medium term	124
10.2.1	Integration of wetlands within the landscape matrix	125
10.2.2	Regional and national monitoring of populations	125
10.2.3	Fragmentation effects	125
10.2.4	Human Resource Development	125
10.2.5	Water level control	128
10.2.6	Control of pesticide use	129
10.2.7	Regulation of human disturbance	130
10.2.8	Public awareness concerning wetlands	130
10.2.9	Ecological assistance	130
10.3	Valuation of ecosystem services	130
10.4	Monitoring and Evaluation	131
	CHAPTER - XI Miscellaneous Regulations	
11.1	Disease management	132
11.2	Strategies	133
11.3	Intervention	134
	CHAPTER - XII ORGANIZATION, ADMINISTRATION AND HUMAN RESOURCES DEVELOPMENT	
12.1	Structure and responsibilities	136
12.2	Staff amenities	136

Sl. No	PARTICULARS	Page No
12.3	Human Resources Development	136
12.3.1	Training calendar for the year	136
	CHAPTER - XIII	
	Eco Sensitive Zone	
13	Eco Sensitive Zone	137
	CHAPTER - XIV	
	BUDGET	
14.1	Financial Forecasting	141
14.2	Summary of prescriptions	147
	EXAMPLE	
14.2.1	Desilting and Cleaning of the channels -	147
14.2.2	Uprootal/removal of invasive species	147
14.2.3	Conducting periodical bird census	148
14.2.4	Eco awareness camps	148
14.2.5	Eco Development Works	149
14.2.6	Eco Tourism	149
14.3	Non - Recurring expenditure	151
14.4	Recurring expenditure	154
14.5	Revenue Realized during previous years	155
14.6	Revenue expected (Indicative)	155
14.7	Fund Flow	155
14.8	Annexure	156-184

PART - I

CHAPTER - I

Introduction to the Area

Management of species conservation with sustained economic benefits to local communities plays a major role in protecting wildlife refuges, especially those that are closer to human dominated landscapes. The lack of integrating the ecological, economic and social dimensions of local people hinders the formulation of strategies and action plan for sustainable management of Protected Areas (National Park, Sanctuary, and Bird Habitats & PAs) in India. The proposed management plan is aimed to evaluate the hydrological, ecological and socio economic dimensions of the Vaduvor Bird Sanctuary (VBS) for conservation of bird habitats, especially for its wintering bird species that attract both national and international tourists.

The Vaduvor Bird Habitats has connectivity with the Point Calimere Wildlife and Bird Sanctuary (located 100 km) in aerial habitats during the wintering phase. This has led to strengthen the protection and eco restoration schemes for the Vaduvor with people's participation and awareness programmes in the landscape. Such an approach would benefit the Vaduvor Lake with the indigenous knowledge and traditional practices of local communities. This would address the sustainable management practices of bird habitats with people's participatory approach such as Joint Forest Management initiatives (eco-development/eco-tourism). The efforts of habitat restoration could both directly and indirectly help the sanctuary and provide attraction for tourists as well. The sustainable eco-tourism with the participation of local communities would preserve the Vaduvor Bird Habitats and its integrity along with its complex habitat matrix.

The management plan seeks to achieve a balance between conservation of the bird sanctuary and economic incentives to the stakeholders through sustainable resource improvement. It also identifies and involves various institutional

mechanisms that harmonize planning at various levels with participation of all stakeholders to achieve the objectives of integrated habitat restoration for conservation of Vaduvloor Bird Habitats. The proposed management plan has been defined to achieve the habitat restoration with an integrated action plan, with special emphasis on economic development of the stakeholders through alternate resource development. Cost-benefit analysis of action plan will be also undertaken to assess the feasibility of various interventions and sustainability of the project.

1.1. Name

Vaduvloor Bird Sanctuary (the tank is also called as Sri Kodandaramaswamieri) is located in Vaduvloor Ahragaram village of Mannargudi Taluk of Tiruvarur district. The sanctuary covers an area of 128.10 ha and was created in 1999. The tank water is extensively utilizing by the villagers for agriculture.

1.2 Location

Vaduvloor bird sanctuary is located between 10°42'9.39"N latitude and 79°19'4.94"E longitude and covers an area of over 128.10 ha (1.28 sq.km) in Mannargudi Taluk of Tiruvarur District in Tamil Nadu. It supports a large number of migratory and resident birds. The bird habitat was transferred from the Wildlife Warden, Nagapattinam as per the Principal Chief Conservator of Forests, Chennai vide the Principal Chief Conservator of Forests, Chennai reference TS1/7339/2012 dated: 29.05.12.

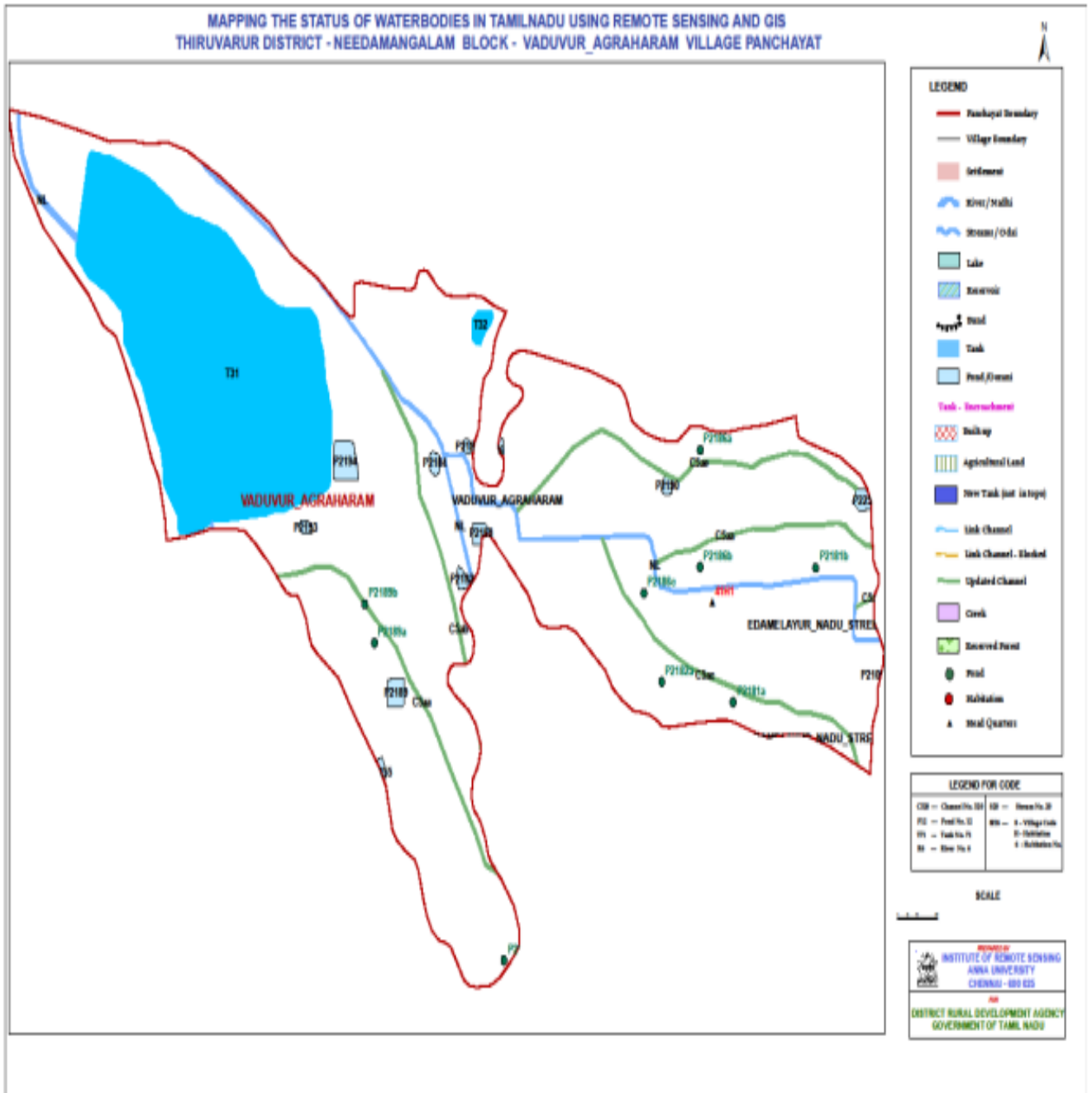
1.3 Constitution

The 128.10 Ha of Vaduvloor Bird Sanctuary was created under Section 26A of Indian Wildlife Protection Act 1972 as per G.O.Ms.No. 169, Environment & Forests Department, dated 22.7.99.

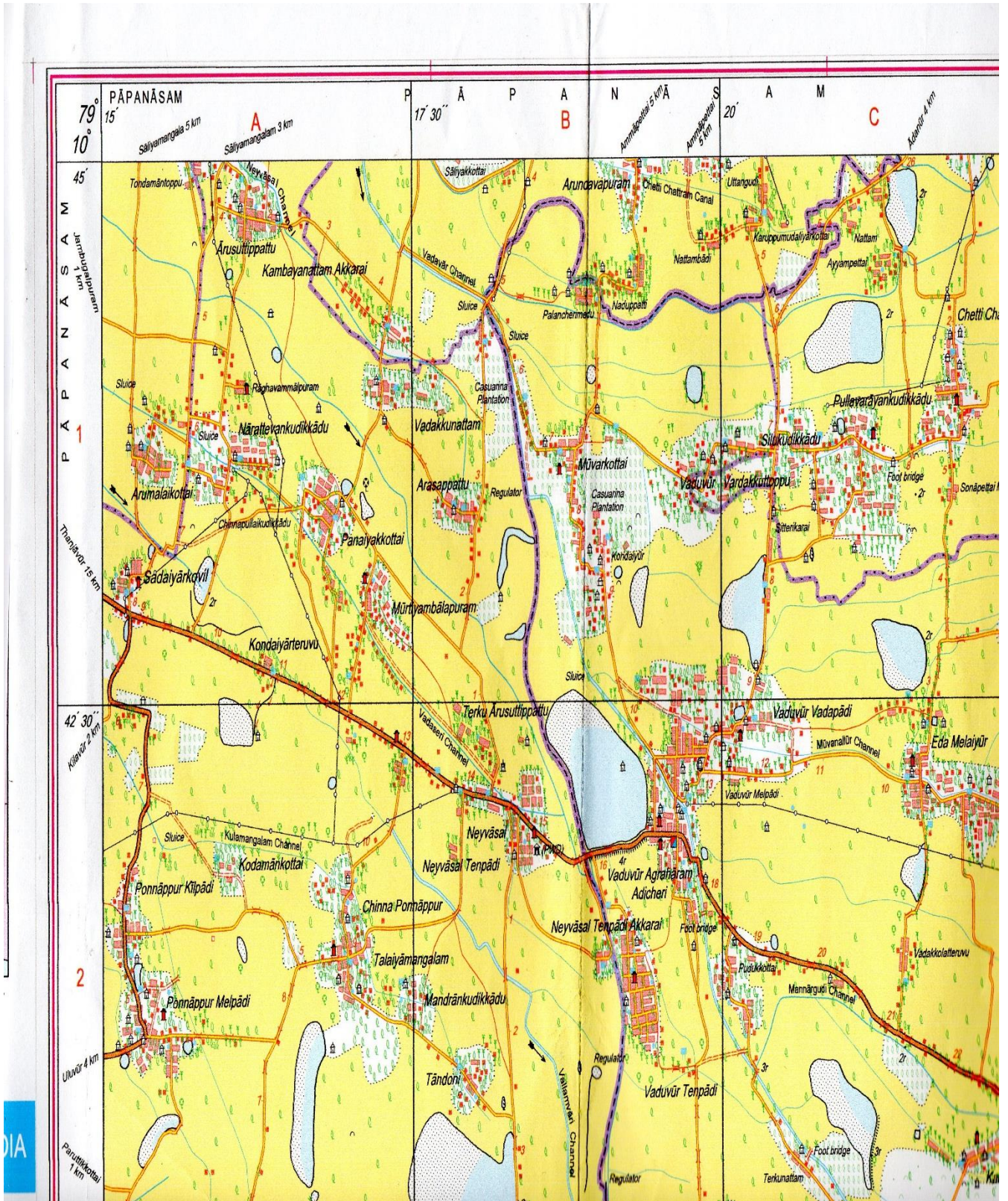
1.4 The Extent of Area

The total area of the Vaduvloor Bird Sanctuary is 128.10 Ha

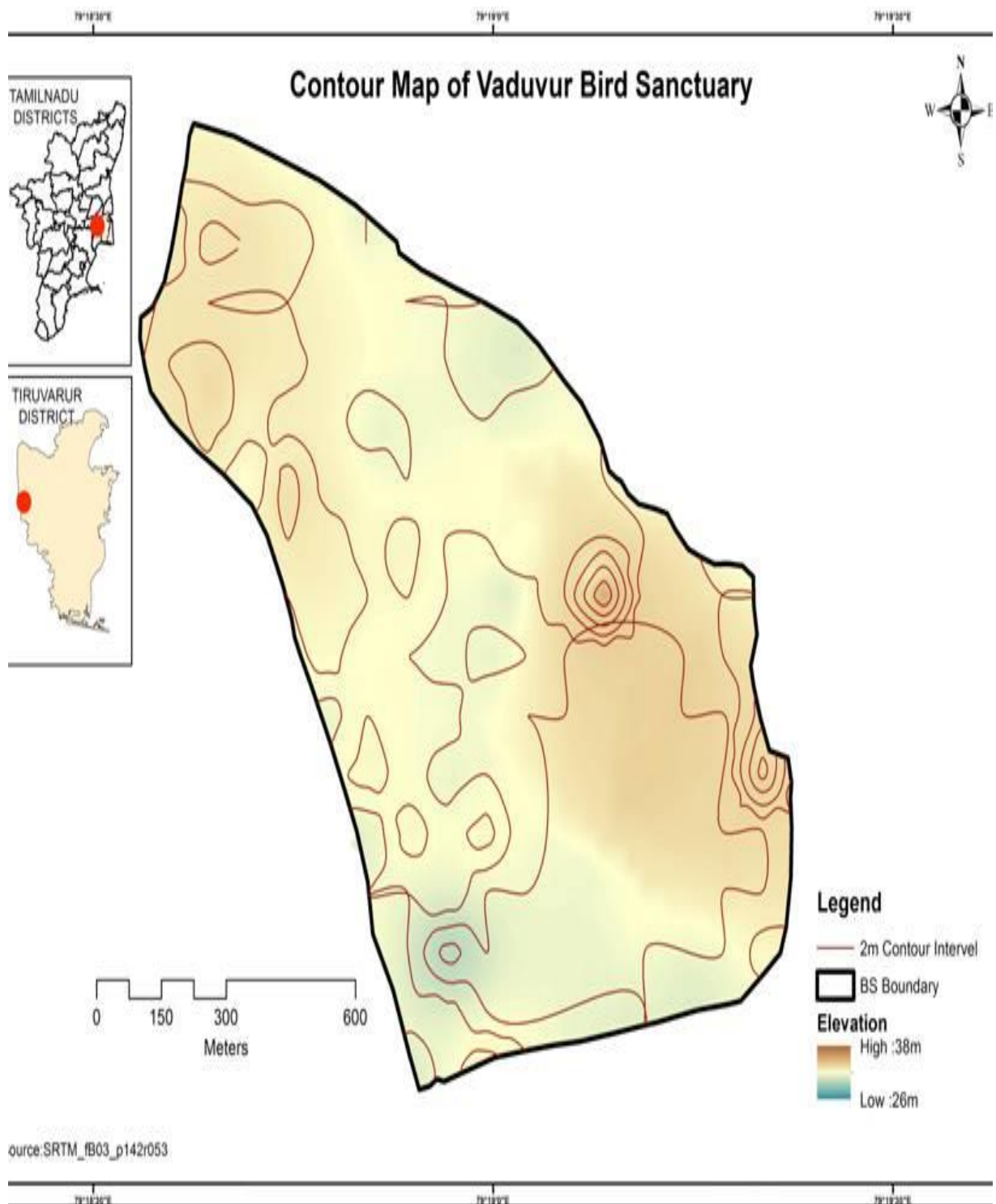
MAPC LOCATION OF VADUVOOR BIRD SANCTUARY



Location of Vaduvor Birds Sanctuary in SI Sheet Map



Contour Map of Vaduvor Birds Sanctuary



Source: Care Earth / TBGP/Wetland Action Plan 2013-18

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ஆம் பசலியில்


சிவகாசி

மாவட்டம்

கிணார்தி

கிராமக் கணக்கு

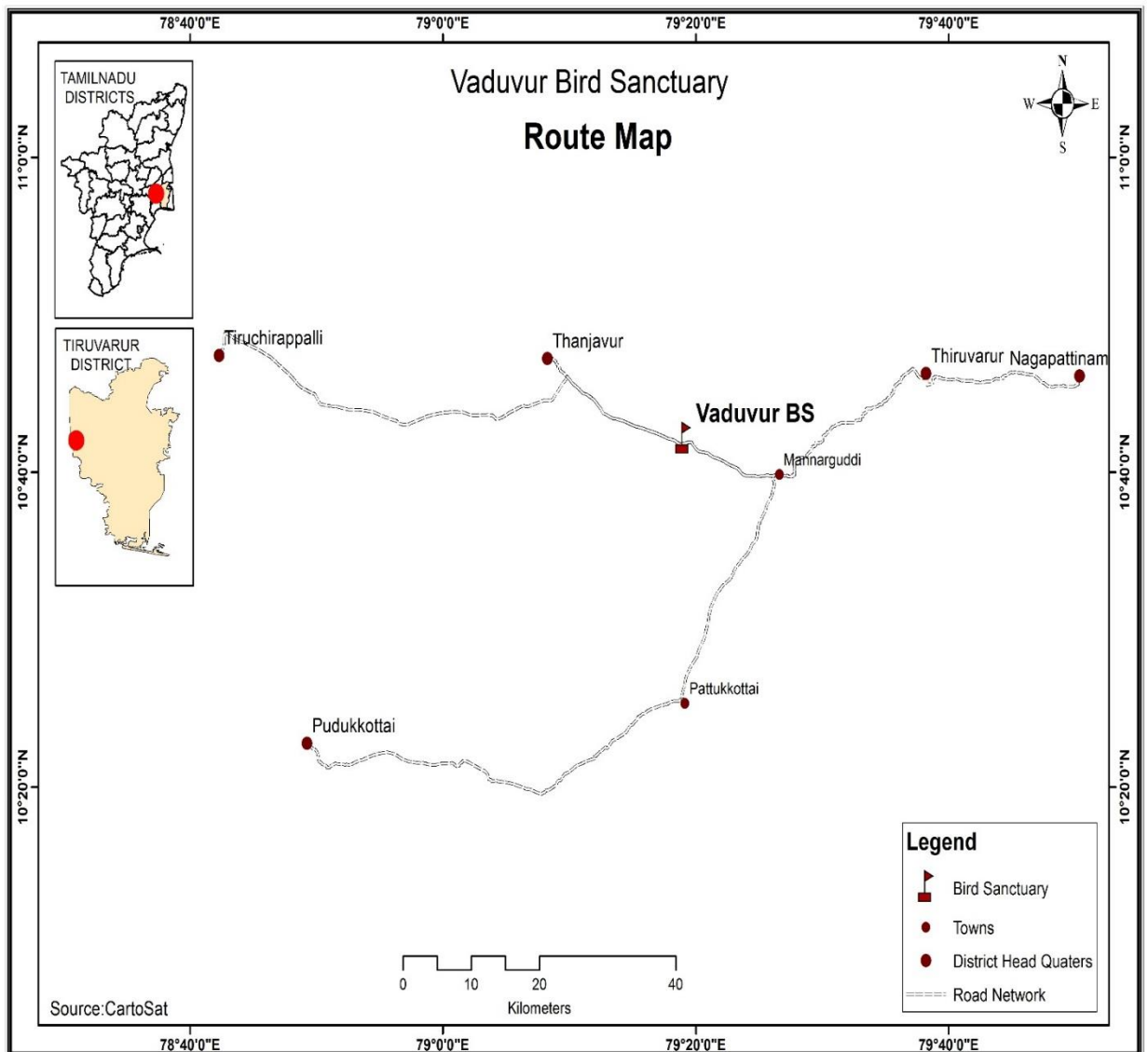
வட்டம் 4. ஓடுவன் சிவகாசி.

நில வரித் திட்டத்தின்படி புலன்களின் விபரம்.					கைப்பற்று தாரருடைய பெயரும் எண்ணும் அல்லது அனுபோக தாரருடைய பெயர்.	சாகுபடி யாளரின் பெயர்.	முதல் போகம்.					
(1) நில அளவை எண்.	(2) உட்பிரிவு எண்.	(3) பரப்பு.	(4) தீர்வை.	(5) ஒரு போகம் அல்லது இரு போகம்.			(6)	(7) நிலத்தின் எந்த பகுதி யாவது சாகுபடியாளரால் பயிரிடப்பட்டுள்ளதா.	(8) எந்த மாதத்தில் பயிர் செய்யப்பட்டது எந்த மாதத்தில் அறுவடை செய்யப்பட்டது.	(9) பயிரின் பெயர்.	(10) பயிரான அறுவடையான பரப்பு.	(11) உண்மையான பாய்ச்சல் ஆதாரம்.
351	1A	28.10.0	-	-	-	-	-	-	சோலை	11.2.15	11.2.15	-
/ சண்முகம் /						 <p>கிராம நிருவாக அலுவலர் வடுவர் அகரவாரம் மன்னார்குடி வட்டம் திருவாரூர் மாவட்டம்.</p>						

1.5 Approach and Access

The sanctuary can be approached from Thanjavur (25 Km), from Thiruvarur (50 Km) via Mannargudi, from Trichy 85 Km via Thanjavur (Nearest Airport), from Kumbakonam 55 Kms and from Velankanni 100 Kms. It is also accessible from Chennai by train to Mannarugudi or Thanjavur junctions.

Route map of Vaduvor bird sanctuary



Source: Care Earth / TBGP/Wetland Action Plan 2013-18

1.6 The Statement of Significance

The sanctuary is an important foraging ground for over 50 species of migratory birds. The birds visit the sanctuary from June to February every year before getting back to their breeding places. Teals and ducks are the most common species in the sanctuary during the wintering period. Painted Storks and Openbill are the other attractive species during the latter part of the season. The major water source for the lake is from the Mettur Dam and Northeast monsoons. The tank is visited by birds for foraging, breeding and roosting activities. The *Acacia nilotica* plantations raised by the department on the earthen bund attracts large numbers of heronry birds to nest and roost. The major large sized species which breed at Vaduvloor are Openbill stork *Anastomus oscitans*, Oriental White Ibis *Threskiornis melanocephalus* and Grey Heron *Ardea cinerea*. The other long distance migratory ducks namely Northern Pintail *Anas acuta*, Northern Shoveller *Anas clypeata* and Eurasian Wigeon *Anas penelope* arrive from mid-October. The other species which nests exclusively on the upper canopy is the near-threatened Oriental Darter *Anhinga melanogaster*. The species that nest on the lower and inner canopy are the Black-crowned Night Heron *Nycticorax nycticorax*, Little Cormorant *Phalacrocorax niger*, Indian Pond Heron *Ardeola striatus*, Little Egret *Egretta garzetta* Cattle Egret *Bubulcus ibis* and Median Egret *Mesophoyx intermedia*. Three species of ducks such as Lesser Whistling Duck *Dendrocygna javanica* Comb Duck *Sarkidiornis mealanotos* and Spotbilled Duck *Anas poecilorhyncha* are recorded here. Teals frequently visit the adjoining paddy fields for food during night hours and stay in the sanctuary during the day time. The visit of a large number of breeding birds, both heronry and other water birds, indicates the availability of food resources of Vaduvloor Lake and adjoining wetlands and paddy field. Six species of aquatic insects and eight species of fish are recorded from the tank. Water Hyacinth and *Ipomoea carnea* are the two invasive weeds replacing the native macrophytes, the major attractants to the migratory and resident ducks. The rapid expansion of these species might affect the biodiversity of the lake including bird communities and other fauna. Suitable nesting sites are also available to birds (a) Marshes: Floating nests are built in floating vegetation, b) Reed beds and tall grasses, c) Trees and Bushes, d) on the ground around streams) in the sanctuary.

CHAPTER - II

Background Information and Attributes

2.1 Boundaries

- North:** The Boundary starts from No. 3 Vaduvur Melpathi village Boundary
- West:** Then the boundary runs just adjacent to Vaduvur Agraharam Village in R.S. 351/1B1, 351/1B2B and Village boundary of 34 Neyvasal Village, Orathanad Taluk of Thanjavur District.
- East:** Then the Boundary runs just adjacent to No.4 Vaduvur Agraharam Village in R.S.No.327 to 329, 231, 332 and 351/2, 351/3
- South:** Then the boundary ends in No.4 Vaduvur Agraharam Village in R.S.No.352, 354, 355, 367, 368-A and 351/A2 and takes of Thanjavur- Mannargudi Road and Village boundary of No.5

2.2 Geology, Rock and Soil:

The soil in the tank is of two types, viz, black cotton soil and sandy alluvium. Fresh alluvium soil is being deposited every year by irrigation water received from Mettur dam. Rocks are absent in the soil. Humus content of soil is low but calcium content is high possibly due to accumulation of bird droppings and skeletal remains of aquatic life forms.

2.3 Terrain

The sanctuary terrain is flat with a gentle slope from north to south. Bulk of the impounded water collects in the southern part of the sanctuary where it is deepest. The sanctuary is however losing its original depth due to years of siltation. No de-silting operation had been carried out since declaration of sanctuary (ie. from 1999)

Vaduvoor Bird Sanctuary-Landscape



Vaduvoor Bird Sanctuary - Landscape



Unique habitats for Migratory Birds

2.4 Climate

This area receives rainfall mainly from the north-east monsoons from September to December. The remaining months are generally dry except for some occasional showers from cyclonic depressions. The average annual rainfall of this area is around 1200 mm. The average number of rainy days in a year is around 52. The rainy months are generally pleasant. Temperature starts rising from March onwards and May and June are generally the hottest months.

2.5 Water Sources

There is no perennial water source in the sanctuary. The sanctuary is an irrigation tank used for storing water for agriculture. It receives water from Mettur dam from August till January. The sanctuary starts getting dry from February onwards and remains completely dry from April till arrival of fresh water.

