NATIONAL WETLAND ATLAS:

TAMILNADU

Sponsored by

Ministry of Environment and Forests

Government of India

Space Applications centre
Indian Space Research Organisation
Ahmedabad – 380 015

This publication deals with the updated database and status of wetlands, compiled in Atlas format. Increasing concern about how our wetlands are being influenced has led to formulation of a project entitled “National Wetland Inventory and Assessment (NWIA)” to create an updated database of the wetlands of India. The wetlands are categorised under 19 classes and mapped using satellite remote sensing data from Indian Remote Sensing Satellite: IRS P6- LISS III sensor. The results are organised at 1: 50, 000 scales at district, state and topographic map sheet (Survey of India reference) level using Geographic Information System (GIS). This publication is a part of this national work and deals with the wetland status of a particular State/Union Territory of India, through text, statistical tables, satellite images, maps and ground photographs.

The atlas comprises wetland information arranged into nine sections. How the NWIA project work has been executed highlighted in the first six sections viz: Introduction, NWIA project, Study area, Data used, Methodology, and Accuracy. This is the first time that high resolution digital remote sensing data has been used to map and decipher the status of the wetlands at national scale. The methodology highlights how the four spectral bands of LISS III data (green, red, near infra red and short wave infra red) have been used to derive various indices and decipher information regarding water spread, turbidity and aquatic vegetation. Since, the aim was to generate a GIS compatible database, details of the standards of database are also highlighted in the methodology.

The results and finding are organised in three sections; viz: Maps and Statistics, Major wetland types, and Important Wetlands of the area. The Maps and Statistics are shown for state and district level. It gives details of what type of wetlands exists in the area, how many numbers in each type, their area estimates in hectare. Since, the hydrology of wetlands are influenced by monsoon performance, extent of water spread and their turbidity (qualitative) in wet and dry season (post-monsoon and pre-monsoon period) are also given. Similarly the status of aquatic vegetation (mainly floating and emergent types) in two seasons is also accounted for. Status of small wetlands are also accounted as numbers and depicted in maps as points. Wetland map also show important ancillary information like roads/rail, relevant habitations. False Colour Composite (FCC) of the satellite image used (any one season) is shown along with the derived wetland map to give a feeling of manifestation of wetlands in remote sensing data and synoptic view of the area. The status of some of the important wetlands like Ramsar sites, National Parks are shown with recent field photographs.

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As a part of the project on National Wetland Inventory and Assessment (NWIA)

Space Applications Centre (ISRO), Ahmedabad

and

Institute of Remote Sensing, Chennai

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MESSAGE

It gives me great pleasure to introduce this Atlas, the latest in a series, prepared by Space Applications Centre, Ahmedabad in connection with the National Wetland Inventory and Assessment Project.

This Atlas maps and catalogues information on Wetlands across India using the latest in satellite imaging, one of the first of its kind. Wetlands are areas of land critical ecological significance that support a large variety of plant and animal species adapted to fluctuating water levels. Their identification and protection becomes very important.

Utility-wise, wetlands directly and indirectly support millions of people in providing services such as food, fiber and raw materials. They play important roles in storm and flood control, in supply of clean water, along with other educational and recreational benefits. Despite these benefits, wetlands are the first target of human interference and are among the most threatened of all natural resources. Around 50% of the earth's wetlands are estimated to already have disappeared worldwide over the last hundred years through conversion to industrial, agricultural and residential purposes. Even in current scenario, when the ecosystem services provided by wetlands are better understood - degradation and conversion of wetlands continues.

Aware of their importance, the Government of India has formulated several policies and plans for the conservation and preservation of these crucial ecosystems. Realising the need of an updated geospatial data base of these natural resources as the pre-requisite for management and conservation planning, National Wetland Inventory and Assessment (NWIA) project was formulated as a joint vision of Ministry of Environment & Forestry, Govt. India, and Space Applications Centre (ISRO). I am told that the latest remote sensing data from Indian Remote Sensing satellite (IRS P6) have been used to map the wetlands. The present atlas is part of this project and highlights the results of the study state in terms of statistics of various types of wetlands, extent of water, aquatic vegetation and turbidity in pre and post monsoon period. I also note that special efforts are made to provide detailed information of important wetlands like Ramsar sites, National Parks etc.

I am certain that this Atlas will raise the bar in developing such database and will be of great use for researchers, planners, policy makers, and also members of the general public.

(Jairam Ramesh)

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FOREWORD

Wetlands defined as areas of land that are either temporarily or permanently covered by water exhibit enormous diversity according to their genesis, geographical location, water regime and chemistry. Wetlands are one of the most productive ecosystems and play crucial role in hydrological cycle. Utility wise, wetlands directly and indirectly support millions of people in providing services such as storm and flood control, clean water supply, food, fiber and raw materials, scenic beauty, educational and recreational benefits. The Millennium Ecosystem Assessment estimates conservatively that wetlands cover seven percent of the earth's surface and deliver 45% of the world's natural productivity and ecosystem services. However, the very existence of these unique resources is under threat due to developmental activities, and population pressure. This calls for a long term planning for preservation and conservation of these resources. An updated and accurate database that will support research and decision is the first step towards this. Use of advanced techniques like Satellite remote sensing, Geographic Information System (GIS) is now essential for accurate and timely spatial database of large areas. Space Applications Centre (ISRO) took up this challenging task under the project "NWIA" (National Wetland Inventory and Assessment) sponsored by Ministry of Environment & Forests. To account for numerous small yet important wetlands found in the country, mapping at 1:50,000 scales has been taken up. Two date IRS LISS III data acquired during pre and post monsoon season are used for inventory to account for wet and dry season hydrology of wetlands. The map outputs include the status of water spread, aquatic vegetation and turbidity. Ancillary layers like road/rail, habitations are also created. Very small wetlands below the mappable unit are also identified and shown points. The results are complied as Atlases of wetlands for states/Union Territories of India. This Atlas highlights results for a particular state/UT and hopes to improve our understanding of the dynamics and distribution of wetlands and their status in the area.

I congratulate the team for bringing out this informative atlas and sincerely hope that this will serve as a useful source of information to researchers, planners and general public.

January 25, 2010

(Ranganath R. Navalgund)

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This project has benefited from the wisdom of many people**.** It is a pleasure to acknowledge the contributions made by the wetland experts especially to Prof. C.K. Varshney, Former Dean, School of Environmental Sciences, Jawaharlal Nehru University, New Delhi, Prof. A.R. Yousuf, The University of Kashmir, Srinagar, Prof. Pradeeep Shrivastava, Head, Wetland Research Centre, Barakatullah University, Bhopal, Dr. Prikshit Gautam, Director, WWF-India, Dr. S. Narendra Prasad, Salim Ali Centre for Ornithology and Nature, Coimbtore and Dr. R.K. Suri, Additional Director, Ministry of Environment and Forests, Govt. of India, New Delhi, and the database experts from ISRO who participated in the peer Review meeting to finalise the “Wetland Classification System” followed in this project

We acknowledge the positive role played by 16th SC-B (Standing Committee on Bioresources and Environment) of NNRMS (National Natural Resources Management System) meeting in formulating this project. We are extremely thankful to the members of the“Steering Committee” of the project, under the chairmanship of Dr E J James, Director – Water Institute, Karunya University, for their periodical review, critical comments and appreciation of the efforts by the project team. We are thankful to SC-B under the chairmanship of Secretary, MoEF, for periodic review of the progress of the project and guidance towards timely completion of the work. We acknowledge the valuable contributions made by Dr J K Garg, the then scientist of SAC for his active role in formulation of this project, co-authoring the procedure manual document.

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(Sushma Panigrahy)

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1.0 INTRODUCTION

It is increasingly realized that the planet earth is facing grave environmental problems with fast depleting natural resources and threatening the very existence of most of the ecosystems. Serious concerns are voiced among scientists, planners, sociologists, politicians, and economists to conserve and preserve the natural resources of the world. One of the difficulties most frequently faced for decision making is lack of scientific data of our natural resources. Often the data are sparse or unconvincing, rarely in the form of geospatial database (map), thus open to challenges. Thus, the current thrust of every country is to have an appropriate geospatial database of natural resources that is based on unambiguous scientific methods. The wetland atlas of Tamilnadu, which is part of the National Wetland Atlas of India, is an attempt in this direction.

1.1 Wetlands

Wetlands are one of the crucial natural resources. Wetlands are areas of land that are either temporarily or permanently covered by water. This means that a wetland is neither truly aquatic nor terrestrial; it is possible that wetlands can be both at the same time depending on seasonal variability. Thus, wetlands exhibit enormous diversity according to their genesis, geographical location, water regime and chemistry, dominant plants and soil or sediment characteristics. Because of their transitional nature, the boundaries of wetlands are often difficult to define. Wetlands do, however, share a few attributes common to all forms. Of these, hydrological structure (the dynamics of water supply, throughput, storage and loss) is most fundamental to the nature of a wetland system. It is the presence of water for a significant period of time which is principally responsible for the development of a wetland. One of the first widely used classifications systems, devised by Cowardin *et al.,* (1979), was associated to its hydrological, ecological and geological aspects, such as: marine (coastal wetlands including rock shores and coral reefs, estuarine (including deltas, tidal marshes, and mangrove swamps), lacustarine (lakes), riverine (along rivers and streams), palustarine ('marshy'- marshes, swamps and bogs). Given these characteristics, wetlands support a large variety of plant and animal species adapted to fluctuating water levels, making the wetlands of critical ecological significance. Utility wise, wetlands directly and indirectly support millions of people in providing services such as food, fiber and raw materials, storm and flood control, clean water supply, scenic beauty and educational and recreational benefits. The Millennium Ecosystem Assessment estimates conservatively that wetlands cover seven percent of the earth's surface and deliver 45% of the world's natural productivity and ecosystem services of which the benefits are estimated at $20 trillion a year (Source : www.MAweb.org). The Millennium Assessment (MA) uses the following typology to categorise ecosystem services:

Provisioning services: The resources or products provided by ecosystems, such as food, raw materials (wood), genetic resources, medicinal resources, ornamental resources (skin, shells, flowers).

Regulating services: Ecosystems maintain the essential ecological processes and life support systems, like gas and climate regulation, water supply and regulation, waste treatment, pollination, etc.

Cultural and Amenity services: Ecosystems are a source of inspiration to human culture and education throughout recreation, cultural, artistic, spiritual and historic information, science and education.

Supporting services: Ecosystems provide habitat for flora and fauna in order to maintain biological and genetic diversity.

Despite these benefits, wetlands are the first target of human interference and are among the most threatened of all natural resources. Around 50% of the earth's wetlands is estimated to already have disappeared worldwide over the last hundred years through conversion to industrial, agricultural and residential developments. Even in current scenario, when the ecosystem services provided by wetlands are better understood - degradation and conversion of wetlands continues. This is largely due to the fact that the 'full value' of ecosystem functions is often ignored in policy-making, plans and corporate evaluations of development projects.

1.2 Mapping and Geospatial technique

To conserve and manage wetland resources, it is important to have inventory of wetlands and their catchments. The ability to store and analyse the data is essential. Digital maps are very powerful tools to achieve this. Maps relating the feature to any given geographical location has a strong visual impact. Maps are thus essential for monitoring and quantifying change over time scale, assist in decision making. The technique used in the preparation of map started with ground survey. The Survey of India (SOI) topographic maps are the earliest true maps of India showing various land use/cover classes including wetlands. Recent years have seen advances in mapping technique to prepare maps with much more information. Of particular importance is the remote sensing and geographic information system (GIS) technique. Remote sensing is

now recognized as an essential tool for viewing, analyzing, characterizing, and making decisions about land, water and atmospheric components.

From a general perspective, remote sensing is the science of acquiring and analyzing information about objects or phenomena from a distance (Jensen, 1986; Lillesand and Keifer, 1987). Today, we define satellite remote sensing as the use of satellite borne sensors to observe, measure, and record the electromagnetic radiation (EMR) reflected or emitted by the earth and its environment for subsequent analysis and extraction of information. EMR sensors includes visible light, near-, mid- and far-infrared (thermal), microwave, and long-wave radio energy. The capability of multiple sources of information is unique to remote sensing. Of specific advantage is the spectral, temporal, and spatial resolution. Spectral resolution refers to the width or range of each spectral band being recorded. Since each target affects different wavelengths of incident energy differently, they are absorbed, reflected or transmitted in different proportions. Currently, there are many land resource remote sensing satellites that have sensors operating in the green, red, near infrared and short wave Infra red regions of the electromagnetic spectrum giving a definite spectral signature of various targets due to difference in radiation absorption and reflectance of targets. These sensors are of common use for land cover studies, including wetlands**.** Figure 1 shows typical spectral signature of few targets from green to SWIR region. Converted to image, in a typical false colour composite (FCC) created using NIR, red and green bands assigned as red, green and blue colour, the features become very distinct as shown in Figure 2. In FCC, the vegetation thus appears invariably red (due to high reflection in NIR from green leaves).

Since the early 1960s, numerous satellite sensors have been launched into orbit to observe and monitor the earth and its environment. Most early satellite sensors acquired data for meteorological purposes. The advent of earth resources satellite sensors (those with a primary objective of mapping and monitoring land cover) occurred, when the first Landsat satellite was launched in July 1972. Currently, more than a dozen orbiting satellites of various types provide data crucial to improving our knowledge of the earth's atmosphere, oceans, ice and snow, and land. Of particular interest to India is the indigenous series of satellites called Indian Remote Sensing satellites (IRS Series). Since the launch of the first satellite IRS 1A in 1987, India has now a number of satellites providing data in multi-spectral bands with different spatial resolution. IRS P6/RESOURCESAT 1 is the current generation satellite that provides multi-spectral images in spatial resolution of 5.8 m (LISS IV), 23.5 m (LISS III) and 56m (AWiFS). Over the past few decades, Indian remote sensing data has been successfully used in various fields of natural resources (Navalgund et al. 2002).

Development of technologies like Geographic Information System (GIS) has enhanced the use of RS data to obtain accurate geospatial database. GIS specialises in handling related, spatially referenced data, combining mapped information with other data and acts as analytical tool for research and decision making. During the past few decades, technological advances in the field of satellite remote sensing (RS) sensors, computerized mapping techniques, global positioning system (GPS) and geographic information system (GIS) has enhanced the ability to capture more detailed and timely information about the natural resources at various scales catering to local, regional, national and global level study.

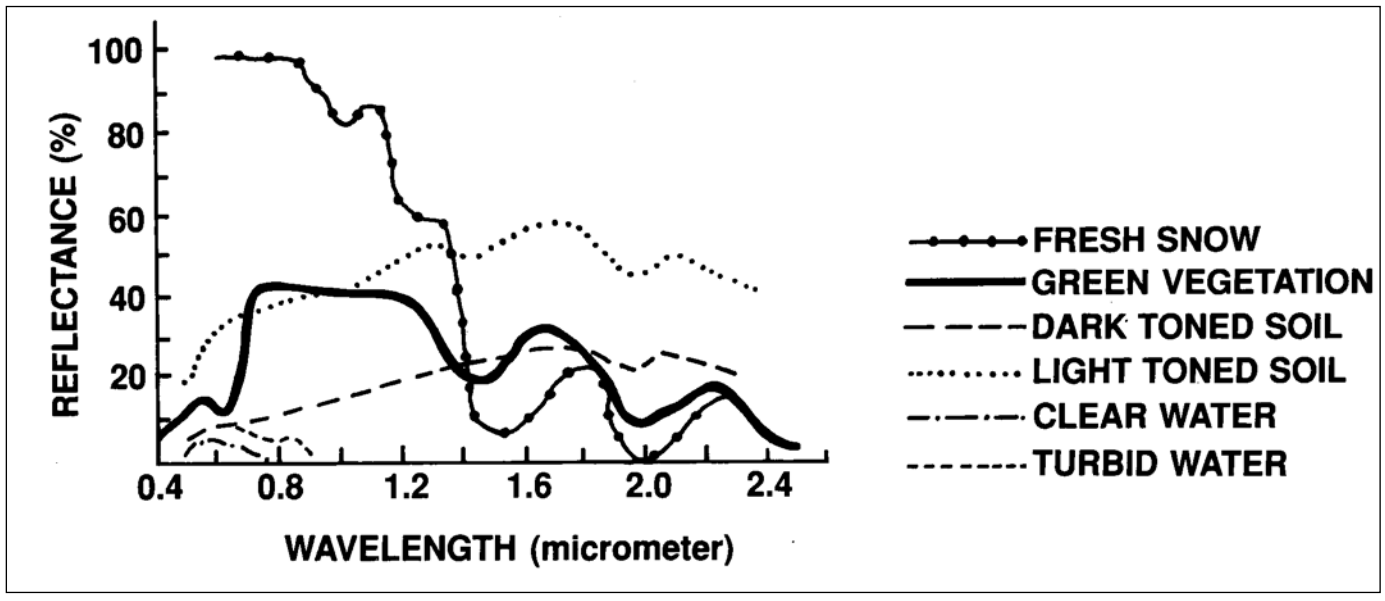


Figure 1: Spectral Signature of various targets

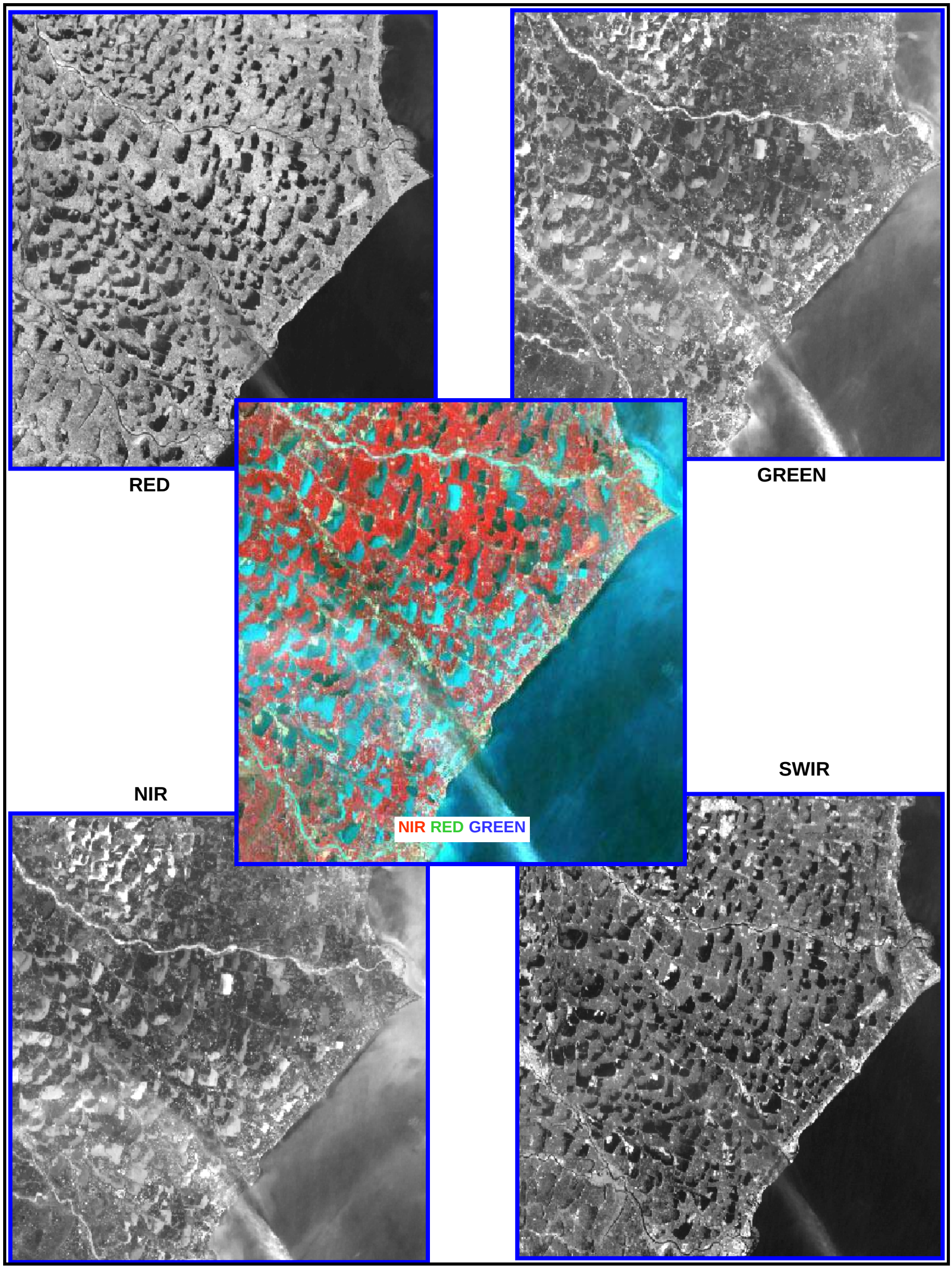


Figure 2: Various land features as they appear in four spectral bands and in a typical three band FCC.

1.3 Wetland Inventory of India

India with its large geographical spread supports large and diverse wetland classes, some of which are unique. Wetlands, variously estimated to be occupying 1-5 per cent of geographical area of the country, support about a fifth of the known biodiversity. Like any other place in the world, there is a looming threat to the aquatic biodiversity of the Indian wetlands as they are often under a regime of unsustainable human pressures. Sustainable management of these assets therefore is highly relevant. Realising this, Govt. of India has initiated many appropriate steps in terms of policies, programmes and plans for the preservation and conservation of these ecosystems. India is a signatory to the Ramsar Convention for management of wetland, for conserving their biodiversity and wise use extending its scope to a wide variety of habitats, including rivers and lakes, coastal lagoons, mangroves, peatlands, coral reefs, and numerous human-made wetland, such as fish and shrimp ponds, farm ponds, irrigated agricultural land, salt pans reservoirs, gravel pits, sewage farms, and canals. The Ministry of Environment and Forests has identified a number of wetlands for conservation and management under the National Wetland Conservation Programme and some financial assistance is being provided to State Governments for various conservation activities through approval of the Management Action Plans. The need to have an updated map database of wetlands that will support such actions has long been realized.

Mapping requires a standard classification system. Though there are many classification systems for wetlands in the world, the Ramsar classification system is the most preferred one. The 1971 Ramsar Convention on Wetlands of International Importance especially as Waterfowl Habitat is the oldest conservation convention. It owes its name to its place of adoption in Iran. It came into being due to serious decline in populations of waterfowl (mainly ducks) and conservation of habitats of migratory waterfowl. Convention provides framework for the conservation and 'wise use' of wetland biomes. Ramsar convention is the first modern global intergovernmental treaty on conservation and wise use of natural resources (www.ramsar.org). Ramsar convention entered into force in 1975. Under the text of the Convention (Article 1.1) wetlands are defined as:

"areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters".

In addition, the Convention (Article 2.1) provides that wetlands:

"may incorporate riparian and coastal zones adjacent to the wetlands, and islands or bodies of marine water deeper than six meters at low tide lying within the wetlands".

The first scientific mapping of wetlands of India was carried out during1992-93 by Space Applications Centre (ISRO), Ahmedabad, at the behest of the Ministry of Environment and Forests (MoEF), Govt. of India using remote sensing data from Indian Remote Sensing satellite (IRS Series). The mapping was done at 1:250,000 scale using IRS 1A LISS-I/II data of 1992-93 timeframe under the Nation-wide Wetland Mapping Project. Since, no suitable wetland classification existed for comprehensive inventory of wetlands in the country at that time, the project used a classification system based on Ramsar Convention definition of wetlands. The classification considers all parts of a water mass including its ecotonal area as wetland. In addition, fish and shrimp ponds, saltpans, reservoirs, gravel pits were also included as wetlands. This inventory put the wetland extent (inland as well as coastal) at about 8.26 million ha. (Garg et al, 1998). These estimates (24 categories) do not include rice/paddy fields, rivers, canals and irrigation channels.

Further updating of wetland maps of India was carried out by SAC using IRS P6/Resourcesat AWiFS data of 2004-05 at 1:250000 scale. In recent years, a conservation atlas has been brought out by Salim Ali Centre for Ornithology and Natural History (SACON, 2004), which provide basic information required by stakeholders in both wetland habitat and species conservation. Space Applications Centre has carried out many pilot projects for development of GIS based wetland information system (Patel et al, 2003) and Lake Information system (Singh et al, 2003).

2.0 NATIONAL WETLAND INVENTORY AND ASSESSMENT (NWIA) PROJECT

Realising the importance of many small wetlands that dot the Indian landscape, it has been unanimously felt that inventory of the wetlands at 1:50,000 scale is essential. The task seemed challenging in view of the vast geographic area of our country enriched with diverse wetland classes. Space Applications Centre with its experience in use of RS and GIS in the field of wetland studies, took up this challenging task. This is further strengthened by the fact that guidelines to create geospatial framework, codification scheme, data base structure etc. for natural resources survey has already been well established by the initiative of ISRO under various national level mapping projects. With this strength, the National Wetland Inventory and Assessment (NWIA) project was formulated by SAC, which was approved and funded by MoEF.