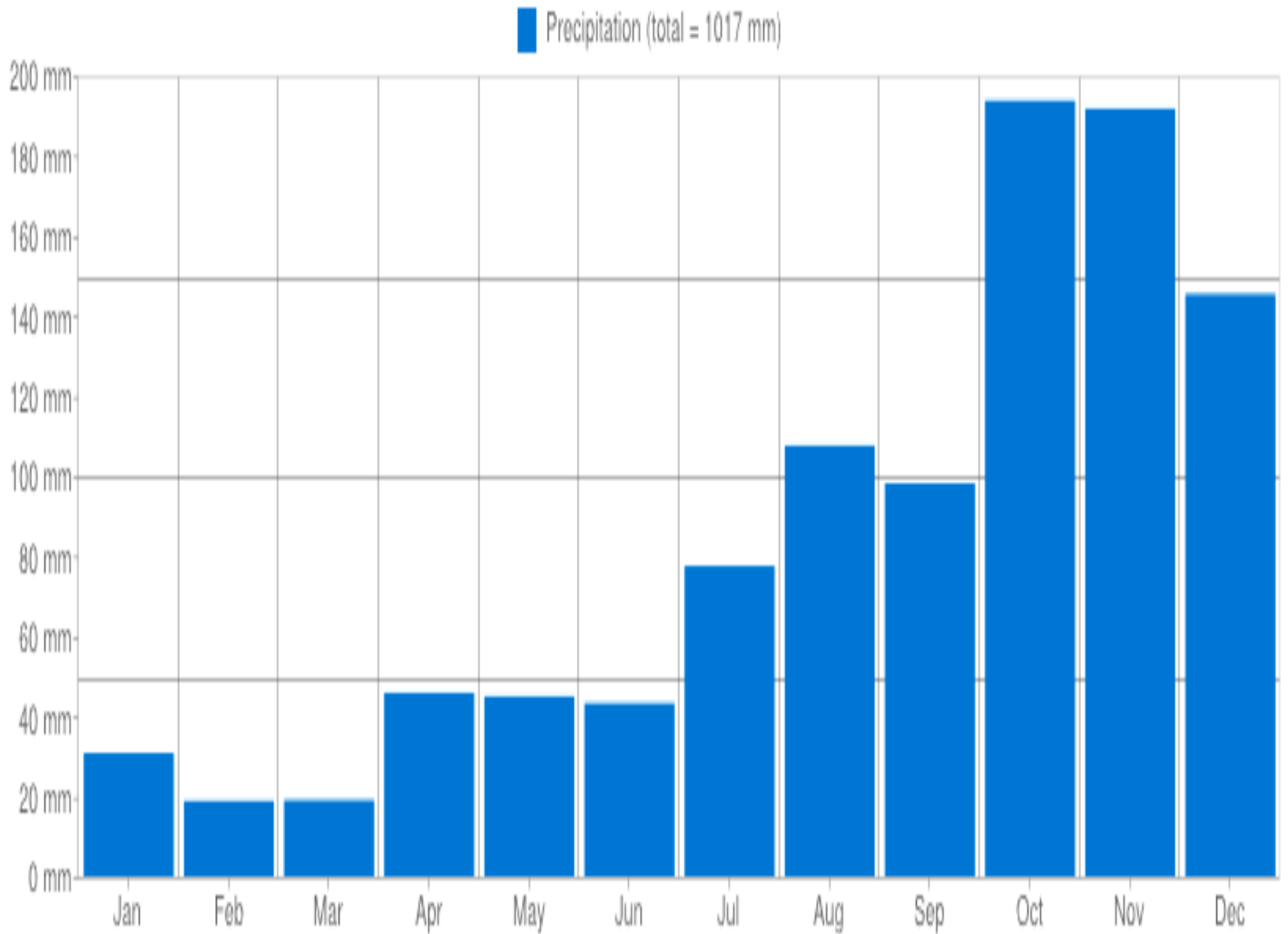
2.6 Flora

As the sanctuary is basically an irrigation tank, there is no forest vegetation within the sanctuary. *Acacia nilotica* plantations raised by Social Forestry Wing stand on the western boundary of the sanctuary. Other species present in the sanctuary include *Azadiracta indica*, *Melia azadirach*, *Pongamia pinnata*, Coconut, Palmyrah, etc. A variety of medicinal plants, mostly in the form of shrubs and climbers, come up annually on the sanctuary bunds. A large portion of the tank on the northern side, close to the steel watch tower, has been encroached by Water hyacinth and ipomoea.

The natural vegetation of the lake comprises emergent, floating and submerged plant species distributed almost throughout the lake and form associations of different species. Their distribution is essentially related to water regimes. The exotic species like *Eichhornia crassipes*, *Salvinia auriculata*, *Pistia stratiotes*, *Lemna minor*, *Wolffia sps.* and *Azolla pinnata* often form thick mats in different pockets of the lake. These species have reached nuisance proportions in some areas.

Annual Precipitation in Vaduvvoor Birds Sanctuary

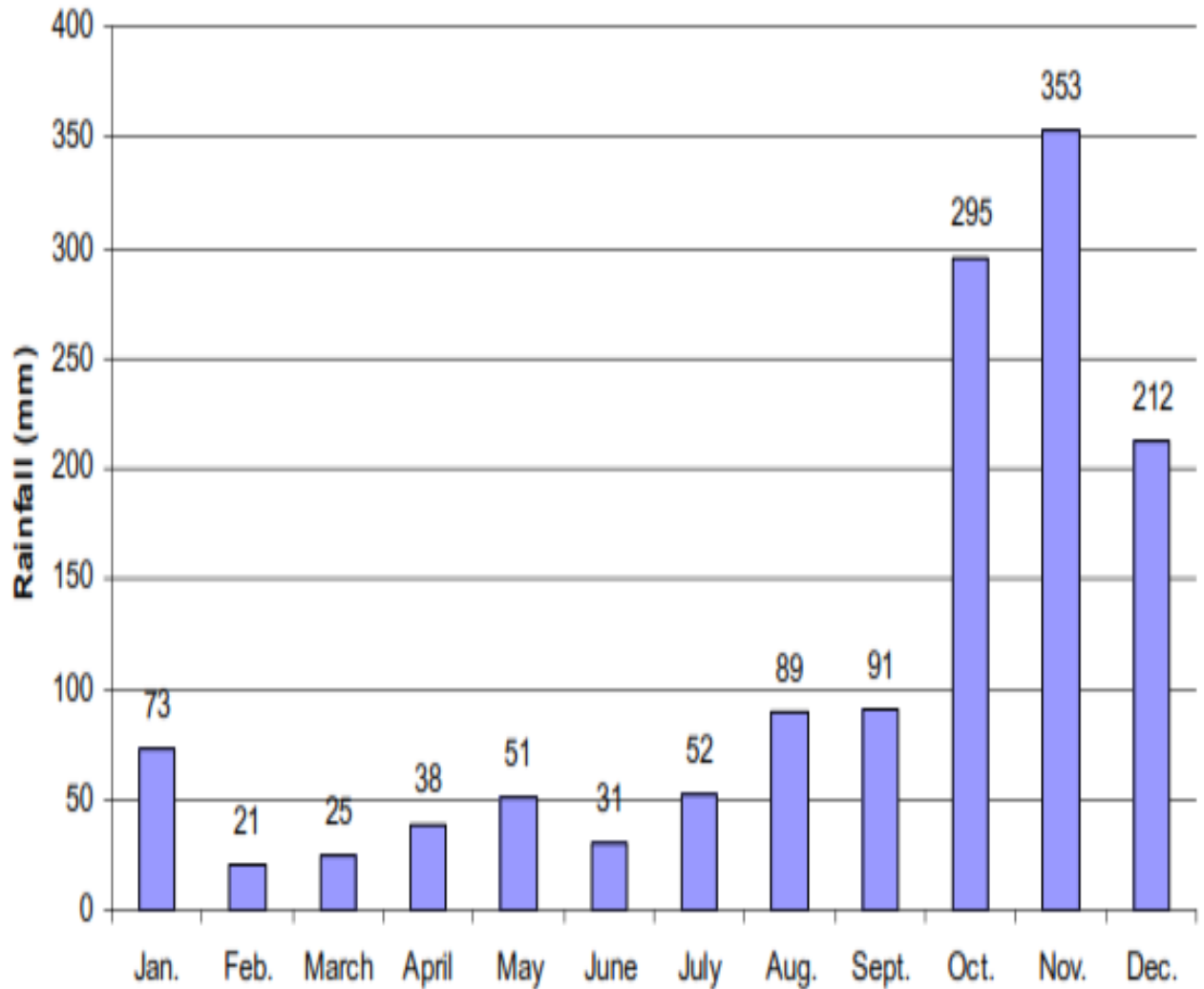
Vaduvvoor



Source: Care Earth / TBGP/Wetland Action Plan 2013-18

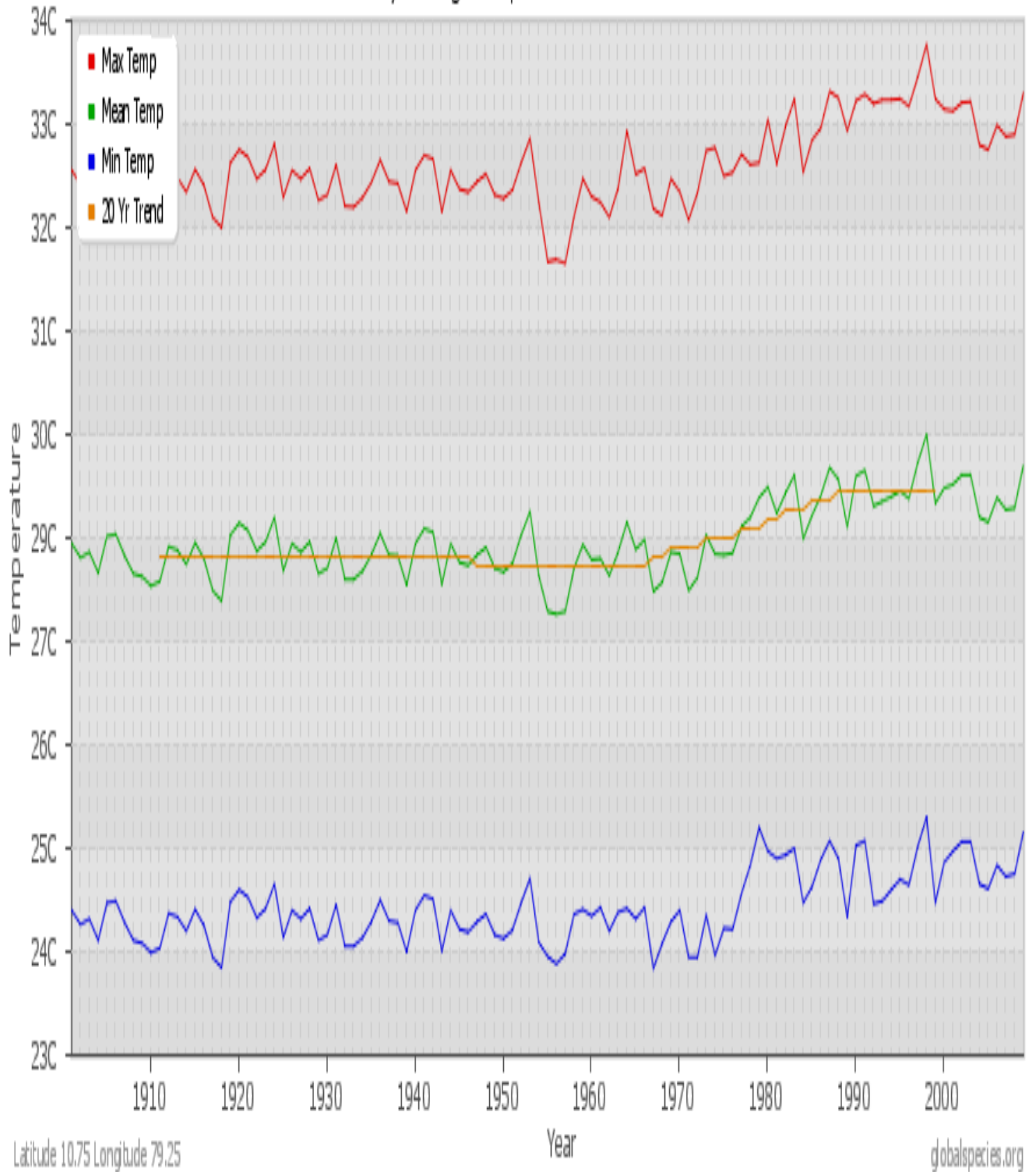
Annual rainfall details of Thiruvavarur District of Tamil Nadu

Annexure 2. Mean annual rainfall of Thiruvarur district of Tamil Nadu



Source: Care Earth / TBGP/Wetland Action Plan 2013-18

Yearly Average Temperatures 1901 - 2009



Source: Care Earth / TBGP/Wetland Action Plan 2013-18

Major inlet canal of the sanctuary - Vadavar - Kannanar canal



The rooted floating-leaf types commonly found in the Birds sanctuary area are: *Nymphaea stellata*, *Nelumbium speciosum*, *Nymphoides indicum*, *Ipomoea aquatica*, *Neptunia oleracia*, *Ludwigia adscendens*, *Pseudoraphis spinosus* and *Echinochloa colonum*. Overall it has been reported that among the aquatic communities, submerged and the free floating macrophytes are less productive compared to other plant communities in spite of their prolific growth and spread in the aquatic systems, as they contain very little dry matter. Management of vegetation is carried out with an objective of exotic species control and maintenance of vegetation areas for water quality maintenance. The Lake had an excessive growth of invasive species often forming dense mats, the most common being *Ipomoea aquatica*, *Eichhornia crassipes*, *Salviniauriculata*, *Ottelia alismoides*, etc. Prolific growth of vegetation in the lake is primarily attributed to high concentrations of inorganic nutrients present in the lake waters, entering the lake in the form of agricultural run-off through various deltaic drains and channels. Several attempts made to eradicate the weeds by mechanical means, have been successful due to the small size of the sanctuary. Uses of chemical methods for control of weeds are not recommended in light of their harmful impacts. Management of vegetation by control of invasive exotic species therefore needs to be attempted adopting integrated approaches.

2.7 Fauna

The sanctuary is visited by large number resident and migratory water birds. The migratory birds start arriving in the sanctuary from September coinciding with the onset of northeast monsoon. Earlier not too many birds used to visit the sanctuary. But after establishment of the *Acacia nilotica* plantations on the western bank, the sanctuary started attracting a large number of water birds. With the formation of earthen mounds and planting of shade and roosting species, the sanctuary has become a regular visiting place for water birds. The sanctuary water abounds with a variety of fishes and other aquatic organisms that comprise the main diet for the water birds. So far, 44 species of water birds have been recorded in the sanctuary.

Aquatic and terrestrial insects and their larvae, small to large sized fish, amphibian, molluscs and slugs, crustacean, worms and even rodents are the other fauna in the lake. An assessment of the abundance and availability of the different prey species throughout the year at the bird sanctuary and associated wetlands is required to manage bird habitats in a scientific manner.

2.8 Habitat

The Vaduvloor Bird Sanctuary is basically an irrigation tank, there is no forest vegetation within the sanctuary. *Acacia nilotica* plantations raised by Social Forestry Wing stand on the western boundary of the sanctuary. Other species present in the sanctuary include *Azadiracta indica*, *Melia azadirach*, *Pongamia pinnata*, Coconut, Palmyrah, etc. A variety of medicinal plants, mostly in the form of shrubs and climbers, come up annually on the sanctuary bunds. The natural vegetation of the lake comprises emergent, floating and submerged plant species distributed almost throughout the lake and form associations of different species. Their distribution is essentially related to water regimes.

The natural vegetation of the lake comprises emergent, floating and submerged plant species distributed almost throughout the lake. Their distribution is essentially related to water level. *Eichhornia crassipes*, *Salvinia auriculata*, *Pistia stratiotes*, *Lemna minor*, *Wolffia sps.* and *Azolla pinnata* are the common weed species and form thick mats in different pockets of the lake. The invasion of such species has altered the eco system in many areas. The rooted floating-leaf types commonly found in the bird area are: *Nymphaea stellata*, *Nelumbium speciosum*, *Nymphoides indicum*, *Ipomoea aquatica*, *Neptunia oleracia*, *Ludwigia adscendens*, *Pseudoraphis spinosus* and *Echinochloa colonum*. Prolific growth of vegetation in the lake is primarily attributed to high concentrations of inorganic nutrients present in the lake waters, entering the lake in the form of agricultural run-off through various deltaic drains and channels.

2.9 Bird Diversity

One hundred and twenty nine species (including land birds) are recorded at Vaduvor Bird Sanctuary. Arrival of migratory species starts from early October at Vaduvor. More than 20000 birds were recorded in the peak wintering period. The abundance of Median Egrets at Vaduvor indicates that it is one of the largest congregation sites in India for the Median Egret. The long distant migrant ducks such as Northern Pintail *Anas acuta*, Northern Shoveller *Anas clypeata*, Garganey *Anas querquedula*, Common Teal *Anas crecca* and Eurasian Wigeon *Anas Penelope* arrive between October and November. A total of nine long distance migratory wader species are also recorded in winter in small numbers (less than 50). Of the 50 water bird species recorded four are Near Threatened species. Nesting of local heronry birds are also observed from July to October. Twenty one species use the lake for nesting at Vaduvor including 12 heronry species and three ducks species. A total of 10 aquatic macrophytes are identified. Of them five are found to be the food plant species to the long distance migratory ducks and other water birds. Vaduvor Lake is used as a feeding and roosting site by both migratory and non-migratory birds. The neighbouring Chitheri Lake is an important alternate roosting and feeding site for most of the birds that occur at Vaduvor Bird Area. Similarly, paddy fields adjoining the sanctuary are very useful feeding sites for both the migratory and resident species of water birds of Vaduvor. Among the five species of long distance migrant ducks, Northern Pintail, Garganey and Common Teal frequently visit the adjoining paddy fields for food during night hours and loafing in the sanctuary during the day time. Birds require high nutritive food during breeding season and the breeding birds are good indicators of the habitat condition. The occurrence of large number of breeding birds both heronry and other water birds indicate the high food resources of Vaduvor Lake and adjoining wetlands and paddy fields. Six species of commonly occurring aquatic insects, and eight species of fish are distributed here. Water Hyacinth and *Ipomoea carnea* are the two invasive weeds replacing the native macrophytes, the major attractants for the migratory and resident ducks. The rapid expansion of this species could ultimately affect the biodiversity of the Lake including birds and ultimately which impact to attract larger

heronry species for nesting and facilitate the free movement for the swimming birds, It is recommended to thin the lower and inner branches of *Acacia nilotica* trees to attract more long distant migratory ducks by creation of sloping earthen bunds.

2.10 Flagship Species

2.10. Oriental Darter: Oriental Darter *Anhinga melanogaster* is a globally Near Threatened wetland dependent species, listed in the IUCN Red List of threatened birds. The importance of Vaduvur Bird Sanctuary in conservation of Oriental Darter will be imperative in the near future as it is one of the largest congregation and breeding site for this species. A maximum of 80 individuals along with eight nests with 2-3 full grown chicks were noticed during the BNHS study.

Median Egret:

The highest congregation of Median Egrets takes place in Vaduvur due to its habitat. Teals and ducks are the commonest species in the sanctuary during the wintering period. Painted Storks and Openbill are the other attractive species to the tank. The major large sized species which breed at Vaduvur are Openbill stork *Anastomus oscitans*, Oriental White Ibis *Threskiornis melanocephalus* and Grey Heron *Ardea cinerea*. The other long distance migratory ducks namely Northern Pintail *Anas acuta*, Northern Shoveller *Anas clypeata* and Eurasian Wigeon *Anas penelope* are the key bird species to the Vaduvur Bird Sanctuary. Three species of ducks such as Lesser Whistling Duck *Dendrocygna javanica* Comb Duck *Sarkidiornis melanotos* and Spotbilled Duck *Anas poecilorhyncha* are found more in numbers during the wintering season.

2.11 Symbiotic Relationship

Symbiotic relationship between aquatic vegetation and other macrophytes are observed which benefits micro flora and fauna those are important to bird species.

2.12 Hydrology

There is no perennial water source to the Vaduvloor Bird sanctuary. Chiefly the sanctuary is an irrigation tank used for storing water for agriculture purpose. It receives water from Mettur dam from August till January. Mostly the sanctuary starts getting dry from February onwards and remains completely dry from April till arrival of fresh water. Degradation of the feeder channel contributes to enhanced soil erosion and loss in water absorption capacity of the tank. It is imperative to undertake measures for feeder channel conservation to ensure regulation of water flow regimes and maintenance of the hydrological functions of the wetland system. Water inflows and outflows to the lake should be estimated with the help of hydrological experts. Assessment of water holding capacity of Vaduvloor Lake should be attempted through various analysis of data generated from contour surveys

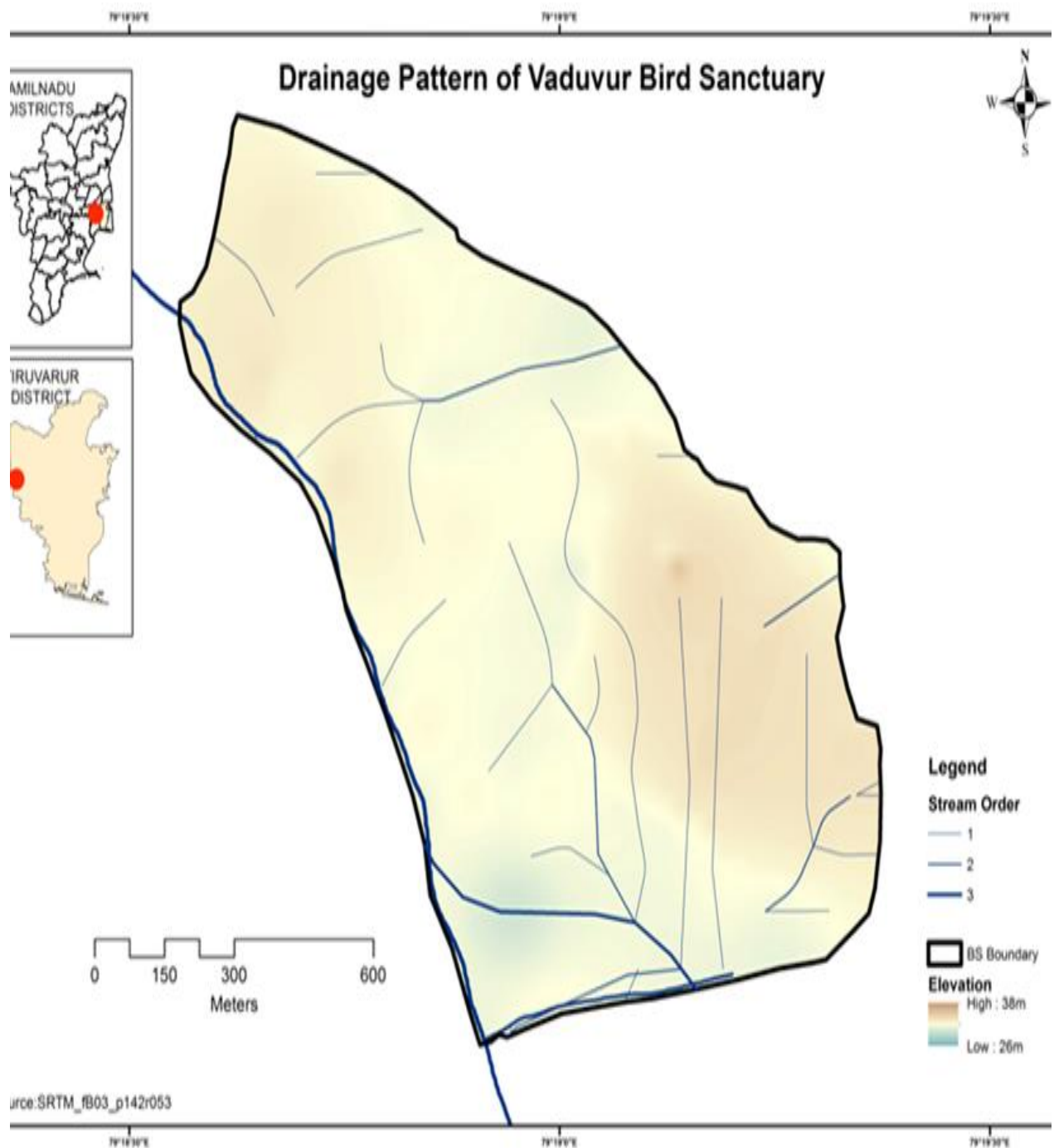
Aquatic habitats are highly suitable for water birds



Aquatic habitats are highly suitable for water birds



2.13 Drainage Pattern



Drainage pattern of Vaduvur Bird Sanctuary
Source: Care Earth / TBGP/Wetland Action Plan 2013-18

Drainage pattern

The current drainage pattern and water use pattern of the Vaduvor Bird Sanctuary could be classified as follows:

1. Domination of water use by agriculture.
2. At present there is no mechanism in place to assess sustainability of the water use pattern and integration of ecological requirements.
3. Increasing intensification of water use in agriculture due to changes in cropping pattern and increase in irrigated area.

The land use of the basin is dominated by agriculture, which accounts for 90% of the land use. The lake basin has a semi-arid climate, with three seasons, namely summer, rainy and winter. Rainfall is received from the southwest as well as northeast monsoon. Temperature ranges between a low of 20C in winter to above 40C during peak summer. The average rainfall is 1200 mm within the Lake area. Failure or delayed monsoon can lead to drought like situations in the Lake and its environment. Depressions in the Bay of Bengal are common and are generally experienced between October and January .The basin is highly populated, and is inhabited by local people.

2.14 Crucial Parameters of the Bird Sanctuary

The crucial parameters of the bird sanctuary for its management are classified as follows

1. Feeder Channel Maintenance
2. Water Management
3. Biodiversity management
4. Socio Development, 5. Heavy Siltation since from 1999

a. Feeder Channel Maintenance

Develop action plan for treatment of feeder channel for soil erosion and sedimentation control and flow regulations through limited engineering and other appropriate (manual) measures. Concrete wall in three sides along the channel should be carried out.

Wintering birds occupy the water tank even in dry season



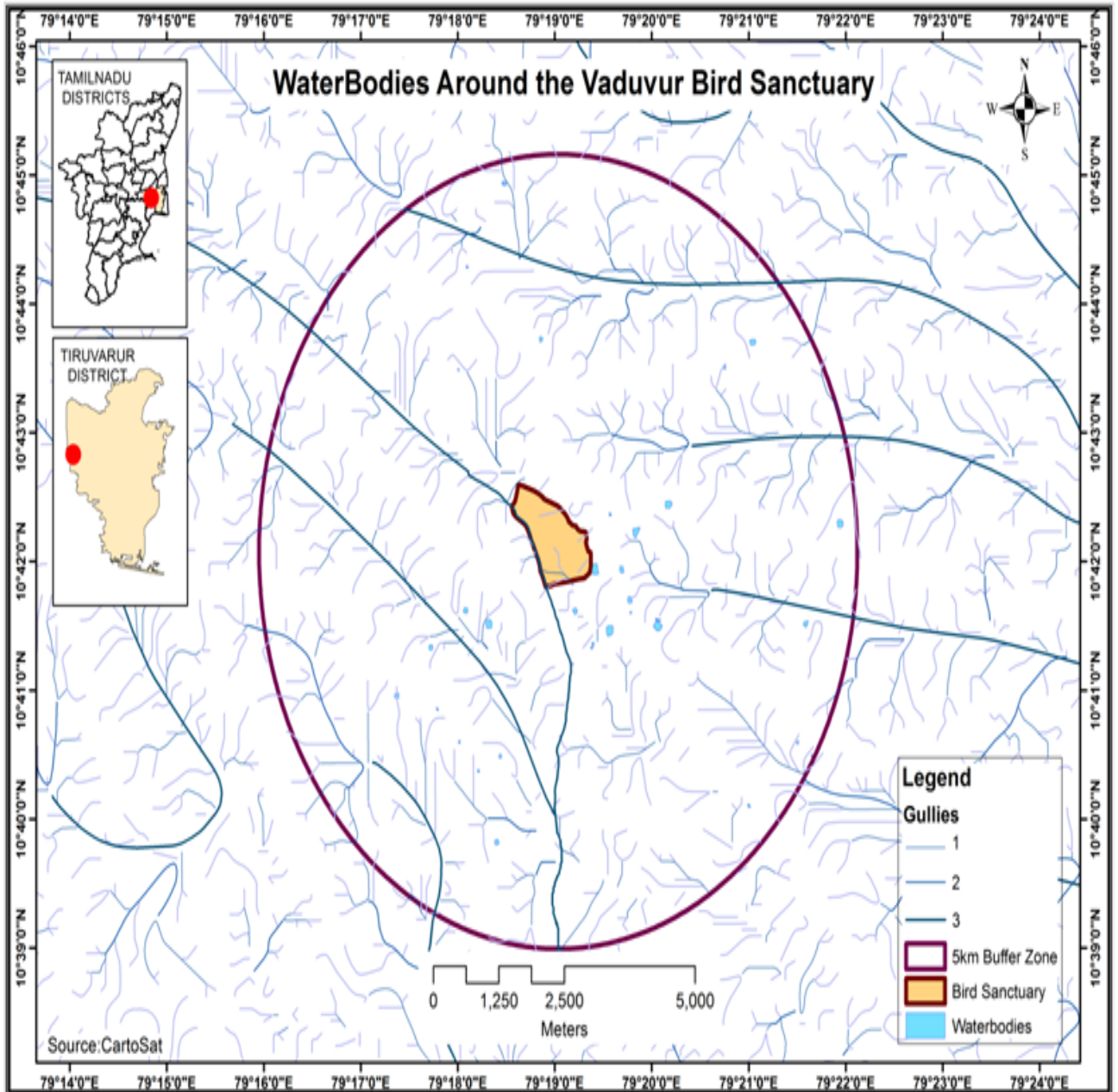
b. Water Management

1. Assessment of current water use and identification of conflicting interests
2. Propose measures for enhancement of water holding capacity using ecologically sustainable interventions
3. Develop action plan for rejuvenation of wetland and optimize water regimes
4. Develop framework for water management considering human and ecological demands
5. Assess current threats to biodiversity due to changes in hydrological regimes, pollution and other anthropogenic pressures

c. Biodiversity Management

1. Propose measures for management of aquatic vegetation and control of invasive species
2. Propose measures for enhancing diversity of fish and other aquatic species
3. Assess threats to water birds due to habitat modifications including water level changes and vegetation characteristics
4. Develop monitoring mechanisms and research areas for assessment of migratory and residential water bird populations
5. Suggest actions for water bird conservation with emphasis on restoration of Near Threatened species population through habitat improvement and networking of protected areas / community reserves
6. Design an ecotourism development plan based on carrying capacity of the wetland system.

Water-bodies are present around the Vaduvor Bird Sanctuary



Source: Care Earth / TBGP/Wetland Action Plan 2013-18

Key species such as Painted Stork and Pelicans are staying beyond the winter period



d. Socio economic Development and Livelihood Improvement

1. Analyze livelihood assets, vulnerability context and opportunities for interventions for livelihood improvement of communities
2. Develop strategies for additional income generation through micro enterprise based on sustainable use of wetland resources
3. Identify specific interventions in sample villages relating to livelihood improvement based on resource appraisal of agriculture, horticulture.
4. Institutional Development and Capacity Building
5. Propose an institutional mechanism to develop the feeder channels with cement concrete to minimize the soil erosion
6. Management practices to achieve integrated conservation and management of wetland and its feeder Channel.
7. Develop an effective monitoring and evaluation framework for integrated conservation and livelihood improvement
8. Generate awareness about the values and functions of sanctuary at various levels within government, communities and developmental agencies
9. Develop curriculum for environmental awareness among formal and non-formal education involving youth clubs and other concerned interested groups
10. Identification of research activities for management planning on scientific basis
11. Integrating ecological, economic and social aspects
12. Identification of critical indicators (e.g. enhancement of bird diversity) for monitoring and evaluation of the strategies adopted for long term conservation of wetland
13. Develop active collaboration with the research institutions for identification of indicators for use in monitoring and evaluation

2.15 Dependence

There are no human habitations inside the sanctuary. Five villages are located around the sanctuary, viz, Vaduvor Vadapathi, Vaduvor Thenpathi, Vaduvor Melpadhi, Vaduvor Agraharam Neyvasal and Tharkas. The local livestock comprises of goats, bulls, cows and buffaloes. The human population of around 20,000 comprises mostly of agriculturists and daily wage labourers. As paddy is the main crop around the Sanctuary, the people are dependent on water from Vaduvor tank for irrigating their agricultural fields. The dependency of the people on the resources of the sanctuary other than water is little. For maintenance of bird habitat it is necessary to retain a minimum level of water in the tank for the maximum possible period. But in drought years when water is in short supply the interests of the birds and local people comes in conflict. The paddy fields in these areas form an important feeding ground for the birds. Sometimes birds like Teals cause damage to paddy crop and thus creating some antagonism towards the Sanctuary.

Grazing Pressure: Livestock grazing takes place during the dry summer months from April to August when the tank remains dry. This is however not a problem for the sanctuary as there no birds in the sanctuary during grazing months. As food preferences for cattle and birds are different, grazing is not much of a threat to the visiting birds. The only problem management faces due to grazing is damage to the establishing plants on mounds and bunds. It is also to examine the beneficial aspects of grazing of livestock in the lake to the biodiversity.

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Agriculture Dependence

Heavy use of water for land based agriculture activities (at present there is no mechanism in place to assess sustainability of the water use pattern and integration of ecological requirements). Increasing intensification of water use in agriculture due to changes in cropping pattern and increase in irrigated area.

Impact of Alien Species

Eichhornia crassipes, *Salvinia auriculata*, *Pistia stratiotes*, *Lemna minor*, *Wolffia* sps. and *Azolla pinnata* are the common weed species and form thick mats in different pockets of the lake. The invasion of such species has altered the eco system in many areas. The rooted floating-leaf types commonly found in the bird area are: *Nymphaea stellata*, *Nelumbium speciosum*, *Nymphoides indicum*, *Ipomoea aquatica*, *Neptunia oleracea*, *Ludwigia adscendens*, *Pseudoraphis spinosus* and *Echinochloa colonum*. Prolific growth of vegetation in the lake is primarily attributed to high concentrations of inorganic nutrients present in the lake waters, entering the lake in the form of agricultural runoff through various deltaic drains and channels.

Threats to Habitats

Because of its location along the highways and the earthen mound that are well surrounded with trenches filled with water, there is absolutely no threat for the nesting birds either from the poachers or the visitors. Since the open water zones are not accessible by walk during the migratory season, there is no possible entry for the intruders. Under the Indian Wildlife Protection Act (1972), hunting of all resident and migratory water birds species is banned.

Aquatic vegetation is more suitable for species such as White Ibis



Disease Transmission

The practice of open farming of domestic ducks in the Vaduvor Bird Sanctuary in close proximity of feeding and resting wild and free flying water birds poses a risk of transmission of diseases between domestic to wild birds. While there have been no reports of highly pathogenic avian influenza strain H5N1 in domestic poultry or wild birds in Vaduvor, twenty one resident and migratory water bird species that have been recorded in Vaduvor are reported in other parts of the world to have been infected by the virus. Additionally, as the sanctuary is an important breeding site for the Near-threatened Oriental Darter and colonies of herons, egrets, storks, cormorants and other birds, the newly hatched young and juveniles are at higher risk from such infectious diseases if they come in contact (direct or indirect) with diseases domestic birds. Hence it is imperative to conduct surveillance for avian influenza through regular health monitoring of breeding birds.

CHAPTER - III

History of Management and Present Practices

3.1. General

The sanctuary wetland was initially under the control of Vennar Division of PWD. The wetland did not attract many water birds till raising of *Acacia nilotica* plantations during the years 1986 and 1988 on its western bank. After the *Acacia* plantations established, wetland birds started congregating the wetland area in large numbers. The large number of water birds visiting the tank prompted the local people and the Forest department to declare the wetland as a bird sanctuary. Until date, 40 species of water birds have been recorded in the sanctuary. With the formation of earthen mounds and planting of shade and roosting species, the sanctuary has become a regular visiting place for wetland birds.

Two watchtowers were constructed in the sanctuary in 1995 for facilitating bird watching. A steel watchtower is located on the northern part of the sanctuary near KothandaRamasamykovil and a cement watchtower is located by the roadside of Thanjavur-Mannargudi highway. Signage's have been put up near the sanctuary for information on water birds. As a part of boundary consolidation effort, chain link fence with cement pillars has been raised all along the sanctuary periphery. An anti-poaching shed was constructed in 1999 as a part of the effort to prevent poaching and other illegal activities inside the sanctuary. Anti-poaching watchers have been employed on daily basis to maintain vigil against poaching and other illegal activities inside the sanctuary. A forest guard and one social forestry watcher are posted with headquarters at Vaduvor for carrying out departmental activities. Annual census of water birds is carried out. Census needs to be preferably conducted in the month of November-December when species variety and population is maximum.

3.2 Infrastructure Facilities Available

Two watch towers constructed in the sanctuary for bird watching. Additional watch tower need to be established on the western bank near Acacia plantation. The existing earthen bunds have been strengthened by concrete wall and bond stones. The entrance of the sanctuary has been developed aesthetically with artificial waterfall to attract more visitors. A tourist rest shed is presently available. But it is not sufficient as only a single room is available and additional facility needs to be created. The sanctuary is equipped with spotter and binoculars for better bird watching by visitors. An interpretation centre needs to be developed for visitors to understand the bird awareness. A qualified tourist guide-cum-Research Assistant needs to be posted on priority basis.

To enhance the aesthetic and experiential quotient of the sanctuary, the tank bund can be converted into a nature trail. This can be done by strengthening the bund, clearing bushes and erecting interpretation signboards along the trail. A few cement benches can be provided on the tank bund for the tourists to sit and watch birds. Interpretation boards have to be erected at strategic places explaining the importance of the sanctuary, importance of birds. For satisfying the information needs of the visitors to the sanctuary, pamphlets and posters needs to be prepared. Students and local people must be made aware about the importance of wildlife conservation. Eco education camps have to be organized in the sanctuary to impart conservation education to these target groups. With the above information on the background the following activities may be taken up to promote tourism and eco-awareness.

Diversity of aquatic vegetation in the bird areas



3.3 Holistic Approach to Intervention

Migratory water birds are the main wildlife of the sanctuary. Their visit to the sanctuary depends upon the availability of water in the tank. The receipt of water and quantum depend on release from Mettur Dam. Often delayed release of water or release of inadequate quantity affect the bird arrival into sanctuary. When water in the sanctuary tank is not sufficient, they visit nearby agricultural fields for feeding. Such birds are then liable for poaching by the local people. Birds are trapped mostly by using nets and decoys placed in paddy fields. Egrets and pond herons are the most often caught birds. A pair of such birds fetches up to forty rupees in the local market. Local people believe that meat of wild birds possesses medicinal properties and so their consumption is beneficial to health. Engaging APW for protecting the birds outside of the sanctuary area during peak months is highly essential to control the birds poaching. Besides poaching, weed encroachment by *Ipomoea* is posing a growing threat to the birds. Nearly half the sanctuary is now under *Ipomoea* encroachment. This has greatly reduced the water spread area available for the water birds. Every year necessary action is being taken for the removal of this invasive weeds.

3.4 Livestock Grazing

Livestock grazing takes place during the dry summer months from April to August when the tank remains dry. This is however not a problem for the sanctuary as there no birds in the sanctuary during grazing months. As food preferences for cattle and birds are different, grazing is not much of a threat to the visiting birds. The only problem management faces due to grazing is damage to the greening efforts on mounds and bunds.

3.5 Invasive alien species

Reduce the prolific growth of exotic aquatic plant species and also mitigate proliferation of introduced invasive fish species (eg *Tilapia* sp) should be the focus for managing Invasive Alien Species. . The invasion of *Prosopischilensis*, and *Eichhorniacrassipeshasto* to be removed from the bird habitats in a slow phase with a proper investigation about its threats to the eco system.

3.5. a. b

Control of *Prosopischilensis*, *Eichhorniacrassipes*, *Ipomoea carnea* and other species could enable additional water holding capacity and enhancement of water depth and water spread area in the sanctuary. Development of micro enterprise based on manufacturing of handicrafts through processing of the invasive plant species. The technology for using natural fibre for manufacturing of handicrafts is available through several organizations. The enterprise would also be a viable alternative for income generation and at the same time would contribute to management of invasive plant species. Integrated control measures using mechanical and biological methods should be adopted

3.6 Protection:

The Vaduvor Lake and adjoining bird habitats are fully protected from bird trapping, encroachment and other illegal activities. The lake is situated adjoining the highway and hence it is well protected without of much human intervention.

3.6.1 Legal Status

The sanctuary was created as per G.O.Ms.No.169, Environment & Forests (FRV 1) Department dt.22.7.99 under section 26A (1) of The Wildlife (Protection) Act, 1972.

3.6.2 Hunting:

Hunting is prohibited inside the sanctuary as per the Wildlife (Protection) Act 1972.

3.6.3 Illegal Activities

Poaching inside sanctuary is totally stopped. Though there is rarely any attempt for Poaching of wild birds, trapping of water birds is very much controlled. Local people sometimes try to catch fish from the tank during night hours for their domestic purpose.

3.6.4 Insect Pest Attacks and Pathological Problems:

There has been no incidence of any insect attacks or pathological problems noticed in the past in the sanctuary.

3.7 Zonation

The zonation for the sanctuary is framed as part of integrated management planning on the principles of management zonation which provide a basis for targeting interventions for achieving conservation and wise use of the wet lands. The zonation is a hierarchical approach comprises a progression in scale from river basin to individual wetland site/ Agriculture field, and should be consistent with the river basin approach adopted for management of Vaduvloor Lake. Interconnectivity in management planning at different hierarchical scales ensures maintenance of ecological integrity of the wetland system.

3.7.1 Core Zone

For the purpose of management planning the entire wetland area is proposed to be demarcated as a core zone and the adjoining wetlands (e.g. Chitheri) and paddy fields which receive water from the lake and offer foraging site for the birds of Vaduvloor Bird Sanctuary buffer zone. Land use within the core zone should be regulated as per the provisions laid under the GO 120 of the Environment, Forest Science and Technology. The order allows fishing with traditional methods, traditional agriculture without any chemical fertilizers and pesticides, use of ordinary boats for communication, right of way with existing roads connecting main habitations and their maintenance by creation of vents and right of maintenance of drainages to avoid water logging within the peripheral areas. The order categorically bans pisciculture and intensive agriculture within the sanctuary area.

3.7.2 Buffer Zone

The buffer areas have an influence on the ecological characteristics of the core area, and therefore could be used for sustainable agriculture and aquaculture purposes. However, for the implementation of the management zoning, the preconditions of sanctuary area declaration as laid down under the Wildlife

(Protection) Act, 1972 have to be met and implemented. The plan summarise that necessary measures would be taken by the state government to address these issues and necessary legal and institutional basis is created for implementation of the integrated management planning. On the whole, there is no specific zonation is made because of the smaller size of the sanctuary.

3.7.3 Tourism Zone

The sanctuary has a great tourism potential because of its location and easy accessibility to the tourists from various destinations. It shows the arrival of tourists and bird watchers are increasing of late. There is no entry fee or regulation on entry of tourists in the sanctuary at present.

Objectives of Tourism

1. To promote wildlife tourism and create awareness amongst the general public on bird conservation and
2. To utilise the sanctuary as a center for imparting eco-education to students and local people.

Problems:

No trained staff is presently available in the sanctuary for offering guidance and information to the visitors. There is a lack of infrastructural facility in the sanctuary for tourists. The interpretation Centre is under construction. It will attract more visitors to the sanctuary.

3.7.4 Status and Issues

i. Core Zone

The entire 128.10Ha, of the lake is the core zone of the sanctuary. The core zone is well protected from all sort of human threats. Habitat restoration and habitat improvement programme are being carried out in the core zone for the scientific management of the sanctuary. Research works are permitted in the core zone with the prior approval from the Chief Wildlife Warden.

Aquatic Plant species diversity is rich in the water tank



ii. Buffer Zone

The eco sensitive zone of the Vaduvloor Bird Sanctuary is part of the buffer zone of the sanctuary. Agriculture field bordering the sanctuary is the buffer area of the bird habitats. The fields are used by the birds during the wintering period. Adequate protection is also given for the agriculture fields through awareness programme.

a) Tradition, Customs and Relationship with the Protected Area

The Vaduvloor Bird Sanctuary is traditionally linked with the customs of agriculture practices in the river basin area. The local communities have a mutual reciprocal approach with the conservation of protected areas in this region. There is one famous temple called Sri Kodandaramaswamy temple located in Vaduvuragraharam village just opposite the eastern end of the bird Sanctuary. Every day many devotees come here and worship lord Rama. It is one of the largest temples in the village which was constructed by Manuneecholan. People visiting the temple can be encouraged to visit the bird sanctuary to tap the tourism potential of the site as twin tourist destinations. The land around the temple is owned by the temple authorities and has been leased out for plantations like eucalyptus.

b). Economic Status and Occupations

The villagers mostly involved in land based activities for their economic sustainability and improvement of livelihood. Most of the villagers have farm lands with horticulture crops as well besides agriculture fields.

c). Land Use: (Area of Influence that is critical for survival of the Bird Sanctuary)

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

Vaduvvoor bird sanctuary was a traditionally an irrigation water tank and the area was under the control of Public Works Department. Historically, the wetland is said to have been created by the local communities by a process in which two members of every family of the village were nominated to undertake manual labour and carve out the wetland.

The area was declared as a bird sanctuary in 1999. As one of the first activities done by Tamil Nadu Forestry Department, *Acacia nilotica* was planted in the North-Western side of the wetland. Further, the fishing lease previously managed by the PWD authorities was stopped to enhance the feed potential of the sanctuary. The encroachments inside the sanctuary were also evicted.

- The sanctuary is surrounded by agricultural fields on almost all sides. Sluice from the tank opening into the fields is located on the north-eastern side of the sanctuary. Birds like Oriental white ibis, Asian openbill and Egrets were observed to be foraging in the nearby agricultural fields. The main road runs parallel to the southern periphery of the sanctuary and adjacent to the road agricultural fields are present which are fed by another outlet canal from the tank. Apart from this an outlet is located on the southern side of the sanctuary. Another inlet/outlet is found on the south-western corner of the sanctuary which gets water from the canal and the overflow drains into agricultural fields. Many small canals supply water for irrigation to the agricultural fields in the vicinity of the sanctuary and there have been instances when excess water from the agricultural fields overflows into the wetland especially in the north and north-eastern side of the sanctuary. Also, there are nearly ten points of overflow (Tam. *Vakyal*) from the agricultural fields to the tank. Hence, this increases the chances of pesticide and excessive nutrient contamination of the tank.
- Main road runs parallel to the western boundary of the sanctuary which experiences heavy vehicular traffic and hence birds cannot be observed from this side of the sanctuary.

- The temple of Kodandaramaswamy (one of the Vaishnavite sacred temples), along with two religious institutions and schools, is located on the eastern side of the sanctuary. The temple tank (referred to as SarayuPushkarani in the ancient texts) is located adjacent to the walk path of the sanctuary on the eastern side.

- There is no unique land use type within the sanctuary; however the buffer zone is composed of agricultural fields. Specific land use type around the sanctuary is agriculture (Map 7 and 8). Traditionally the lake was an irrigation tank that supplied water to nearby agriculture fields. Agriculture thrives in this area depending on seasonally filled wetland. The total area under agriculture around the sanctuary is 4428 hectares however the area under cultivation is 3331 hectares. The cultivation is mainly done using irrigation tanks, and using bore wells and tube wells during dry seasons of the year. Some villages around the sanctuary which do not receive water from wetland for agriculture carry out cultivation using village tanks and bore wells. Rainfed cultivation in this area is very low the total area under the rain fed cultivation is 627.4 hectare mainly in Neivsal and Arasampattu villages. The total agricultural area cultivated using bore well and tube wells is 950 ha (Table 11). The extent of agricultural land was more in Neivasal (513 ha) and less in Arasampattu (101 ha). The soil is fertile and two different soil types - clay red soil and black soil are found here.

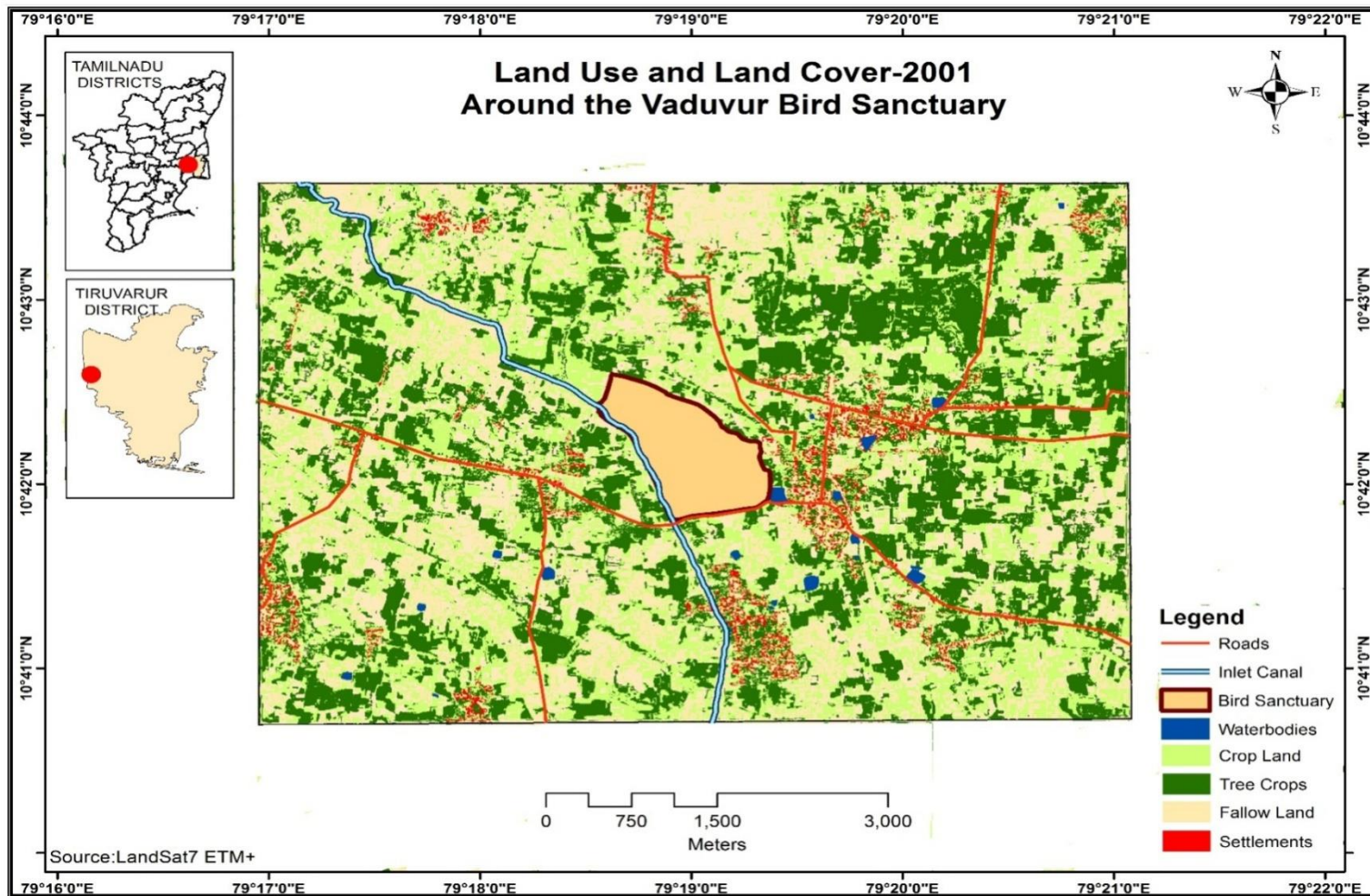
Birds foraging in the agricultural fields around the bird sanctuary.