The main objectives of the project are:

- To map the wetlands on 1:50000 scale using two date (pre and post monsoon) IRS LISS III digital data following a standard wetland classification system.
- Integration of ancillary theme layers (road, rail, settlements, drainage, administrative boundaries)
- Creation of a seamless database of the states and country in GIS environment.
- Preparation of State-wise wetland atlases

The project was initiated during 2007. The first task was to have a classification system that can be used by different types of users while amenable to database. An expert/peer group was formed and the peer review was held at SAC on June 2007 where wetland experts and database experts participated and finalized the classification system. It was agreed to follow the classification system that has been used for the earlier project of 1:250,000 scale, with slight modification. Modified National Wetland Classification system for wetland delineation and mapping comprise 19 wetland classes which are organized under a Level III hierarchical system. The definition of each wetland class and its interpretation method was finalized. The technical/procedure manual was prepared as the standard guideline for the project execution across the country (Garg and Patel, 2007). The present atlas is part of the national level data base and deals with the state of Tamilnadu.

2.1 Wetland Classification System

In the present project, Modified National Wetland Classification system is used for wetland delineation and mapping comprising 19 wetland classes which are organized under a Level III hierarchical system (Table 1). Level one has two classes: inland and coastal, these are further bifurcated into two categories as: natural and man-made under which the 19 wetland classes are suitably placed. Two date data pertaining to pre-monsoon and post monsoon was used to confirm the classes. Wetlands put to agriculture use in any of the two dates are not included as wetland class. Definitions of wetland categories used in the project is given in Annexure-I.

2.2.1 Spatial Framework and GIS Database

The National Spatial Framework) (NSF) has been used as the spatial framework to create the database (Anon. 2007) . The database design and creation standard suggested by NRDB/NNRMS guidelines is followed. Feature codification scheme for every input element has been worked out keeping in view the nationwide administrative as well as natural hierarchy (State-district- within the feature class for each of the theme. All data elements are given a unique name, which are self explanatory with short forms.

Following wetland layers are generated for each inland wetland:

- Wetland extent: As wetlands encompass open water, aquatic vegetation (submerged, floating and emergent), the wetland boundary should ideally include all these. Satellite image gives a clear signature of the wetland extent from the imprint of water spread over the years.
- Water spread: There are two layers representing post-monsoon and pre-monsoon water spread during the year of data acquisition.

- Aquatic vegetation spread: The presence of vegetation in wetlands provides information about its trophic condition. As is known, aquatic vegetation is of four types, viz. benthic, submerged, floating, and emergent. It is possible to delineate last two types of vegetation using optical remote sensing data. A qualitative layer pertaining to presence of vegetation is generated for each season (as manifested on pre-monsoon and post-monsoon imagery).
- Turbidity level of open water: A layer pertaining to a qualitative turbidity rating is generated. Three qualitative turbidity ratings (low, medium and high) is followed for pre and post-monsoon turbidity of lakes, reservoirs, barrages and other large wetlands.
- Small wetlands (smaller than minimum mappable unit) are mapped as point features.
- Base layers like major road network, railway, settlements, and surface drainage are created (either from the current image or taken from other project data base).

In the case of coastal wetlands only wetland extent is given.

Table 1: Wetland Classification System and coding

Wettcode*	Level I	Level II	Level III
1000	Inland Wetlands		
1100		Natural	
1101			Lakes
1102			Ox-Bow Lakes/ Cut-Off Meanders
1103			High altitude Wetlands
1104			Riverine Wetlands
1105			Waterlogged
1106			River/stream
1200		Man-made	
1201			Reservoirs/ Barrages
1202			Tanks/Ponds
1203			Waterlogged
1204			Salt pans
2000	Coastal Wetlands		
2100		Natural	
2101			Lagoons
2102			Creeks
2103			Sand/Beach
2104			Intertidal mud flats
2105			Salt Marsh
2106			Mangroves
2107			Coral Reefs
2200		Man-made	
2201			Salt pans
2202			Aquaculture ponds

***** Wetland type code

3.0 STUDY AREA

Tamilnadu the Southern most state in India has a geographical extent of 1,30,409km². It is surrounded by Andhra Pradesh and Karnataka in the north and north west, the Indian Ocean in the south, Kerala in the west and Bay of Bengal in the east. The state extends from the Coromandel Coast in the east to the forested Western Ghats in the west. It is located between 8° 00'-13° 30'N latitude and 76° 15'-80° 18'E Longitudes (Figure 3). It is the second most industrialized state in the country after Gujarat. This land has a vibrant culture, a rich tapestry of history, a nature's Paradise of extended beaches, wetlands, clear skies and many more.

Physiographically the state can be divided into two broad divisions as the eastern coastal plains and the hills of north and east, which is endowed with a varied coastal habitats like mangroves, corals, seaweeds, sea grass beds, salt marshes, mudflats, sand dunes etc. Tamilnadu coast is the longest coastline (1076 km) in the East Coast of India. Ports, fishing harbors and a variety of coastal industries like nuclear and thermal power plants, refineries, fertilizers and marine chemicals are situated on the coast of Tamilnadu. The Eastern and Western Ghats meet in this state and run along its eastern and western borders. The hills of the Western Ghats have dense forests as compared to Eastern Ghats. This region receives maximum rainfall and hence favours plantations of tea, coffee and spices. However, the upper reaches of the Eastern Ghats are not without their share of beauty and Yercaud in the Shevaroy hills is famous for its fruit orchards and banana and coffee plantations. The most arid and desert like-area is in the Tirunelveli district and is known as Palai.

As per the 2001 census data, the population of the state was 62405679. The density of population is 480 persons per km² and literacy rate of the state was 73.50%. The total number of districts in Tamilnadu is 30. Chennai, the capital of Tamilnadu, is an important coastal city of India having a major port and many industries.

The state has a maximum temperature of 43° C and a minimum temperature of 18° C. The monsoon season is usually during October to December. Average Rainfall is 961.8 mm. Tamilnadu is well developed in communications, a wide network of national and state highways as well as railway lines serve the state.

The state has a number of rivers, estuaries and lagoons. The rivers flow west to east towards the Bay of Bengal. Some of the important rivers are Kaveri, Vaigai, Tampraparni, Periyar, Pennar. The River Kaveri is the major estuary in Tamilnadu and the minor estuaries include Vellar, Pazhayar, Adyar etc. The fertile Coromandel plains are irrigated by the Kaveri and its delta in Thanjavur - Nagapattinam region is known as the granary of Tamilnadu. The main lagoons are Pulicat lake (South) and Muthupettai.

Tamilnadu has a wealth of flora and fauna and some of its major wildlife sanctuaries like Mudumalai and Anaimalai are situated in the hills of the Western Ghats which is the habitat of elephants, tigers, bisons and a variety of monkey and deer. Of the 3000 and more plant species found in Tamilnadu, a majority are found in the mixed deciduous forests of this region. Cinchona from which quinine - a drug for treating malaria - is extracted and eucalyptus grow abundantly in the Nilgiris. Forests of medicinal herbs are found in Palani hills and Courtallam. Palmyrah trees grow by the thousands in Tirunelveli and its products are used as raw materials for several cottage industries. Rubber is the main plantation crop in Kanniyakumari and the more exotic sandalwood grows, though not in very large numbers, in the Javadhu hills of Vellore district.

The state is rich in mineral resources. The major mineral resources include Lignite, Vermiculite, Garnet, Zircon, Graphite, Ilmenite, Rutile, Monazite and Magnesite etc.

The state of Tamilnadu is covered in 228 Survey of India topographic maps on 1:50,000 scale that form the spatial frame work for mapping (Figure-4).

A detail of district information followed in the atlas is given in Annexure-II.

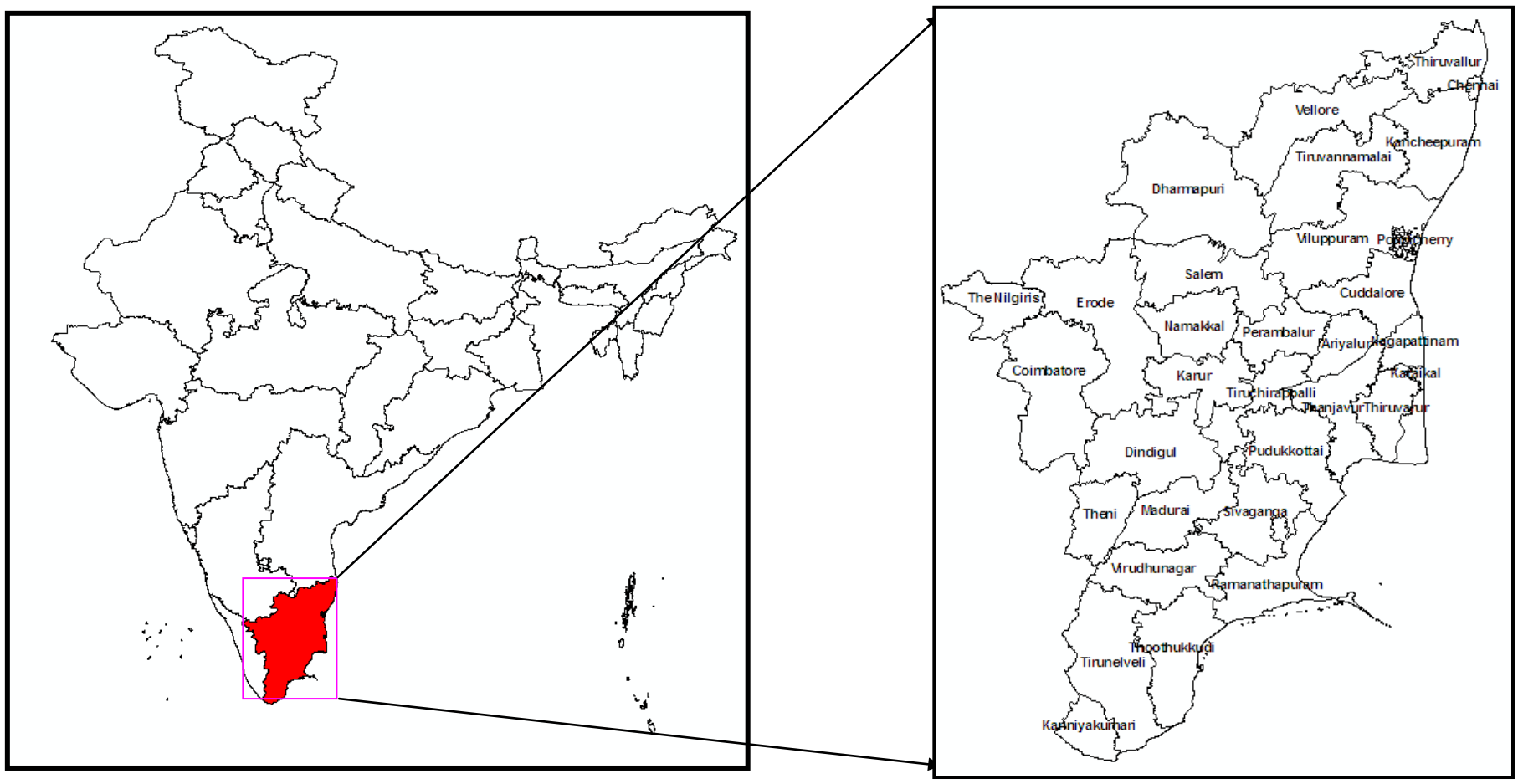


Figure 3: Location Map

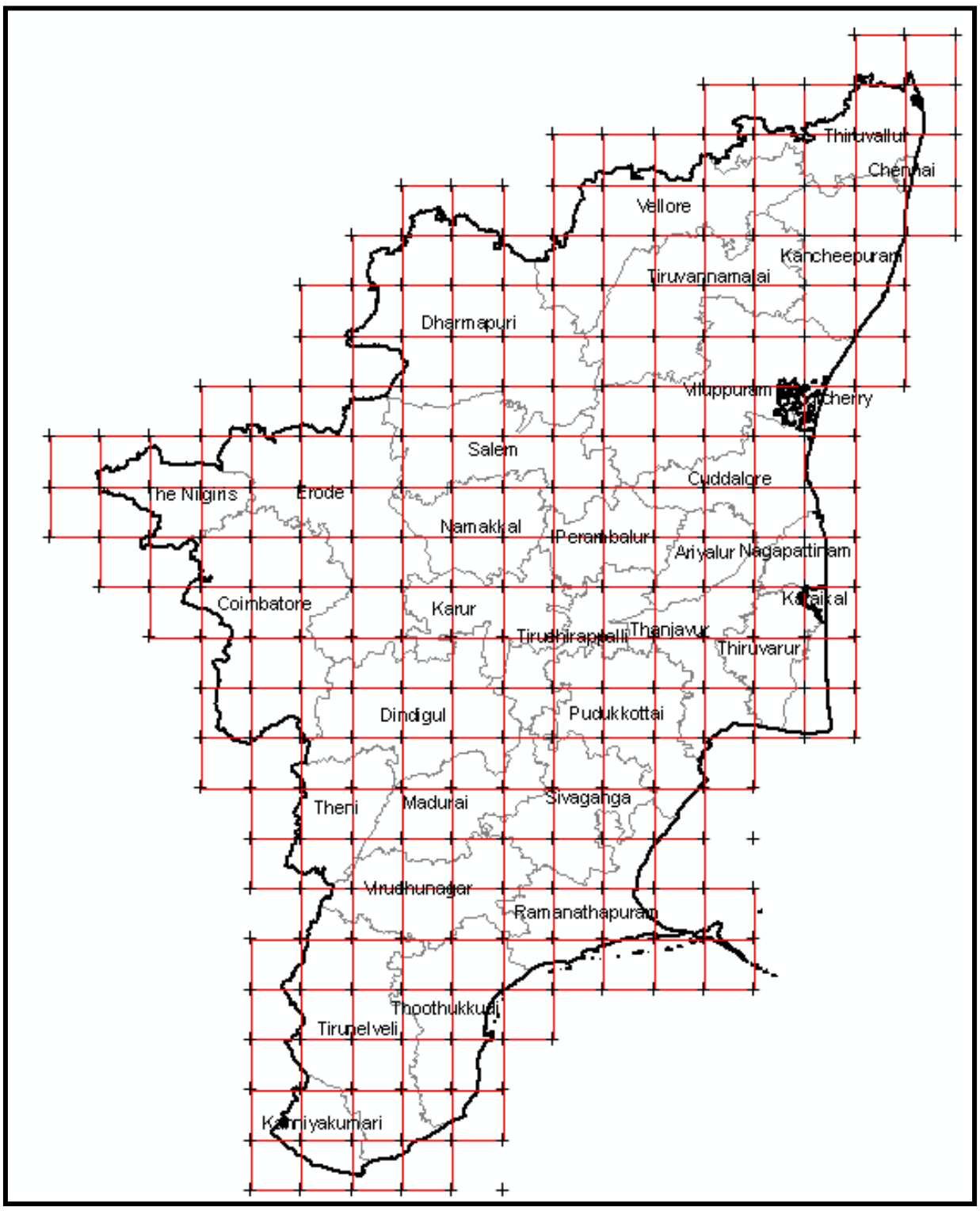


Figure 4: Spatial Framework of Tamilnadu

4.0 DATA USED

Remote sensing data

IRS P6 LISS III data was used to map the wetlands. IRS P6 LISS III provides data in 4 spectral bands; green, red, Near Infra Red (NIR) and Short wave Infra Red (SWIR), with 23.5 m spatial resolution and 24 day repeat cycle. The spatial resolution is suitable for 1:50,000 scale mapping. The state of Tamilnadu is covered in 15 IRS LISS III scenes (Figure 5). Two date data, one acquired during March and another during January were used to capture the pre-monsoon and post-monsoon hydrological variability of the wetlands respectively (Table-2). Figure 6 shows the overview of the part of Tamilnadu as seen in the LISS III FCC of post- monsoon pre-monsoon data respectively.

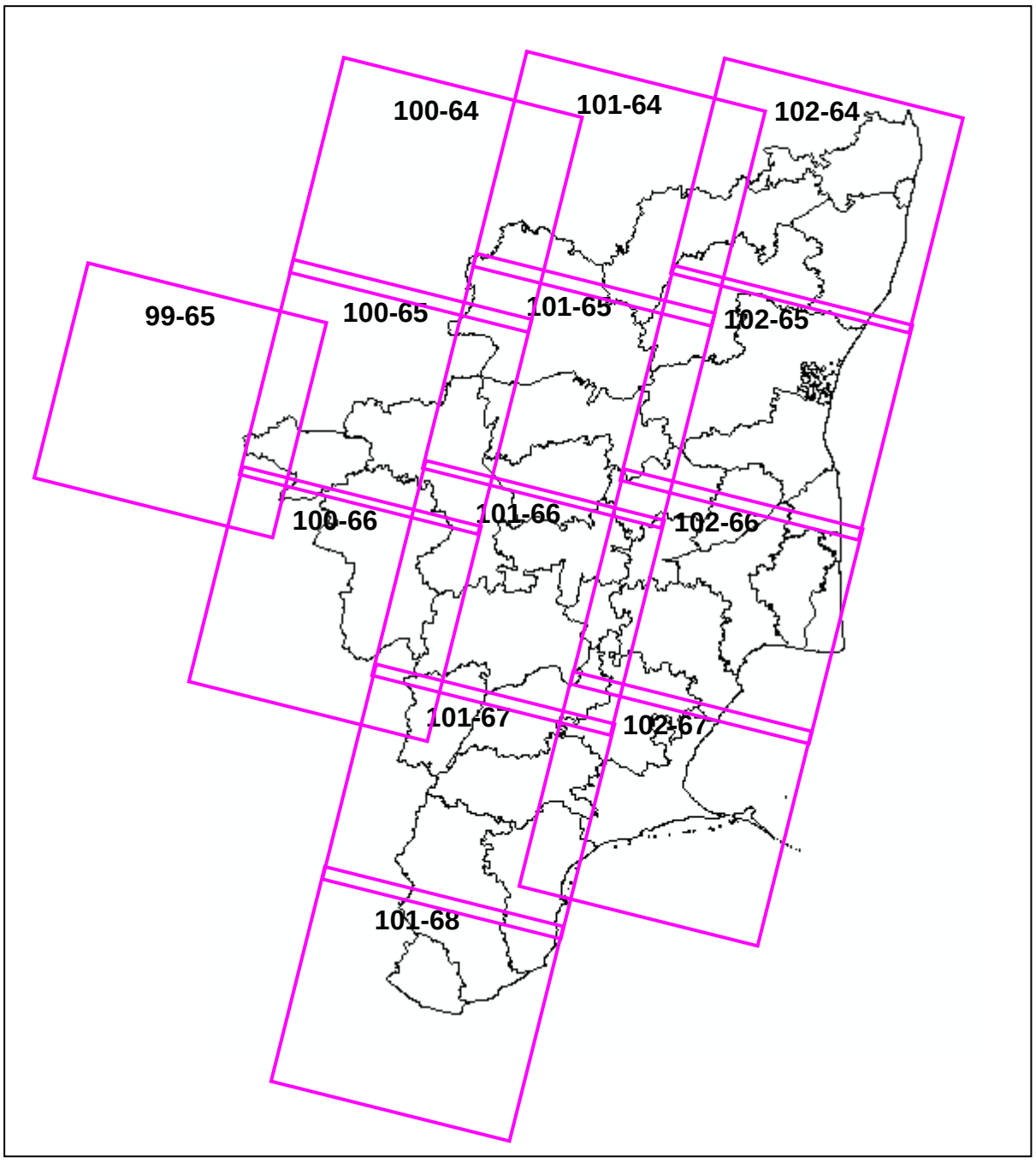


Figure 5: IRS P6 LISS-III coverage (path-row) of Tamilnadu

Ground truth data

Remote sensing techniques require certain amount of field observation called “ground truth” in order to convert into meaningful information. Such work involves visiting a number of test sites, usually taking the satellite data. The location of the features is recorded using the GPS. The standard proforma as per the NWIA manual was used to record the field data. Field photographs are also taken to record the water quality (subjective), status of aquatic vegetation and water spread. All field verification work has been done during October and November 2008.

Table-2: Satellite data used

Sr. No.	Sensor	Path-Row	Date of Acquisition		
			Post-monsoon	Pre-Monsoon (Set 1)	Pre-monsoon (Set 2)
1	LISS-III	99-65	17-December-05	27-February-06	5-January-07
2	LISS-III	99-66	5-January-06	27-February-06	5-January-07
3	LISS-III	100-64	28-November-05	28-March-06	10-May-07
4	LISS-III	100-65	28-November-05	28-March-06	10-May-07
5	LISS-III	100-66	13-February-05	28-March-06	10-May-07
6	LISS-III	100-67	13-February-05	28-March-06	23-March-07
7	LISS-III	101-64	20-January-06	2-April-06	8-February-07
8	LISS-III	101-65	20-January-06	2-April-06	8-February-07
9	LISS-III	101-66	20-January-06	2-April-06	28-March-07
10	LISS-III	101-67	20-January-06	2-April-06	28-March-07
11	LISS-III	101-68	3-December-05	2-April-06	28-March-07
12	LISS-III	102-64	8-December-05, 25-January-06	7-April-06	7-April-06
13	LISS-III	102-65	8-December-05	7-April-06	20-May-07
14	LISS-III	102-66	8-December-05	7-April-06	20-May-07
15	LISS-III	102-67	8-December-05	7-April-06	20-May-07

Other data

Survey of India topographical maps (SOI) were used for reference purpose. Lineage data of National Wetland Maps at 1:250,000 scale was used for reference.

5.0 METHODOLOGY

The methodology to create the state level atlas of wetlands is adhered to NWIA technical guidelines and procedure manual (Garg and Patel, 2007). The overview of the steps used is shown in Figure 7. Salient features of methodology adopted are

- Generation of spatial framework in GIS environment for database creation and organisation.
- Geo-referencing of satellite data
- Identification of wetland classes as per the classification system given in NWIA Manual and mapping of the classes using a knowledge based digital classification and onscreen interpretation
- Generation of base layers (rail, road network, settlements, drainage, administrative boundaries) from satellite image and ancillary data.
- Mosaicing/edge matching to create district and state level database.
- Coding of the wetlands following the standard classification system and codification as per NWIA manual.
- Preparation of map compositions and generation of statistics
- Outputs on A3 size prints and charts for atlas.

Work was carried out using ERDAS Imagine, Arc/Info and Arcgis softwares.

5.1 Creation of spatial framework

This is the most important task as the state forms a part of the national frame work and is covered in multiple map sheets. To create NWIA database, NNRMS/NRDB standards is followed and four corners of the 1:50,000 (15' x 15') grid is taken as the tics or registration points to create each map taking master grid as the reference. Spatial framework details are given in NWIA manual (Garg and Patel 2007). The spatial framework for Tamilnadu state is shown in Figure 4.

5.2 Geo-referencing of satellite data

In this step the raw satellite images were converted to specific map projection using geometric correction. This is done using archived geometrically corrected LISS III data (ISRO-NRC-land use / land cover project). Standard image processing software was used for geo-referencing. First one date data was registered with the archived image. The second date data was then registered with the first date data.

5.3 Mapping of wetlands

The delineation of wetlands through image analysis forms the foundation for deriving all wetland classes and results. Consequently, a great deal of emphasis has been placed on the quality of the image Interpretation. In the present study, the mapping of wetlands was done following digital classification and onscreen visual interpretation. Wetlands were identified based on vegetation, visible hydrology and geography. There are various methods for extraction of water information from remote sensing imagery, which according to the number of bands used, are generally divided into two categories, i.e. Single-band and multi-band methods. Single-band method usually involves choosing a band from multi-spectral image to distinguish water from land by subjective threshold values. It may lead to over- or under-estimation of open water area. Multi-band method takes advantage of reflective differences of each band. In this project, five indices known in literature that enhances various wetland characteristics were used (McFeeters, 1996; Xu Hanqiu, 2006; Townshend and Justice, 1996; Tucker and Sellers, 1986; Lacaux et al, 2007) as given below:

i) Normalised Difference Water Index (NDWI) = (Green-NIR) / (Green + NIR)

ii) Modified Normalised Difference Water Index (MNDWI) = (Green-MIR) / (Green + MIR)

iii) Normalised Difference Vegetation Index (NDVI) = (NIR - Red) / (NIR + Red)

iv) Normalised Difference Pond Index (NDPI) = (MIR – Green / MIR + Green)

v) Normalised Difference Turbidity Index (NDTI) = (Red – Green) / (Red + Green)

The indices were generated using standard image processing software, stacked as layers. (Figure 8). Various combinations of the indices/spectral bands were used to identify the wetland features as shown in Figure 9. The following indices were used for various layer extractions:

- Extraction of wetland extent :

  MNDWI, NDPI and NDVI image was used to extract the wetland boundary through suitable hierarchical thresholds.