Figure.11. Temple located adjacent to eastern boundary of the Sanctuary

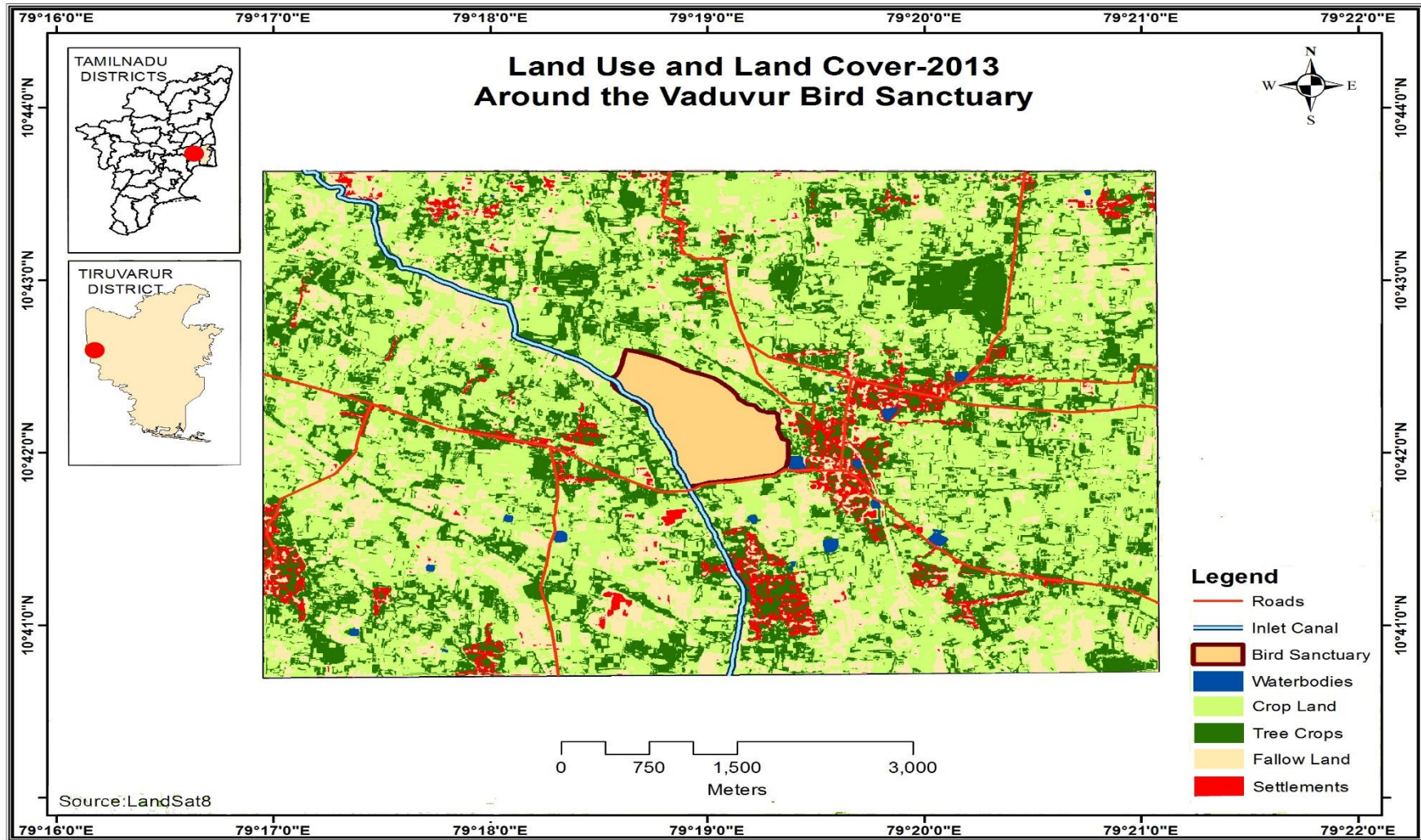


Sluice from Vaduvor tank draining the agricultural fields



Map 7. Land Use and Land Cover around Vaduvur Bird Sanctuary in the year 2001

Source: CareEarth / TBGP/Wetland Action Plan 2013-18



Map 8. Land Use and Land Cover around Vaduvur Bird Sanctuary in the year 2013

Source: Care Earth / TBGP/Wetland Action Plan 2013-18

Total area under agriculture in villages around Vaduvor bird sanctuary

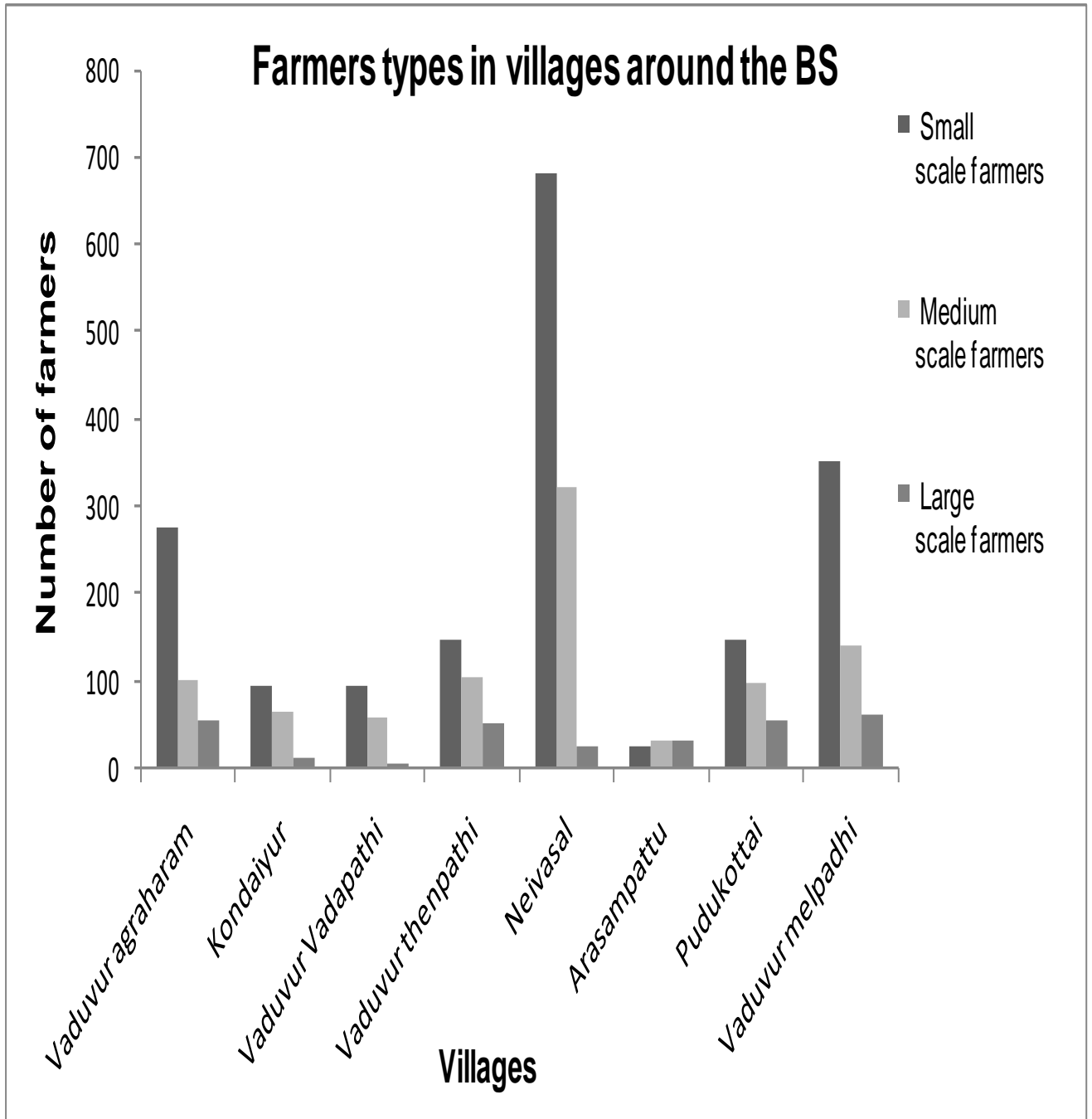
Village name	Total area under agriculture (ha)	Area under cultivation (ha)	Rainfed cultivation (ha)	Cultivation using irrigated tanks (ha)	Cultivation using bore/well (ha)
Vaduvuragraharam	598	420	0	420	25
Kondaiyur	500	400	2	400	10
VaduvurVadapathi	383	248	11	247	110
Vaduvurthenpathi	700	400	0	400	81
Neivasal	625.0	513	513	513	52
Arasampattu	162	101	101	70	60
Pudukottai	537	391	0	392	98
Vaduvurmelpadhi	923	858	0	858	514

Source: Care Earth / TBGP/Wetland Action Plan 2013-18

Farmers in villages around the bird sanctuary completely depend on farming mainly during monsoon season. All households in villages do not own agricultural land. The people who own agricultural land have been categorized on the basis of amount of land they own. The farmers having 1-3 ha of land are small scale, 3-5 ha are medium scale and more than 5 ha are large scale farmers. There are 3010 farmers identified around the bird sanctuary out of which 1808 are small scale farmers, 915 are medium and 287 are large scale farmers. The number of small scale farmers is high in Neivasal, Vaduvurmelpadhi and Vaduvuragraharam villages. More than 100 medium scale farmers are present in Vaduvurthenpathi, Neivasal and Vaduvurmelpadhi villages. Nearly 50 large scale farmers are present in most of the villages around the bird sanctuary.

Different kinds of crops are cultivated in villages around the sanctuary but paddy is the major crop. Paddy is cultivated throughout the year if water is available. Sugarcane and Grams (Black and green) are minor crops in this area (Table 12). The sowing of paddy starts in September-November and harvesting of the crop is usually done in January- March. Paddy being a three month crop weeding is done 3-4 times after planting.

Various Types of farmers present around the Vaduvor Bird Sanctuary



Source: CareEarth / TBGP/Wetland Action Plan 2013-18

**Major and Minor crops and their cropping seasons cultivated in villages around
Vaduvloor Bird Sanctuary**

Village name	Major crops	Minor crops	Season of sowing (Month)	Season harvest(Month)	Weeding(Month)
Vaduvuragraharam	Paddy	Sugarcane, Grams (Black and Green)	1. Paddy: Sep-Nov 2. Sugarcane: annual crop 3. Grams: Jan-Feb	1. Jan-Mar 2. After 10 to 12 months 3. Apr-May	1. Nov-Dec (Every 2 weeks) 2. 3 to 4 weeks after sowing
Kondaiyur	Paddy	Sugarcane, Grams (Black and Green)	1. Paddy: Sep-Nov 2. Sugarcane: annual crop 3. Grams: Jan-Feb	1. Jan-Mar 2. After 10 to 12 months 3. Apr-May	1. Nov-Dec (Every 2 weeks) 2. 3 to 4 weeks after sowing
VaduvurVadapathi	Paddy	Sugarcane, Grams (Black and Green)	1. Paddy: Sep-Nov 2. Sugarcane: annual crop 3. Grams: Jan-Feb	1. Jan-Mar 2. After 10 to 12 months 3. Apr-May	1. Nov-Dec (Every 2 weeks) 2. 3 to 4 weeks after sowing
Vaduvurthenpathi	Paddy	Sugarcane, Grams (Black and Green)	1. Paddy: Sep-Nov 2. Sugarcane: annual crop 3. Grams: Jan-Feb	1. Jan-Mar 2. After 10 to 12 months 3. Apr-May	1. Nov-Dec (Every 2 weeks) 2. 3 to 4 weeks after sowing
Neivasal	Paddy	Sugarcane, Grams (Black and Green)	1. Paddy: Sep-Nov 2. Sugarcane: annual crop 3. Grams: Jan-Feb	1. Jan-Mar 2. After 10 to 12 months 3. Apr-May	1. Nov-Dec (Every 2 weeks) 2. 3 to 4 weeks after sowing

Village name	Major crops	Minor crops	Season of sowing (Month)	Season harvest(Month)	Weeding(Month)
Arasampattu	Paddy	Sugarcane, Grams (Black and Green)	1. Paddy: Sep-Nov 2. Sugarcane: annual crop 3. Grams: Jan-Feb	1. Jan-Mar 2. After 10 to 12 months 3. Apr-May	1. Nov-Dec (Every 2 weeks) 2. 3 to 4 weeks after sowing
Pudukottai	Paddy	Sugarcane, Grams (Black and Green)	1. Paddy: Sep-Nov 2. Sugarcane: annual crop 3. Grams: Jan-Feb	1. Jan-Mar 2. After 10 to 12 months 3. Apr-May	1. Nov-Dec (Every 2 weeks) 2. 3 to 4 weeks after sowing
Vaduvurmelpadhi	Paddy	Sugarcane, Grams (Black and Green)	1. Paddy: Sep-Nov 2. Sugarcane: annual crop 3. Grams: Jan-Feb	1. Jan-Mar 2. After 10 to 12 months 3. Apr-May	1. Nov-Dec (Every 2 weeks) 2. 3 to 4 weeks after sowing

The use of fertilizers was found to be high in all villages and fertilizers such as DAP, Urea, Potash and pesticides like Cartap hydrochloride 50%, EkaluxEc 25 (organophosphorus group) and Carbendazim 50% WP are used for agriculture. Agriculture is the major livelihood of the people in all villages and villagers are highly dependent upon chemical pesticides and fertilizers for cultivation rather than organic products owing to their fast acting nature. To a lesser extent compost (Cattle dung) is used in all villages. Even though the usage of organic fertilizer is low, it works very effectively in controlling crop damagers; however it is a slow process. Till now there have been no records of bird mortality due to pesticide contamination. **However there is an enhanced possibility of pesticide contamination in wetland as all agricultural lands are located very near to the wetland and the runoff from agriculture fields can affect the wetland biodiversity.**

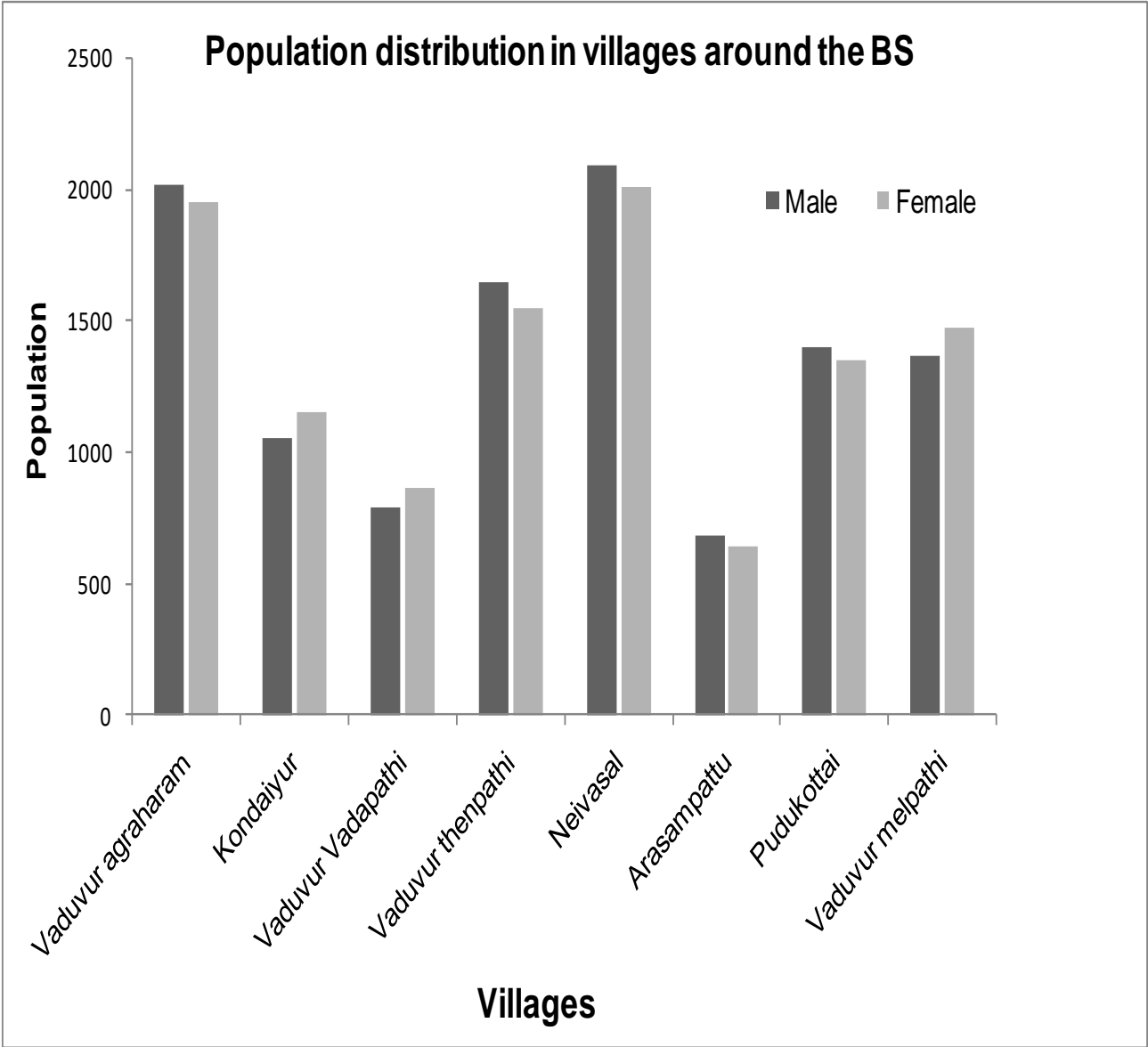
Usage of inorganic and organic products for agriculture around Vaduvor Bird Sanctuary

Pesticide	Weedicide	Fertilizers	Organic Fertilizer
1. Cartap hydrochloride 50% 2. EkaluxEc 25 3. Carbendazim 50% WP 4. Hexaconazole 5 % EC 5. Monocrotophos	1. Bispyribac sodium 10% 2. 24D sodium salt	1. Potash 2. Urea 3. Nitrogen complex 4. DAP 5. Micro gold (Micro nutrient mixture)	1. Cattle dung

d. Demographic Details of the landscape

Vaduvor bird Sanctuary is located in Vaduvur village in Mannarguditaluk of Tiruvarur district. There are five panchayats in close proximity to the bird Sanctuary viz., VaduvurAgraharam, VaduvurVadapathi, VaduvurThenpadi, Neivasal and Moovarkaootai. The villages located in close proximity to bird Sanctuary (within 3km radius) are, 1. VaduvurAgraharam, 2. Vaduvurmelpadhi, 3. VaduvurVadapathi, 4. VaduvurThenpathi, 5. Kondaiyur, 6. VaduvurPudukottai, 7. Neivasal and 8. Arasampattu. The total population around the bird Sanctuary is 22031 comprising 11045 males and 10986 females. The number of households in eight villages around the sanctuary is 5335. The density of the population in villages was observed to be 4.00 persons/ household. The highest male and female population was recorded in Vadavuragraharam and lowest in Arasampattu village. The number of land owning households is 2912.

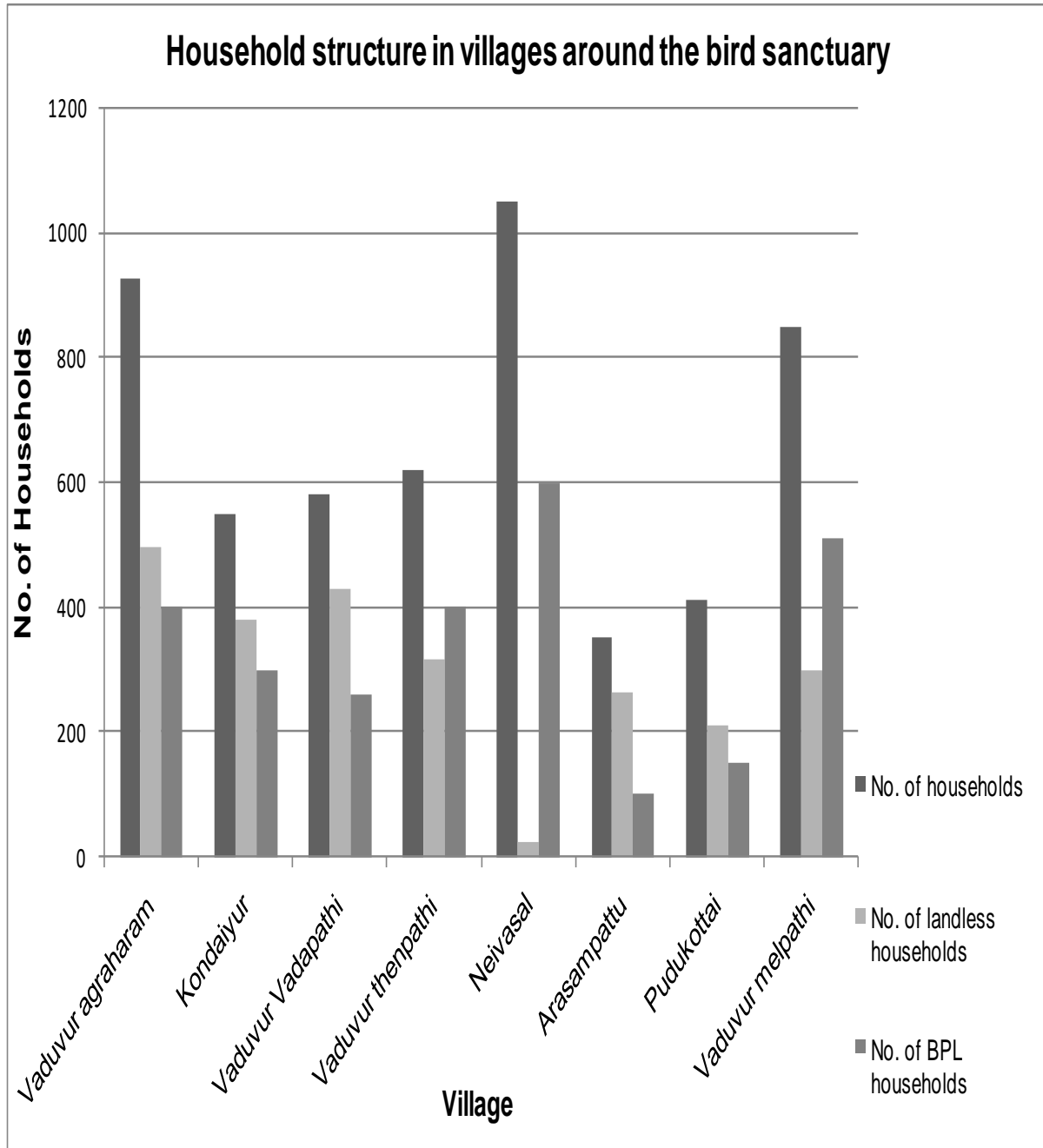
Population distribution in villages around Vaduvor Bird Sanctuary



Source: Care Earth / TBGP/Wetland Action Plan 2013-18

The total number of households around the bird Sanctuary is 5335. Highest number of households in villages was recorded in Neivasal village (1050) and lowest in Arasampattu village (350).

Structure of household



Source from Wetland Action Plan 2013-18 Prepared By Care Earth

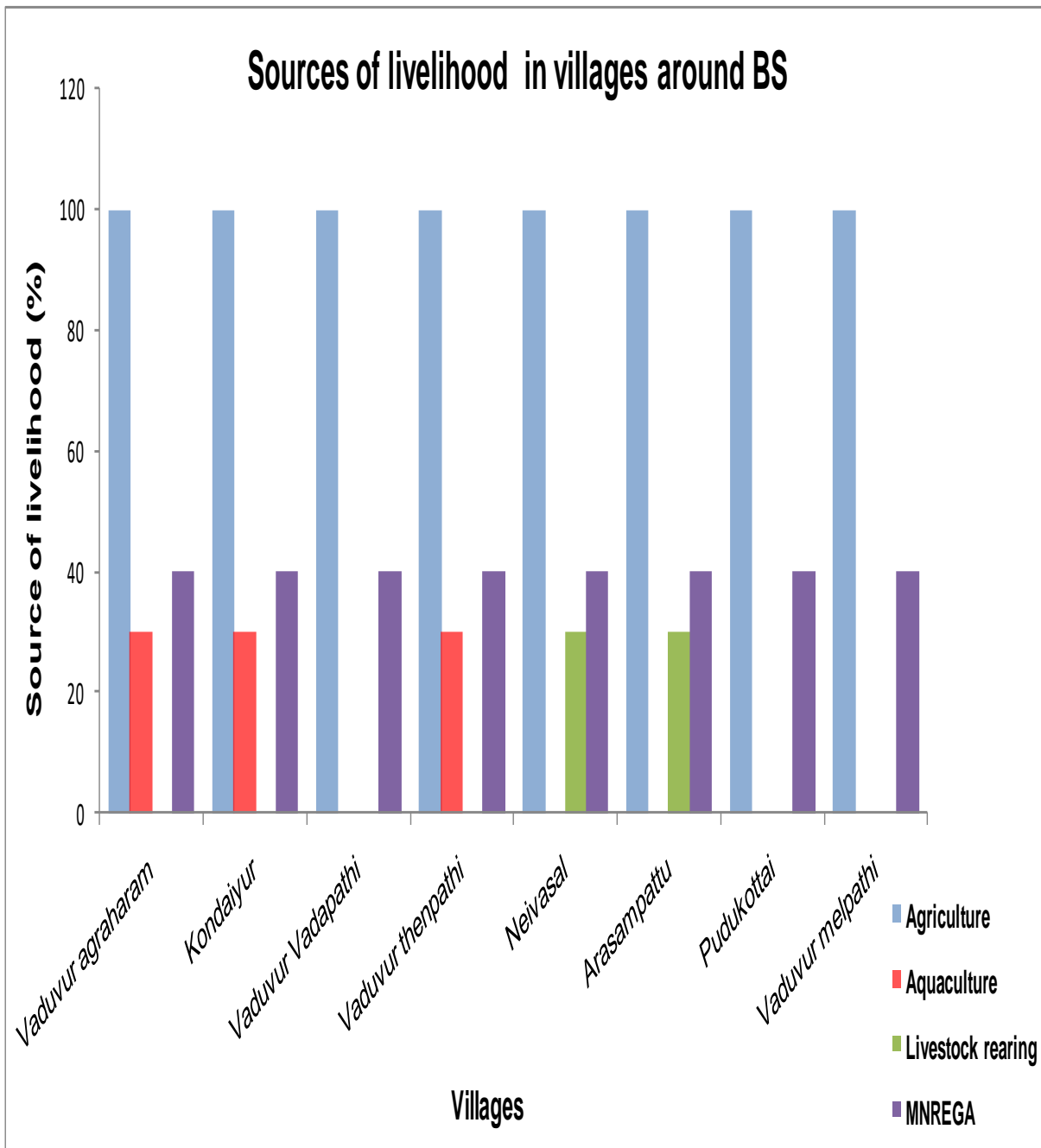
Agriculture is major source of livelihood for people in all villages. However, few residents in all villages do not own agricultural lands. They work in other's agricultural land as a daily labourer or lease out land from other landowners for cultivation. Highest number of landless households was recorded in Vaduvuragraharam (495 households) followed by VaduvurVadapathi and Kondaiyur villages and lowest in Neivasal (25). No migration has been observed in the villages.

Total number households Below Poverty Line (BPL) in all the villages around the bird sanctuary is 2721. Less than or nearly 400 households are reported to be BPL in all the villages except Neivasal and Vaduvurmelpathi. In Neivasal villages though the number of landless households is the least, the number of households falling under BPL category is high.

Though farming is seasonal the villagers are completely dependent upon agriculture as a major livelihood source. During the lean agriculture season villagers work as a daily labour and go for MNREGA works. As the rainy season approaches people stop the MNREGA work and commence farming activities. Some households in villages like Vaduvuragraharam, Kondaiyur and Vaduvurthenpathi maintain aquaculture ponds to support their livelihood. The main fishes reared and harvested are Catla and Tilapia. Large scale livestock rearing is reportedly practiced in Neivasal and Arasampattu villages.

Nearly 65% of the total population was found to be literate in all the villages. Highest literacy level of 85% was recorded in Vaduvuragraharam village. The lowest literacy level was recorded in Neivasal (60%). One school is present in each of the villages around the sanctuary. Two PHCs are present in Vaduvuragraharam and Arasampattu around the sanctuary. 78 SHGs and VFCs are found in the villages. All the villages have SHGs and 3 villages have VFCs, Vaduvuragraharam, Vaduvurvadapathi and Vadavurthenpathi.

Livelihood Source dependency in villages around Vaduvor Birds Sanctuary



Source: Care Earth / TBGP/Wetland Action Plan 2013-18

e. Infrastructure developments

As part of infra-structure developments tourism activities such as new entrance arch at the entrance gate, new interpretation centre and visitors facilities in bird walk area are under progress in the sanctuary. Infra-structure facilities (quarters) for the staff is nil in the sanctuary area.

f. Cultural aspects of wetlands/landscape

There is no cultural place are available in the vicinity of the bird sanctuary. Gothandaswamy temple (PerumalKovil) is a religious place located just adjoining the sanctuary. Iyyanar Temple is located in the Bird Walk areas which is a god for more than 100 villages for their worship every year with regular Pooja.

iii. Eco-Tourism Zone

a. Existing Facilities

The following existing facilities are available for the tourists while visiting the sanctuary. The facilities are less although the landscape is unique in terms of bird diversity and abundance throughout the year.

1. Bird Walk area (1.5 km) to see birds
2. Two Watch Towers

b. Focus: Policies

The eco-tourism will be focussed towards orientation with eco-tourism activities as follows:

PROFILE OF THE ECO TOURISM SITE:

- | | |
|--------------------------|----------------------|
| 1) Name of the District. | : Thirurur |
| 2) Name of the Circle. | : Trichirappalli |
| 3) Name of the Division. | : Thirurur |
| 4) Name of the Range | : Mannargudi Range |
| 5) Name of the Section | : Mannargudi Section |
| 6) Name of the beat | : Vaduvor beat |

- 7) Name of the RF/RL : _
- 8) Name of the Revenue Village and Hamlet : Vaduvloor
- 9) Nearest airport - Name and Distance : Trichirappalli : 80 km
- 10) Nearest Railway station - Name and Distance : Mannargudi 30 Kms.
- 11) Nearest Bus Stand : Vaduvloor - 1 Km.

The existing EDC (VaduvloorAgrakaram) will be fine-tuned for developing it in close partnership with the forest department. The VaduvloorAgrakaram village is located in VaduvloorPanchayat and has 300 households. Their main occupation is agriculture and other trading business. The EDC will function on the basis of Joint Forest Management guidelines of the Tamilnadu, 1997 and the entire financial transaction will be done through Village Forest Development Council (VFDC) and the committee will decide as to the expenditure /utilization of the VFDF with due approval from the DFO, Thirurur who will monitor the entire process.

The formation of ETC could strengthen the mechanism of local people's participation in the overall growth of the bird sanctuary for its scientific management. The proposed ETC is of great significance in promoting the conventional tourism into eco-friendly activities for various target tourists visiting the sanctuary. With the implementation of ETC, socio economic growth of the villages bordering the sanctuary and individual resource mobilization will be promoted in a realistic manner. This could be achieved with the close partnership and co-ordination with various line agencies along with the existing conservation policies of the sanctuary authorities. The success of the ETC could also dependent on the magnitude of resource mobilization for the functional role of the ETC which is feasible by amending a few financial components within the overall resources of the division every year.

The ETC will be focused towards the overall development of the sanctuary with financial benefits for villagers with long term sustainability. The members of the ETC will be fine-tuned in all the activities through a mechanism of capacity building and skill development by the experts in the relevant fields. Various fee structures for visitors will be formulated with a better facility and face lift to the sanctuary in all aspects. This will not have any negative setbacks in their minds about the overall administration of the ETC, especially for the betterment of the Vaduvor Bird Sanctuary in the long run.

Describe the Anticipated Levels (Numbers) and pattern (Periodicity) of Tourism

The anticipated tourist's arrival will be assessed per month to visit the bird sanctuary. Number of visitors allowed per day will be estimated with the facilities available in the sanctuary this will minimize the treat levels from the tourists on bird sanctuary.

Tourism - Related Infra Structure (accommodation, sanitary arrangements, /nature trails /trek routes, conservation and awareness programme, visit to interpretation centre: Strengthening ETC.)

1. Overall development of Eco Tourism Activities
2. Developing Infrastructure Facilities for the Tourists
3. Purchase of Equipment for Tourism Activities
4. Promoting Conservation and Awareness to the Visitors
5. Establishing more Communication Net Works
6. Increasing adequate staying facilities for the tourists within the sanctuary and
7. Strengthening Protection Measures: Bird Trade/Identification of Bird Trappers
8. The above activities will be executed by the ETC members in close partnership with the forest authorities.

3.8 Research, Monitoring and Training

3.8.1 Research

There is no permanent Research Assistant to conduct research on management subjects which is highly warranted for the sanctuary. However permission is accorded to willing scientists and colleges to carry out research on long term/short term/consultancy works in the sanctuary. Census of water bird is being conducted as per fund availability every year. The practice of monitoring water birds during migratory season was introduced since September 2000. In the year 2008 permission was accorded to BNHS for conducting ecological studies on birds for a period of one year from August 2008 to March 2009.

3.8.2 Monitoring

A lot of information collected on hydrology is mainly focused on water use for irrigation or flood control. The baseline data is grossly inadequate and all these aspects are thus gray areas for management planning. Inventorization assessment of hydrological processes, biodiversity and socio economic aspects are critical to management planning and baseline information needs to be developed. The coordination between various departments should be improved for taking various activities for the conservation and development of the Lake. The coordinating agency is critical to overall development of policy, planning and implementation.

3.8.3 Human Resources Development - Training

At present there is no staff in the sanctuary with training in wildlife management. Training to the staff would improve their efficiency and would allow them to provide proper information and guidance to the people. Short term training programme can be organized for the staff promising staff can be deputed for training to Bombay Natural History Society for intensive training on bird identification and related works.

The following skill development is needed for the front line staff

1. Annual refresher course on census
2. Wildlife Management training to the interested frontline staff through Wildlife Institutions
3. Exposure visit to frontline staff and wildlife managers.
4. Preparation and supply of bird and vegetation identification book of this sanctuary

3.9 Administrative Set up

The existing administrative set up for the Vaduvloor Bird Sanctuary and Habitats are as follows:

District Forest Officer	-	Thirurur Forest Division (1) – HQ – Thirurur
Forest Range Officer	-	Mannargudi (Vaduvloor Bird Sanctuary) (1) HQ – Mannargudi
Section Forester	-	Mannargudi (Sanctuary) (1) – HQ – Mannargudi
Forest Guards	-	Vaduvloor Beat (Sanctuary) (1) - HQ- Vaduvloor
Anti-poaching Watchers	-	Vaduvloor Bird Sanctuary (4) - HQ- Vaduvloor
Driver	-	Guard cum Driver (1) – HQ- Mannargudi

3.10 Communication

Communication system is totally not available for the sanctuary. Presently the staffs are using their personal mobile for their field works.

CHAPTER - 1V

Development Programmes and Conservation Issues

4.1. SWOT Analysis

A synoptic account of the SWOT analysis that has been undertaken to enable robust management and conservation of the Vaduvloor Bird Sanctuary is detailed in the following section.

4.1.1 Strength

The Vaduvloor Bird Sanctuary is not a large area (128.10 ha) and it is hence possible to take up innovative management initiatives and implement them. The entire focus of water management so far has been on human uses ignoring requirements for ecological purposes such as maintenance of viable population of winter birds breeding such as the Near-Threatened Oriental Darter and other nesting species.

4.1.2 Weaknesses

Lack of effective institutional mechanism to coordinate activities at various levels within the state government for conservation and development of Vaduvloor Lake and its catchments is the major factor for degradation of the lake environment. Although several agencies are involved in the implementation of the sectoral activities for socioeconomic development, often they lead to impacts on regenerative capacity of the lake ecosystem.

4.1.3 Opportunities

Management planning for natural resources management essentially requires involvement of concerned stakeholders in both planning & implementation. Only a few villages are located around the sanctuary and hence it is feasible to protect and manage the sanctuary along with its biodiversity in the long run.

4.1.4 Threats

There is no serious threat from development activities and also from other biotic interferences from local communities. Grazing by livestock in the tank is not a major threat to the eco system. Only the invasion of alien plant species is the threat to the bird habitat which is being addressed by the forest authorities as part of strengthening eco system.

De-silting of the tank has not been carried out since declaration, so the inflow water quantum and subsequent runoff is totally affected leading to very little water being impounded and much of the water being drained out.

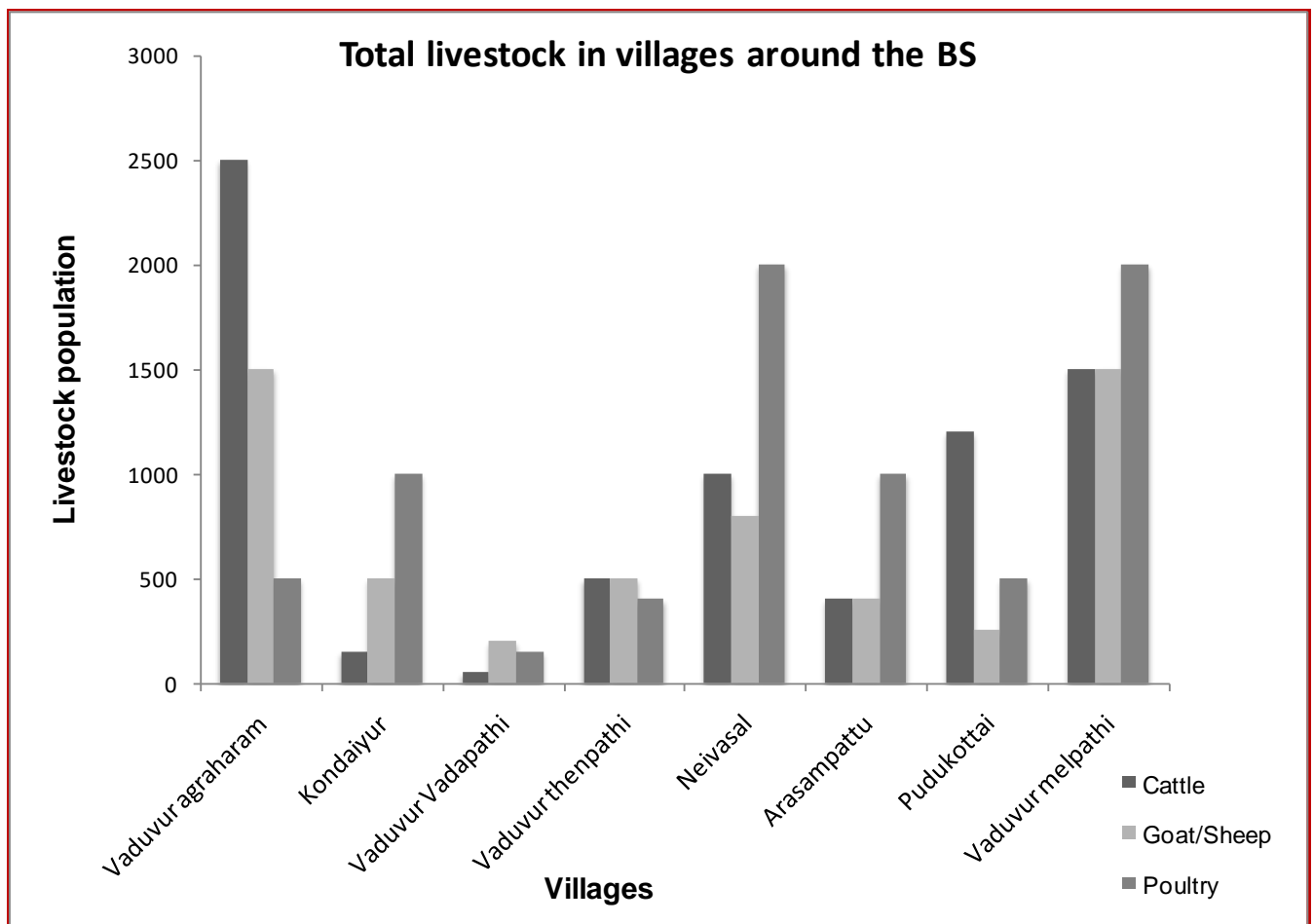
4.1.5 Critical Review and Result of Past Intervention

In the adjacent landscapes, traditional rain-fed crop varieties have been replaced by high yielding but water intensive seed varieties since 1970s. The land use of the basin is dominated by agriculture, which accounts for 90% of the land use. The lake basin has a semi-arid climate, with three seasons, namely summer, rainy and winter. Rainfall is received from the southwest as well as northeast monsoon. Temperature ranges between a low of 20°C in winter to above 40°C during peak summer. The average rainfall is 1200 mm within the Lake area. Failure or delayed monsoon can lead to drought like situations in the Lake and its environment. Depressions in the Bay of Bengal are common and are generally experienced between October and January and it could cause heavy rain. Basin has shallow and medium black cotton soil and sandy alluvium. Fresh alluvium soil is being deposited every year by irrigation water received from Mettur dam. Rocks are absent in the soil. Humus content of soil is low but calcium content is high possibly due to accumulation of bird droppings and skeletal remains of aquatic life forms. The basin is highly populated. Agriculture is the primary economic activity in the basin.

4.1.6 Challenges and way forward

The greatest challenge to the management of the bird sanctuary is increasing invasion of alien plant species and free movement of people from all sides without any barrier. Periodical removal of alien species is being undertaken every year but the invasion is massive in some areas of the sanctuary. To control the movement of livestock, eco-friendly fencing is proposed surrounding the boundary of the sanctuary. Main challenge is retaining minimum water level in whole year for which regular deepening is necessary and silt should be transported away from the Sanctuary. Disposal of silt will be fixed with co-ordination of District administration.

Livestock Details in villages around the Vaduvvoor Bird Sanctuary



Source: Care Earth / TBGP/Wetland Action Plan 2013-18

Aquatic Grasses and herbs are also common and attracts bird species



Water grasses are also distributed in the sanctuary



Invasion of alien species is a serious threat to the sanctuary



Invasion of alien species is a serious threat to the sanctuary



PART - II

CHAPTER - V

5.1 Vision

Protection, restoration and conservation of wetlands for the cause of biodiversity conservation and human wellbeing.

5.2 Mission

To restore, develop and manage the Vaduvloor Bird Sanctuary as a critical breeding habitat for the large wetland birds of India, while also providing opportunities for local people, naturalists and visitors from other parts of the state and country, to appreciate and learn about nature and its components.

5.3 Objectives of Management

- i. Provide adequate protection to the birds visiting the sanctuary and their habitat.
- ii. Carry out habitat improvement activities for providing maximum opportunity to the visiting birds for feeding, breeding and roosting through habitat restoration.
- iii. Promote eco-tourism and create awareness on bird conservation.
- iv. Promote eco-development activities and reducing the dependence on bird habitats.

Specific goals are to asses and evaluate;

- a. Factors affecting the integrated land management and eco system of Vaduvloor Bird Sanctuary
- b. Threats to the bird habitats
- c. Significance of Bird Habitats
- d. Restoration of Bird Habitats
- e. People's Participatory Approach for improvement of habitats
- f. Restoration schemes for conservation and management
- g. Restoration schemes addressing tourism improvement
- h. Awareness programme with stakeholder's participation

All the goals are approached with the following management components which are directly related to habitat restoration of bird habitats and thus benefit the local communities.

1. Water Management and Habitat Restoration
2. Biodiversity Management
3. Socio economic Development and Livelihood Improvement and
4. Eco-tourism improvement with forestry extension activities

Need for Habitat Restoration

The land use of the water tank of Vaduvloor Bird Sanctuary is dominated by agriculture, which accounts for 90% of the total land use area in this region. The lake basin has a semi-arid climate, with three seasons, namely summer, rainy and winter. Rainfall is received from the Southwest as well as Northeast Monsoons. The average rainfall is 1200 mm within the Lake area, Failure or delayed monsoon can lead to drought like situations in the Lake and its environment. Basin has shallow and medium black cotton soil and sandy alluvium. Fresh alluvium soil is being deposited every year by irrigation water received from Mettur dam. The basin is highly populated with land use by people. Agriculture is the primary economic activity in the basin. Thus, there is a strong need for habitat restoration for the Vaduvloor Lake with scientific management interventions with the involvement of local communities.

5.4 Problems and Issues: Solutions

The intense practice of integrated land use practices in and around the Vaduvloor Bird Sanctuary are challenging to the bird sanctuary. The birds visiting the sanctuary often go to the surrounding agricultural fields for feeding and return to the sanctuary for shelter and roosting. The APW are engaged for providing adequate protection to the birds outside the sanctuary. It is need not be mentioned that for ideal maintenance of the bird habitat, water in the tank is required for at least eight months in a year. Such a pattern is not possible as availability of water in the tank depends upon release of water from Mettur dam and regularity of

Northeast Monsoons. Weed encroachment is a major problem of the sanctuary. Presently, nearly half of the sanctuary area is under *Ipomoea* encroachment. This has greatly reduced the water spread area which is available to the water birds. Weed removal and de-silting are two major challenges and problems to the sanctuary. It is also necessary to ensure water during the summer season for resident birds. Therefore, creation of smaller ponds to store water during summer season is the highest priority.

Threats from livestock is common during the dry season





CHAPTER - VI

Future Strategies

6.1 Strategies

6.2 Harmonisation

In view of the historical association between the local communities and birds, as also the concrete measures undertaken by the Department to engage with the local communities, notably farmers on the issue of protecting birds, there are no major conflicts in the sanctuary area.

6.3 Management of admitted rights

Determination of rights:

1. The boundary of the land for which permission is given for Birds Sanctuary should be 50 metre away from the inner toe of the bund
2. Determination will be done by the survey officials of the Revenue Department in the presence of the Public Works Department and the Department Officials.
3. The Forest Department does not object to action taken by the Public Works Department of the eri. The Public Works Department staff reserve their right for free access to any part of the land area for their routine inspection and for attending allied matters/connected therewith.
4. The Public Works Department has got the right to regulate the water supply and release the same to ayacut lands.
5. The Forest Department should not do anything that might obstruct or affect the free flow of water to the leading channels of sluices in the eri.
6. The Forest Department should inform their plan of action to the Public Works Department authorities. The objections of the Public Works Department authorities on the plan of action of the Forest Department should be necessarily taken up for consideration.
7. The Forest Department in consultation with the Public Works Department may make improvements to the Sanctuary.
8. A committee shall be constituted in due course, with Collector as Chairperson and Members from Public Works Department, Forest and Revenue Departments which shall meet bi-annually to decide on any important issue arising from time to time.

Details of monitoring committee proposed to constitute for Vaduvur Birds Sanctuary

Sl. No	Category	Designation	Proposal
1	Chairman	District Collector	District Collector, Thiruvarur District
2	Member Secretary	District Forest Officer	District Forest Officer, Thiruvarur Division, Thiruvarur
3	Member	Executive Engineer	Public Works Department , Vennar Division, Thanjavur
4	Member	Revenue Divisional Officer	Revenue Divisional Officer, Mannargudi
5	Member	Thasildar	Mannargudi Taluk, Mannargudi

6.4 Human disturbances, its effects and management

Because of its location along the highways and the earthen mound are well surrounded with trenches filled with water, absolutely no threat for the nesting birds either from the poachers or the visitors. The open water zones are also not accessible by walk during the migratory season, no possible entry for the intruder. Under the Indian Wildlife Protection Act (1972), hunting of all resident and migratory water birds species is banned. Grazing pressure on the lake is a serious threat to the birds during summer period.

There is a possibility for disease spread from livestock to wild ducks and other species vulnerable to contagious diseases. Avian influenza is a disease caused by a virus which has multiple strains or types, some of which are more dangerous than others. Influenza is divided into three types: a, b and c. type a. influenza includes most human and all avian influenza viruses. Highly pathogenic avian influenza is rarely found in waterfowl, but causes severe disease in domestic poultry with a high death rate. The H5N1 virus is the strain of avian influenza that has infected numerous species of birds in Asia, Europe and Africa since the end of 2003.

Native species are planted in the tank to restore habitats



Avian flu viruses have been found in many bird species, but are most common in shorebirds such as **sandpipers** and **plovers** and **waterfowl** such as **ducks**, and **geese**. Influenza virus has been found in wild birds throughout the year, but waterfowl is the only group where it occurs year round. Birds that become infected with avian influenza viruses often show no symptoms or have only mild illnesses, but certain highly pathogenic strains can cause serious disease and mortality. Generally the wild bird species those are affected with the Bird Flu are commonly noticed for the following bird communities: Wild water birds, particularly those within the orders Anseriformes (waterfowl) and Charadriiformes (shorebirds and gulls) are the natural hosts and reservoirs for the low pathogenic form of AIV, which is replicated in the intestinal tract, shed through feces, and transmitted via the fecal-oral route. The role of wild birds in the transmission of h5n1 currently remains unclear. It appears the primary mode of spread in Asia has been in the poultry trade, but migratory wild birds are recognized as a secondary source of spread (3 of 21 countries). Monitoring is being done to find out the evidence of bird flu in migratory birds by analysing dead specimen with proper investigation technique.

6.5 Strategies for Water Level Manipulation and Control

Conservation and sustainable development of any water bird sanctuary requires integrated planning for management at the river basin recognizing the inter connectedness with its catchments and coastal processes. As the river basin are located in Karnataka and water flow for the sanctuary is from the Mettur Dam, the issue of catchment treatment is not relevant to this bird sanctuary. In addition to the conservation of water birds, the major purpose is to establish the effective management practices for restoration of the wetland system for the ecological and economic security of the people dependent upon the wetland resources for their livelihoods. The water source management will be looked into the following ways as part of improving the water regime capacity to the bird sanctuary.

1. Assessment of current water use and identification of conflicting interests

2. Propose measures for enhancement of water holding capacity using ecologically sustainable interventions
3. Develop action plan for rejuvenation for wetland and optimize water regimes and
4. Develop framework for water management considering human and ecological demands

River basin planning requires understanding of the carrying capacity of the river basin with a view to produce desired goods and services from limited resource base and achieve equitable quality of life while maintaining desired environmental quality in the region.

Planning for sustainable development calls for trades off between desired production and consumption levels. It also emphasises on development of supportive mechanisms within the generative capacity while maintaining the environmental quality. The challenge, therefore, is to conserve wildlife sanctuary with its rich biodiversity while providing sustained economic benefits to the stakeholders. The management planning framework seeks to balance between conservation of wildlife sanctuary and providing economic incentives to the stakeholders through sustainable resource development. It also seeks to ensure an effective institutional mechanism that harmonizes planning at various levels with participation of all concerned stakeholders to achieve the objectives of integrated conservation and sustainable resource development. Project implementation mechanisms have been defined to achieve the management objectives identified under the action plan, with special emphasis on economic development of the stakeholders through alternate / additional resource development.

Management Intervention

Sl. No	Activities	Expected Outcomes
I.	Strengthening the Boundaries	
1.	Construction of Protection wall all around the sanctuary boundary	Prevent the entry of trespassers and poachers, encroachment, illegal fishing, soild waste dumping and other threats to the wetland. In total, an intact boundary is established.
2.	Providing revetment arrangements in the boundaries of the sanctuary	
3.	Engaging Anti - poaching watchers round the year @ 6 Nos per month for 5 years	Through check in hunting in the sanctuary area and in areas that augment migratory birds thereby leading to increase in number of migratory visitors.
4.	Deepening and strengthening the existing sanctuary boundaries and formation of mud flat islands using the excavated earth at the lake dependent birds and for planting aviphilic trees over them	Increase in resting grounds for birds favours foraging, favours tourist attraction. In a long run, the transitory resting site shall get transformed into a breeding ground.
5.	Eradication of unwanted exotic weeds in the lake	This favours indigenous aquatic vegetation and the aqua fauna dependent on it. Reduction in weed growth results in increase in dissolved oxygen, favouring fish life, reduction in release of toxic exudates, improved change in water taste, colour and odour making water potable, reduction in phytotoxicity, reduction in pathogen load, eutrophication.

Awareness Creation & Capacity Building		
6.	Erection of signages	<ul style="list-style-type: none"> • Increase the responsibility of the tourists. • Regularization in tourist flow and resource use. • Equipment of frontline staff in bird identification and documentation. • Detailed database on bird species abundance and population. • The above database can help to upgrade the status of the sanctuary into a Ramsar site.
7.	Eco-bird voice along the natural trail	
8.	Creating Children eco-learning park	
9.	Conducting Eco-Camps to students Public	
10.	Capacity Building Training programme for field staff / line department agencies / ETC/ EDC members	
11.	Printing publicity materials of stickers pamphlets etc	
12.	Conducting Bird Census	
Eco-Tourism & Infrastructure Development		
13.	Construction of visitors hall	<ul style="list-style-type: none"> • The Infrastructure creation focuses on promoting eco-tourism. • Increase in tourist flow to Vaduvur. • Regulating tourist movement in the sanctuary area thereby minimizing disturbance and maximizing resting time (this favour foraging and breeding)
14.	Construction of Anti-Poaching shed	
15.	Creating visitors resting place	
16.	Maintenance of existing path way	
17.	Providing drinking water facilities to the tourist	
18.	Purchase of binoculars for viewing water birds	
19.	Providing current consumption LED lamps	
20.	Providing paver block path way arrangements	
21.	Establishment of wooden eco-sheds and cafeteria	
22.	Providing dust pins	
23.	Clearing the natural trail	

Research and Development		
24.	Engaging an Eco-Guide	The research outcomes are aimed at increasing knowledge on the wetland and its biodiversity primarily to derive management interventions. The knowledge on weed inflow, spread, invasiveness, water inflow and outflow, moisture gradient change, siltation, source streams management shall increase. Only this can prevent ecological degradation of the wetland.
25.	Engaging a wetland consultant cum wildlife biologist for 5 years	

CHAPTER - VII

Protection Plan

The protection plan is detailed to focus on birds (the nominate species of the sanctuary) while according equal importance to the supporting habitat viz. the Vaduvor wetland.

7.1 Birds

1. With specific reference to birds, the following are proposed:
2. Strengthening of existing network protected areas in and around the sanctuary
3. Establishment of a conservation reserve/bird sanctuary to extend to areas of the lake not covered by the current boundaries
4. Networking with state and national government and non-government agencies and institutions to implement cooperative and collaborative actions for water bird management and conservation initiatives.
5. Involvement in activities to implement priorities of International Treaties (including CAF Action Plan, CMS, Ramsar, CBD).
6. Involvement of local communities in water bird and habitat conservation programme
7. Involvement of government agencies, academic institutions and NGOs in inventory and monitoring of water birds and their eco system
8. Establish a long-term intensive monitoring programme for wetland birds.
9. Establish a bird migration study programme for breeding and migratory water birds, in collaboration with local and international expertise.
10. Establish Bird Health Surveillance and Monitoring Programme for breeding and migratory water birds, in collaboration with local and international expertise.

7.2 Habitat

The following are the suggested steps as part of habitat improvement in the sanctuary.

- a) Enhancement of native food and cover plants as a resource base for water birds
- b) Maintenance of open water areas and proportionate emergent vegetation diversity to respond to the wide diversity of feeding and nesting habitats required by different bird species.

Biological Indicators

1. Abundance of food and shelter plants
2. Increase in density and population of benthic fauna
3. Enhancement of fish dependent water bird populations.

Strategies

- a) Maintaining connectivity of existing bird sanctuaries and other wetlands in the Vaduvor Lake and surrounding wetlands
- b) Restoration of encroached land (if any) to enhance area of water bird habitats.

Control of invasive species

- a) Reduce the prolific growth of exotic (non-native) aquatic plant species: Coverage of *Prosopischilensis*, *Eichhorniacrassipes* and other species is reduced and
- b) Mitigate proliferation of introduced invasive fish species eg Tilapia species.

Strategies

- a) Control of *Prosopischilensis*, *Eichhorniacrassipes*, *Ipomoeacarnea* and other species to provide additional water holding capacity and enhancement water depth and water spread area
- b) Development of micro enterprise based on manufacturing of handicrafts through processing of the invasive plant species. The enterprise would also be a viable alternative for income generation and at the same time would contribute to management of invasive plant species
- c) Integrated control measures using mechanical and biological methods should be adopted

Enhance aquatic habitats and aquatic species diversity:

Acacia nilotica and other species (Lilly, lotus) plantations have been raised and regular monitoring is being carried out by the Department. To control the movement of livestock cattle grazing in the summer season Anti-poaching watchers are engaged.

Removal of Invasive Species:

Weed removal has been done periodically in the sanctuary by using daily wages workers. Annual removal of *Ipomoea* and other weeds is to be carried out for creating more water spread area for birds. The exotic species such as *Eichhorniacrassipes*, *Salviniaauriculata*, *Pistiastratiotes*, *Lemna minor*, *Wolffiasps.* and *Azollapinnata* often form thick mats in different areas of the lake and thus alter the native vegetation. These species affect the overall composition of aquatic plants in many areas. Water Hyacinth and *Ipomoeacarnea* are the two invasive weeds replacing the native macrophytes, the major attractants to the migratory and resident ducks. The rapid expansion of these species would ultimately affect the biodiversity of the Lake including birds and ultimately affect larger heronry species for nesting and facilitate the free movement for the swimming birds.

Created bunds and ponds:

Bunds and ponds provide good water source and shelter for the migratory and residential bird. So smaller ponds and bunds were created and plantation was done on the bunds in this Sanctuary. The bunds was properly repaired and strengthened periodically with engaging the daily wages workers. The mounds are utilized by larger birds e.g. White Ibis, Asian Openbill and Indian Cormorant for nesting and roosting. The open waters between the mounds were found to be inhabited by ducks and coots.

Enhance peripheral and nearby terrestrial habitats for birds:

This Sanctuary is surrounded by agricultural fields. The birds that are frequently visit the agro fields e.g. Oriental White Ibis, Asian Open bill, and Egrets were often hunted or capture alive by the local villagers and Narikuravas. Hence, to minimize the conflict between farmers and the management, fruit bearing plants on the peripheral area of the Sanctuary. E.g Barringtonia, banyan tree, screw pine plant have been planted.

Monitor/ Document aquatic vegetation:

Documentation of the flora including aquatic vegetation and fauna (Birds, Mammals, Reptiles, fishes Amphibians, Dragonflies, Damselflies, and Butterflies) of the Sanctuary is validated by interacting with experts through the photographs taken from the Sanctuary. The check list will be made by the biologist engaged by the department and the preliminary work has commenced.

Monitor bird diversity and abundance 2013-14

Annual census of water birds is carried out in the month of November-December when species variety and population is high. The practice of taking daily water bird count during migratory season was introduced in September 2000 and the register is maintained properly by the management.

Monitor bird diversity and abundance 2014-15

Annual census of water birds would be carried out when species variety and population is high. Bird diversity, Species diversity, preferable plant species for the bird, introducing artificial nests and observed the utilization will be monitored. A limited number of bird count stations will be established at random location in the sanctuary and the bird count will be regularised throughout the season.

Routinely survey birds for contagious diseases (e.g. bird flu)

Managers receive basic training in routine checking for outbreaks of avian flu and any other diseases transmitted by birds. However the veterinary doctor from respective division visits the sanctuary in a periodical manner to assess the wetland and the register is properly maintained by the management. Daily wage labourers were engaged with the doctor for helping the field work and operating the boat.