- Extraction of open water :

  MNDWI was used within the wetland mask to delineate the water and no-water areas.

- Extraction of wetland vegetation :

  NDPI and NDVI image was used to generate the vegetation and no-vegetation areas within a wetland using a suitable threshold.

- Turbidity information extraction :

  NDTI and MNDWI image was used to generate qualitative turbidity level (high, moderate and low) based on signature statistics and standard deviations. In the False Colour Composite (FCC) these generally appear in different hues (Table-3).

Table 3: Qualitative turbidity ratings

Sr. No.	Qualitative Turbidity	Conditional criteria	Hue on False Colour Composite (FCC)
1.	Low	> $+1\sigma$	Dark blue/blackish
2.	Moderate	> -1σ to <= $+1\sigma$	Medium blue
3.	High/Bottom reflectance	<= $\mu - 1\sigma$	Light blue/whitish blue

5.4 Conversion of the raster (indices) into a vector layer

The information on wetland extent, open water extent, vegetation extent and turbidity information was converted into vector layers using region growing properties or on-screen digitisation.

5.5 Generation of reference layers

Base layers like major rail, road network, settlements, drainage are interpreted from the current image or taken from other project database. The administrative boundaries (district, state) are taken from the known reference data.

5.6 Coding and attribute scheme

Feature codification scheme for every input element has been worked out keeping in view the nationwide administrative as well as natural hierarchy (State-district-taluka) within the feature class for each of the theme. All data elements are given a unique name/code, which are self explanatory with short forms.

5.7 Map composition and output

Map composition for atlas has been done at district and state level. A standard color scheme has been used for the wetland classes and other layers. The digital files are made at 1:50,000 scale. The hard copy outputs are taken on A3 size.

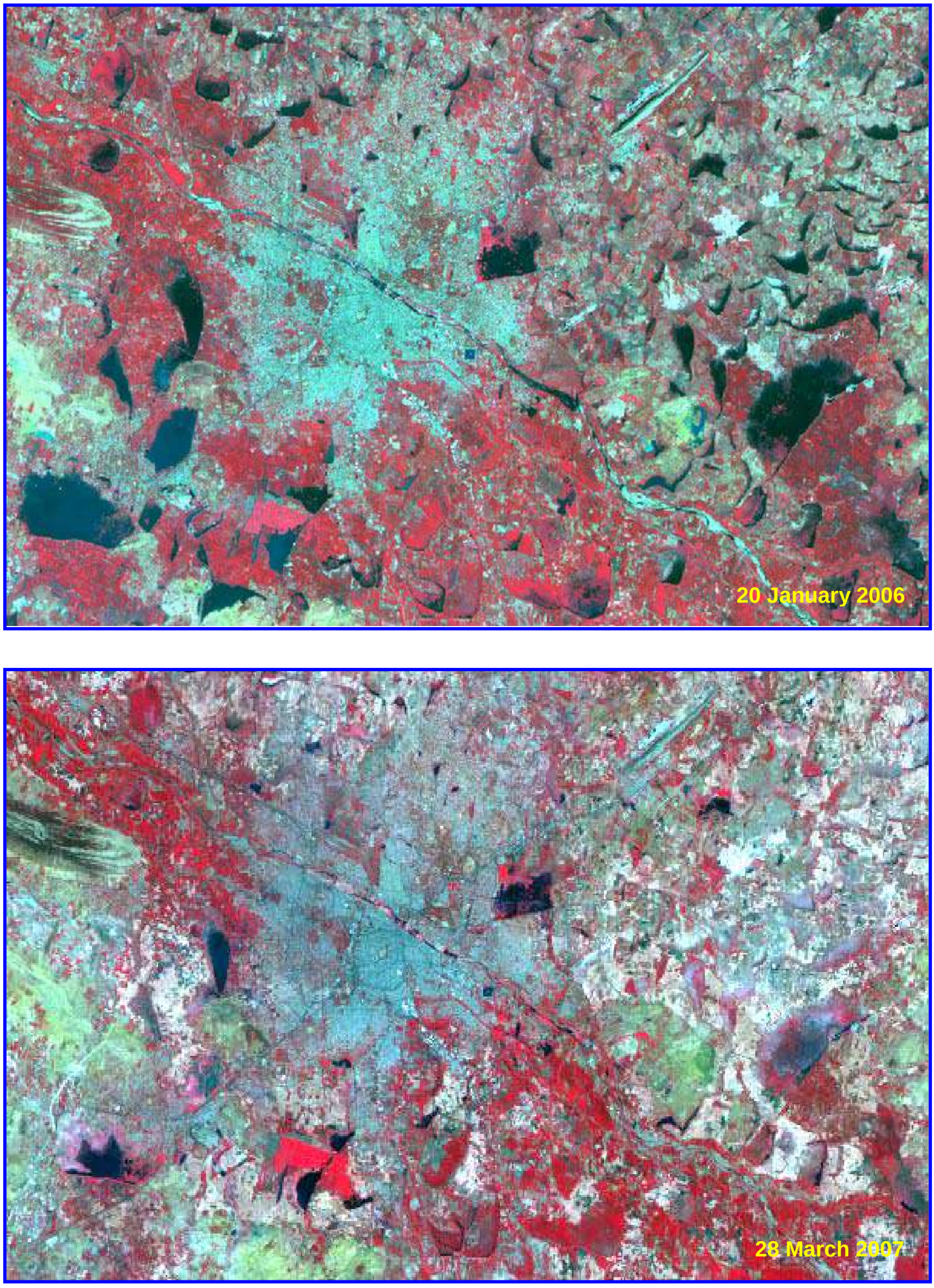


Figure 6: IRS LISS-III FCC(Post-monsoon and Pre-monsoon) : Part of Tamilnadu state

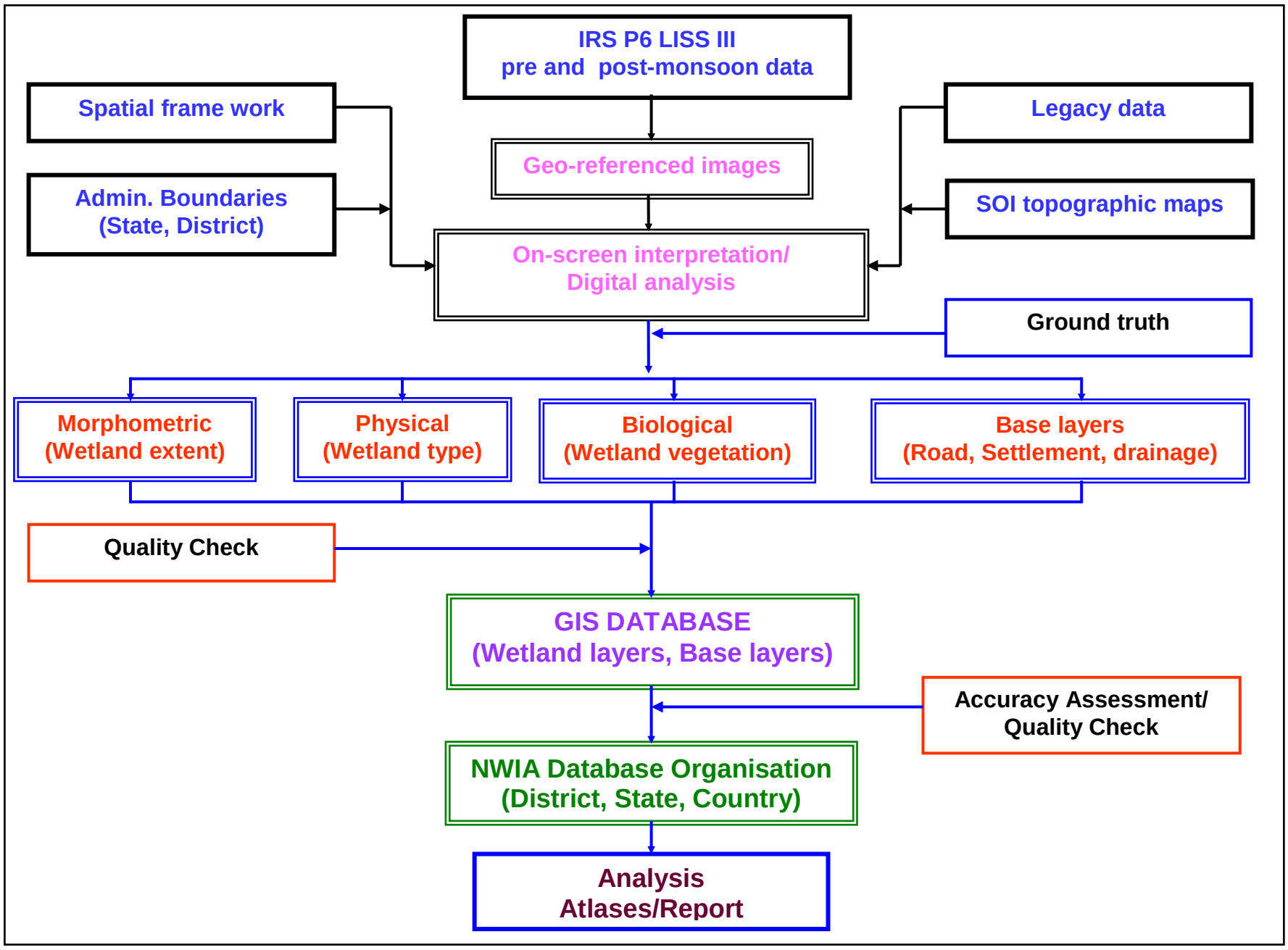


Figure 7: Flow chart of the methodology used

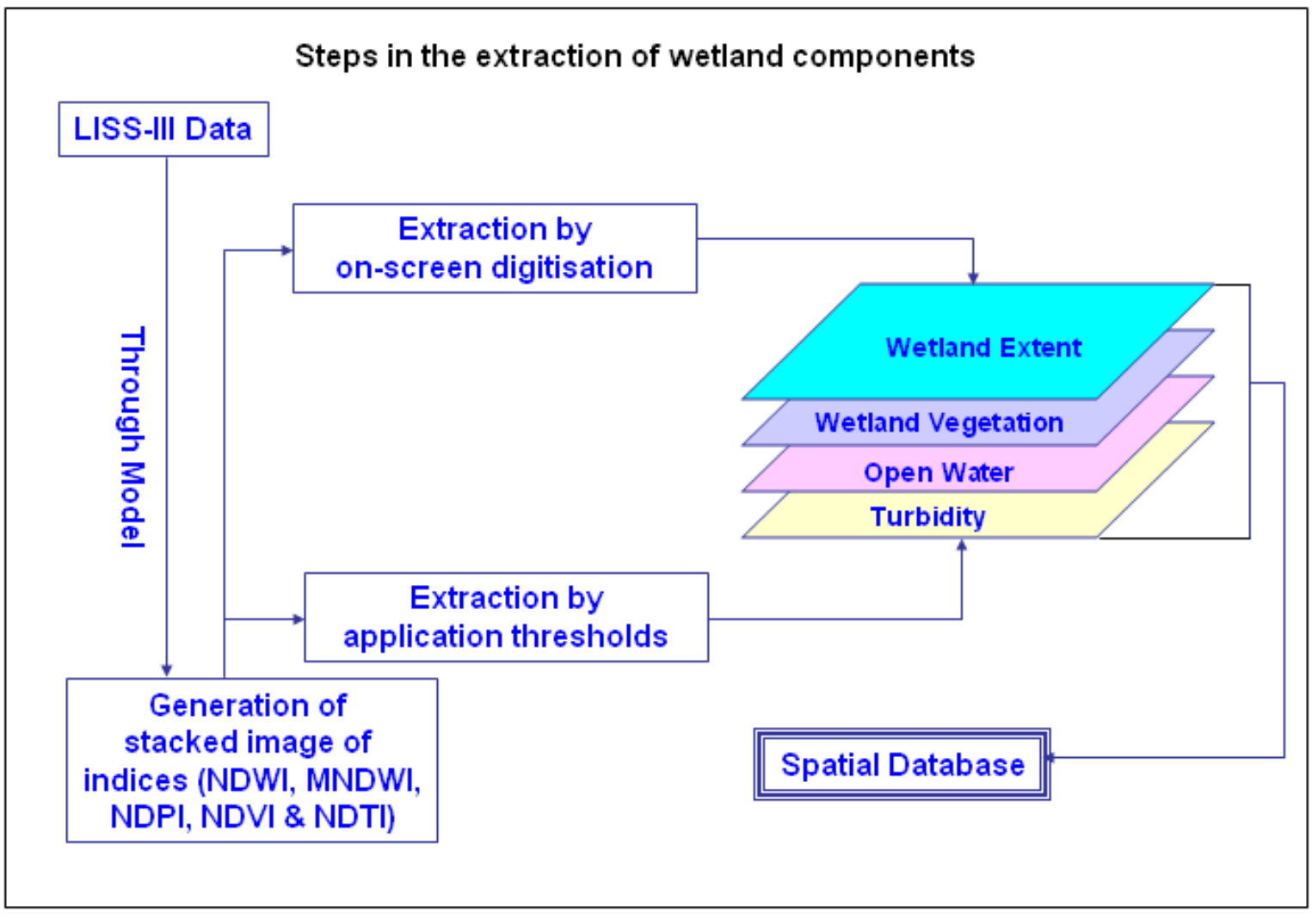
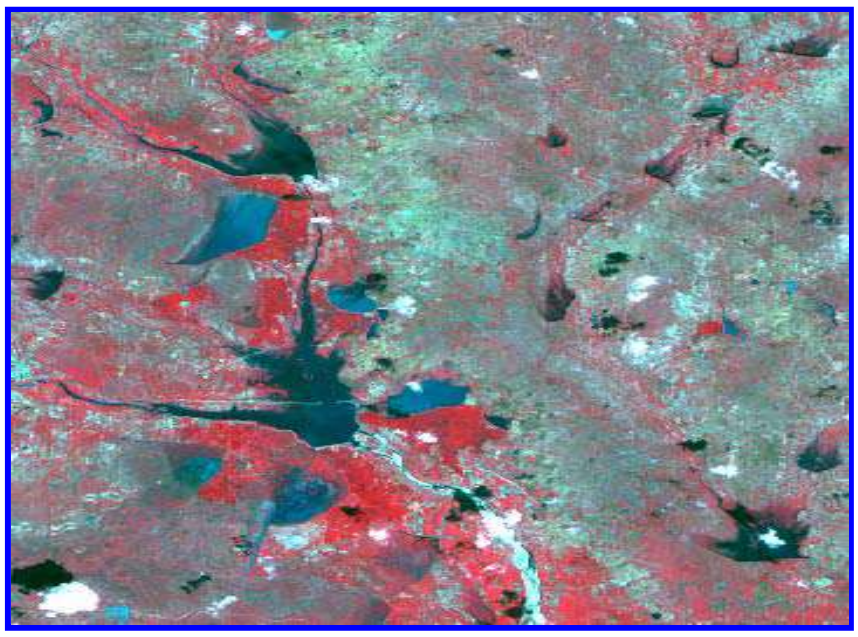
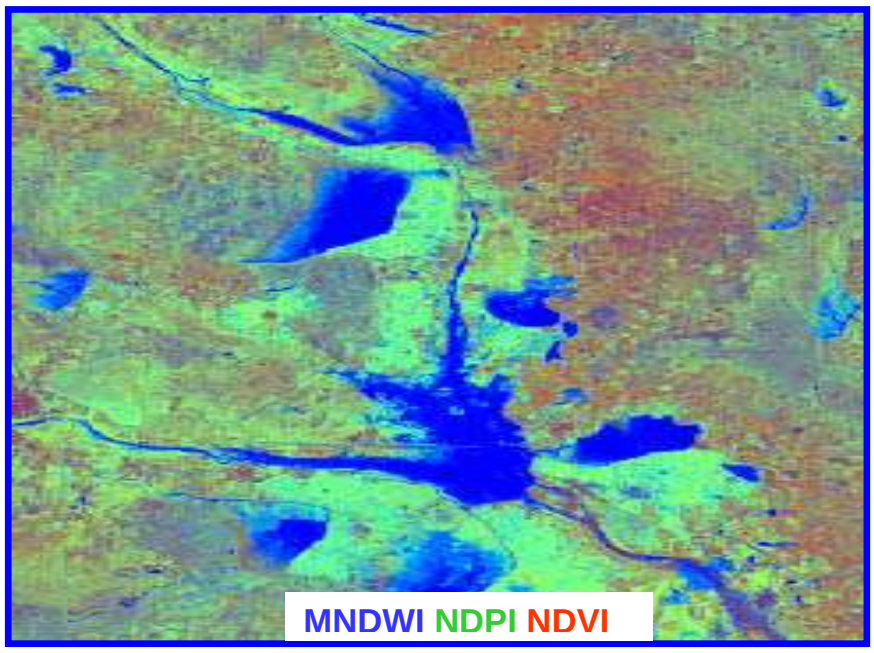
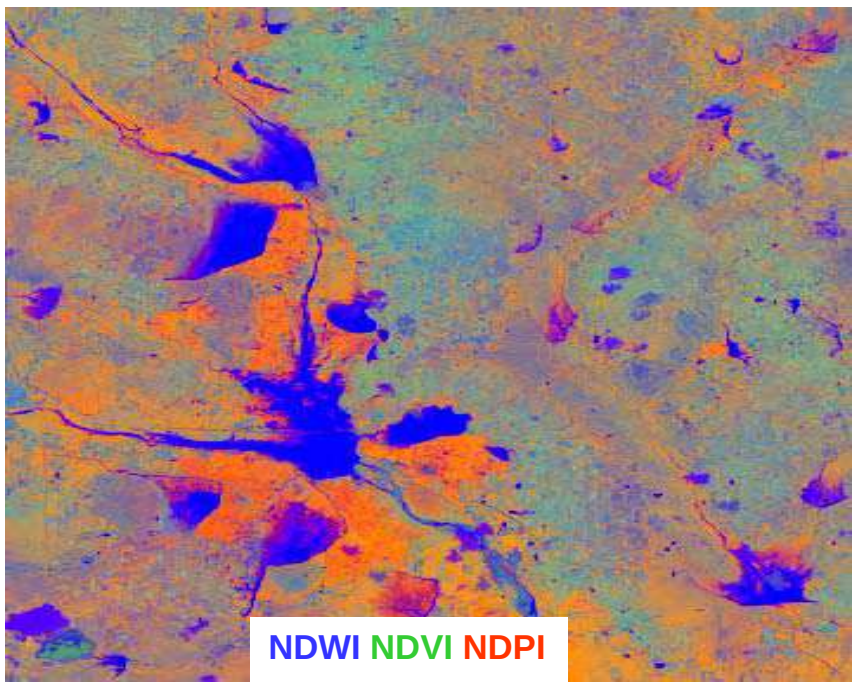


Figure 8: Steps in the extraction of wetland components

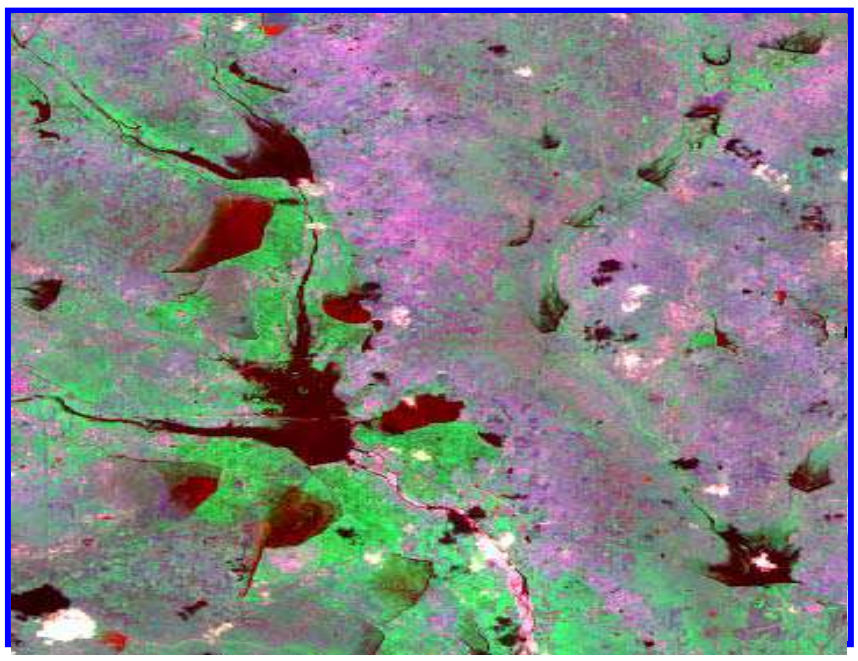




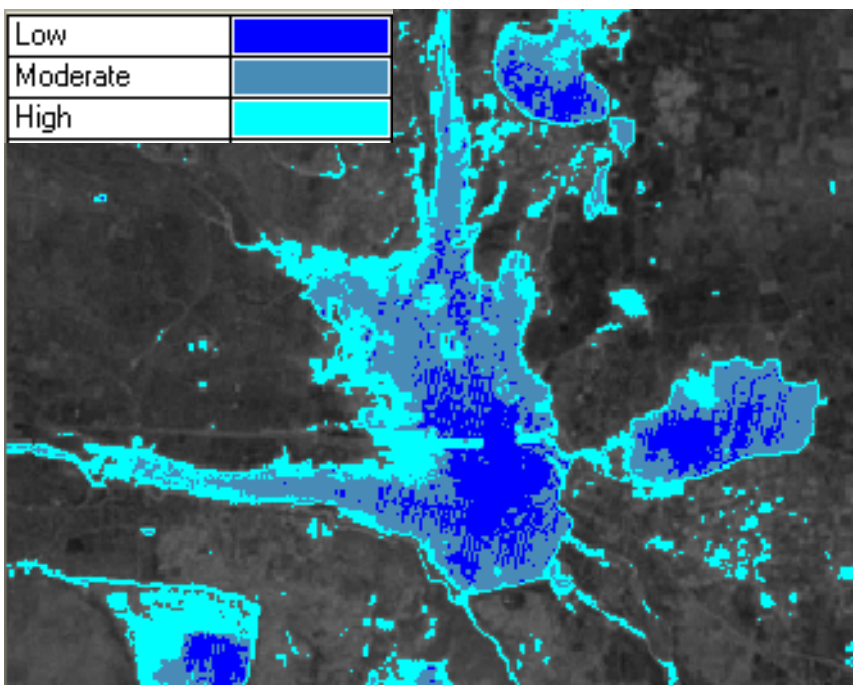
Useful for wetland boundary extraction/delineation



Useful for wetland vegetation & open water features



Kullur Santhai Réservoir, Virdhunagar
IRS LISS III data, 20 January 2006



Color coded: MNDWI

Useful for qualitative turbidity delineation

Figure 9: Various combinations of the indices/spectral bands used to identify wetland components

6.0 ACCURACY ASSESSMENT

A comprehensive accuracy assessment protocol has been followed for determining the quality of information derived from remotely sensed data. Accuracy assessment involves determination of thematic (classification) as well as locational accuracy. In addition, GIS database(s) contents have been also evaluated for accuracy. To ensure the reliability of wetland status data, the project adhered to established quality assurance and quality control measures for data collection, analysis, verification and reporting.

This study used well established, time-tested, fully documented data collection conventions. It employed skilled and trained personnel for image interpretation, processing and digital database creation. All interpreted imageries were reviewed by technical expert team for accuracy and code. The reviewing analyst adhered to all standards, quality requirements and technical specifications and reviewed 100 percent of the work. The various stages of quality check include:

1. Image-to-Image Geo-referencing/Data generation
2. Reference layer preparation using NWIA post monsoon and pre-monsoon LISS-III data.
3. Wetland mapping using visual/digital interpretation techniques.
4. Geo-data base creation and organization
5. Output products.

6.1 Data verification and quality assurance of output digital data files

All digital data files were subjected to rigorous quality control inspections. Digital data verification included quality control checks that addressed the geospatial correctness, digital integrity and some cartographic aspects of the data. Implementation of quality checks ensured that the data conformed to the specified criteria, thus achieving the project objectives. There were tremendous advantages in using newer technologies to store and analyze the geographic data. The geospatial analysis capability built into this study provided a complete digital database to better assist analysis of wetland change information. All digital data files were subjected to rigorous quality control inspections. Automated checking modules incorporated in the geographic information system (Arc/GIS) were used to correct digital artifacts including polygon topology. Additional customized data inspections were made to ensure that the changes indicated at the image interpretation stage were properly executed.