Interpret and display research findings in multi-media for benefit of visitors (Tamil & English)

Every year students come to the sanctuary from various colleges and participate in water bird census. The management is now preparing the video documentary on Vaduvor water birds. This will be going to telecast with good multi-media instruments to the visitors in interpretation centre which is under construction. Further bird callings, puzzles will be the benefits of the visitors it will create the awareness to the visitors on Vaduvor bird sanctuary and birds.

7.3 Watershed

An evaluation of the current water use pattern within the Vaduvor Bird Sanctuary highlights the following facts:

- a) Domination of water use by agriculture
- b) At present there is no mechanism in place to assess sustainability of the water use pattern and integration of ecological requirements.
- c) Increasing intensification of water use in agriculture due to changes in cropping pattern and increase in irrigated area.

Traditional rain-fed crop varieties have been replaced by high yielding but water intensive seed varieties since 1970s. The land use of the basin is dominated by agriculture, which accounts for 90% of the land use. The lake basin has a semi-arid climate, with three seasons, namely summer, rainy and winter. Rainfall is received from the southwest as well as northeast monsoon. Temperature ranges between a low of 20°C in winter to above 40°C during peak summer, the average rainfall is 1200 mm within the Lake area. Failure or delayed monsoon could lead to drought like situations in the Lake and its environs. Depressions in the Bay of Bengal are common and are generally experienced between October and January – can cause heavy rain. Water mostly received from Mettur dam.

Plantations of *Acacia nilotica* in the Bird Sanctuary



Planting Water Lilli and Lotus

Removal of invasive plants



Removal of invasive plants



Removal of invasive species



Created bunds and ponds



Created bunds and ponds



Enhance peripheral and nearby terrestrial habitats for birds



Enhance peripheral and nearby terrestrial habitats for birds

Enhance peripheral and nearby terrestrial habitats for birds



Details of advisory committee proposed to constitute under Section 33B of Wildlife Protection Act 1972 for Vaduvur Birds Sanctuary

Sl. No	Category	Designation	Proposal
1	Head	Conservator of Forest	Conservator of Forest, Trichy Circle, Trichy
2	Member Secretary	District Forest Officer	District Forest Officer, Thiruvarur Division, Thiruvarur
3	Member	Member of Legislative Assembly	Member of Legislative Assembly, Mannargudi
Representatives of Panchayat Raj Institution			
4	Member	Panchayat Union, Chairman	Panchayat Union, Chairman, Mannargudi
5	Member	President, Vaduvur Agraharam Village	President, Vaduvur Agraharam Village
6	Member	President, Vaduvur Vadapathi Village	President, Vaduvur Vadapathi Village
7	Member	NGO	Dr. N. Sivaganesan Executive Director Wildlife and Environment Trust- WET No-40, Kavarai Street Mayiladuthurai
8	Member	NGO	Dr.N. Balachandran, BNHS Kodiyakkarai
Individual active in the field of Wildlife Conservation			
9	Member		D.Rajesh, M.Sc Zoology, S/o. R.Durai, Vellamandapam, East street Kudavasal, Thiruvarur Dt. Pin. 610 107. Mobile No. 8220696686

10	Member	-	R.Rajasekaran, B.Sc, B.Ed., (Zoology & Biological Science), S/o. K.Ravimaran, Injikkollai, Kumbakonam Taluk, Thanjavur Dt. Pin. 612 605 Mobile No. 8012092914
11	Member	-	T.Senthil Kumar, M.Phil, Zoology S/o. R.Thanikodi, Kodiyavinayakanallur, Arunthavapulam Thirukkuvalai Taluk Nagapattinam Dt. Pin. 614 711. Mobile No. 9688522194
One representative each from department dealing with Home and Veterinary matters			
12	Member	-	Revenue Divisional Officer, Mannargudi
13	Member	-	Joint Director Animal Husbandry, Thiruvarur
Honorary Wildlife Warden			
14	Member	-	Dr.N.Sivaganesan, Ph.d, has been proposed to appoint as honorary Wildlife Warden to Vaduvur Birds Sanctuary vide this office reference No 2044/2015 /D dated 14/09/2015

CHAPTER - VIII

Management Intervention

8.1 Conservation and Restoration of Degraded Habitat

Habitat restoration activity is focused with active management issues based on existing activities of the Vaduvor Bird Sanctuary which primarily includes land and water management, biodiversity conservation, and socio-economic aspects. The key issues will be identified based on gaps in the existing management practices and key issues emerging out of hydrological processes and changes in biodiversity. The human interventions and people's participatory programme are being considered for execution of habitat restoration as mentioned below

1. Development of Feeder Channel
2. Periodical De-silting
3. Monitoring of Aquatic Vegetation
4. Delineation of Zones and Distribution of Bird Species in relation to critical areas
5. Inter linkages of Hydrological processes and Biodiversity Conservation Issues
6. Conservation Strategies of Bird Sanctuary and Providing Economic Incentives to Stakeholders through sustainable resource development of the Sanctuary.
7. Enhancing water holding capacity through removal of alien plant weeds

Management of Drainage System

There is no perennial water source in the sanctuary. The sanctuary is an irrigation tank used for storing water for agriculture. It receives water from Mettur Dam from August till January.

a. Improvement of Hydrological Regimes

Water inflows and outflows to the lake should be estimated with the help of hydrological experts. Comparison of Satellite imageries of 8-10 years back of Vaduvor basin with the existing imageries to understand the changes in the land use pattern and crop pattern could help us to develop action plan on hydrological regimes.

b. Developmental Activities:

The impact of agriculture in and around the bird sanctuary should be evaluated.

c. Institutional Support:

Forests, Horticulture, Soil Conservation, Environment and Remote Sensing, Science and Technology, Agriculture, Fisheries, Public Health Engineering, Rural Development, Khadi and Village industries, Tourism, and Revenue are involved in various developmental activities of the Vaduvor Lake. The main activities of these institutions relate to implementation of various programmes for land and water management, socio-economic development and conservation of natural resources. This institutional mechanism has to be evaluated with periodical workshops and awareness camps for them.

Restoration of Breeding Habitats

Nesting bird habitats/ site specific locations in the sanctuary are:

- a) Marshes where floating nests are built in floating vegetation
- b) Reed beds and tall grasses
- c) Trees and bushes
- d) On the ground around streams

These areas are used by 45 species of birds. The food habits and feeding styles of these breeding species depend on a variety of aquatic vegetation (including seeds, stems, leaves, and corms), aquatic and terrestrial insects and their larvae, small to large sized fish, amphibians, molluscs and slugs, crustacean, worms and even rodents. Proper habitat modifications techniques are needed to the above nesting sites with suitable habitat matrix for the species.

The restoration of the lake would result in suitable environmental conditions, which will provide better habitats for water birds to exploit the resources. This provides an important opportunity for systematic studies through regular monitoring of entire lake system. Such a study will also provide the basis for updating of management actions in relation to water level controls, management of areas for different vegetation types and cover regimes, prey abundance

Existing tourist's facilities at the sanctuary



Existing tourist's facilities at the sanctuary



Biodiversity: Habitat Restoration

The following aspects to be improved as part of habitat restoration

- a) Improved knowledge of year-round habitat requirements of birds, especially migratory and breeding water birds in the Vaduvor Bird Sanctuary and surrounding wetlands and conservation priorities.
- b) Increased carrying capacity of the Vaduvor Bird Sanctuary and surrounding wetlands for birds, especially migratory and breeding water birds.
- c) Improved knowledge of migration strategies, precise international and national migration routes (including breeding, staging and non-breeding sites) and linkages of water birds using the Vaduvor Bird Sanctuary and surrounding wetlands.
- d) Control of poaching through strengthening existing network of protected areas
- e) Establishment of a bird sanctuary/conservation area in unprotected areas of the Lake

- f) Involvement of local communities through formation of bird protection committees
- g) Improved understanding of the health of birds (particularly of zoonotic diseases, which have the potential for transmission to people).

With the implementation of habitat restoration the following habitat indicators would be visible in the bird sanctuary

Visible Habitat Indicators with the implementation of habitat restoration schemes:

- a) Water bird species (Diversity and Abundance) are improved
- b) Populations of threatened and vulnerable species are protected
- c) Populations of all breeding water bird species is increased through improvement of breeding habitats with suitable habitat conditions
- d) Information on migration strategies and precise routes of major long distance migrant and local migrant water bird species is available
- e) Long term water bird population monitoring information is available
- f) Long term surveillance information on the health of birds (particularly zoonotic diseases) is available.

Invasive Species: Habitat Restoration

Strategies:

- a) Control of *Prosopischilensis*, *Eichhorniacrassipes*, *Ipomoeacarnea* and other species to provide additional water holding capacity and enhancement water depth and water spread area
- b) Development of micro enterprise based on manufacturing of handicrafts through processing of the invasive plant species. The technology for using natural fiber for manufacturing of handicrafts is available through several organizations (for example, Kottapuram Integrated Development Society) the enterprise would also be a viable alternative for income generation, and at the same time would contribute to management of invasive plant species.
- c) Integrated control measures using mechanical and biological methods may also be attempted

Habitat Improvement: The following activities are suggested for habitat improvement:

- a) Creation of earthen mounds and planting them with suitable perching trees.
- b) *Acacia nilotica* plantations can be raised on northern boundary for the benefit of birds.
- c) Annual removal of *Ipomoea* and other weeds to be carried out for creating more water spread area for birds.
- d) De-silting of the tank needs to be carried out on a priority basis. The tank depth needs to be increased by a meter. This shall retain more water for birds as well as for agriculture. The de-silted soil should be removed outside the sanctuary area. For removal of the de-silted soil necessary permission may be obtained from the District administration.
- e) Sanctuary bund needs to be repaired and strengthened. Defecation on the bunds by the local people has to be discouraged.
- f) Creation of smaller ponds of 50mx50m size to store water during summer season.
- g) Purchase of boats for management of water spread area and monitoring

8.2 Management of Eutrophication, Water Quality, Pesticides and other Chemical:

The Lake had an excessive growth of invasive species often forming dense mats, the most common being *Ipomoea aquatica*, *Eichhornia crassipes*, *Salvinia suriculata*, *Ottelia alismoides*, etc. Prolific growth of vegetation in the lake is primarily attributed to high concentrations of inorganic nutrients present in the lake waters, entering the lake in the form of agricultural run-off through various deltaic drains and channels. Thus water quality turns to be more of eutrophication with the influence of usage of chemicals and pesticides in the agriculture fields and the runoff water accumulate these substances into the lake. Such a process of change in the water quality might affect the food resources to bird species.

8.3 Direct Intervention

The practice of management issues with direct intervention is attempted in the below mentioned ways to improve the habitat quality of bird habitats

1. Management of water regimes
2. Habitat restoration activities
3. Biodiversity improvement
4. Socio economic development of local communities adjoining the bird habitats

8.4 Intervention to Improve Availability of all forms of food

Management intervention is tailored to improve the bird habitats to enrich food resources in the lake for migratory birds. The following are major steps to achieve the increasing trend of food availability in the lake.

- a) Propose measures for management of aquatic vegetation and control of invasive species to bring more diversity of insects and fish fauna into the lake ecosystem
- b) Propose measures for enhancing diversity of fish and other aquatic species with proper protection of lake
- c) Assess threats to water birds due to habitat modifications including water level changes and vegetation characteristics and minimize the threats to improve all forms of food items to migratory birds
- d) Develop monitoring mechanisms and research areas for assessment of migratory and residential water bird populations

8.5 Management techniques for conservation and protection of bird habitats

Management efforts are largely focussed on the following components:

- a) Habitat restoration to bring a better habitat quality in aquatic habitats that supports wintering birds
- b) Water augmentation in the tank for creating suitable critical areas for bird species
- c) Protection of water tank to maintain adequate food resources to birds
- d) Provide provision for roosting of birds by altering vegetation growth in densely covered areas
- e) Plantation in bunds for bird's shelter in the tank

Protection measures those are adopted to protect the bird sanctuary against encroachment is the highest priority as part of protection of bird habitats. The existing field personnel of the sanctuary consist of one Forester, Forest Guard, and Anti-poaching watchers. While posting field staff in the field care has to be taken to ensure persons with inclination to work in wildlife divisions. The traditional bird trappers are bring into a mechanism of awareness programme and nearby villages should be concentrated for this exercise. Adequate protection should be provided by front line staff to control the poaching outside the sanctuary. The following activities are suggested for protection.

- a) Creation / redeployment of one more Forest Watchers to strengthen the protection with Forest Guard
- b) Construction of residential quarters for field staff
- c) Engaging protection watchers for anti-poaching activities
- d) Identification of vulnerable areas outside the sanctuary for poaching incidences.
- e) Identification of nearby water bodies and wetlands which supports the bird population in and around the sanctuary.
- f) Engaging protection watchers for strengthening the protection of birds in vulnerable areas outside the sanctuary and water bodies
- g) Providing communication equipment's as part of strengthening protection.

8.6 Management of Water catchment areas and the channels

Feeder Channel Maintenance:

Develop action plan for treatment of feeder channel for soil erosion and sedimentation control and flow regulations through limited engineering and other appropriate (manual) measures.

Water Management

The water management in the park is ensured with a careful evaluation as mentioned below to attract bird species diversity and abundance in the lake:

- a) Assessment of current water use and identification of conflicting interests
- b) Propose measures for enhancement of water holding capacity using ecologically sustainable interventions
- c) Develop action plan for rejuvenation for wetland and optimize water regimes
- d) Develop framework for water management considering human and ecological demands
- e) Assess current threats to biodiversity due to changes in hydrological regimes, pollution and other anthropogenic pressures

8.7 Management of Seasonal Flooded Areas

The influx of more water into the bird sanctuary from the nearby channels and agriculture fields with the impact of seasonal flood is being regulated through an outlet mechanism being maintained by the PWD. Moreover there was no seasonal flood has been witnessed in the lake with the influence of water from Mettur Dam and also rain from depression in Bay of Bengal.

8.8 Removal of Invasive Species

The exotic species like *Eichhorniacrassipes*, *Salviniaauriculata*, *Pistiastratiotes*, *Lemna minor*, *Wolffiasps.* and *Azollapinnata* often form thick mats in different areas of the lake and thus alter the native vegetation. These species have reached a status and thereby affect the overall composition of aquatic plants in many areas. Water Hyacinth and *Ipomoeacarnea* are the two invasive weeds replacing the native macrophytes, the major attractants to the migratory and resident ducks. The rapid expansion of these species would ultimately affect the biodiversity of the Lake including birds and ultimately affect larger heronry species for nesting and facilitate the free movement for the swimming birds. Therefore, it is recommended to thin the lower and inner branches of *Acacia nilotica* trees where ever distributed.

8.9 Grazing Management

Livestock grazing takes place during the summer months from April to August when the tank remains dry for three to four months. Impact of grazing is not a serious problem for the sanctuary as there are no birds in the sanctuary during grazing period by livestock. As food preferences for cattle and birds are different, grazing is not much of a threat to the visiting migratory birds. However, the grazing of cattle could pose a serious threat to the plantation on mounds and bunds besides spreading off contagious diseases.

The sanctuary authorities deploy the anti-poaching watchers regularly to drive the cattle from the lake during the dry season. However, grazing in the tank is banned during the winter period when the birds arrive in large numbers.

It is also planned to make a physical barrier surrounding the bird area to prevent cattle from invading into the sanctuary. A mutual reciprocal agreement between villagers and forest authorities will be prepared as part of grazing management. It is also necessary to conduct a field investigation about the merits and demerits of impact of cattle on the dynamics of Vaduvor Bird Sanctuary.

8.10 Strategies for Holistic Approach to Integrated Management of the Watershed

An evaluation of the current water use pattern within the Vaduvor Bird Sanctuary and Habitats highlights the following:

- a) Domination of water use by agriculture purpose
- b) At present there is no mechanism in place to assess sustainability of the water use pattern and integration of ecological requirements for both local people and lake.
- c) Increasing intensification of water use in agriculture due to changes in cropping pattern and increase in irrigated area in and around the bird habitats.

- d) The traditional rain-fed crop varieties have been replaced by high yielding with water intensive seed varieties since 1970s. The land use of the basin is dominated by agriculture, which accounts for 90% of the land use. The lake basin has a semi-arid climate, with three seasons, namely summer, rainy and winter. Rainfall is received from the southwest as well as northeast monsoon.

Temperature ranges between a low of 20°C in winter to above 40°C during peak summer. The average rainfall is 1200 mm within the lake area. Failure or delayed monsoon can lead to drought like situations in the Lake and its environment. Depressions in the Bay of Bengal are common and are generally experienced between October and January can cause heavy rain. Fresh alluvium soil is being deposited every year by irrigation water received from Mettur dam. The basin is highly populated, and is inhabited by high density of people.

8.11 Eco-Development Activities

The policy of Eco-Development is catching up as an alternative strategy for Forest Protection and Conservation, involving local communities in the management of the Protected Areas (especially Buffer Zones). It is being implemented for a few villages adjoining the bird sanctuary by making local level adjustments imperative for matching ground level situation and bird diversity.

Objectives:

The Eco-development objectives of the sanctuary have been designed in line with the general theme that helps effective conservation of the forests through the economic development of the sanctuary which locals depend by adopting an active strategy evolved through micro-planning. Ecological development has to be achieved by adopting a strategy where the bird habitat villagers have zero dependency and resultant impact on the bio-diversity of the Vaduvor Bird Sanctuary. All the uncovered villages within a distance of 3 kms from the sanctuary boundary must be incorporated into the eco-development programme. The existing population may be categorized into: 1. totally dependent 2. Partial dependent and 3. Non- dependent on the water tank.

It is suggested to develop separate eco-development package for each category. The baseline data must be compared after successful implementation of the project. The various indicators of development like per capita income, health care, education status, extent of sanctuary dependency and empowerment of women must be well studied in all the targeted villages.

The EDC Approach:

- 1) Rejuvenating the existing Eco-development committees (EDC) concerned with conservation by educating, motivating and eliciting participation in the eco-development villages. The guidelines prepared by the Ministry of Environment and Forests describes Eco-Development as a package of programmes that will demonstrate the concern of the forest department for the socio economic development of the fringe villages leading to promotion of co-operation of the village communities in the conservation and the management of bird habitats.
- 2) Create awareness among the target villages about the value of the fringe areas (in this case: agriculture fields: buffer) focusing on the vision of conservation of wintering bird communities of Vaduvor Lake.
- 3) Achieve reduction in resource dependency (grazing pressure/wood collection/trapping of birds) of the sanctuary by providing alternative livelihoods thereby leading to habitat restoration of wet lands and conservation awareness among local people.
- 4) Provide opportunities for local people participation in sanctuary management through an institutional mechanism.
- 5) Enhance the capacity and upgrade skills of local people for alternate economic activities by way of organizing training courses and workshops on a periodical manner.
- 6) Active collaboration of local people in conservation by reducing adverse impacts of local people on biodiversity and also to reduce the adverse impact on bird habitats from local people providing alternative employment opportunities.

- 7) Provide micro financing with micro enterprises and by promoting self-help groups through revolving fund at village level set up by a corpus fund. Ecological development has to be achieved by adopting a strategy of zero dependence of the sanctuary from sanctuary dwellers

8.12 Factors that attracts migratory birds and its management

The following proximate factors attracts the diversity and abundance of migratory birds in Vaduvloor Sanctuary

1. Extent of water availability in the water bodies (wet lands, ponds, streams and agriculture fields)
2. Availability of aquatic vegetation
3. Abundance of fish and other food items, including aquatic insects
4. Extent of rainy days (Dam water and Monsoon rain besides water sources from depression effect)
5. Availability of critical foraging grounds (creeks/mounds/shallow/wet land areas)
6. Suitable Roosting Sites
7. Purity of fresh water
8. Suitable sites resting and nesting activities
9. Less biotic interference in water tank s
10. Suitable ambient temperature in day time
11. Availability of water at least for 9 months
12. Abundance of water insects in wet lands
13. Diversity of ground vegetation
14. Poor visitor's turn over to bird areas throughout the year
15. Localized availability of food resources throughout the year
16. Availability of open meadows with bunds
17. Selection of new areas by wintering birds in agriculture locations
18. Availability of more fresh water bodies in adjoining sanctuary

Migratory Birds and its Management

The wintering migratory birds to the Vaduvloor Bird Sanctuary are a boon to the lake eco system as part of biodiversity conservation. A variety of options are framed to strengthen the management of the sanctuary for migratory birds. The following are the major components under which the management objectives are addressed for the sanctuary:

Water Management:

Conservation and sustainable development of any water bird sanctuary requires integrated planning for management at the river basin recognizing the inter- connections with its catchments and coastal processes. As the river basin are located in Karnataka and water flow for the sanctuary is from the Mettur Dam, the issue of catchment treatment is not relevant to this bird sanctuary .In addition to the conservation of water birds, the major purpose is to establish the effective management practices for restoration of the wetland system for the ecological and economic security of the people dependent upon the wetland resources for their livelihoods. The water source management will be looked into the following ways as part of improving the water regime capacity to the bird sanctuary.

- a) Assessment of current water use and identification of conflicting interests
- b) Propose measures for enhancement of water holding capacity using ecologically sustainable interventions
- c) Develop action plan for rejuvenation for wetland and optimize water regimes and
- d) Develop framework for water management considering human and ecological demands

Biodiversity Management:

Various bio-diversity components will be executed in the field as part of improving habitat enhancement programme

- a) Management of aquatic vegetation and control of invasive species
- b) Measures for enhancing diversity of fish and other aquatic species
- c) Reduce threats to water birds due to habitat modifications including water level changes and vegetation characteristics
- d) Assess current threats to biodiversity due to changes in hydrological regimes, pollution and other anthropogenic pressures

Socioeconomic Development and Livelihood Improvement:

The major steps to improve socio economic development and livelihood strategies are addressed with the following factors:

- a) Improve and analyze livelihood assets with vulnerability and opportunities for interventions for livelihood improvement of communities
- b) Develop strategies for income generation through micro enterprise based on sustainable use of wetland resources of the Vaduvor Bird Sanctuary
- c) Identify specific interventions in sample villages relating to livelihood improvement based on resource appraisal of land based agriculture activities.
- d) Develop institutional development and capacity building and
- e) Management practices to achieve integrated conservation and management of wetland and its feeder Channel.
- f) Develop an effective monitoring and evaluation system for integrated conservation and livelihood improvement
- g) Generate awareness about the values and functions of sanctuary at various levels within government, communities and related agencies
- h) Identification of critical indicators (e.g. enhancement of bird diversity) for monitoring and evaluation of the strategies adopted for long term conservation of wetland

IV. Participatory Approach:

The broad approach aimed for habitat restoration of bird habitats includes following:

- a) Participatory approaches of involving local communities, NGOs and other stakeholders to ensure sustainability of habitat restoration schemes.
- b) Revival of indigenous knowledge and traditional practices of local communities
- c) Application of knowledge based field techniques for restoration through research and development activities.
- d) Periodic monitoring and evaluation with focus on achieving the goals and objectives rather than merely activities.
- e) The critical problems confronting Vaduvor birds Sanctuary will be thoroughly analyzed to develop better habitat restoration as part of scientific management. The targets under each management objective will be assessed based on rapid field survey.
- f) The Integrated Monitoring and Planning will be focused on biodiversity conservation and maintaining ecological processes and functions through land and water management.
- g) Sustainable resource development is proposed to be achieved through fisheries and agriculture development.
- h) Micro-enterprises involving value additions would provide additional / alternate income generation to the local communities.
- i) Special emphasis has been laid on ecotourism development as an important tool for awareness programme about the wetland values and functions. Institutional development and community participation are envisaged as cross cutting components to achieve sustainable development of wetlands with participatory approach.

V. Eco-Tourism Improvement

The concept of Eco Tourism is proposed as part of conservation and protection strategy for the Vaduvloor Lake and Bird Sanctuary. The module will be planned to protect various endangered species and their habitats of wintering birds. With the implementation of eco-tourism, the integrity of bird habitats is maintained through the participation of local communities along with the support of the forest department. Of late, the Eco Development Committees (EDC) has motivated the local communities in promoting their life style by weaning away their dependency on natural resources. Presently, this practice has been expended to different protected areas for conservation of biodiversity including important bird areas.

The theme of eco-tourism has been focusing the up liftment of village communities in their socio economic development by sharing of their physical inputs to the forest development for its management. This could also benefit different tourist's stakeholders to provide comforts to enjoy wilderness by availing different eco-friendly packages offered to them by the eco-tourism activities. Further, the sanctuary management policy has been targeted to encourage the local communities in taking up responsibilities to launch various eco-friendly activities based on site specific resources and other cultural values. In this context, the Vaduvloor Bird Sanctuary has the potentiality for initiating eco-tourism because of rich biodiversity. Further, this site is famous for its unique bird diversity during wintering period from October to February.

Various eco-tourism activities are proposed to attract the tourists for the sustainability of the bird habitats in the long run. The major tourist facilities proposed as part of eco-tourism for the sanctuary are as follows:

- a) As the area of the sanctuary is very small it is not possible to have a separate tourism zone. The entire sanctuary can be permitted for tourism activity.
- b) More watch towers may be erected on the western bank near Acacia plantation. Eco rest sheds are required to meet the demands of visiting tourists. More camping equipment's need to be purchased for bird watchers.

An interpretation centre with necessary materials may be developed for visitors. A qualified tourist guide-cum-Research Assistant needs to be posted on priority basis. The tank bund of the sanctuary can be converted into a nature trail. This can be done by strengthening the bund, clearing bushes and erecting interpretation signboards along the trail for visitors. More cement benches may be provided on the tank bund for the tourists for bird observation. Interpretation boards have to be erected at strategic places explaining the importance of the sanctuary and importance of birds.

- c) Pamphlets and posters needs to be updated and freely made available for visitors. Eco camps have to be organized in the sanctuary to impart conservation education to various target groups. With the above information on the background the following activities may be taken up to promote eco-tourism and eco-awareness for attracting visitors to the bird sanctuary.

8.13 Rescue and Rehabilitation Plan

There is no scope for rescue of animals except for trapping of birds by traditional people in adjoining crop fields. The trapped birds are released in the presence of District Forest Officer. Rehabilitation plan for traditional bird trappers in the adjoining sanctuary areas could change their life style and they become conservationist. This has been tried in many protected areas and successfully implemented as well. Similar programme could be tried in the sanctuary on a demonstrative scale by identifying traditional bird trappers and involve them in forestry works with suitable alternate livelihood scheme as well.

CHAPTER - IX

(Eco-tourism, Eco-development, Interpretation and Conservation Education)

9.1 The Strategies

Ecotourism, when practiced correctly, is an important economic and educational activity. It has the scope to link into a wider constituency and build conservation support while promoting awareness about the worth and fragility of such ecosystems to the public as a whole. It also promotes the non-consumptive use of wilderness areas, for the benefit of local communities living in and around of the sanctuary, those dependent on these fragile landscape.

9.2 Eco-Tourism

The concept of the eco-tourism could well fit into the Vaduvor Bird sanctuary areas where the lake abutting a few villages in the boundary. It is more realistic to implement the concept of ETC to develop a strong mechanism of reducing the biotic pressure on the bird habitats of the sanctuary which comprises of a variety of biodiversity components, especially diverse assemblages of wintering birds.

9.2.1 Principle

If the present style of conventional tourism is transformed into "*Community Eco Tourism*", it could simultaneously benefit the local communities and the sanctuary management for its various management policies. Eco tourism is defined as "*responsible travel to natural areas that conserves the environment and improves the well-being of local communities*". Such tourism is low impact, educational, and protects the environment, while directly benefiting the economic growth of the local communities"

9.3 Intervention

The Eco-Tourism approach is planned to achieve the following ways for the benefit of local communities and also protect the bird sanctuary in the long run with sustainability. A separate field protocol will be scheduled to achieve the proposed components under the overall frame schedule of ETC.