MAPS AND STATISTICS

7.0 WETLANDS OF TAMILNADU: MAPS AND STATISTICS

Area estimates of various wetland categories for Tamilnadu have been carried out using GIS layers of wetland boundary, water-spread, aquatic vegetation and turbidity. Total 24684 wetlands have been mapped at 1:50,000 scale in the state. In addition, 18294 small wetlands (< 2.25 ha) have also been identified. Total wetland area estimated is 902534 ha that is around 6.92 per cent of the geographic area (Table 4). The major wetland types are Lakes/Ponds (316091 ha), Tanks/Ponds (237613 ha), River/Stream (136878 ha), and Reservoirs (56419 ha). Area under mangroves is around 7315 ha. Coral reefs (3899 ha) exists mainly in Ramnathpuram district. Graphical distribution of wetland type is shown in Figure 10.

Aquatic vegetation is observed in Lakes/Ponds, and Tanks/Ponds. The area under aquatic vegetation is more during pre monsoon (531600 ha) than that of post monsoon (167273 ha). The open water spread significantly lower during pre monsoon (296268 ha) compared to post monsoon (657861 ha).

Table 4: Area estimates of wetlands in Tamilnadu

Area in ha

Sr. No.	Wettcode	Wetland Category	Number of Wetlands	Total Wetland Area	% of wetland area	Open Water	
						Post-monsoon Area	Pre-monsoon Area
	1100	**Inland Wetlands - Natural**					
1	1101	Lakes/Ponds	4369	316091	35.02	236456	45436
2	1104	Riverine wetlands	2	127	0.01	121	41
3	1105	Waterlogged	44	3928	0.44	3382	2168
4	1106	River/Stream	194	136878	15.17	131049	131479
	1200	**Inland Wetlands -Man-made**					
5	1201	Reservoirs/Barrages	99	56419	6.25	46443	31064
6	1202	Tanks/Ponds	19343	237613	26.33	164346	23078
7	1203	Waterlogged	38	10811	1.20	9353	5816
		Total - Inland	**24089**	**761867**	**84.41**	**591150**	**239082**
	2100	**Coastal Wetlands - Natural**					
8	2101	Lagoons	74	25057	2.78	25041	22034
9	2102	Creeks	17	3404	0.38	3339	3403
10	2103	Sand/Beach	73	9798	1.09	-	-
11	2104	Intertidal mud flats	84	33164	3.67	-	-
12	2105	Salt Marsh	42	6108	0.68	5369	2596
13	2106	Mangroves	78	7315	0.81	-	-
14	2107	Coral Reefs	36	3899	0.43	-	-
	2200	**Coastal Wetlands - Man-made**					
15	2201	Salt pans	47	22889	2.54	22505	19733
16	2202	Aquaculture ponds	144	10739	1.19	10457	9420
		Total - Coastal	**595**	**122373**	**13.56**	**66711**	**57186**
		Sub-Total	**24684**	**884240**	**97.97**	**657861**	**296268**
		Wetlands (<2.25 ha), mainly Tanks	18294	18294	2.03	-	-
		Total	**42978**	**902534**	**100.00**	**657861**	**296268**

Area under Aquatic Vegetation	167273	531600

Area under turbidity levels		
Low	314273	70189
Moderate	247677	159206
High	95911	66873

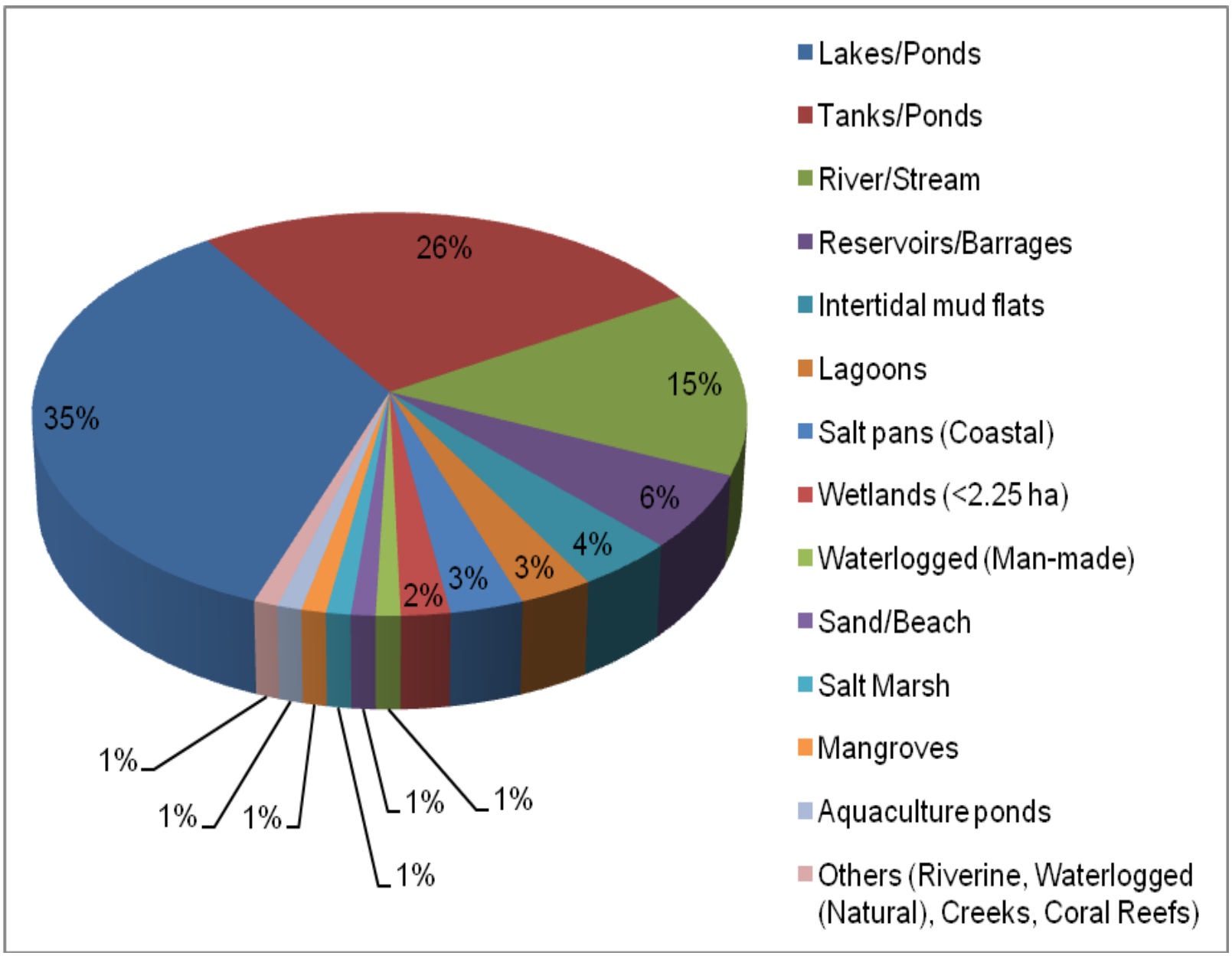


Figure 10: Type-wise wetland distribution in Tamilnadu

7.1 DISTRICT-WISE WETLAND MAPS AND STATISTICS

There are 30 districts. The geographic area of the districts varies from 178 sq.km (Chennai) to 8162 sq.km (Erode). The wetlands occupy as high as 18.05% of geographic area (Ramnathpuram district), and as low as 1.08% (Coimbatore). In terms of total wetland area (% wetland area), Kancheepuram is the leading district (80445 ha, 8.91%) and Chennai is the least (917 ha, 0.10 %). District-wise wetland area estimates is given in Table-5 and graphical distribution of wetlands is shown in Figure - 11.

Lakes/Ponds and Tanks/Ponds are the dominate wetland types in almost all districts. In coastal areas, Lagoons, Inter tidal mudflats and Saltpans are dominate wetland types.

The following section gives the details of district wise wetland statistics and maps. The districts are arranged as per census serial number. Wetland statistics followed by wetland map and corresponding satellite data for each district is given to have a fairly good idea about the distribution pattern and density of wetlands in the district.

Table-5:District-wise wetland area

District	Geographic Area * (sq. km)	Wetland Area (ha)	% of total wetland area	% of district geographic area
Thiruvallur	3422	53863	5.97	15.74
Chennai	178	917	0.10	5.15
Kancheepuram	7857	80445	8.91	10.24
Vellore	6077	32640	3.62	5.37
Dharampuri	4498	18215	2.02	4.05
Thiruvannamalai	6191	48130	5.33	7.77
Viluppuram	7222	64105	7.10	8.88
Salem	5205	15270	1.69	2.93
Namakkal	3363	7687	0.85	2.29
Erode	8162	13570	1.50	1.66
The Nilgiris	2453	3127	0.35	1.27
Coimbatore	7469	8070	0.89	1.08
Dindigul	6267	13815	1.53	2.20
Karur	2896	16383	1.82	5.66
Tiruchirappalli	4404	18626	2.06	4.23
Perambalur	3690	8070	0.89	2.19
Ariyalur **	1942	11042	1.22	5.69
Cuddalore	3678	28135	3.12	7.65
Nagapattinam	2716	47833	5.30	17.61
Thiruvarur	2097	22591	2.50	10.77
Thanjavur	3348	34184	3.79	10.21
Pudukkottai	4663	72402	8.02	15.53
Sivaganga	4189	67172	7.44	16.04
Madurai	3742	24614	2.73	6.58
Theni	3242	5293	0.59	1.63
Virudhunagar	4232	29071	3.22	6.87
Ramanathapuram	4090	73808	8.18	18.05
Thoothukkudi	4621	37810	4.19	8.18
Tirunelveli	6823	37709	4.18	5.53
Kanniyakumari	1672	7937	0.88	4.75
Total	**130409**	**902534**	**100.00**	6.92

* Census 2001 data is used ** GIS data is used

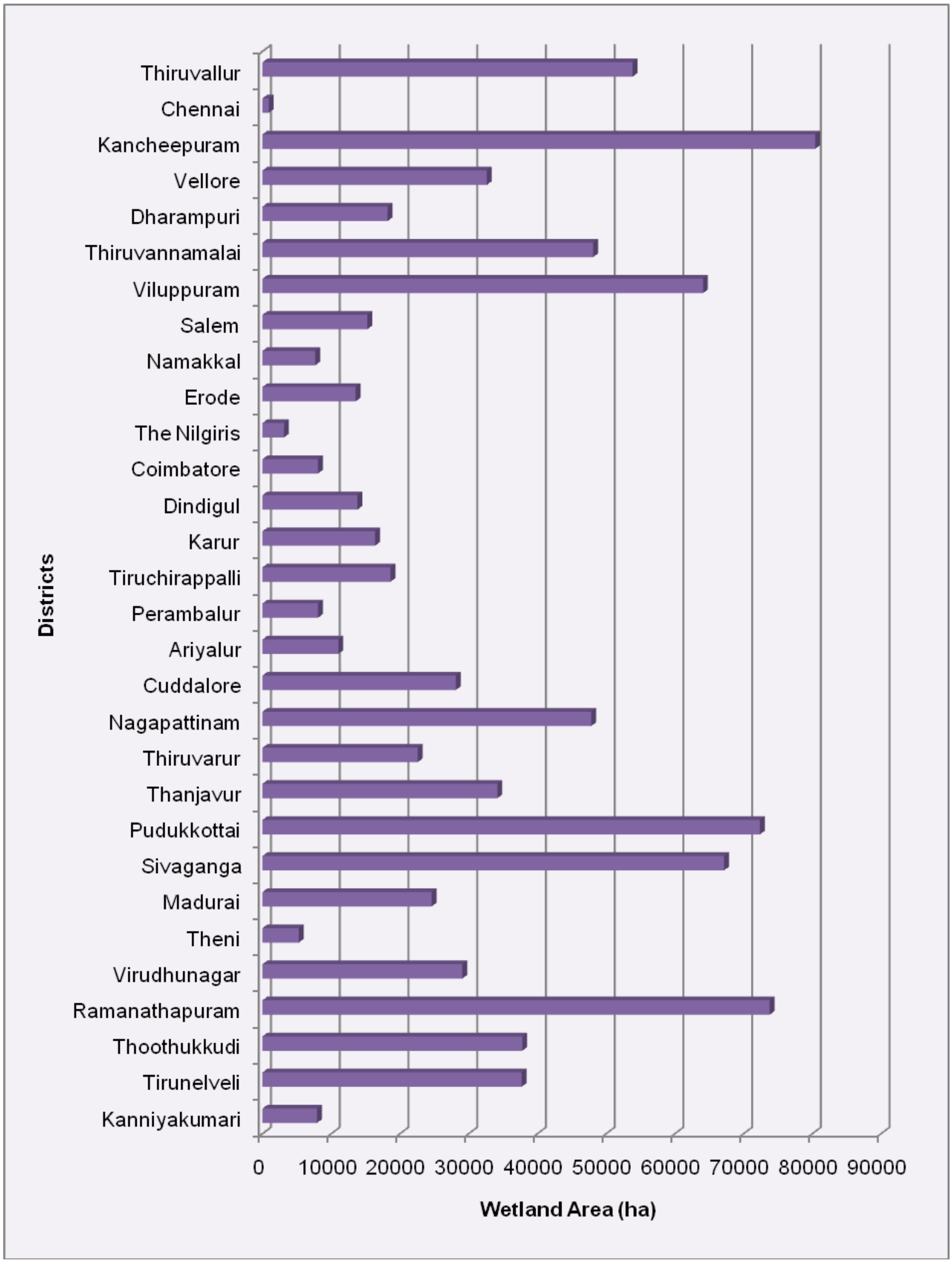
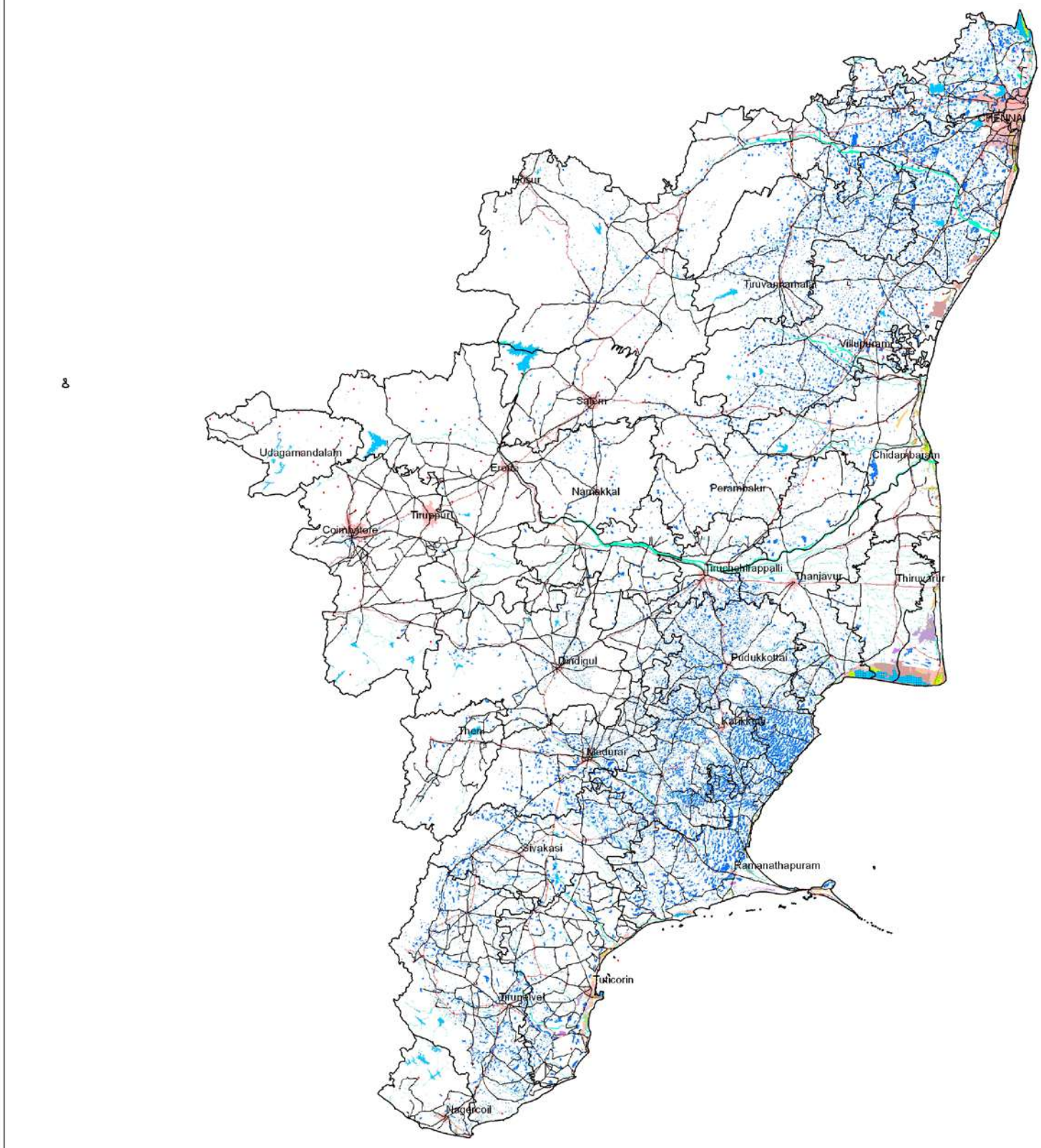


Figure 11: District-wise wetland distribution

State : Tamil Nadu

WETLAND MAP

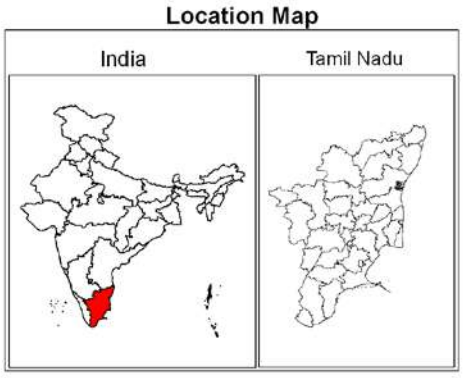


Symbol Typecode	Level I	Level II	Level III
	Inland Wetlands		
		Natural	
1101			Lakes/Ponds
1102			Ox-bow lakes/ Cut-off meanders
1103			High altitude wetlands
1104			Reverine wetlands
1105			Waterlogged
1106			River/Stream
		Man-made	
1201			Reservoirs/Barrages
1202			Tanks/Ponds
1203			Waterlogged
1204			Salt pans
	Coastal Wetlands		
		Natural	
2101			Lagoons
2102			Creeks
2103			Sand/Beach
2104			Intertidal mud flats
2105			Salt marsh
2106			Mangroves
2107			Coral reefs
		Man-made	
2201			Salt pans
2202			Aquaculture ponds

Legend

- Wetlands (<2.25ha)
- Drainage (line)
- Major Roads
- Railway
- Settlements
- Town/Settlements
- District Boundary
- State Boundary
- International Boundary

Location Map



50 25 0 50 100 Kilometers

Data Source :

IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

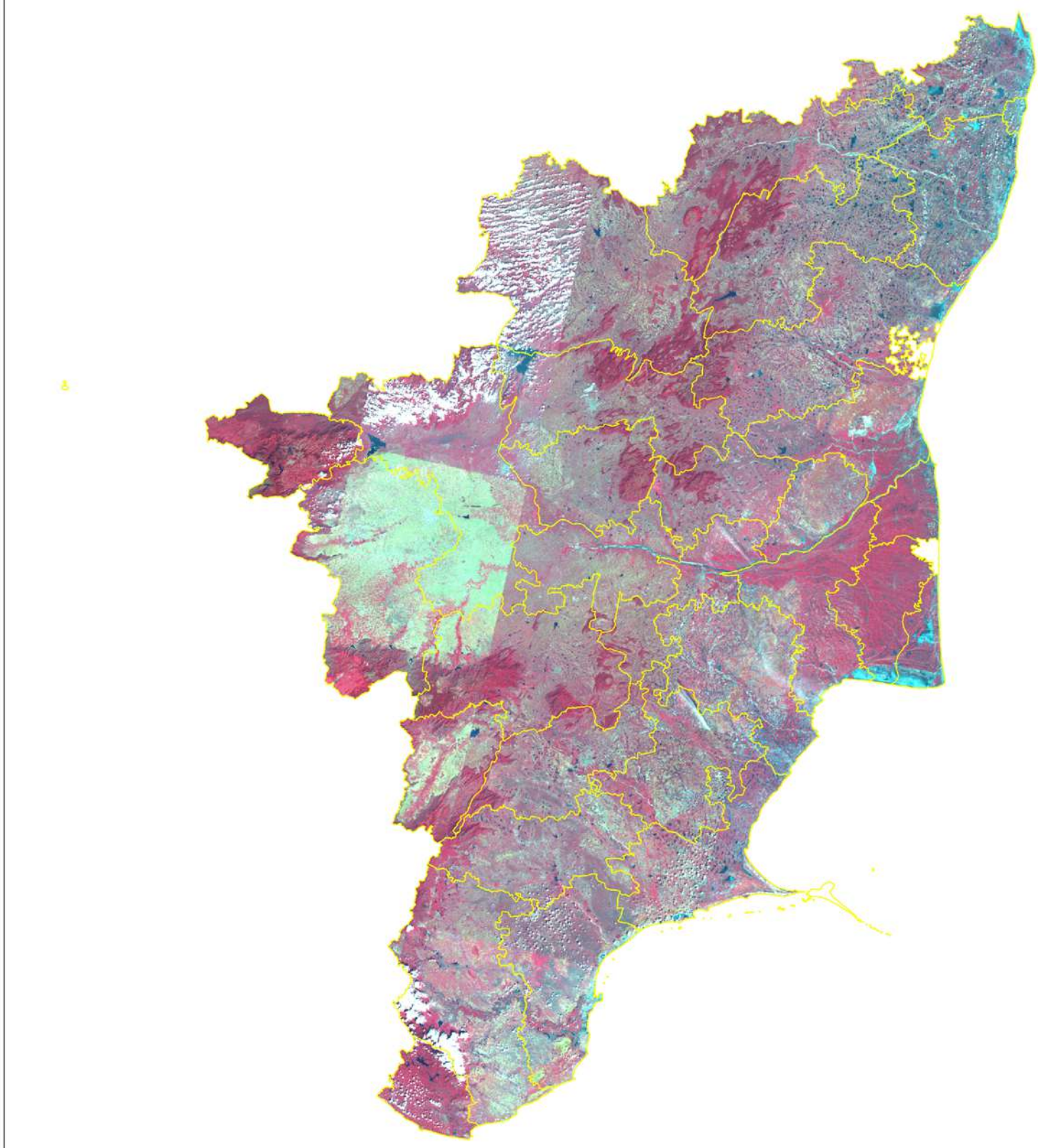
Prepared By :

Space Applications Centre (ISRO), Ahmedabad
and
Institute of Remote Sensing, Anna University, Chennai

Sponsored By:

Ministry of Environment and Forests
Government of India

State : Tamil Nadu



IRS P6 LISS-III Post-monsoon data (2006)

7.1.1 Thiruvallur

Thiruvallur district is located in the North Eastern part of Tamil Nadu. The district is surrounded by Kancheepuram district in the South, Vellore district in the West, Bay of Bengal in the East and Andhra Pradesh State in the North. Thiruvallur is one of the fast developing districts of Tamil Nadu situated near Chennai city, giving it a special industrial and commercial importance.

Total geographic area of Thiruvallur is 3422 km². As per the 2001 census data, the population of the district was 27,38,866 . The density of population was 800 persons per km².

Total area under wetland is 53863 ha, which includes 590 small wetland (<2.25 ha). Lakes/Ponds occupy 33.54% of wetland area. The second major wetland type is Tanks/Ponds. There are 603 Tanks/Ponds with 11825 ha area (21.95%). The other wetland types are; Lagoons (14.92 %), Reservoirs (10.54 %) and River/Stream (9.34 %). Poondi reservoir and Pulicat Boating Center are major tourist spots. Details of wetland statistics is given in Table 6.

Aquatic vegetation is observed in Lakes/Ponds, and Tanks/Ponds. The area under aquatic vegetation is more during pre monsoon (30091 ha) than that of post monsoon (7717 ha). The open water spread significantly lower during pre monsoon (21902 ha) compared to post monsoon (44224 ha).