- a) Historical and Religious Values
- b) Biodiversity Hot Spot
- c) Wintering bird communities – Nesting/Roosting/Feeding
- d) Conservation and Awareness for various stakeholders



There are two rooms available at Vaduvloor Bird Sanctuary for tourists besides number of eco-friendly resting benches are made available all along the bird walk area. The landscape of lake is a potential tourist attraction for sightings of birds. The trek to forest areas using the bird walk area will be an enjoyable one. There are many nature trekking path ways in the Bird Sanctuary.

1) Involvement of the Local Communities in the existing activities and the Socio-Economic Benefits derived by them from such involvement

The existing EDC Committees will be converted into Eco-Tourism Committees (ETC) for the adjoining village of Vaduvor Agaragaram. The funds generated from such an ecotourism programme will be utilized to provide socio-economic upliftment of the local communities by creating community assets and facilities and by providing microfinance for individuals and group entrepreneurship programs. It is also possible to show a path way for further growth of the ETC in other areas of the sanctuary after successful implementation of ETC activities to the tourists. The Eco-tourism Committees have been modelled on the EDC/JFM guidelines of Tamilnadu with a General body and Executive Body for administrating the ETC in a transparent manner.

2) Presence of other Popular Tourist Destination available within 50 km radius of the proposed Eco Tourism Site.

- 1) Thanjavur Temple: Distance from Vaduvur is 25 kms, on the way to Trichy town.
- 2) Muthupet Lagoons: Mangrove vegetation distributed all along the estuarine areas and boating is the common entertainment for the tourists (40 km).
- 3) Udayamarthandapuram Bird Sanctuary: It is another protected area for conservation of migratory birds (35 km)
- 4) Muthupet Darga: A popular destination for many tourist including other state people (35 km)
- 5) Mannargudi Temple: Rajagopala Swamy: (15 km)
- 6) Guru Bhagawan Tempel i(Alang) (25 km)

Proposed Eco Tourism Activities and the Infrastructure Requirements:

New Eco Tourism Activities, if any or improvement of the existing activities (Eco Cycle Ride/Bird Watching/ Trekking /Visiting Interpretation Centre /Film Show/Night Camping using Tents, Medicinal Area Trekking Routes, Boat Cafeteria, Visitors Eco Friendly Shelters, Eco-Shops).

The above components will be tailored into the eco-tourism activity in Vaduvor Bird Sanctuary which will be managed by the ETC members by forming a separate council as ETC which will be registered. The ETC members will be selected from the existing EDC groups.

9.3.1 Formation of Eco Development Committees (EDC's)

At present six Eco Development Committees are functioning in Vaduvor Bird Sanctuary. It is also planned to constitute a few more EDC for a better "social fence" between forest authorities and local people to protect the bird habitats in the long run. The existing EDC are as follows:

1. Neyvasal
2. VaduvorThenpathy
3. VaduvorVadapathy
4. Dhargas
5. VaduvorAragaram
6. Vaduvor
7. Sitheri
8. VaduvorMelpathi

The constitution details of EDC are mentioned in the section 8.3 of this report.

9.3.2 Eco-Guides

There is no eco-guide to assist the tourists in identification of birds and plant species which are medicinal value. It is proposed to utilize villagers (youth) as eco watchers with proper training on the ecology of avifauna by experts. These watchers could be deployed on a temporary basis from July to December when birds are congregated in the lake. Sufficient financial provision may be made in the annual plan of every year. In most of the protected areas (elephant reserve/tiger reserve/wildlife sanctuaries), eco guides are being used as part of eco-tourism activities.

9.4 Linkage

Several State Government Departments including Forests, Horticulture, Soil conservation, Environment and Remote Sensing, Science and Technology, Agriculture, Fisheries, Public Health Engineering, Rural Development, Tourism, and Revenue are involved in regulation and development activities of the sanctuary. The main activities of these organizations relate to implementation of various habitat restoration programmes for land and water management, socio-economic development and conservation of natural resources.

9.5 Participatory Management

The management of the Vaduvloor Bird Sanctuary is focused with people's participatory approach management to conserve the integrity of the sanctuary with the involvement of villagers in forestry works such as plantation, weed removal, and other development works of the sanctuary. Participatory approaches involving local communities, scientists, NGOs and other line agencies are ensured for sustainable management of the sanctuary. The existing Eco Development Committee members are involved in the habitat restoration activities of the sanctuary through participatory mechanism. For an effective people's participation, participatory rural appraisal was conducted to prepare micro plan for each village to reduce the forest dependent on the sanctuary by local communities. With the implementation of participatory management, the biodiversity of the sanctuary is protected with its long term sustainability.

9.6 Publicity, Eco-Awareness and Nature Camps

Among the various management activities, eco-awareness program on various themes for various stakeholders would be a crucial management step for conservation of the Vaduvloor Bird Sanctuary. Therefore, a separate eco awareness and nature camps would be significant to promote better management strategies for the sanctuary with the enrichment of knowledge through eco awareness and conducting nature camps to various stakeholders. At present such a practice of eco awareness and organizing nature camps are not well planned for visitors and students in the sanctuary.

The aim of the eco-awareness programme for the sanctuary at Vaduvloor is to spread the conservation significance about the biodiversity of the bird sanctuary to various stakeholders (local people/forest field staff/line agencies) in order to protect the water tank in a sustainable manner with participatory approach. It is true that the problems in wildlife conservation are intricately related to the quality of the local communities. Unless this underlying problem is solved, efforts to ensure biodiversity conservation can hardly succeed. In this context, eco-awareness plays a major role for protection of Vaduvloor Bird Sanctuary. It is realized that the knowledge gained through the awareness program is a positive approach for scientific management of sanctuary and wildlife. Experiences in protecting bird habitats have revealed that unless a strong eco-awareness program framed periodically, the management of biodiversity conservation goals could not be achieved to a desired level. Such an approach could lead to a sustainable management strategy for the benefit of the lake sanctuary.

Objectives of Eco-Awareness

1. Educating, motivating and eliciting various components of bird sanctuary
2. Sharing of knowledge about current forest policies and conservation issues
3. Scientific management of Vaduvloor Lake with the participation of local communities and line agencies

The following major scopes will be considered as part of eco awareness and nature camps programme for various stakeholders:

1. Significance of the bird habitats
2. Landscape Richness: Bird Diversity
3. Wet land Eco system and importance of tank to local communities (water basin)
4. Biodiversity Values (Wet lands/Wintering grounds for migrants and Land birds)

Eco- awareness program and nature camps will be targeted with the following modules

1. Significance of Bird Sanctuary and Lake Eco-System
2. Identification of Birds (Nesting/Roosting/Feeding sites) critical resources
3. Field documentation procedure
4. Assessment of bird habitats in relation to threats
5. Identification of critical areas for birds
6. Use pattern of lake in relation to water regime and aquatic habitats
7. Field Techniques of identifying wintering birds
8. Role of birds in wetland ecosystem

Other modules as part of eco-awareness program and nature camps:

- a) Create awareness about the value of the wet lands, focusing on the vision of conservation and need for protecting various critically endangered bird species and their habitats
- b) Targeting reduction of resource dependency by local communities and there by leading to overall habitat restoration
- c) Develop a joint protocol mechanism by involving various institutions / stakeholders in Protected Area Management through an institutional approach
- d) Formulate a strong skill development and confidence building among the locals to manage the bird sanctuary in a long term basis
- e) Periodically organize cleaning the lake with various line agencies and
- f) Motivate the fisherman communities in protecting the lake for maintaining suitable habitats to birds
- g) Coordinate with district administration in administrating the water tank for the benefit of birds and local farmers

Potential agencies identified for the eco-awareness program and Nature camps

- a) Public Works Department
- b) Fisheries Department
- c) VaduvorPanchayat Union
- d) Agriculture Department
- e) Tourism Department
- f) Revenue Department
- g) HR & C Department
- h) Animal Husbandry Department
- i) High ways Department

The above institutions are contributing their services both directly and indirectly for an integrated management of Vaduvor Bird Sanctuary. These institutions are targeted to obtain their support in the scientific management of the water basin for the benefits of wintering birds and also to preserve the integrity of the landscape with sustainability.

Eco-Awareness Experts

The experts from the following institutions will be made a tie up arrangement for the programme to take classes on eco awareness and nature camps in the field.

1. A V C College (Autonomous), Mayiladuthurai
2. Bombay Natural History Society (BNHS), Camp-Kodiyakarai
3. Environmental Science: Bharathidasan University, Trichy
4. Care Earth, Chennai
5. Wildlife and Environment Trust – WET, Mayiladuthurai
6. Arumbugal Trust, Thirunelveli

Target groups for the Eco-Awareness and Nature camps:

1. School children (local and from other districts)
2. Visitors to the sanctuary
3. Local communities: EDC members/VFC members/covered under the TBGP programme and Women Self Help Groups
4. Frontline field staff of the Forest Division
5. College students and research scholars working on wetlands conservation
6. Various Line agencies
7. Traditional fisherman communities and bird trappers

9.7 Interpretation Centre - Design and Plan

A new interpretation centre is under construction at the sanctuary campus. The interpretation centre is designed to attract more tourists with the information pertaining to the Vaduvloor Bird Sanctuary and its ecological importance.

9.8 Learning Gardens

Presently there is no specific learning garden relevance to the sanctuary area is available to the tourists in the sanctuary. It is planned to develop a comprehensive learning garden, for identification of birds using sounds and modules. Eco learning gardens of Butterfly Park and medicinal garden could also attract the tourist in the learning centres. The learning garden could be used to train the frontline field staff from various wetland areas as part of their field exposure cum knowledge improvement on migratory birds. Thus learning centre to be established in the sanctuary for the benefit of tourists and field staff.

9.9 Environmental Education

Students from nearby schools and colleges are regularly visiting the sanctuary during the season as part of environmental education programme. Environmental education activities are not available now to the tourists although it is planned to provide such a module to visiting tourists and students with the facility of new interpretation centre. Film show on the importance of environmental education will be made available to the tourists in the interpretation centre.

9.10 Nature Trails/ Walk through

At present a nature trail of one kilometre is meant for naturalist to observe birds and visit to medicinal areas. The nature trail is further extended for another one more kilometre and work is under progress. The visitors are being provided with binoculars to sight birds.

CHAPTER-X-

Research, Monitoring and Evaluation

10.1 Research

There are no in house researchers present in the sanctuary. The forest department engages with the academic institutions for carrying out research studies. Every year students come to the sanctuary from various colleges and participate in water bird census. Apart from this the Tamil Nadu Forest Department conducts awareness programmes in Schools. The permission is accorded to willing scientists and colleges for carrying out research. Census of water bird is being conducted as per fund availability. The practice of taking daily water bird count during migratory season was introduced in September 2000. In the year 2008 permission was given to BNHS for conducting the Ecological studies for a period of one migratory season starting from July 2008-March 2009.

Published information regarding Vaduvor bird sanctuary is as follows:

V. Gokula and Ananthraj, P. (2013). Diversity of waterbirds in relation to months in Vaduvor lake, Tamil Nadu, India. *Online Journal of BioSciences and Informatics*, Vol: 5(3):549-567.

V. Gokula and Ananthraj, P. (2011). Birds of Vaduvor Bird Sanctuary, Tamil Nadu, India: an annotated Checklist. *Zoo's print*(16): 20-24.

S. Subramanya (2005): Heronries of Tamil Nadu. *Indian Birds*, Vol (6): 126-140

C. Sivasubramanian and Sridharan, G. (2008) An overview of bird diversity in Vaduvor bird sanctuary, Tiruvarur Dt. Tamil Nadu. Proceedings of the National Seminar on Recent trends in Aquaculture Biotechnology. P.G. and Research Dept. of Zoology, Jamal Mohammed College, Tiruchirappalli. 123-127, 2008.

10.2 Prioritization of Research - Long, Short and Medium Term

The sanctuary authorities encourage long term research on management issues and identification of important endangered taxa. Long term research covering ecology of critically endangered bird species are not attempted so far by research institutions. Similarly short term assessment on bird monitoring and its conservation has not been attempted although it is crucial for management of the reserve.

10.2.1 Integration of wetlands within the landscape matrix

Bird Habitat Corridors:

There are several wet lands are located outside the Vaduvloor Bird Sanctuary which connects the Point Calimere Wildlife and Bird Sanctuary, Panchanathikulam, Udayamarthandapuram and beyond as connecting migratory paths to birds. These sites attract thousands of migratory birds with the result of contiguous lagoons and wetland patches. The distribution of wetlands within the landscape provides an ideal location for “*stop over*” for wintering grounds to migratory birds for their foraging and shelter. This long stretch of wet land area is well protected and the extent of human induced disturbance is less and hence this area is highly used by the birds both migratory and resident populations.

A master plan to be developed for each of the wet land located outside the Vaduvloor Bird Sanctuary for conservation of large tracts of wet lands to protect migratory birds.

10.2.2 Regional and National Monitoring of Populations

Various national and international institutions are tied up to monitor the migratory population. BNHS has already working on the programme with various international organizations as part of their studies on bird migration in India. Such an institutional arrangement may be made to assess and monitor the bird population and its arrival and dispersal from the sanctuary.

10.2.3 Fragmentation effects

There is no notable impact of fragmentation on the Vaduvloor Bird Sanctuary and habitat.

10.2.4 Human Resource Development

A well designed and implemented HRD program for the forest field staff could help in the gain of knowledge on conservation and protection of the bird sanctuary, especially protection of wintering grounds through habitat restoration, management of water regime and biodiversity conservation initiatives with a participatory approach.

Orientation and skill development are the two major exercises important to the forest field staff on various themes related to the management of the sanctuary using various experts. The themes are identified based on the management priorities for conservation of wet lands, and protection of wintering birds. The orientation will be designed to improve capacity building and skill development of field staff namely; Foresters, Forest Guards, Forest Watchers and Anti-Poaching Watchers. The following modules are intended for the programme to uplift their professional knowledge in managing the bird sanctuary by the forest field staff.

Field Orientation: Basic Approach

The orientation will be done to the field staff with a priority on understanding various field protocols. These are fundamental field issues to implement various field management programmes in a scientific basic

Major fundamental issues covered under the orientation to the Forest Field Staff by the experts are:

1. Jungle crafts
2. Identification of animal signs
3. Field documentation procedure
4. Assessment of bird habitats
5. Identification of birds in the field
6. Understanding use pattern of birds
7. Identification of critical areas to birds
8. Scientific documentation of field diaries
9. Learning techniques of identifying animals and plants
10. Strategies to control illegal bird trapping
11. Management and Administrative protocol
12. Management of Eco Development Committee
13. Management of Eco Tourism Committee
14. Promoting Communication Skills
15. Understanding leadership quality
16. Learning conservation and awareness techniques
17. Proper documentation of field cases and registration

The program with a well-tailored skill development for the forest field staff as part of HRD have been designed in order to achieve various problems of the bird sanctuary in a challenging manner.

Modules for HRD:

A. Significance of the Vaduvloor Bird Sanctuary:

- a) Location
- b) Habitat Types
- c) Endangered Species – Bird species
- d) Wintering Ground – Bird Habitats - Wet Land Conservation

B. Threats to the Sanctuary:

Human Induced

HRD and Skill Development:

The orientation on various components will be as targeted for the forest field staff in order to improve their standards for managing the bird habitats in a scientific manner. The field orientation could promote the field staff in upgrading their knowledge which could be highly important as part of management practices.

- a. Understand Personal Capabilities:** Various capabilities of each field staff will be assessed through mutual dialogues during the orientation programme. The ways and means of further improving the standards of their capabilities will be analysed.
- b. Personal Strength:** The personal strength of individual member could be examined during the orientation programme.
- c. Weakness:** All the field staff shall be individually assessed to know about their weakness in terms of delivering responsibilities in the working areas. The solution for removing negative attitudes from individual member will be prioritized during the training on skill development.

- d. **Developing Endurance Level:** The improvement of endurance level among the forest field staff would be assessed by the experts. The endurance of the field staff could help the protection mechanism both directly and indirectly.
- e. **Establishing Communication Skills:** The improvement of communication strategy for the forest field staff will be target in the training as part of skill development. Factor related to acquiring more knowledge on various issues of conservation programme will be briefed for improving communication skill.
- f. **Develop body language as per the requirements:** The maintenance of body language will be focused as part of improving the confidence and skill development for the forest field staff.

10.2.5 Water level control

There is no perennial water source in the sanctuary. The sanctuary is an irrigation tank used for storing water for agriculture. It receives water from Mettur Dam from August till January. Mostly the sanctuary starts getting dry from February onwards and remains completely dry from April till arrival of fresh water from Dam and Rain. Degradation of the feeder channel contributes to enhanced soil erosion and loss in water absorption capacity of the wetland. It is imperative to undertake measures for feeder channel conservation to ensure regulation of flow regimes and maintenance of the hydrological functions of the wetland system for the benefit of the sanctuary.

Water inflows and outflows to the lake should be estimated with the help of hydrological experts. Estimate should be made separately for the north-east and south-east monsoon. Comparison of the Satellite imageries of 8-10 years back of Vaduvor basin with the current imageries to understand the changes in the land use pattern and crop pattern. Assessment of water holding capacity of Vaduvor Lake should be attempted through analysis of data generated through contour surveys

Environmental Flow Assessment of Vaduvor Bird Sanctuary and lake for identification of optimal water allocation scenarios for agriculture, considering biodiversity safe guarding. The water regime includes consideration of the values, timing and quality of flows including periods of low or nil flow and floods for river systems, and the floodplain should be included in environmental flow. Environmental flows have become increasingly widely accepted as an important component an integrated water resources management, while environmental flows are intended to sustain the goods and services that aquatic ecosystem is provide, in many cases water use is in conflict with environmental water requirements, and hence providing environmental flows requires careful consultation, negotiation and ultimately often compromise by one or more water sector.

Ramsar Convention on Wetlands has adopted a resolution containing “guidelines for the allocation and management of water for maintaining the ecological functions of wetlands”. India being signatory to the Ramsar and Vaduvor being a potential Ramsar site (based on the eligible criteria required for the designation as a Ramsar site) this resolution is particularly relevant. The resolution emphasizes on seven principles which include sustainability as a goal; clarity of process; equity in participation; credibility of science; transparency of implementation; flexibility of management; and, accountability of decisions Based on evaluation of scenarios, the existing operation of barrages would be adjusted / synchronized to meet the desired water allocation objectives. The allocation pattern would be periodically reviewed and adapted based on monitoring and evaluation of ecosystem features and trends in a stakeholder driven process.

10.2.6 Control of Pesticide Use

The use of pesticide in the adjoining agriculture fields could pass on into the lake during the peak season. Constant eco awareness programme for farmers with reference to use of organic fertilizers could reduce the contamination of water with pesticide. Reducing intensity of chemical fertilizer and pesticide use through promoting organic cultivation and establishment of institutions for supply of quality agricultural inputs are to be encouraged to safe guard the bird habitats in the long run.

10.2.7 Regulation of Human Disturbance

The influence of human disturbance to the Vaduvor Bird Sanctuary may be regulated in the following ways:

1. Reduce poverty within communities (living on the fringes of the sanctuary) by 50% within 2020
2. Improve quality of life through enhanced access to drinking water, proper sanitation and access to basic livelihood through institutional mechanism
3. Increase in average household incomes by over the present occupational diversification through alternate sources of income to households who previously engaged in aquaculture
4. More Self Help Groups to be established to initiate micro credit operations
5. Identify traditional sanctuary dependent people with suitable rehabilitation programme (traditional bird trappers/graziers)

10.2.8 Public awareness concerning wetlands

An appreciable public awareness about the wetlands of Vaduvor Bird Sanctuary prevails among the minds of local people living adjoining the sanctuary as evident from their involvement in Eco Development Committees (No 8) and also benefit of wet land for various development programmes of villages.

The accumulation of bird droppings in the Vaduvor lake benefits the crop production in a significant manner which villagers are well aware. The tank is the main water basin for supply of water to agriculture fields for as many as 18 Panchayat Villages in this region. Thus, there is a strong public awareness about the Vaduvor wet lands in the minds of local communities.

10.2.9 Ecological Assistance

The ecological value of the bird sanctuary is mostly supported by the co-ordinated efforts of various line agencies beyond the forest department. Such assistance provides a conservation platform to achieve the management goals of the sanctuary in the long run.

10.3 Valuation of Eco System Services

The Vaduvor Bird Sanctuary is so dynamics in terms of artificial eco system along with its wintering migratory and land birds and thus rich in biodiversity for wet land conservation.

10.4 Monitoring and Evaluation

The monitoring exercise should be done by the field staff with reference to various development activities in the bird habitats. Ideally monitoring and evaluation works to be done by conducting a mechanism of feedback dialogues with field staff and local communities on the works done on various management activities. The monitoring works to be done by the Forest Range Officers and DFO towards the merits and demerits of development works. The monitoring exercise would bring out a workable "state of art" for bird sanctuary that helps the habitats in the long run.

Monitoring: Criteria

- a) Evolve various field criteria for scientific monitoring especially the impact of water regime in the sanctuary. This might evolve a positive step to bring out a workable module towards the conservation initiatives for bird habitats.
- b) The outcome of the project monitoring and evaluation will bring out changes in overall biodiversity of the Vaduvloor Bird Sanctuary, although there is no specific guidelines are now available to the field staff for monitoring exercise except routine protection and attending habitat restoration works.

Monitoring: Process

The monitoring process of the sanctuary would generate a framework for action plan that might evolve according to the up gradation of habitats on various parameters for scientific management along with co-existence with local people.

The management of the bird habitats should continue to ensure monitoring process which should form routine management initiative. This could enable to identify the trends in changes of key habitat parameters such as water regime in the tank. The field staff could document and collect basic biological data from the field using beat maps and this could help in various ways, especially occurrence of bird species throughout the year. These data sources shall be made available in the office with proper compilation by field experts.

CHAPTER - XI

Miscellaneous Regulations

11.1 Disease Management

The sanctuary is surrounded by villages of varying sizes. Each village has a number of domestic animals (mulch animals, stray cattle, goat, dogs and other poultry). With the movement of livestock inside the bird sanctuary, there is always a possibility for spreading of contagious diseases. The problem of disease spread maybe higher during the summer period from March to April when livestock is mostly dependent on Vaduvor Lake for foraging. Prompt reporting of an infectious animal disease or its symptoms to livestock population is crucial as part of wildlife management. Disease could spread rapidly to wild birds if not noticed in right time. In this context, immunization has been regular in practice for livestock belonging to the villages bordering the Vaduvor Bird Sanctuary. Nevertheless, people who own or keep livestock are responsible for their care and health.

The sanctuary management has set a number of rules to monitor the health of kept animals with the local communities. These rules largely concern prevention, monitoring and control (PMC) of animal diseases. The PMC are being targeted by the field staff periodically as part of sanctuary management. Early reaction is to carry out without delay the disease control activities needed to contain the outbreak and then to eliminate the disease and infection in the shortest possible time frame and in the most cost-effective way, or at least to return to the status quo that existed previously and to provide objective, scientific evidence that one of these objectives has been achieved. It is far too late to leave the planning of an emergency disease eradication or control programme to the time when a disease outbreak has actually occurred. There will then an intense political pressure and pressure from livestock farmer groups for immediate action. In such a climate mistakes will be made, resources misused, deficiencies rapidly highlighted, and there will be unavoidable delays resulting in further disease spread and higher costs-unless there has been adequate forward planning and preparation.

Vision: Wildlife Health and Strategies

Management of wildlife health is an important component in the management of protected areas/sanctuary. Population dynamics of wildlife mostly related to mortality due to disease besides natural mortality. The movement of livestock population within the sanctuary not only limits the food resources to wildlife but also spread contagious diseases. The long term remedial measure could be to launch disease control measures to contain the outbreak of contagious diseases and then to eliminate them in the shortest possible time frame. Immunization of livestock to control and prevent diseases for wildlife species could be one of the management tools being adopted in most of the PA management in India. If it is implemented in a phased manner for the periphery villages bordering the sanctuary, especially in peak pinch period (summer). The effort taken as part of immunization for livestock from various villages highlighted the importance of effective prevention of animal diseases. The special program also described the strategies of controlling disease control and eradication methods that need to be taken into account for the management of the bird sanctuary. This program highlighted the importance of effective immunization services for the prevention of diseases in livestock through vaccination. It also described the principles and strategies of epidemic livestock disease control and eradication procedure that need to be taken into account as part of sanctuary management plan.

11.2 Strategies

Periodical vaccination for livestock is undergoing in the bird sanctuary by Veterinary Department Personnel (Vaduvoor) every year, especially in the summer. The following contagious disease is identified in the livestock and immunization drugs are provided with the help of forest department by organizing special camp in the villages bordering the bird habitats. The village covered under the vaccination programme are; 1.Neyvasal, 2.VaduvoorThenpathy, 3.Vaduvoor Vadapathy, 4. Dhargas, 5.Vaduvoor Agragaram and 6.Vaduvoor.

Immunization for Contagious diseases

1. Avian influenza-bird' flu
2. Bovine spongiform
3. Tuberculosis
4. Foot and mouth disease
5. Anthrax
6. Black quarter
7. Cow pox
8. Rinder pest
9. Hemorrhagicsepticemia
10. Brucella.
11. Footrot
12. External parasites
13. Rabies
14. Ecto-parasites

11.3 Intervention

Various immunization components to be taken into account with the veterinary personnel and wildlife experts to prevent dissemination of diseases to water fowls in the tank.

1. Maintain proper hygiene in the vicinity of settlement
2. More care and management in maintaining livestock during the dry spell of the year
3. Try to identify initial symptoms of diseases among domestic livestock
4. Care to be taken while purchasing new animals
5. Call for a veterinarian immediately for any suspected diseases in livestock.
6. Livestock drinking from contaminated rivers and streams may be avoided
7. Do not bury or burn died animals in the open, other than in exceptional circumstances

The awareness themes could lead to develop a better management of livestock in the following ways with most effective ways of eliminating disease from cattle. The main benefits of the awareness programme are: a) improved farm expansion b) improved farm sustainability c) better stock health and welfare and d) a farmer/veterinarian relationship ensured

a) Guidelines for the local communities/farmers

1. Set of important guidelines to be provided to the farmers about the up keeping of their livestock to prevent disease eruption and spread.
2. Some of the diseases are more prevalent during special festivals within the bird sanctuary (example: bird flu) with the result of overcrowd of visitors and livestock. During this period, those diseases are prevalent and likely to affect the wild birds. During this period of special event the forest department in close co-operation with animal husbandry will organize mass immunization program to prevent the cattle borne diseases spread to bird habitats.

CHAPTER - XII

Organization, Administration and Human Resource Development

12.1 Structure and Responsibilities

The Vaduvloor Bird Sanctuary is part of the Thiruvarur Forest Division and managed by the Mannargudi Forest Range Office with the administrative guidance of the District Forest Officer, Thiruvarur District. The field level administration is vested with the Forest Range Officer, Mannargudi (HQ-Mannargudi) who has been assisted by Forester, Forest Guards and Watchers besides Anti-Poaching Watchers. The sanctuary falls under the Trichy Circle with the Conservator of Forests as the administrative head for the Vaduvloor Bird Sanctuary and Bird Habitats.

12.2 Staff Amenities

There are no proper staff amenities available at the Vaduvloor Bird Sanctuary. Residential quarters are not available to the staff.

12.3 Human Resources Development

HRD for the staff is mainly organized in Tamil Nadu Forest Academy for special orientation programme on TBGP activity, Human Animal Conflict and other special short term refreshing courses.

12.3.1 Training Calendar

There is no specific training schedule available for the staff as part of management courses to conserve the bird habitats. The staff are regularly attending training programme in the Tamil Nadu Forest Academy, Coimbatore.

CHAPTER - XIII

DRAFT NOTIFICATION OF ECO-SENSITIVE ZONE FOR VADUVUR BIRD SANCTUARY, THIRUVARUR DISTRICT MINISTRY OF ENVIRONMENT AND FORESTS

Draft Notification

Boundaries of Eco-sensitive Zone:-

(1) The said Eco sensitive Zone is an area of 749.52 ha up to 1 km radius from the boundary of the protected area of Vaduvur Bird Sanctuary in North, West, South and East direction situated in the Thiruvarur District of Tamil Nadu.

North	E079.31626	N10.71674	West	E079.30226	N10.70182
South	E079.31655	N10.68666	East	E079.33332	N10.70232

Total area of Eco sensitive Zone of Vaduvur Bird Sanctuary

S. No	Name of the Area	Extent in Ha	Legal Status
1	Govt. poramboke land in revenue villages	168.00	Revenue Poramboke Land
2	Private Patta lands in 6 Revenue villages	581.52	Revenue Land
	Total area	749.52 Ha	

Monitoring Committee:-

- In exercise of the powers conferred by sub-section (3) of section 3 of the Environment (Protection) Act, 1986) 29 of 1986, the Central Government hereby constitutes a committee to be called the Monitoring Committee to monitor the compliance with the provisions of this notification.
- The Monitoring Committee referred to in sub-paragraph (1), shall consist of not more than ten members so as to represent the following, namely:-

1	District Collector, Thirurur	Chairman
2	District Forest officer, Thirurur	Member Secretary
3	Revenue Divisional Officer, Mannargudi	Member
4	The District Environmental Engineer, Tamil Nadu State Pollution Control Board, Nagapattinam	Member
5	An Ecologist (Thanjavur Tamil University)	Member
6	A representation from Town Country Planning Department	Member
7	A representation from local NGO	Member
8	A representation from Ministry of Environment, Forests and Climate Change, Government of India, New Delhi	Member

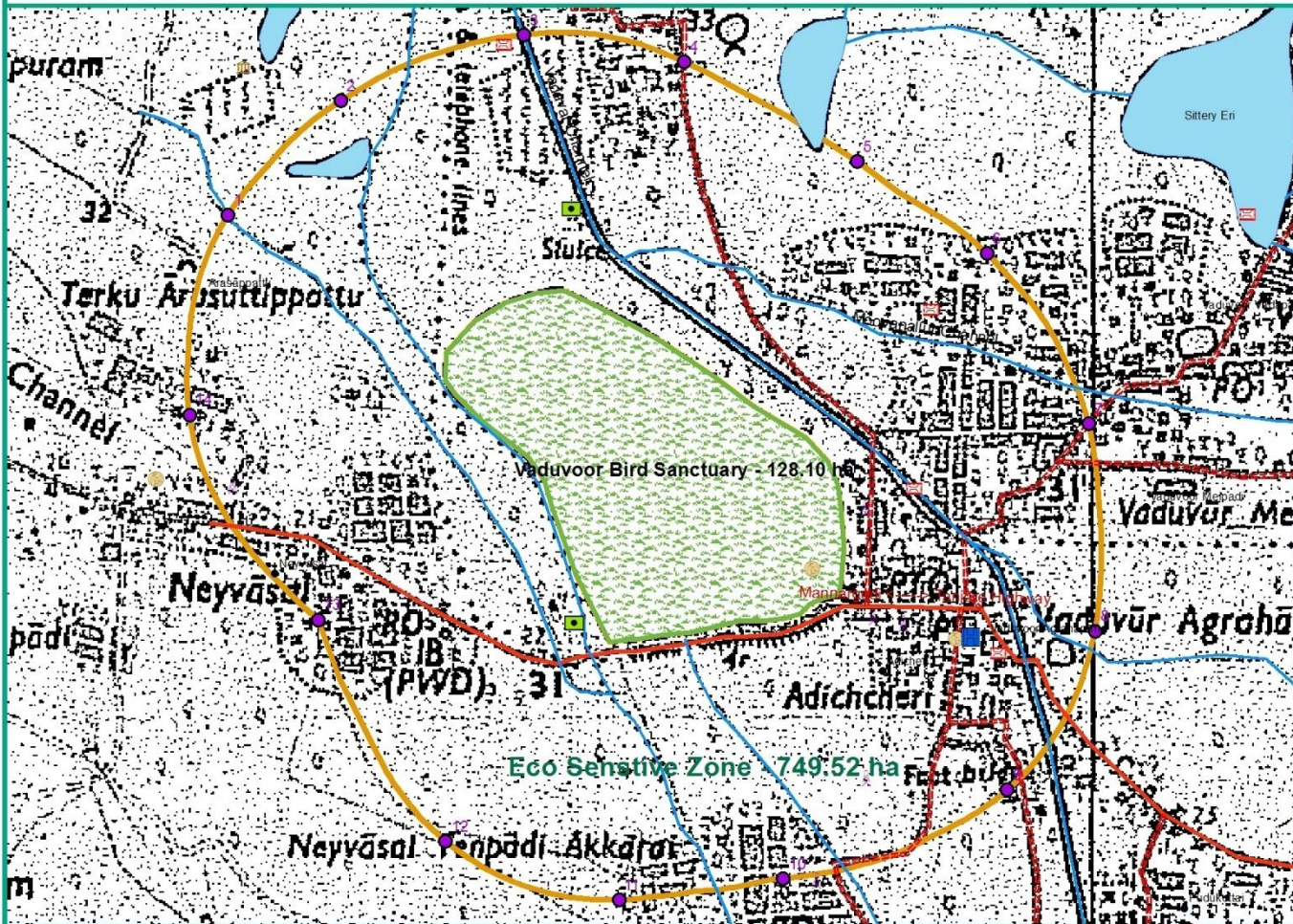
The draft Eco Sensitive Zone proposal is under active consideration of the Government of Tamil Nadu. After final notification under relevant reaction of the Environmental (Protection) Act, 1986 by Government of India, shall be annexed in the Management Plan.

ECO SENSITIVE ZONE FOR VADUVOOR BIRD SANCTUARY THIRUVARUR FOREST DIVISION



ECO SENSITIVE ZONE - 749.52 Ha

0 0.5 1 Kilometers



- Legend**
- Vaduvor Bird Sanctuary
 - Eco Sensitive Zone
 - Pond
 - Canal_River
 - State Highway
 - Village Road
 - Bridge
 - Cell Phone Tower
 - Regulator
 - Saw Mill

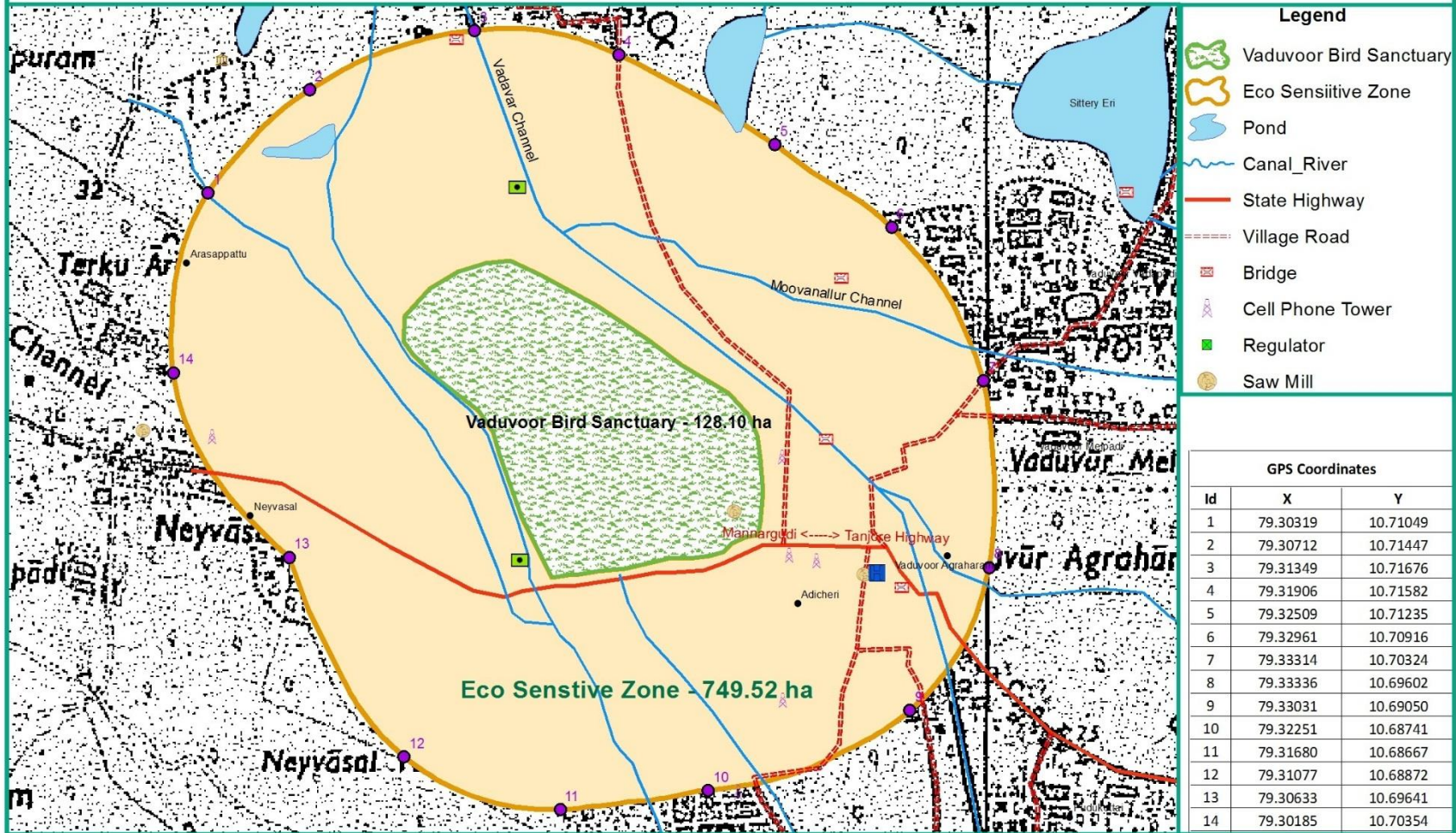
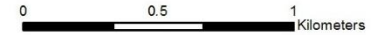
GPS Coordinates

Id	X	Y
1	79.30319	10.71049
2	79.30712	10.71447
3	79.31349	10.71676
4	79.31906	10.71582
5	79.32509	10.71235
6	79.32961	10.70916
7	79.33314	10.70324
8	79.33336	10.69602
9	79.33031	10.69050
10	79.32251	10.68741
11	79.31680	10.68667
12	79.31077	10.68872
13	79.30633	10.69641
14	79.30185	10.70354

ECO SENSITIVE ZONE FOR VADUVOOR BIRD SANCTUARY THIRUVARUR FOREST DIVISION



ECO SENSITIVE ZONE - 749.52 Ha



**CHAPTER-XIV
BUDGET**

14.1. Financial Forecasting

Sl. No	Name of the Component	2016-17		2017-18		2018-19		2019-20		2020-21	
		Qty.	Amount	Qty.	Amount	Qty.	Amount	Qty.	Amount	Qty.	Amount
I	Protection										
1(i)	Engaging Anti-poaching Watcher in the sanctuary area.	2 nos	1.62	2 nos	1.62	4 Nos.	3.24	6 Nos.	4.86	6 Nos.	4.86
1(ii)	Engaging Anti-poaching Watcher outside the sanctuary area. (The birds are moving from the Sanctuary in searching of food to nearby agricultural fields, so to avoid illegal activities such as hunting & poaching. Engaging anti-poaching watchers outside the Sanctuary is very much essential to control such activities)	0	0	4 Nos.	3.24	7 Nos.	5.67	7 Nos	5.88	7 Nos.	6.3
2	Construction of boundary wall with using RCC pillars along the sanctuary area	0	0	0	0	300 RM	30.00	0	0	300 RM	33.00
3	Construction of Anti-poaching shed	0	0	0	0	1 No.	3.50	0	0	0	0
4	Purchase of Binoculars and spotters for bird watching	0	0	0	0	LS	2.00	0	0	LS	2.00
5	Maintenance of Boat including cost of Fuel and Maintenance	0	0	1 No.	2.4	1 No.	2.40	1 No.	2.64	1 No.	2.88

Management Plan: Vaduvor Bird Sanctuary & Habitats – 2015: Thirurur Forest Division

Sl. No	Name of the Component	2016-17		2017-18		2018-19		2019-20		2020-21	
		Qty.	Amount	Qty.	Amount	Qty.	Amount	Qty.	Amount	Qty.	Amount
6	Providing Solar LED lamps with necessary fitting arrangements in the sanctuary area	0	0	0	0	20 Nos	7.00	0	0	0	0
	Sub Total		1.62		7.26		53.81		13.38		49.04
II.	Conservation										
7	Planting taller plants	1000 nos	2.00			500 Nos	1.00			500 Nos	1.30
8	Providing revetment arrangements in the boundaries of the sanctuary					1000 RM	55.95	-	-	200 RM	11.4
9	Providing paver block					1500 RM	54.21	-	-	200 RM	8.60
10	Deepening and strengthening of existing sanctuary water logging areas					20000 M ³	34.11	-	-	3000 M ³	5.40
11	Eradication of unwanted weeds and farms	40 Ha	2.00	40Ha	2.00	40 Ha	2.20	40Ha	2.20	40Ha	2.50
12	Clearing the nature trail	5000Rm	0.50	5000 Rm	0.50	5000Rm	0.60	5000Rm	0.60	5000 Rm	0.70
	Sub Total		4.50		2.50		148.07		2.80		29.90
III	Infrastructure										

Management Plan: Vaduvloor Bird Sanctuary & Habitats – 2015: Thirurur Forest Division

Sl. No	Name of the Component	2016-17		2017-18		2018-19		2019-20		2020-21	
		Qty.	Amount	Qty.	Amount	Qty.	Amount	Qty.	Amount	Qty.	Amount
13	Construction of visitors hall at adjoining of sanctuary premises	0	0	0	0	1 No.	9.00	0	0	0	0
14	Construction of Public Toilet and sanitary facilities at adjoining of sanctuary premises	0	0	0	0	1 No	5.00	0	0	0	0
15	Creating a Children's Eco learning Park	0	0	0	0	1 No	7.00	0	0	0	0
	Sub Total		0		0		21.00		0		0
IV	Eco-Awareness Programme										
16	Conducting Eco-Camps to students, Public etc.,	4 camps	0.60	5 camps	0.75	5 camps	1.00	5 camps	1.10	5 camps	1.20
17	Erection of signage	1 No.	0.06	2 Nos	0.50	2 Nos	0.75	2 Nos	1.00	2 Nos	1.10
18	Printing publicity materials of stickers, pamphlets etc.,	L.S	0.50	LS	2.50	LS	2.60	LS	2.70	LS	2.80
19	Eco bird voice along the natural trail		0		0	LS	2.00	0	0	0	0
	Sub Total		1.16		3.75		6.35		4.80		5.10
V	Census										
20	Conducting Birds census	Ls	0.50	1 No	0.50	1 No	0.55	1 No	0.60	1 No	0.65
21	Periodical monitoring and Documentation	0	0	LS	1.00	LS	1.00	LS	1.00	LS	1.00
	Sub Total	0	0		1.50		1.55		1.60		1.65

Management Plan: Vaduvloor Bird Sanctuary & Habitats – 2015: Thirurur Forest Division

Sl. No	Name of the Component	2016-17		2017-18		2018-19		2019-20		2020-21	
		Qty.	Amount	Qty.	Amount	Qty.	Amount	Qty.	Amount	Qty.	Amount
VI	Research										
22	Engaging Biologist / Research Assistant - 12 months	0	0	1 No.	2.40	1 No	2.64	1 No	2.76	1 No	2.88
23	Research on birds ecology	0	0	LS	5.00	LS	5.00	LS	5.00	LS	5.00
24	Training bird identification for students/front line staff	0	0	LS	4.00	LS	4.00	LS	4.00	LS	4.00
	Sub Total				11.40		11.64		11.76		11.88
VII	Eco Tourism										
25	Creating visitors resting places at important locations	0	0	0	0	0	0	0	0	2 Nos	7.00
26	Establishment of cafeteria for the visitors	0	0	0	0	0	0	0	0	LS	2.00
27	Corpus fund for Eco Tourism committees -	0	0	0	0	0	0	0	0	0	0
	Sub Total	0	0	0	0	0	0	0	0	0	9.00

14.2. Summary of Prescriptions

14.2.1. De-silting and cleaning of the channels

De-Silting and cleaning of existing channels are very important to retain the water holding capacity and water flow for the Bird Sanctuary. The VBS have lost the water holding capacity due to years of siltation because de-silting activity hasn't done since 1999. Due to silting the original depth was spoiled in this sanctuary so de-silting of the Bird Sanctuary needs to be carried out on a priority basis. The tank depth needs to be increased by a meter at least, this will help to retain more water for birds as well as for agriculture and it's attract more water birds towards the Sanctuary. The de-silted soil should be removed from the sanctuary to outside. The necessary permission may obtain from the District administration for removal of the de-silted soil.

Degradation of the feeder channel will directly affect to the water absorption capacity of the Sanctuary and induce the soil erosion. It is necessary to undertake the control measures for feeder channel conservation to ensure regulation of water flow regimes and maintenance of the hydrological functions of the wetland system. Water inflows and outflows to the lake should be estimated with the help of hydrological experts. Assessment of water holding capacity of the Sanctuary should be attempted through various analysis of data generated from contour surveys.

14.2.2. Uprootal/removal of invasive species

The increasing of invasive species is one of the major problem to the managers. Periodical removal of such species is undergoing every year but the invasion such species continuously growing in some areas of the sanctuary. The invasive species such as *Eichhorniacrassipes*, *Salviniaauriculata*, *Pistiastratiotes*, *Lemna minor*, *Wolffiasps.* and *Azollapinnata* often form thick mats in different areas of the lake and thus alter the native vegetation. These species have reached a status and thereby affect the overall composition of aquatic plants in many areas.

Water Hyacinth and *Ipomoeacarnea* are the two invasive weeds replacing the native macrophytes, the major attractants to the migratory and resident ducks. The rapid expansion of these species would ultimately affect the biodiversity of the Lake including birds and the larger heronry species for nesting and facilitate the free movement for the swimming birds. Therefore, it is recommended to thin the lower and inner branches of *Acacia nilotica* trees where ever distributed. Control of *Prosopischilensis*, *Eichhorniacrassipes*, *Ipomoeacarnea* and other species to provide additional water holding capacity and enhancement water depth and water spread area.

14.2.3. Conducting Periodical bird census

Conducting bird census has been a regular activity in the sanctuary since 2000. It is conducted generally in the month of November-December when the species diversity and population is high. Census is conducted by the sanctuary staff along with ornithologist from the various institution and wildlife organizations.

14.2.4. Eco awareness camps

Eco-awareness program on various themes for various stakeholders would be a crucial management step for conservation of the Vaduvloor Bird Sanctuary. Therefore, a separate eco awareness and nature camps would be significant to promote better management strategies for the sanctuary with the enrichment of knowledge through eco awareness and conducting nature camps to various stakeholders.

The aim of the eco-awareness programme for the sanctuary at Vaduvloor is to spread the conservation significance about the biodiversity of the bird sanctuary to various stakeholders (local people/forest field staff/line agencies/School & Collage Students) in order to protect the water tank in a sustainable manner with participatory approach

The Eco-Awareness Camps conducting with following objectives:

1. Create Awareness to the local people regarding ecological impotents of birds and the wetland with the role of our eco system.
2. Educating, motivating and eliciting various components of bird sanctuary.
3. Sharing of knowledge about current forest policies and conservation issues.
4. Scientific management of Vaduvor Lake with the participation of local communities and line agencies.

14.2.5. Eco-Development Works

The following existing facilities are available for the tourists while visiting the sanctuary. Bird walk area (1.5 km) to see birds and two watch towers are present in the sanctuary area. The tank bund can be converted into a nature trail this can be done by strengthening the bund, clearing bushes and erecting interpretation signboards along the trail. Recently an interpretation centre is developed for creating awareness among the visitors. A few cement benches are present on the tank bund for the tourists to sit and watch the birds. Interpretation boards have been placed at strategic places explaining the importance of the sanctuary, importance of birds. For satisfying the information needs of the visitors to the sanctuary, pamphlets and posters needs to be prepared. Students and local people must be made aware about the importance of wildlife conservation.

14.2.6. Eco-Toursim

The sanctuary is open for visitors throughout the year and tourists can visit the sanctuary without paying any fee. Every year 3500-4000 tourists arrive at Vaduvor. Tourism is high in the month of Nov-Feb and low in the month of May-Sep. The best time to visit the Sanctuary is November-February. Several migratory water birds come to the Sanctuary in January. As the sanctuary is situated on the Thanjavur-Mannargudi highway, a large number of people travelling on the route visit the sanctuary to have a view of the birds in the tank. There are two watch towers and one elevated bund around the wetland for observing birds. A steel watchtower is located on the northern part of

the sanctuary near Kothandarasamykoil and a cement watchtower is located by the roadside of Thanjavur-Mannargudi highway. Signage have been put up near the sanctuary for information on water birds. People can walk easily on elevated bund which provides a good view for bird watching. Binoculars are available for the visitors at sanctuary under the safe custody of forest guard.

14.3. Non- Recurring expenditure

BUDGET FORE CASTING NON - RECURRING

Sl. No.	Name of the Component	Recurring / non recurring	2016-17		2017-18		2018-19		2019-20		2020-21	
			Qty.	Amt	Qty.	Amt	Qty.	Amt	Qty.	Amt	Qty.	Amt
1	Providing revetment arrangements in the boundaries of the sanctuary	Non recurring	1000 RM	55.95	–	–	200 RM	11.40	–	–	200 RM	12.20
2	Providing paver block in the pathway	Non recurring	1500 RM	54.21	–	–	200 RM	8.60			200 RM	9.60
3	Deepening and strengthening of existing sanctuary water logging areas	Non recurring	20000 M3	34.11	–	–	3000 M3	5.40	–	–	3000 M3	6.60
4	Construction of boundary wall along the sanctuary area	Non recurring	300 RM	30.00	–	–	300 RM	33.00	–	–	300 RM	36.00
5	Construction of Anti poaching shed	Non recurring	1 No.	3.00	–	–	–	–	–	–	1 No.	3.00
6	Purchase of Binoculars and spotters for bird watching	Non recurring	LS	2.50	–	–	–	–	–	–	–	–
Sl.	Name of the Component	Recurring	2016-17		2017-18		2018-19		2019-20		2020-21	

No.		/ non-recurring	Qty.	Amt	Qty.	Amt	Qty.	Amt	Qty.	Amt	Qty.	Amt
7	Providing Solar LED lamps with necessary fitting arrangements in the sanctuary area	Non recurring	20 Nos	7.00	-	-	-	-	-	-	20 No	8.00
8	Providing drinking water facilities for the tourists with proper pipe line in the bird walk area	Non recurring	LS	2.00	-	-	-	-	-	-	LS	1.00
9	Construction of visitors hall at adjoining of sanctuary premises	Non recurring	1 No	9.00	-	-	-	-	-	-	1 No	10.00
10	Construction of Public Toilet and sanitary facilities at adjoining of sanctuary premises	Non recurring	1 No	5.00	-	-	-	-	-	-	1 No	6.00
11	Creating a Children's Eco learning Park	Non recurring	1 No	7.00	-	-	-	-	-	-	1 No.	8.00
12	Erection of signages	Non recurring	2 Nos.	1.00	2 Nos.	1.06	2 Nos.	1.10	2 Nos.	1.14	2 Nos.	1.18
13	Eco bird voice along the natural trail	Non recurring	LS	2.00	-	-	-	-	-	-	LS	2.00
Sl. No.	Name of the Component	Recurring / non-recurring	2016-17		2017-18		2018-19		2019-20		2020-21	
			Qty.	Amt	Qty.	Amt	Qty.	Amt	Qty.	Amt	Qty.	Amt

14	Training bird identification centre for youth	Non recurring	LS	1.00	LS	1.00	LS	1.00	LS	1	LS	1.00
15	Periodical monitoring and evaluation of Eco Tourism and Report Preparation	Non recurring	LS	1.00	LS	1.00	LS	1.00	LS	1	LS	1.00
16	Wooden Eco Sheds for visitors (Umbrella Structure) (2 Nos) with proper facilities in bird walk areas	Non recurring	2 Nos	3.00	-	-	2 Nos	5.00	-	-	2 Nos	6.00
17	Maintenance of existing pathway	Non recurring	200 Rm	3.00	-	-	200 RM	3.50	-	-	200 RM	4.00
18	Establishment of dust pins with slogans along the bird walk	Non recurring	10 Nos	5.00	-	-	-	-	-	-	-	-
19	Research on birds	Non recurring	LS	3.50	-	-	-	-	-	-	LS	5.00
20	Creating visitors resting places at important locations	Non recurring	2 Nos	6.00	-	-	-	-	-	-	2 Nos	7.00
21	Establishment of cafeteria for the visitors	Non recurring	LS	2.00	LS	1.00	LS	1.00	LS	1.00	LS	1.00
Total					237.27		4.06		71.00		4.14	128.58

14.4. Recurring expenditure

BUDGET FORE CASTING RECURRING

Sl. No.	Name of the Component	Recurring / non-recurring	2016-17		2017-18		2018-19		2019-20		2020-21	
			Qty.	Amt	Qty.	Amt	Qty.	Amt	Qty.	Amt	Qty.	Amt
1	Eradication of unwanted weeds and farms	Recurring	20 ha	1.20	5 ha	0.32	5 ha	0.35	5 ha	0.38	5 ha	0.40
2	Engaging Anti-poaching watchers	Recurring	11 Nos	8.91	13 Nos.	10.92	13 Nos.	11.70	13 Nos.	12.48	13 Nos.	13.26
3	Clearing natural trail	Recurring	1500 RM	0.50	-	-	1500 RM	0.75	-	-	1500 RM	1.00
4	Training programme for field staff/line agencies/ETC/EDC on capacity and skill development	Recurring	LS	2.00	LS	2	LS	2.00	LS	2.00	LS	2.00
5	Conducting Eco-Camps to students, Public etc.,	Recurring	15 camps	3.75	15 camps	3.75	15 camps	4.50	15 camps	5.25	15 camps	6.00
6	Printing publicity materials of stickers, pamphlets etc.,	Recurring	LS	2.50	LS	2.5	LS	2.50	LS	2.5	LS	2.50
7	Engaging of Eco-Guide	Recurring	2 Nos	1.62	2 Nos	1.62	2 Nos	1.62	2 Nos	1.62	2 Nos	1.62
8	Conducting bird census	Recurring	1 No	0.50	1 NO	0.6	1 No	0.65	1 No.	0.70	1 No	0.75
9	Engaging a biologist	Recurring	1 No.	2.16	1 No.	2.16	1 No.	2.16	1 No.	2.40	1 No.	2.40
Total				23.14		23.87		26.23		27.33		29.93

14.5.Revenue Realised During Previous years -- NIL –

14.6. Revenue expected (Indicative) -- NIL -

14.7.Fund Flow

Fund for carrying out the prescription of this Management Plan will be secured 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, CSR and others will be attempted to be secured and works implemented keeping the broad strategies/prescription highlighted in this Management Plan.