Table 6: Area estimates of wetlands in Thiruvallur

Area in ha

Sr. No.	Wettcode	Wetland Category	Number of Wetlands	Total Wetland Area	% of wetland area	Open Water	
						Post-monsoon Area	Pre-monsoon Area
	1100	**Inland Wetlands - Natural**					
1	1101	Lakes/Ponds	241	18068	33.54	15162	3801
2	1105	Waterlogged	2	328	0.61	271	3
3	1106	River/Stream	10	5032	9.34	4703	4703
	1200	**Inland Wetlands -Man-made**					
4	1201	Reservoirs/Barrages	2	5678	10.54	3509	4717
5	1202	Tanks/Ponds	603	11825	21.95	10362	1959
6	1203	Waterlogged	3	269	0.50	108	12
		Total - Inland	**861**	**41200**	**76.49**	**34115**	**15195**
	2100	**Coastal Wetlands - Natural**					
7	2101	Lagoons	63	8037	14.92	8030	5010
8	2103	Sand/Beach	4	805	1.49	-	-
9	2106	Mangroves	6	1148	2.13	-	-
	2200	**Coastal Wetlands - Man-made**					
10	2201	Salt pans	3	1043	1.94	1041	761
11	2202	Aquaculture ponds	15	1040	1.93	1038	936
		Total - Coastal	**91**	**12073**	**22.41**	**10109**	**6707**
		Sub-Total	**952**	**53273**	**98.90**	**44224**	**21902**
		Wetlands (<2.25 ha), mainly Tanks	590	590	1.10	-	-
		Total	**1542**	**53863**	**100.00**	**44224**	**21902**

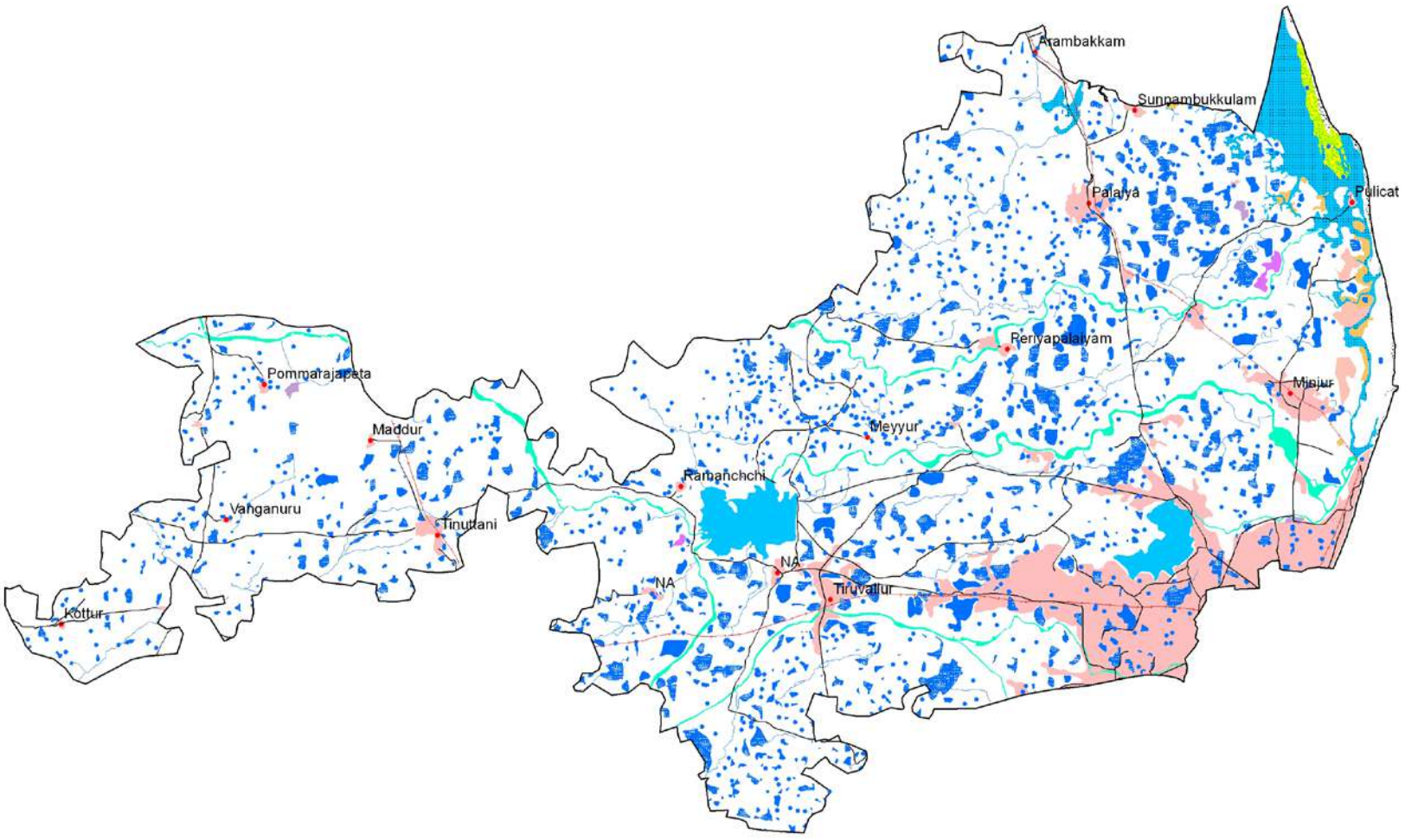
Area under Aquatic Vegetation	7717	30091

Area under turbidity levels		
Low	26057	5889
Moderate	3713	4741
High	14454	11272

State : Tamil Nadu

WETLAND MAP

District : Thiruvallur

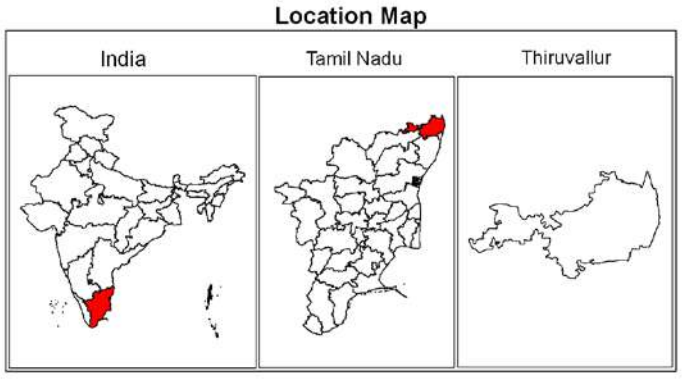


Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25ha)
- Drainage (line)
- Major Roads
- Railway
- Settlements
- Town/Settlements
- District Boundary
- State Boundary
- International Boundary

Location Map



10 5 0 10 20 Kilometers

Data Source :

IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

Prepared By :

Space Applications Centre (ISRO), Ahmedabad
and
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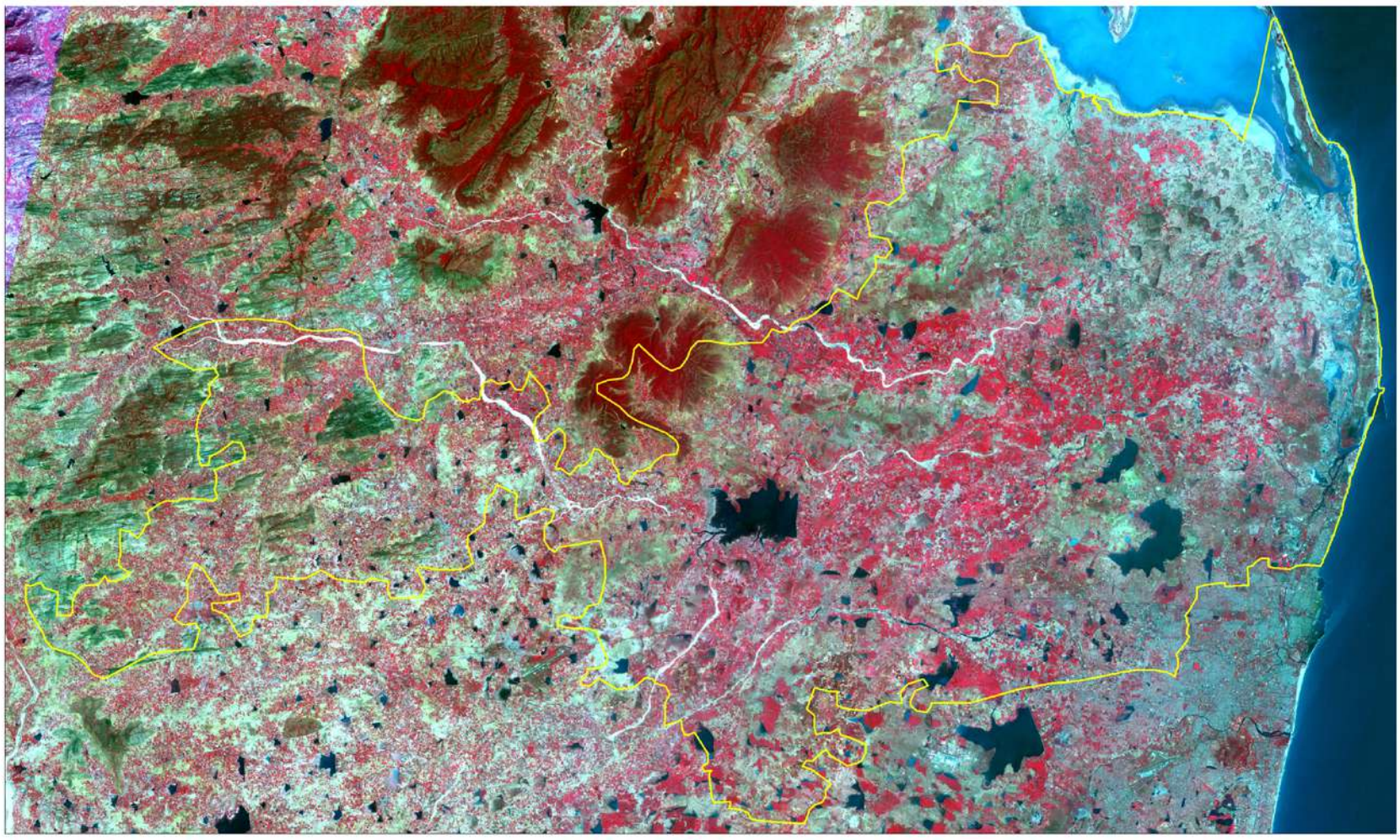
Sponsored By:

Ministry of Environment and Forests
Government of India

State : Tamil Nadu

District : Thiruvallur



IRS P6 LISS-III pre-monsoon data (2006)

7.1.2 Chennai

Chennai, besides being the capital city of Tamil Nadu is also an important district of the state. The district city is one of the four metropolises of India, playing significant role in the historical, cultural and intellectual development of the nation. The district is located on the north-east end of Tamil Nadu on the coast of Bay of Bengal. Surrounded by the Bay of Bengal in the east and the remaining three sides by Chengalpattu and Thiruvallur Districts, Chennai has an even topography of land with slight rising from the sea level.

Total geographic area of Chenai is 178.20 km². As per the 2001 census data, the population of the district was 42,16,268. The density of population was 24,231 persons per km² and literacy rate of the district was 80%.

Total area under wetland is 917 ha, which includes 15 small wetland (<2.25 ha). Major wetland types of the district are Sand/beach, Creeks, River/stream and Lakes/ponds. Lakes/Ponds occupy 8.62% of wetland area. There are 5 Tanks/Ponds with 76 ha area (8.29%). Details of wetland statistics is given in Table 7.

Aquatic vegetation is observed in Lakes/Ponds, and Tanks/Ponds. The area under aquatic vegetation is more during pre monsoon (165 ha) than that of post monsoon (42 ha). The open water spread significantly lower during pre monsoon (348 ha) compared to post monsoon (470 ha).

Table 7: Area estimates of wetlands in Chennai

Area in ha

Sr. No.	Wettcode	Wetland Category	Number of Wetlands	Total Wetland Area	% of wetland area	Open Water	
						Post-monsoon Area	Pre-monsoon Area
	1100	**Inland Wetlands - Natural**					
1	1101	Lakes/Ponds	1	79	8.62	71	-
2	1105	Waterlogged	3	44	4.80	44	16
3	1106	River/Stream	1	124	13.52	124	124
	1200	**Inland Wetlands -Man-made**					
4	1202	Tanks/Ponds	5	76	8.29	42	21
		Total - Inland	**10**	**323**	**35.22**	**281**	**161**
	2100	**Coastal Wetlands - Natural**					
5	2102	Creeks	2	186	20.28	186	186
6	2103	Sand/Beach	5	380	41.44	-	-
7	2105	Salt Marsh	1	3	0.33	3	1
8	2106	Mangroves	2	10	1.09	-	-
		Total - Coastal	**10**	**579**	**63.14**	**189**	**187**
		Sub-Total	**20**	**902**	**98.36**	**470**	**348**
		Wetlands (<2.25 ha), mainly Tanks	15	15	1.64	-	-
		Total	**35**	**917**	**100.00**	**470**	**348**

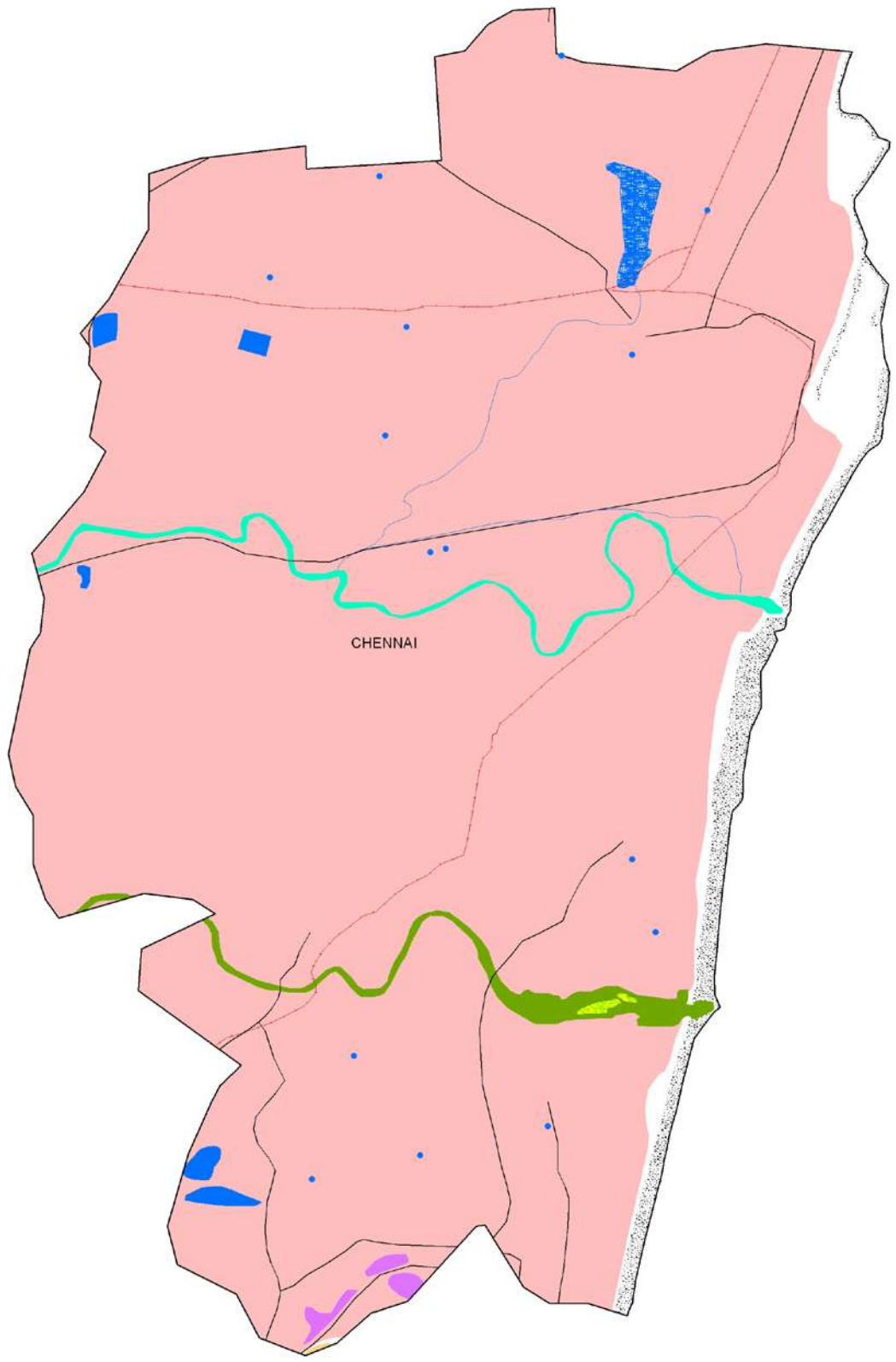
Area under Aquatic Vegetation	42	165

Area under turbidity levels		
Low	157	38
Moderate	2	-
High	311	310

State : Tamil Nadu

WETLAND MAP

District : Chennai

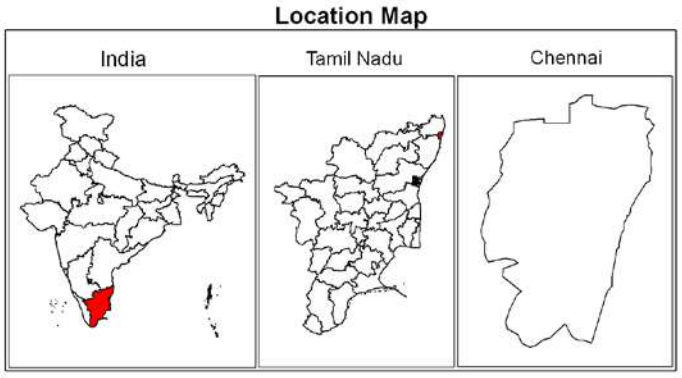


Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25ha)
- Drainage (line)
- Major Roads
- Railway
- Settlements
- Town/Settlements
- District Boundary
- State Boundary
- International Boundary

Location Map



1 0.5 0 1 2 Kilometers

Data Source :

IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

Prepared By :

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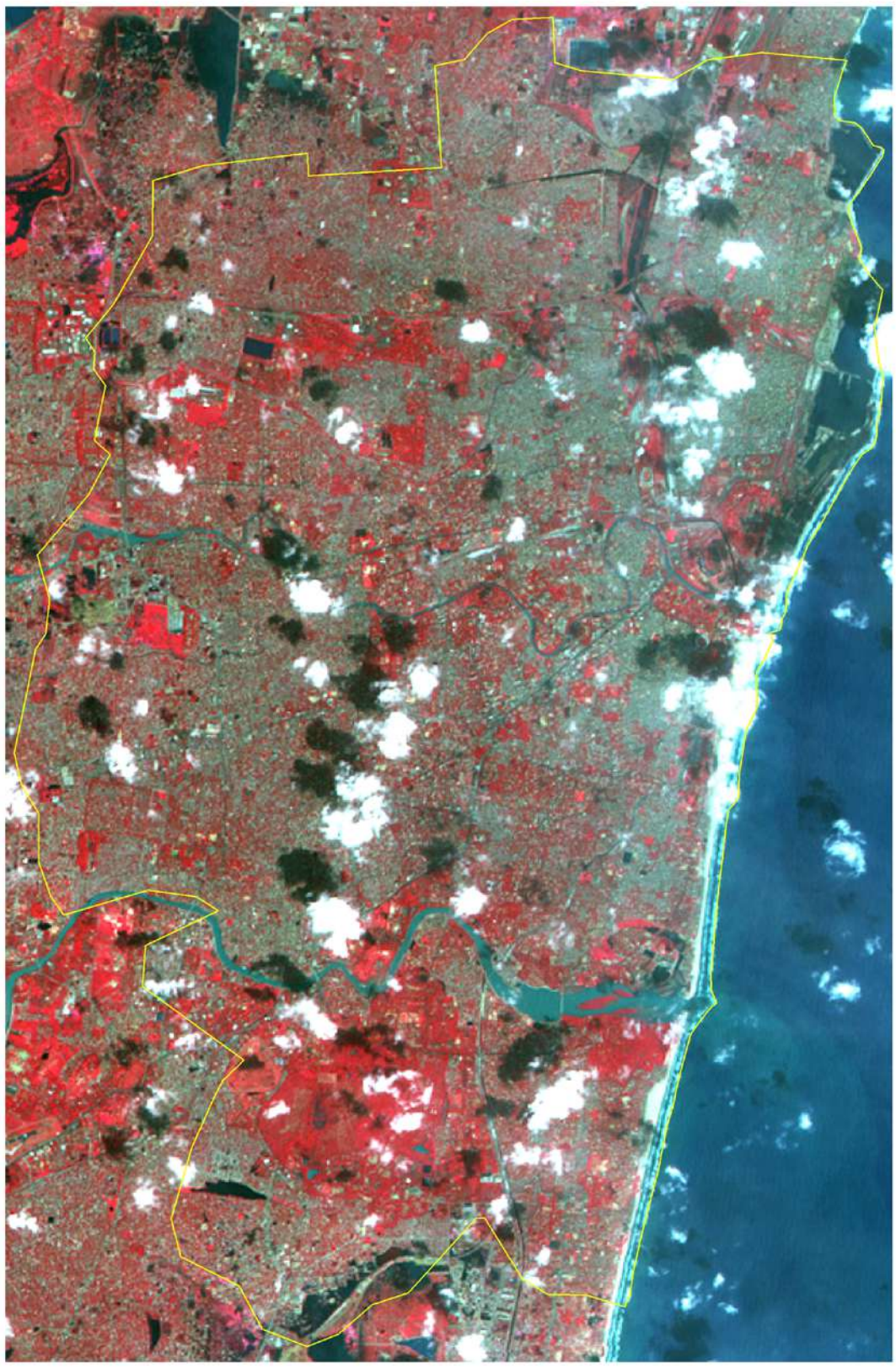
Sponsored By:

Ministry of Environment and Forests
Government of India

State : Tamil Nadu

District : Chennai



IRS-P6 LISS-III Post-monsoon data(2006-2007)

7.1.3 Kancheepuram

Kancheepuram is situated on the northern East Coast of the state and is adjacent to Bay of Bengal and Chennai city. The district is bounded on the west by Vellore and Thiruvannamalai district, on the north by Thiruvallur district and Chennai district, on the south by Villuppuram district and on the east by Bay of Bangal.

Total geographic area of Kancheepuram is 7857 km². As per the 2001 census data, the population of the district was 30,38,000. The density of population was 592 persons per km² and literacy rate of the district was 66.38%.

Major tourist attractions in the district include Vedantangal--Birds Sanctuary, Covelong beach, Sadras beach, and the crocodile bank.

Total area under wetland is 80445 ha, which includes 487 small wetland (<2.25 ha). Lakes/Ponds occupies 44.03% of wetland area. The second major wetland type is Tanks/Ponds. There are 1178 Tanks/Ponds with 18372 ha area (22.84%). The other wetland types are: River/stream (12.02%), Salt Pants(5.24 %), Reservoirs (4.70 %) and Inter-tidal mudflats (4.63 %). Details of wetland statistics is given in Table 8.

Aquatic vegetation is observed in Lakes/Ponds, and Tanks/Ponds. The area under aquatic vegetation is more during pre monsoon (45379 ha) than that of post monsoon (2965 ha). The open water spread significantly lower during pre monsoon (29962 ha) compared to post monsoon (70469 ha).

Table 8: Area estimates of wetlands in Kancheepuram

Area in ha

Sr. No.	Wettcode	Wetland Category	Number of Wetlands	Total Wetland Area	% of wetland area	Open Water	
						Post-monsoon Area	Pre-monsoon Area
	1100	**Inland Wetlands - Natural**					
1	1101	Lakes/Ponds	469	35421	44.03	33730	9664
2	1105	Waterlogged	5	120	0.15	120	-
3	1106	River/Stream	15	9669	12.02	8863	8629
	1200	**Inland Wetlands -Man-made**					
4	1201	Reservoirs/Barrages	2	3781	4.70	3740	2421
5	1202	Tanks/Ponds	1178	18372	22.84	17119	2668
6	1203	Waterlogged	1	103	0.13	98	27
		Total - Inland	**1670**	**67466**	**83.87**	**63670**	**23409**
	2100	**Coastal Wetlands - Natural**					
7	2102	Creeks	5	1385	1.72	1385	1385
8	2103	Sand/Beach	7	1601	1.99	-	-
9	2104	Intertidal mud flats	4	3725	4.63	-	-
10	2105	Salt Marsh	1	646	0.80	644	611
11	2106	Mangroves	2	115	0.14	-	-
	2200	**Coastal Wetlands - Man-made**					
12	2201	Salt pans	4	4215	5.24	3989	3917
13	2202	Aquaculture ponds	14	805	1.00	781	640
		Total - Coastal	**37**	**12492**	**15.53**	**6799**	**6553**
		Sub-Total	**1707**	**79958**	**99.39**	**70469**	**29962**
		Wetlands (<2.25 ha), mainly Tanks	487	487	0.61	-	-
		Total	**2194**	**80445**	**100.00**	**70469**	**29962**

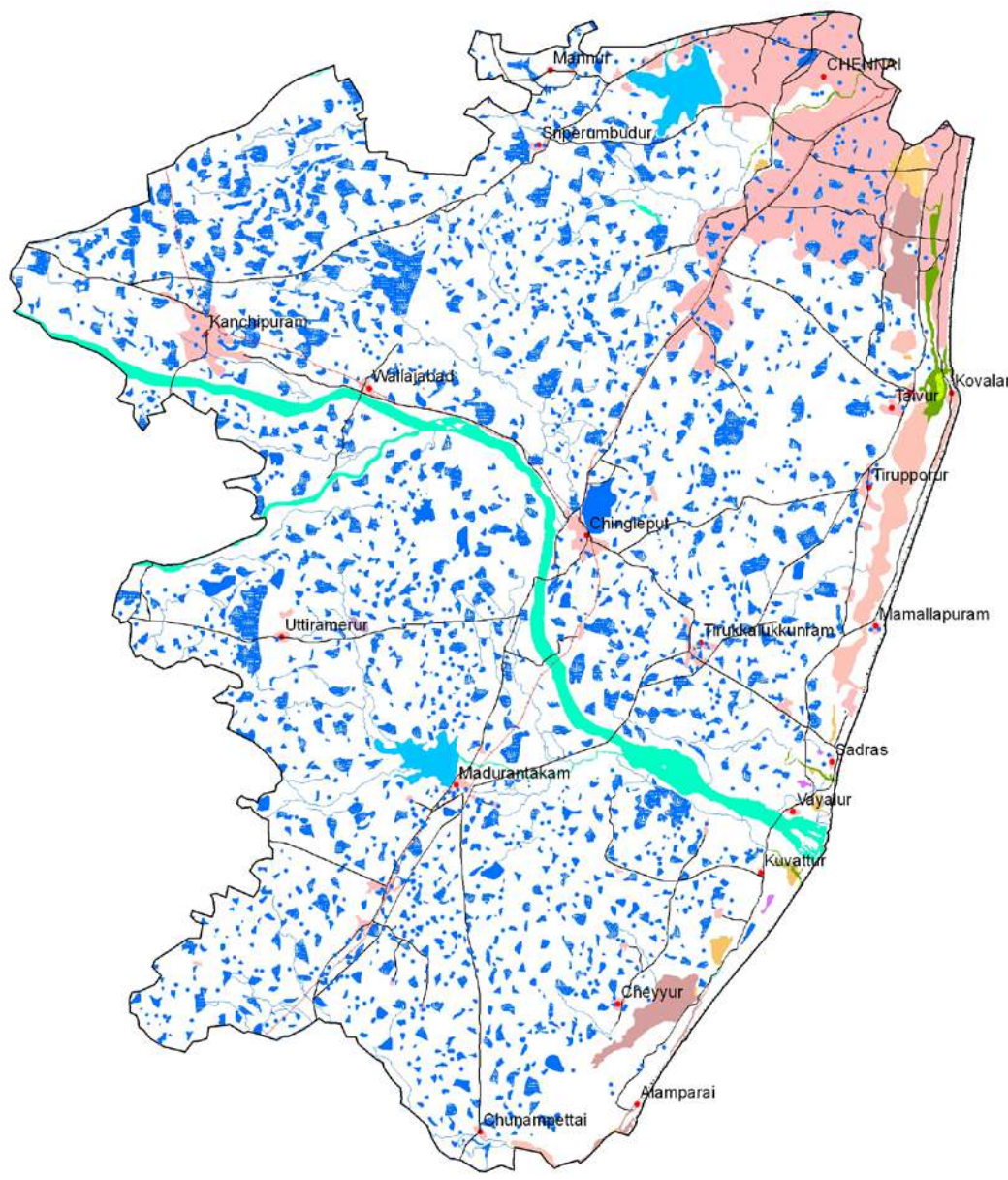
Area under Aquatic Vegetation	2965	45379

Area under turbidity levels		
Low	48696	11097
Moderate	13397	11403
High	8376	7462

State : Tamil Nadu

WETLAND MAP

District : Kancheepuram

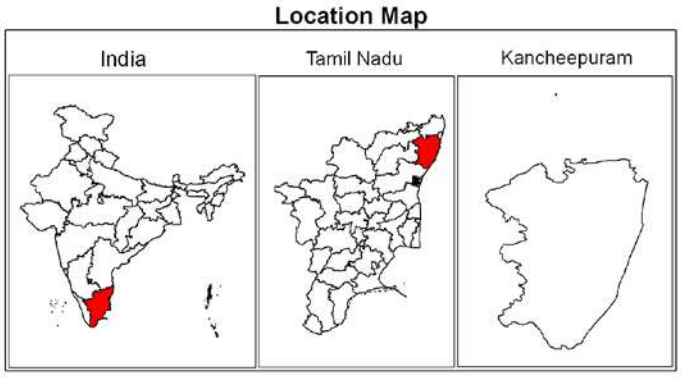


Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25ha)
- Drainage (line)
- Major Roads
- Railway
- Settlements
- Town/Settlements
- District Boundary
- State Boundary
- International Boundary

Location Map



7 3.5 0 7 14 Kilometers

Data Source :

IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

Prepared By :

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and
Institute of Remote Sensing, Anna University, Chennai

Sponsored By:

Ministry of Environment and Forests
Government of India

State : Tamil Nadu

District : Kancheepuram

IRS-P6 LISS-III Post-monsoon data(2006-2007)

7.1.4 Vellore

Vellore is bounded on the northeast by Thiruvallur District, on the southeast by Kanchipuram District, on the south by Tiruvannamalai District, on the southwest by Krishnagiri District, and on the northwest and north by Andhra Pradesh state. Major towns in the district include Arakkonam, Arcot, Elagiri, Gudiyattam, Karigiri, Ranippettai, Sholinghur, Tiruppattur, Vaniyambadi, Vellore, and Walajapet.

Total geographic area of Vellore is 6077 km². As per the 2001 census data, the population of the district was 30,26,432. The density of population was 498 persons per km² and literacy rate of the district was 72.81%.

Total area under wetland is 32640 ha, which includes 354 small wetland (<2.25 ha). Lakes/Ponds occupy 48.06% of wetland area. The second major wetland type is Tanks/Ponds. There are 561 Tanks/Ponds with 7973 ha area (24.43%). Area under River/Stream is 8511 ha (26.08 %). Details of wetland statistics is given in Table 9.

Aquatic vegetation is observed in Lakes/Ponds, and Tanks/Ponds. The area under aquatic vegetation is more during pre monsoon (18306 ha) than that of post monsoon (4294 ha). The open water spread significantly lower during pre monsoon (12958 ha) compared to post monsoon (26786 ha).

Table 9: Area estimates of wetlands in Vellore

Area in ha

Sr. No.	Wettcode	Wetland Category	Number of Wetlands	Total Wetland Area	% of wetland area	Open Water	
						Post-monsoon Area	Pre-monsoon Area
	1100	**Inland Wetlands - Natural**					
1	1101	Lakes/Ponds	214	15687	48.06	13120	4167
2	1106	River/Stream	17	8511	26.08	7473	7500
	1200	**Inland Wetlands -Man-made**					
3	1201	Reservoirs/Barrages	1	115	0.35	35	72
4	1202	Tanks/Ponds	561	7973	24.43	6158	1219
		Sub-Total	**793**	**32286**	**98.92**	**26786**	**12958**
		Wetlands (<2.25 ha), mainly Tanks	354	354	1.08	-	-
		Total	**1147**	**32640**	**100.00**	**26786**	**12958**

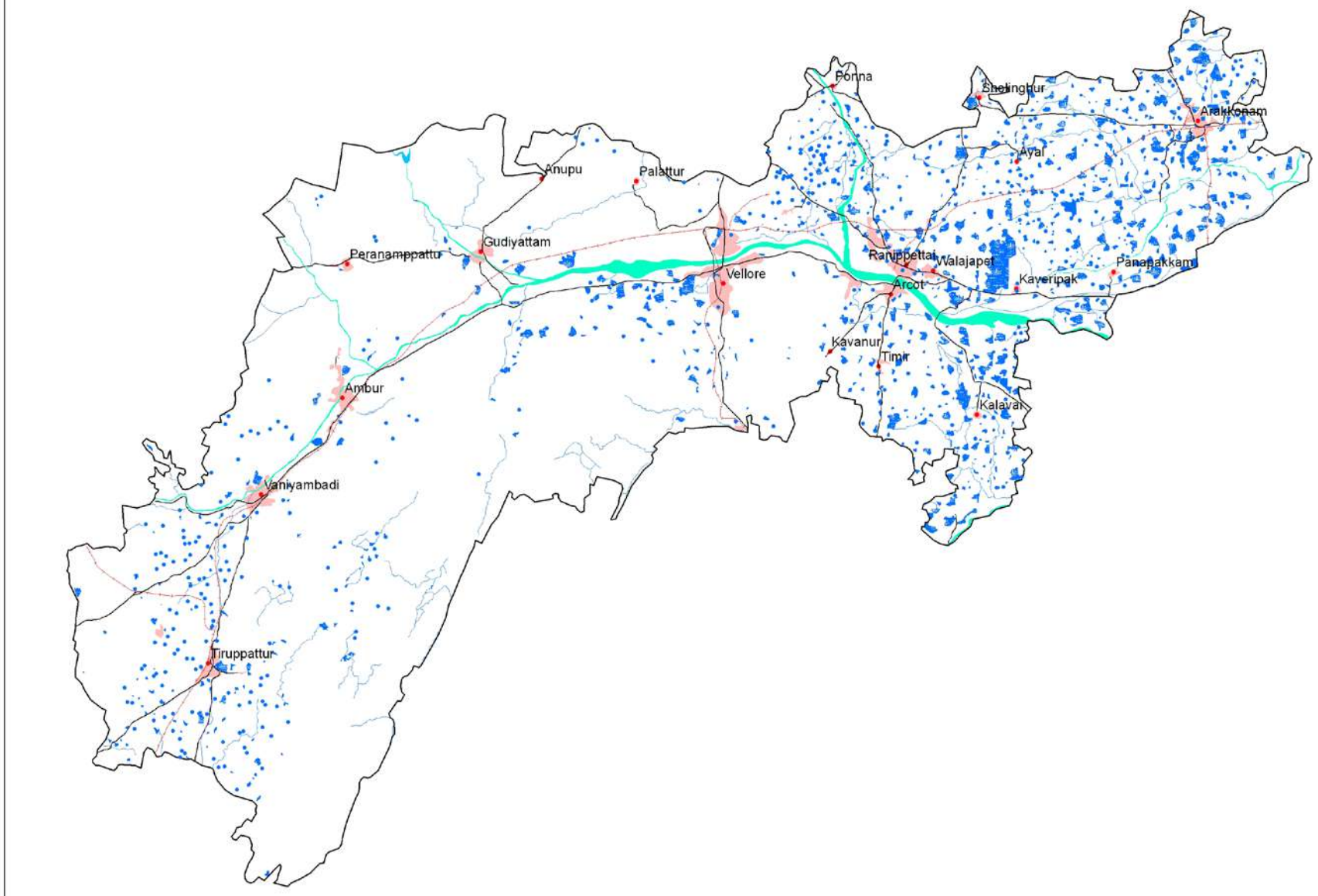
Area under Aquatic Vegetation	4294	18306

Area under turbidity levels		
Low	16976	3884
Moderate	9208	8556
High	602	518

State : Tamil Nadu

WETLAND MAP

District : Vellore

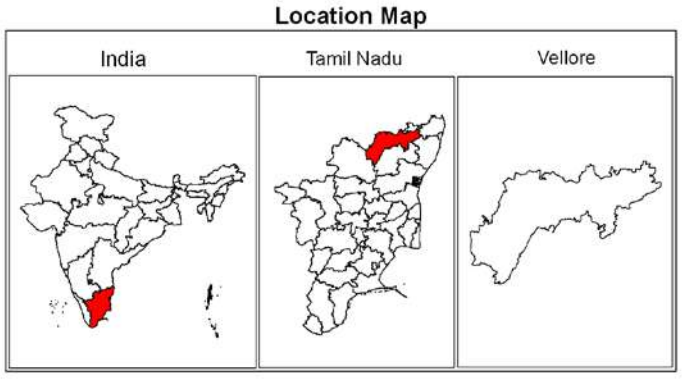


Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25ha)
- Drainage (line)
- Major Roads
- Railway
- Settlements
- Town/Settlements
- District Boundary
- State Boundary
- International Boundary

Location Map



10 5 0 10 20 Kilometers

Data Source :

IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

Prepared By :

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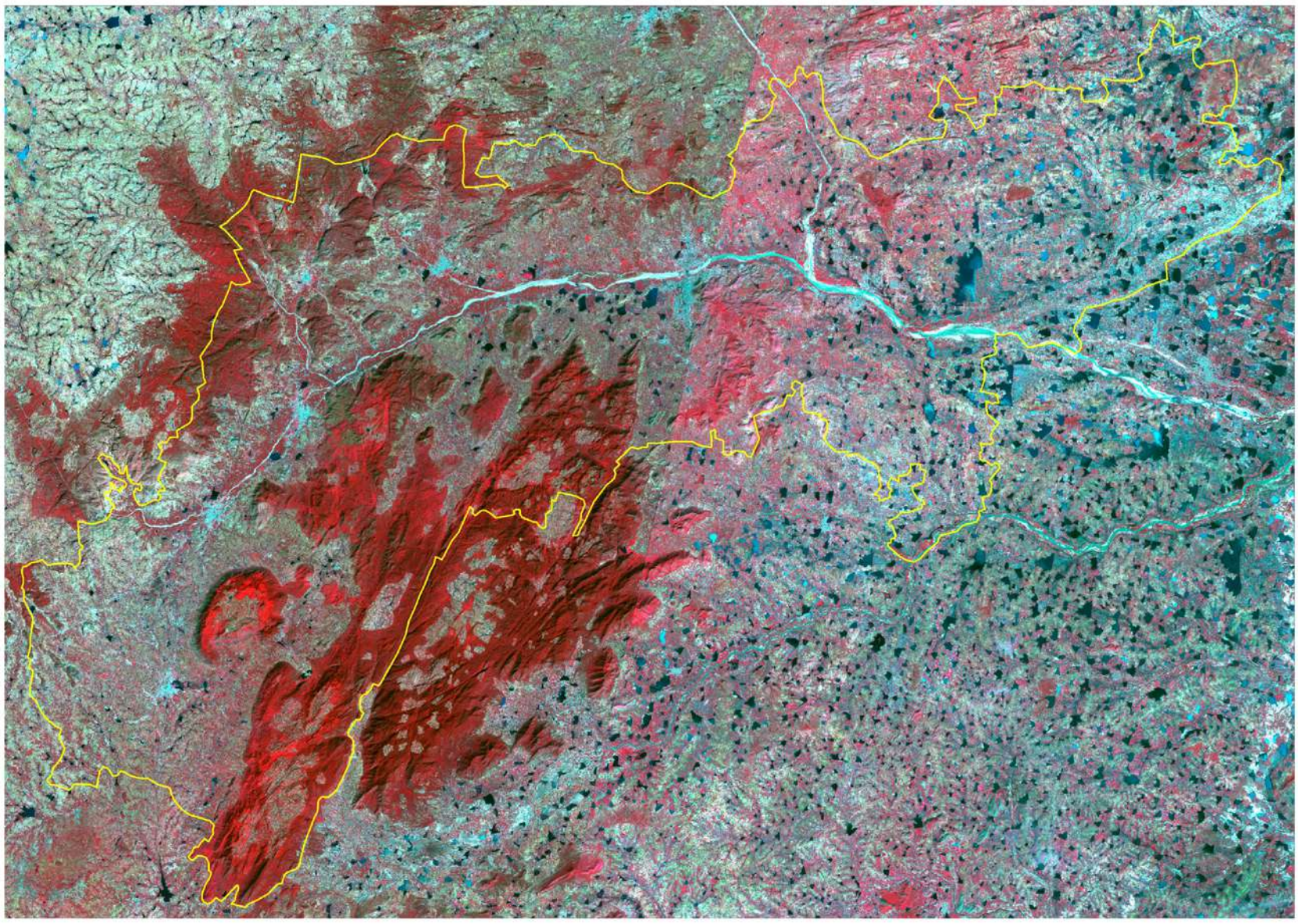
Sponsored By:

Ministry of Environment and Forests
Government of India

State : Tamil Nadu

District : Vellore



IRS P6 LISS-III post-monsoon data (2007)

7.1.5 Dharampuri

Dharmapuri is situated in the north-western corner of the state and is bounded by Tiruvannamalai and Villupuram Districts on the east, Salem District on the South, Krishnagiri District on the north and Kaveri river on the west. Dharmapuri district's economy depends on agriculture. About 70% of the population of the district depends on agriculture for their livelihood. A major portion of the cultivable land in the state comes under horticulture.

Total geographic area of Dharmapuri is 4497.77 km². As per the 2001 census data, the population of the district was 12,95,182. The density of population was 288 persons per km² and literacy rate of the district was 63.50 %.

Total area under wetland is 18215 ha, which includes 482 small wetland (<2.25 ha). Lakes/Ponds occupies 12.42% of wetland area. The major wetland types are Tanks/Ponds and Reservoirs. There are about 812 Tanks/Ponds with 7069 ha area (38.81%) and six Reservoirs (6329 ha) exists in the district. Details of wetland statistics is given in Table 10.

Aquatic vegetation is observed in Lakes/Ponds, and Tanks/Ponds. The area under aquatic vegetation is more during pre monsoon (11357 ha) than that of post monsoon (2756 ha). The open water spread significantly lower during pre monsoon (6321 ha) compared to post monsoon (14718 ha).

Table 10: Area estimates of wetlands in Dharampuri

Area in ha

Sr. No.	Wettcode	Wetland Category	Number of Wetlands	Total Wetland Area	% of wetland area	Open Water	
						Post-monsoon Area	Pre-monsoon Area
	1100	**Inland Wetlands – Natural**					
1	1101	Lakes/Ponds	32	2263	12.42	1789	284
2	1106	River/Stream	14	2072	11.38	2059	1565
	1200	**Inland Wetlands -Man-made**					
3	1201	Reservoirs/Barrages	6	6329	34.75	5610	3444
4	1202	Tanks/Ponds	812	7069	38.81	5260	1028
		Sub-Total	**864**	**17733**	**97.35**	**14718**	**6321**
		Wetlands (<2.25 ha), mainly Tanks	482	482	2.65	-	-
		Total	**1346**	**18215**	**100.00**	**14718**	**6321**

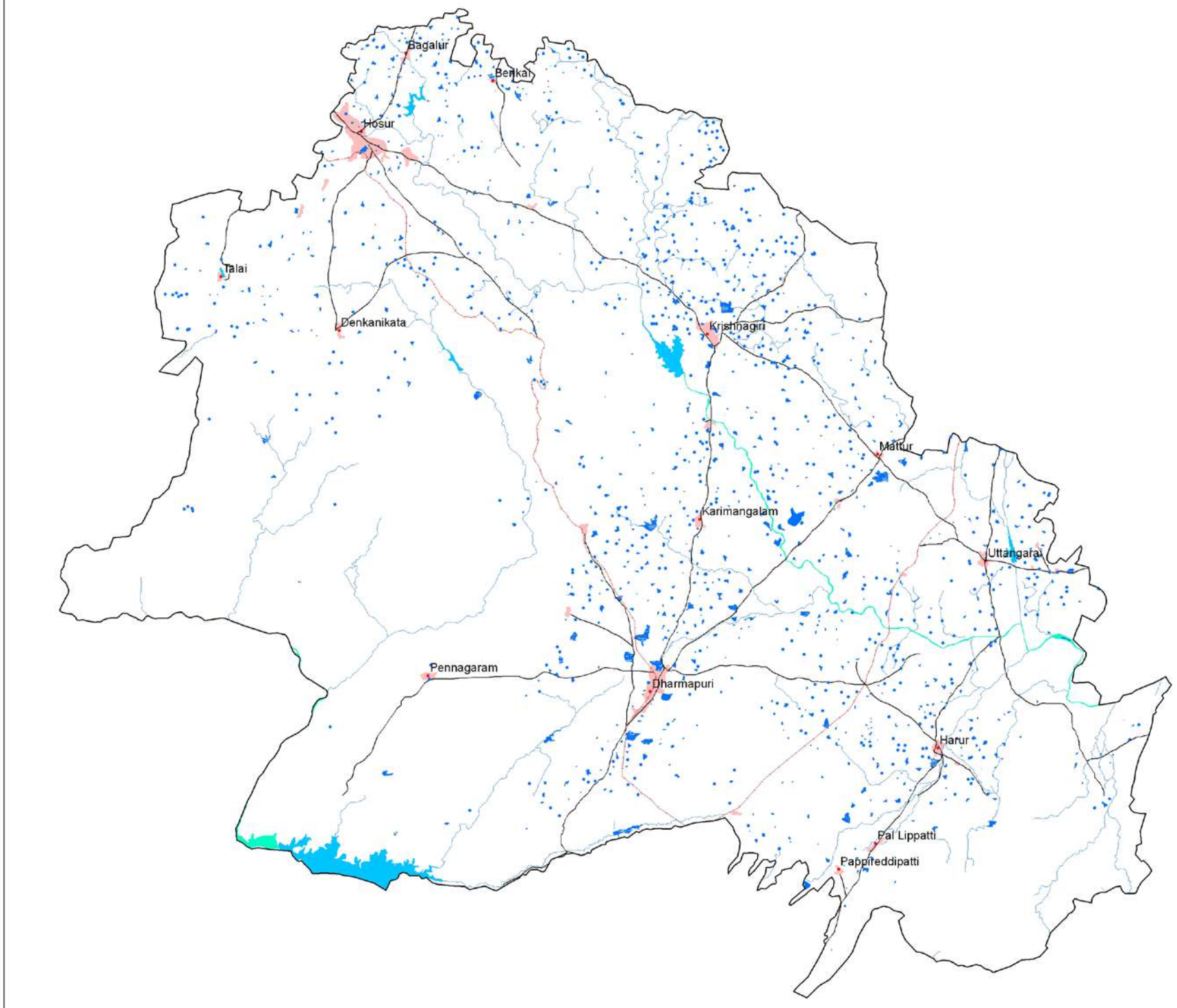
Area under Aquatic Vegetation	2756	11357

Area under turbidity levels		
Low	8421	1927
Moderate	6154	4341
High	143	53

State : Tamil Nadu

WETLAND MAP

District : Dharampuri

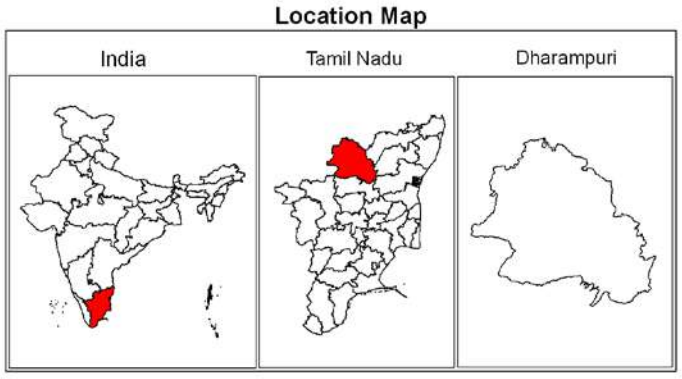


Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25ha)
- Drainage (line)
- Major Roads
- Railway
- Settlements
- Town/Settlements
- District Boundary
- State Boundary
- International Boundary

Location Map



7 3.5 0 7 14 Kilometers

Data Source :

IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

Prepared By :

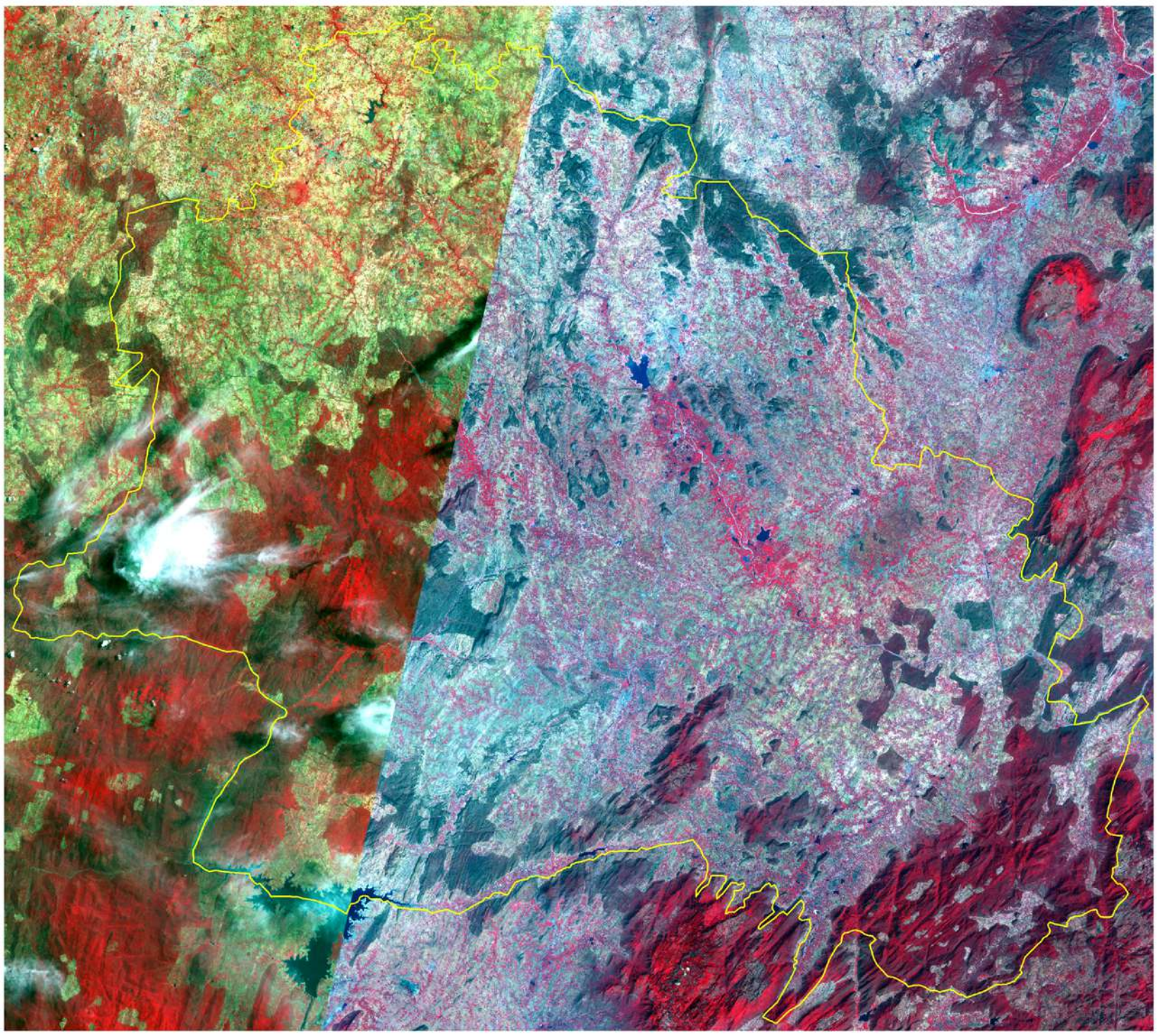
Space Applications Centre (ISRO), Ahmedabad
and
Institute of Remote Sensing, Anna University, Chennai

Sponsored By:

Ministry of Environment and Forests
Government of India

State : Tamil Nadu

District : Dharampuri



IRS P6 LISS-III pre-monsoon data (2006)

7.1.6 Thiruvannamalai

Tiruvannamalai district is bounded on the north and west by Vellore district, on the southwest by Krishnagiri district, on the south by Villupuram district and on the east by Kanchipuram district. One sixth of the area of this district is covered by reserve forest and hills which is part of Eastern Ghats under Javvadhu Hills. The important hills in this district are Tiruvannamalai (2668 ft MSL), Javvadhu hills (2500 ft MSL) and Kailasagiri (2743 ft MSL).

Total geographic area of Tiruvannamalai is 6191 km². As per the 2001 census data, the population of the district was 21,81,853 . The density of population was 352 persons per km² and literacy rate of the district was 60.39%.

Total area under wetland is 48130 ha, which includes 262 small wetland (<2.25 ha). Lakes/Ponds occupies 44.56% of wetland area. The second major wetland type is Tanks/Ponds. There are 1362 Tanks/Ponds with 20661 ha area (42.93%) in the district. The other wetland types are; Reservoirs (4.58 %) and River/Stream (7.0 %). Details of wetland statistics is given in Table 11.

Aquatic vegetation is observed in Lakes/Ponds, and Tanks/Ponds. The area under aquatic vegetation is more during pre monsoon (38776 ha) than that of post monsoon (6896 ha). The open water spread significantly lower during pre monsoon (9077 ha) compared to post monsoon (40730 ha).

Table 11: Area estimates of wetlands in Thiruvannamalai

Area in ha

Sr. No.	Wettcode	Wetland Category	Number of Wetlands	Total Wetland Area	% of wetland area	Open Water	
						Post-monsoon Area	Pre-monsoon Area
	1100	**Inland Wetlands – Natural**					
1	1101	Lakes	327	21448	44.56	18656	3768
2	1106	River/Stream	15	3371	7.00	3359	3359
	1200	**Inland Wetlands -Man-made**					
3	1201	Reservoirs/ Barrages	1	2204	4.58	2144	1001
4	1202	Tanks/Ponds	1362	20661	42.93	16447	949
5	1203	Waterlogged	1	176	0.37	117	-
		Total - Inland	**1706**	**47860**	**99.44**	**40723**	**9077**
	2200	**Coastal Wetlands - Man-made**					
6	2202	Aquaculture ponds	1	8	0.02	7	-
		Total - Coastal	**1**	**8**	**0.02**	**7**	**-**
		Sub-Total	**1707**	**47868**	**99.46**	**40730**	**9077**
		Wetlands (<2.25 ha), mainly Tanks	262	262	0.54	-	-
		Total	**1969**	**48130**	**100.00**	**40730**	**9077**

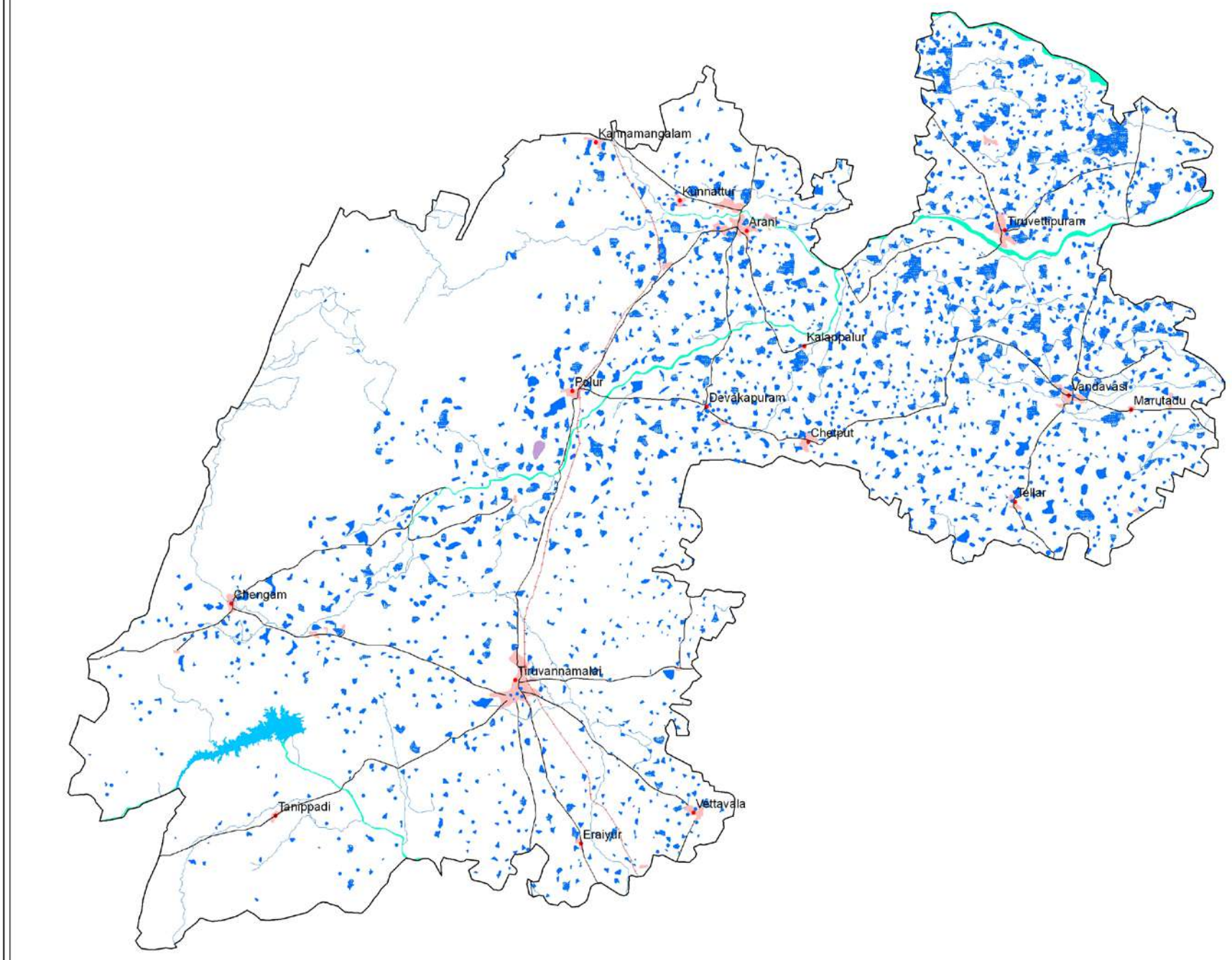
Area under Aquatic Vegetation	6896	38776

Area under turbidity levels		
Low	35818	4451
Moderate	4815	4626
High	97	-

State : Tamil Nadu

WETLAND MAP

District : Tiruvannamalai

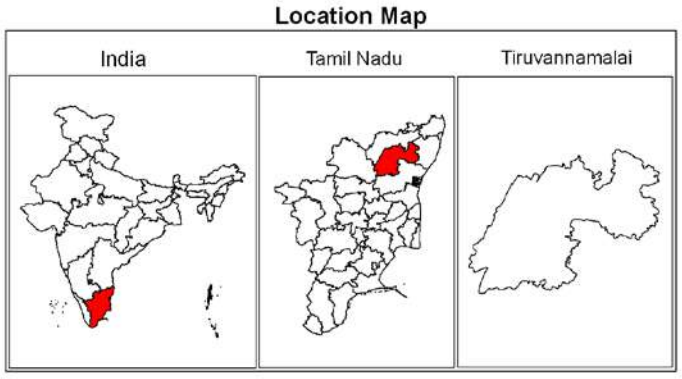


Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25ha)
- Drainage (line)
- Major Roads
- Railway
- Settlements
- Town/Settlements
- District Boundary
- State Boundary
- International Boundary

Location Map



10 5 0 10 20 Kilometers

Data Source :

IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

Prepared By :

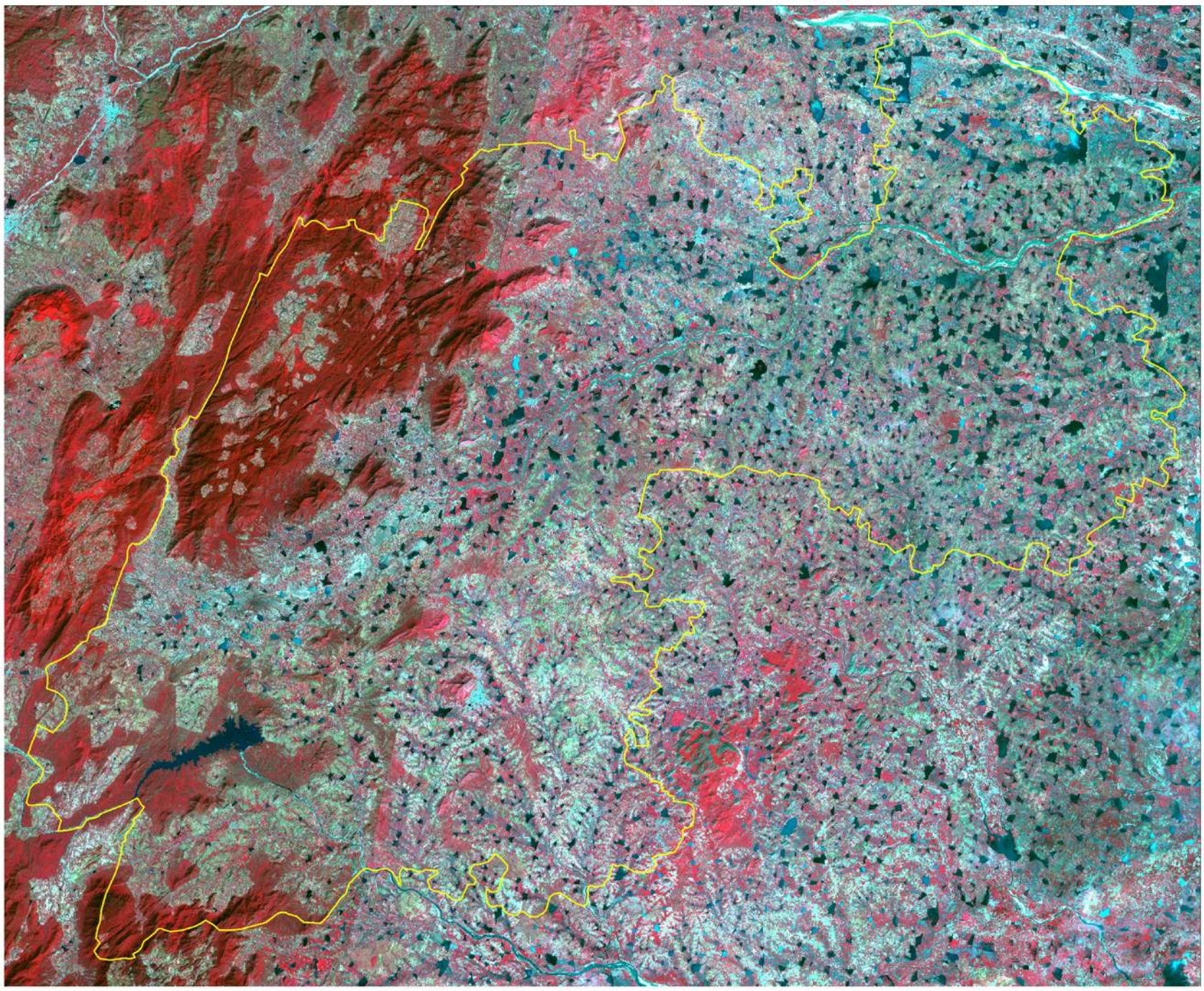
Space Applications Centre (ISRO), Ahmedabad
and
Institute of Remote Sensing, Anna University, Chennai

Sponsored By:

Ministry of Environment and Forests
Government of India

State : Tamil Nadu

District : Tiruvannamalai



IRS P6 LISS-III post-monsoon data (2007)

7.1.7 Viluppuram

Viluppuram or (Villupuram) is the district headquarters of the Viluppuram district, which was bifurcated from the erstwhile composite Sourt Arcot district from 30th September, 1993. It is the Second largest district in the.

Total geographic area of Viluppuram is 7222.03 km². As per the 2001 census data, the population of the district was 2960373. The density of population was 406 persons per km² and literacy rate of the district was 64.70%.

Total area under wetland is 64105 ha, which includes 596 small wetland (<2.25 ha). Lakes/Ponds occupies 30.06% of wetland area. The major wetland type in the district is Tanks/Ponds. There are 1600 Tanks/Ponds with 25850 ha area (40.32%). The other wetland types are; Inter-tidal mudflats (10.99 %), Reservoirs (2.95 %) and River/Stream (11.40 %). Details of wetland statistics is given in Table 12.

Aquatic vegetation is observed in Lakes/Ponds, and Tanks/Ponds. The area under aquatic vegetation is more during pre monsoon (45640 ha) than that of post monsoon (9134 ha). The open water spread significantly lower during pre monsoon (10230 ha) compared to post monsoon (46481 ha).

Table 12: Area estimates of wetlands in Viluppuram

Area in ha

Sr. No.	Wettcode	Wetland Category	Number of Wetlands	Total Wetland Area	% of wetland area	Open Water	
						Post-monsoon Area	Pre-monsoon Area
	1100	**Inland Wetlands – Natural**					
1	1101	Lakes/Ponds	316	19272	30.06	16148	779
2	1106	River/Stream	17	7310	11.40	7287	7287
	1200	**Inland Wetlands -Man-made**					
3	1201	Reservoirs/Barrages	4	1890	2.95	969	142
4	1202	Tanks/Ponds	1600	25850	40.32	20504	656
5	1203	Waterlogged	3	237	0.37	207	-
		Total - Inland	**1940**	**54559**	**85.11**	**45115**	**8864**
	2100	**Coastal Wetlands - Natural**					
6	2103	Sand/Beach	2	528	0.82	-	-
7	2104	Intertidal mud flats	1	7048	10.99	-	-
8	2106	Mangroves	1	8	0.01	-	-
	2200	**Coastal Wetlands - Man-made**					
9	2201	Salt pans	1	690	1.08	690	690
10	2202	Aquaculture ponds	11	676	1.05	676	676
		Total - Coastal	**16**	**8950**	**13.96**	**1366**	**1366**
		Sub-Total	**1956**	**63509**	**99.07**	**46481**	**10230**
		Wetlands (<2.25 ha), mainly Tanks	596	596	0.93	-	-
		Total	**2552**	**64105**	**100.00**	**46481**	**10230**

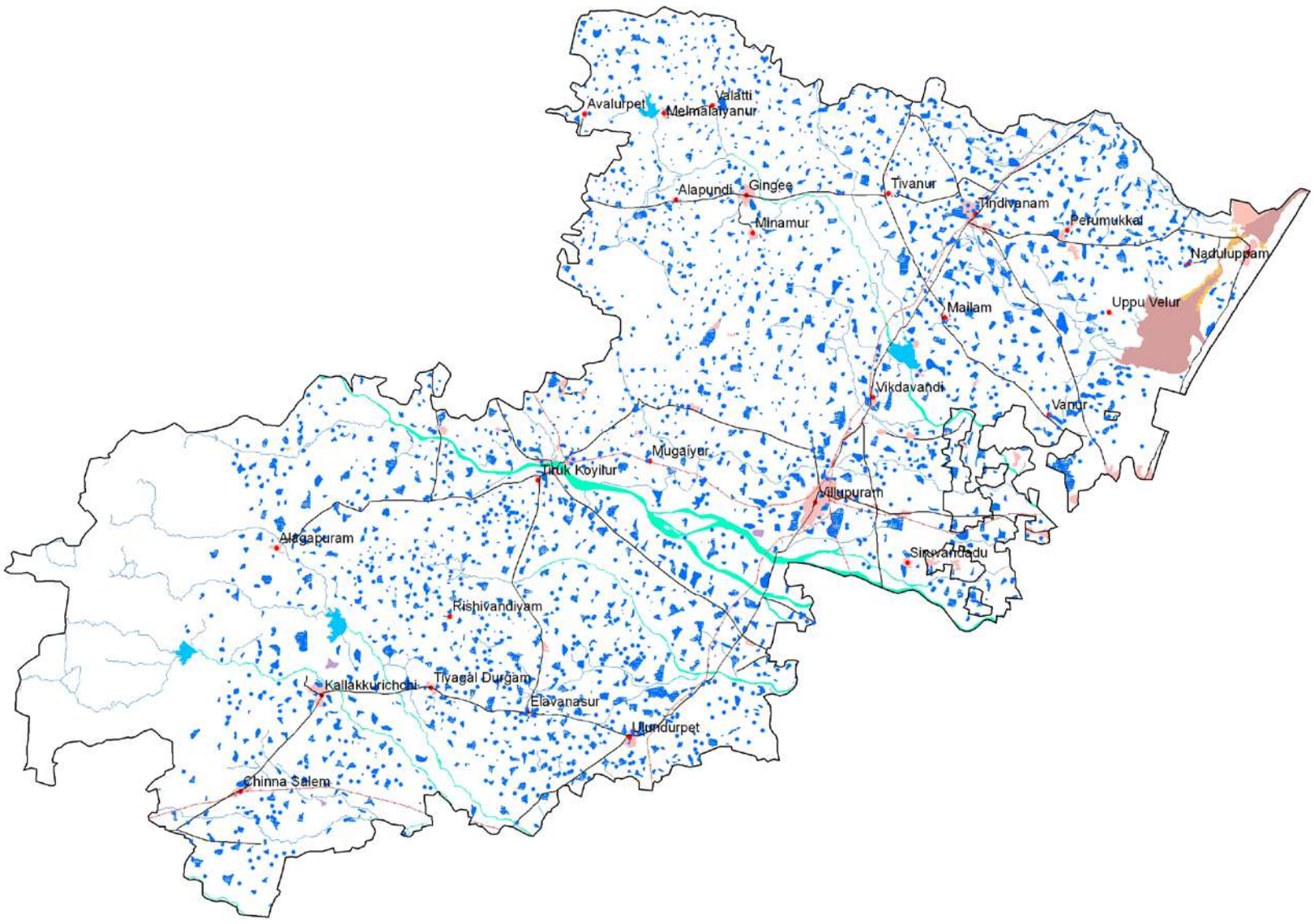
Area under Aquatic Vegetation	9134	45640

Area under turbidity levels		
Low	37544	1836
Moderate	5689	5688
High	3248	2706

State : Tamil Nadu

WETLAND MAP

District : Viluppuram

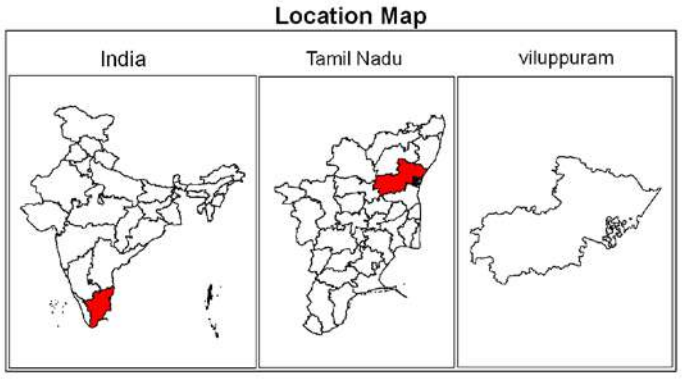


Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25ha)
- Drainage (line)
- Major Roads
- Railway
- Settlements
- Town/Settlements
- District Boundary
- State Boundary
- International Boundary

Location Map



10 5 0 10 20 Kilometers

Data Source :

IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

Prepared By :

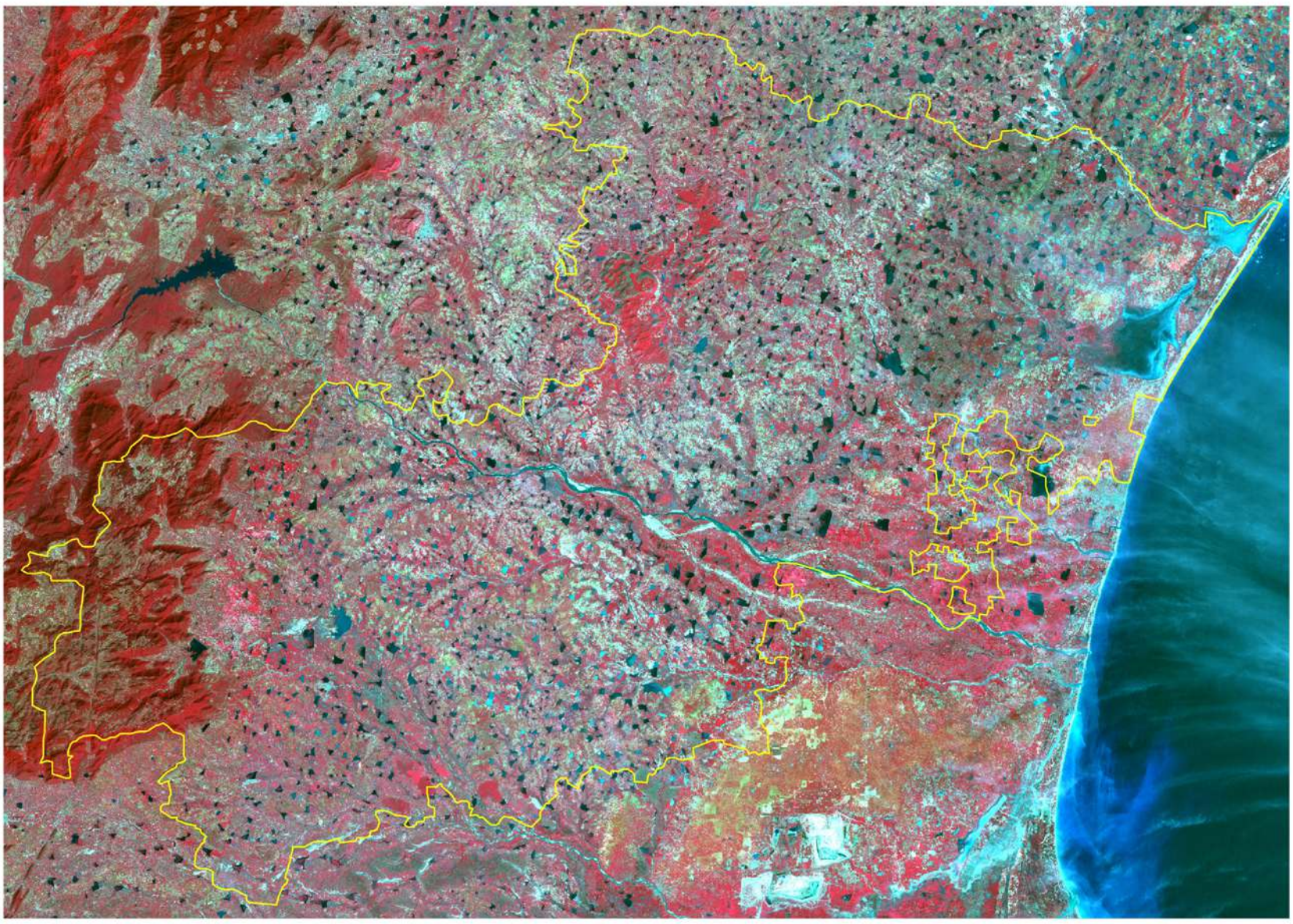
Space Applications Centre (ISRO), Ahmedabad
and
Institute of Remote Sensing, Anna University, Chennai

Sponsored By:

Ministry of Environment and Forests
Government of India

State : Tamil Nadu

District : Viluppuram



IRS P6 LISS-III post-monsoon data (2007)

7.1.8 Salem

Salem was the largest district of Tamil Nadu before it was bifurcated into two administrative districts viz. Salem and Dharmapuri districts. Today Salem is an important destination for travel and tourism. The cool and plesant climate prevailing here makes it an ideal summer retreat.

Total geographic area of Salem is 5205 km². As per the 2001 census data, the population of the district was 30,16,346. The density of population was 573 persons per km² and literacy rate of the district was 57.50 %.

Total area under wetland is 15270 ha, which includes 110 small wetland (<2.25 ha). Lakes/Ponds occupies 13.56% of wetland area. The major wetland types are Reservoirs and Tanks/Ponds. There are 204 Tanks/Ponds (2849 ha) and six reservoirs (8687 ha) exist in the district. Details of wetland statistics is given in Table 13.

Aquatic vegetation is observed in Lakes/Ponds, and Tanks/Ponds. The area under aquatic vegetation is more during pre monsoon (6710 ha) than that of post monsoon (1622 ha). The open water spread significantly lower during pre monsoon (8439 ha) compared to post monsoon (13490 ha).

Table 13: Area estimates of wetlands in Salem

Area in ha

Sr. No.	Wettcode	Wetland Category	Number of Wetlands	Total Wetland Area	% of wetland area	Open Water	
						Post-monsoon Area	Pre-monsoon Area
	1100	**Inland Wetlands – Natural**					
1	1101	Lakes/Ponds	39	2071	13.56	1432	403
2	1106	River/Stream	10	1553	10.17	1553	1551
	1200	**Inland Wetlands -Man-made**					
3	1201	Reservoirs/Barrages	6	8687	56.89	8445	5453
4	1202	Tanks/Ponds	204	2849	18.66	2060	1032
		Sub-Total	**259**	**15160**	**99.28**	**13490**	**8439**
		Wetlands (<2.25 ha), mainly Tanks	110	110	0.72	-	-
		Total	**369**	**15270**	**100.00**	**13490**	**8439**

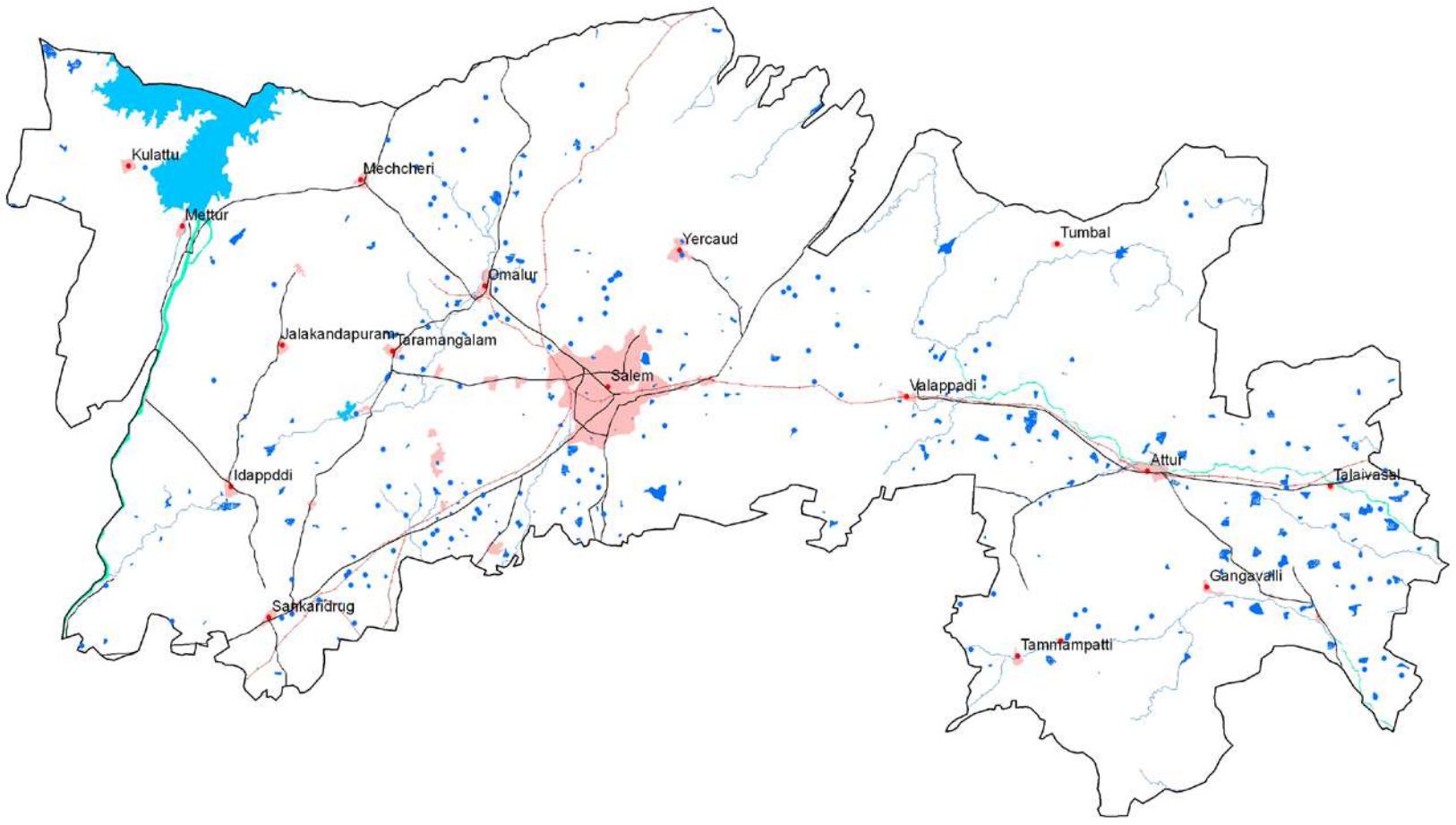
Area under Aquatic Vegetation	1622	6710

Area under turbidity levels		
Low	3603	1435
Moderate	9887	7004
High	-	-

State : Tamil Nadu

WETLAND MAP

District : Salem

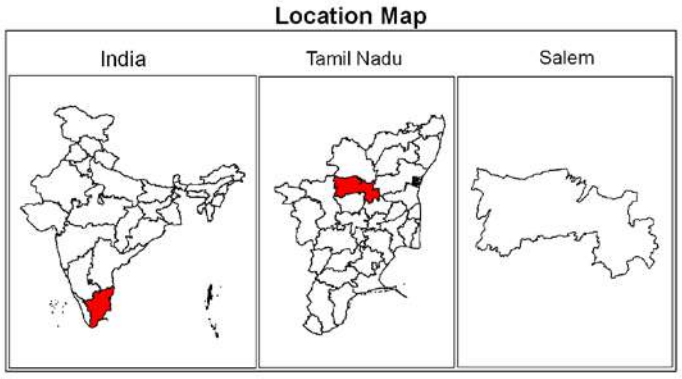


Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25ha)
- Drainage (line)
- Major Roads
- Railway
- Settlements
- Town/Settlements
- District Boundary
- State Boundary
- International Boundary

Location Map



8 4 0 8 16 Kilometers

Data Source :

IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

Prepared By :

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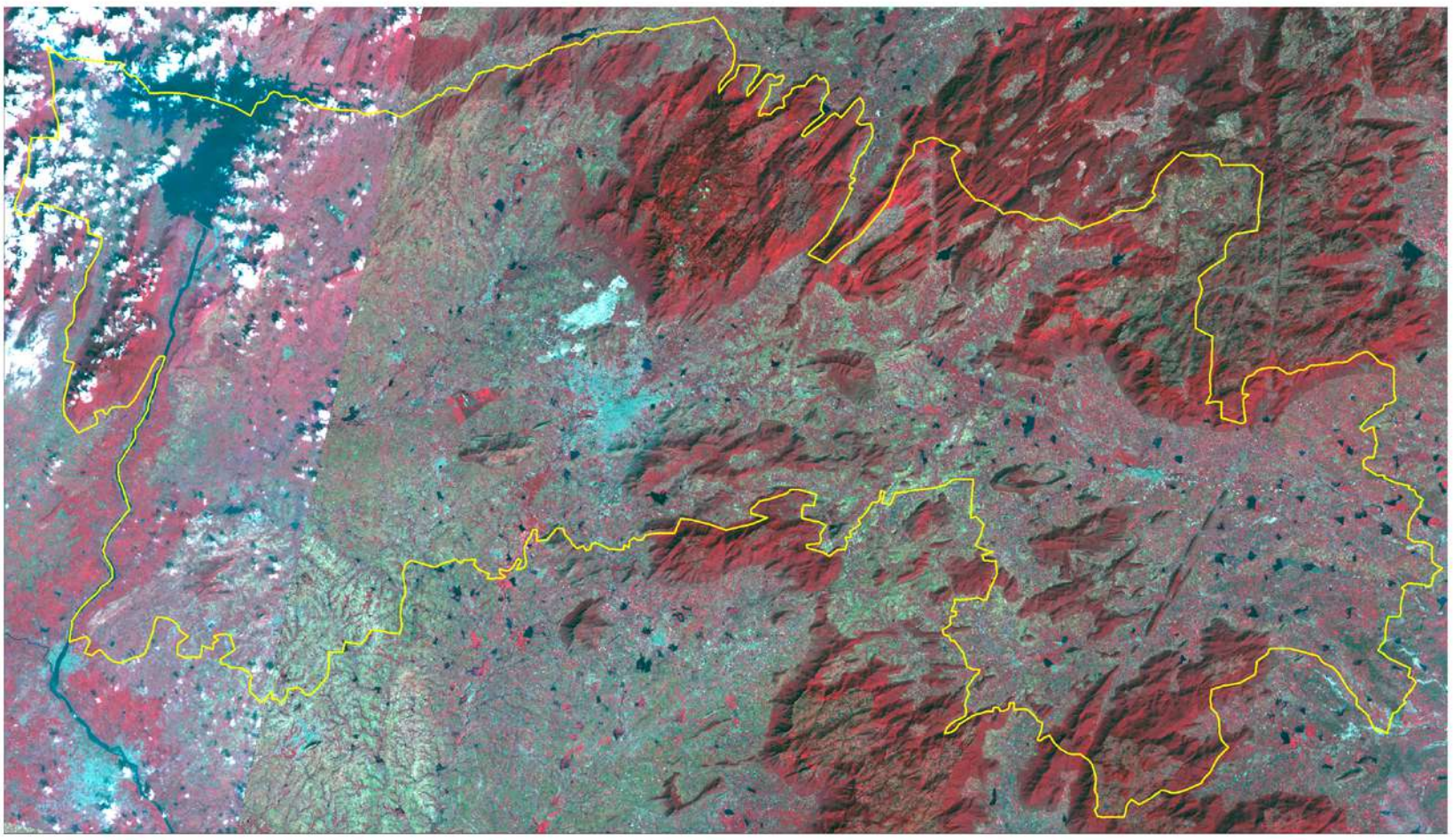
Sponsored By:

Ministry of Environment and Forests
Government of India

State : Tamil Nadu

District : Salem



IRS P6 LISS-III post-monsoon data (2007)

7.1.9 Namakkal

Namakkal is bounded on the north by Salem district, on the east by Attur taluk of Salem district, Perambalur and Tiruchirapalli districts, on the south by Karur district and on the west by Erode district. The administrative headquarters of this district is located at the same town of Namakkal. The district is extensively covered with hilly ranges and rocks with undulatory plains. The Kollimalai range with peaks 1219 metres runs along the east of Nammakkal and Rasipuram taluks. The main source of revenue from the forests is from the Sandalwood trees which occur naturally in abundance in the plateau and hilly ranges.

Total geographic area of Namakkal is 3363 km². As per the 2001 census data, the population of the district was 14,95,661. The density of population was 444 persons per km² and literacy rate of the district was 67.66%.

Total area under wetland is 7687 ha which includes 163 small wetland (<2.25 ha). Major wetland types of the district are Tanks/ponds, Rivers/stream and Lakes/ponds. There are 192 Tanks/Ponds with 3096 ha area (40.28%). Details of wetland statistics is given in Table 14.

Aquatic vegetation is observed in Lakes/Ponds, and Tanks/Ponds. The area under aquatic vegetation is more during pre monsoon (3800 ha) than that of post monsoon (2663 ha). The open water spread significantly lower during pre monsoon (3720 ha) compared to post monsoon (4814 ha).

Table 14: Area estimates of wetlands in Namakkal

Area in ha

Sr. No.	Wettcode	Wetland Category	Number of Wetlands	Total Wetland Area	% of wetland area	Open Water	
						Post-monsoon Area	Pre-monsoon Area
	1100	**Inland Wetlands – Natural**					
1	1101	Lakes/Ponds	18	1326	17.25	497	180
2	1106	River/Stream	1	3102	40.35	3102	3102
	1200	**Inland Wetlands -Man-made**					
3	1202	Tanks/Ponds	192	3096	40.28	1215	438
		Sub-Total	**211**	**7524**	**97.88**	**4814**	**3720**
		Wetlands (<2.25 ha), mainly Tanks	163	163	2.12	-	-
		Total	**374**	**7687**	**100.00**	**4814**	**3720**

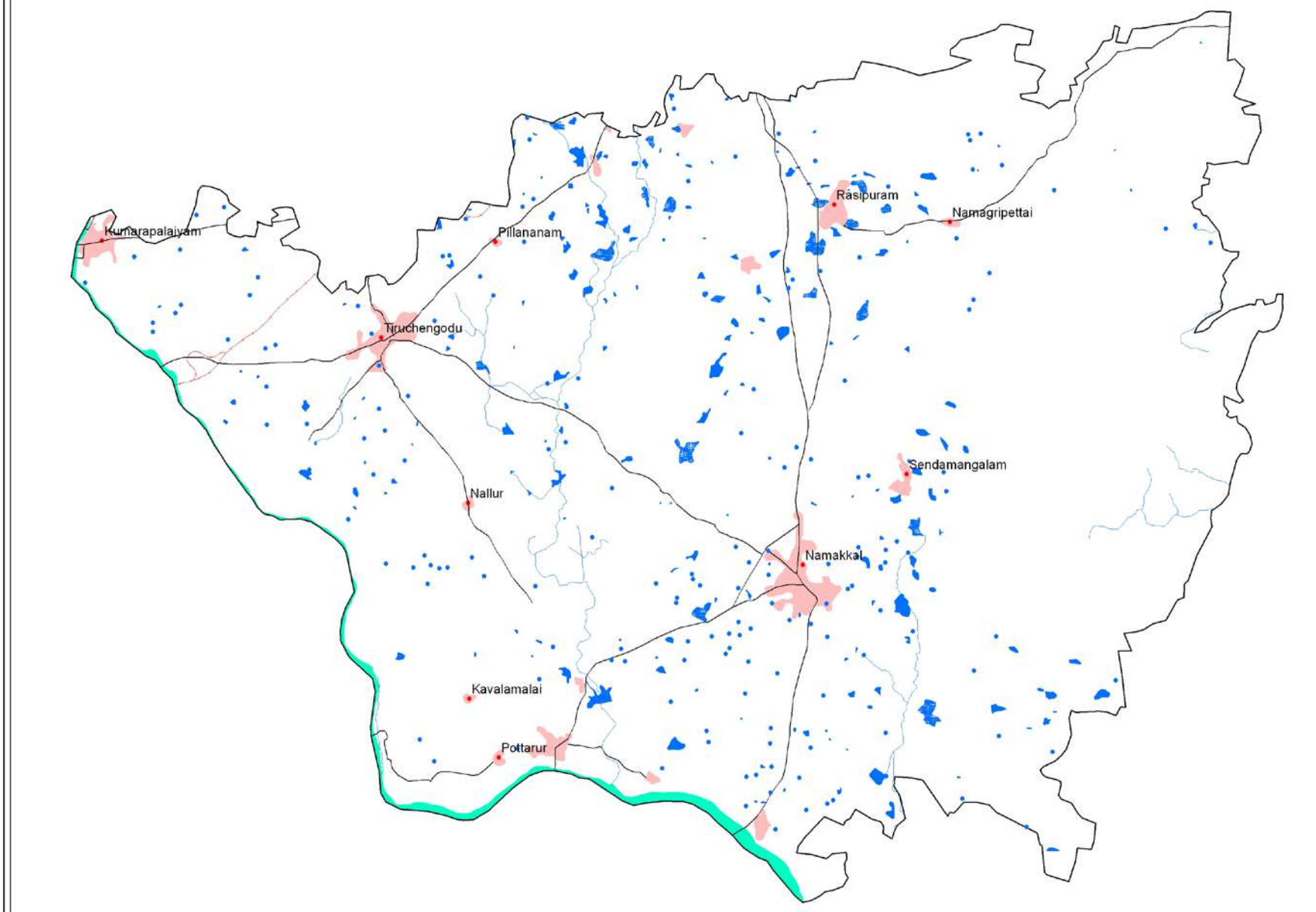
Area under Aquatic Vegetation	2663	3800

Area under turbidity levels		
Low	1713	619
Moderate	3101	3101
High	-	-

State : Tamil Nadu

WETLAND MAP

District : Namakkal

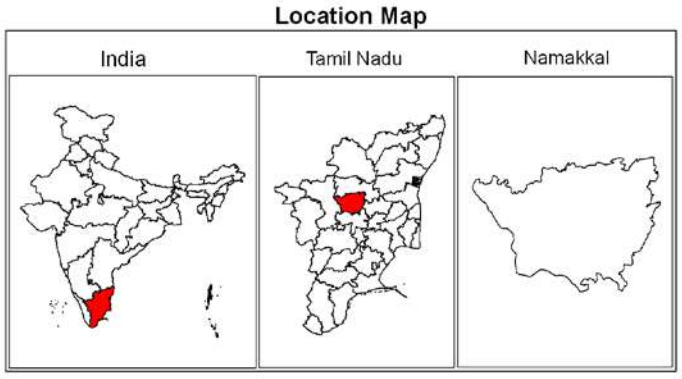


Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25ha)
- Drainage (line)
- Major Roads
- Railway
- Settlements
- Town/Settlements
- District Boundary
- State Boundary
- International Boundary

Location Map



5 2.5 0 5 10 Kilometers

Data Source :

IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

Prepared By :

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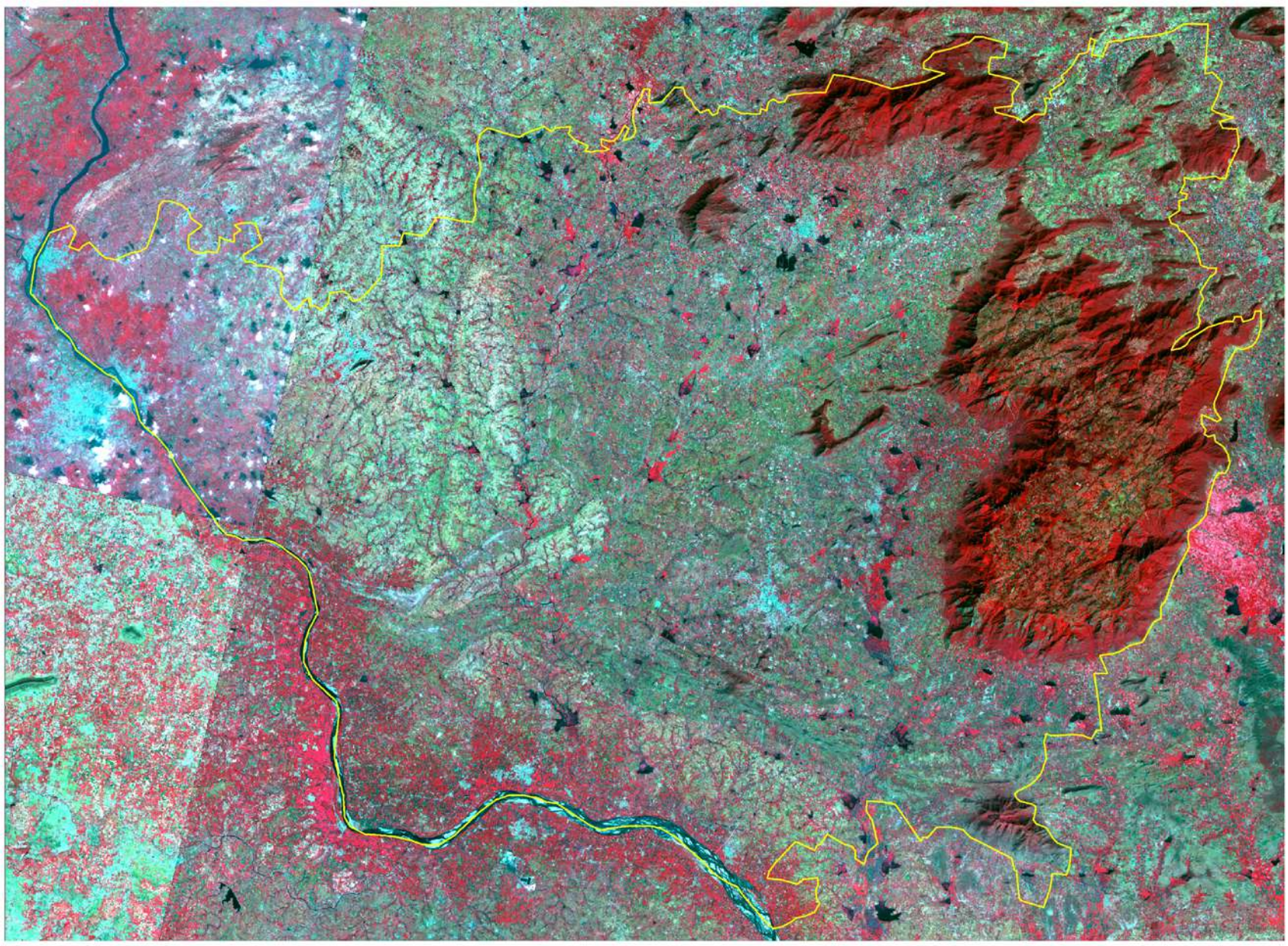
Sponsored By:

Ministry of Environment and Forests
Government of India

State : Tamil Nadu

District : Namakkal



IRS P6 LISS-III post-monsoon data (2007)

7.1.10 Erode

Erode District is lying on the extreme north of the state. It is bounded mostly by Karnataka State and also River Palar covers long distance. To the East lies Namakkal and Karur Districts. Dindigul District is its immediate neighbor to the South and on the West; it has Coimbatore and Nilgiri Districts, as its boundaries. Thus Erode District is essentially a land-locked area having no sea-cost of its own.

Erode is blessed with a huge area under forests covers. Approximately 2287 km² of land is under dense forest. These forests are rich in commercially significant items such as teak, sandalwood, rosewood, vogai, pillaimaruthu etc.

Total geographic area of Erode is 8161.91 km². As per the 2001 census data, the population of the district was 25,74,067. The density of population was 314 persons per km² and literacy rate of the district was 59.52%.

Total area under wetland is 13570 ha, which includes 397 small wetland (<2.25 ha). Major wetland types of the district are Reservoirs (51.35 %), River/Stream (34.30 %) and Tanks/ponds (7.77 %). Details of wetland statistics is given in Table 15.

Aquatic vegetation is observed in Lakes/Ponds, and Tanks/Ponds. The area under aquatic vegetation is more during pre monsoon (3408 ha) than that of post monsoon (1667 ha). The open water spread significantly lower during pre monsoon (9683 ha) compared to post monsoon (11490 ha).

Table 15: Area estimates of wetlands in Erode

Area in ha

Sr. No.	Wettcode	Wetland Category	Number of Wetlands	Total Wetland Area	% of wetland area	Open Water	
						Post-monsoon Area	Pre-monsoon Area
	1100	**Inland Wetlands - Natural**					
1	1101	Lakes/Ponds	11	462	3.40	343	194
2	1106	River/Stream	19	4654	34.30	4654	4606
	1200	**Inland Wetlands -Man-made**					
3	1201	Reservoirs/Barrages	9	6968	51.35	5827	4524
4	1202	Tanks/Ponds	100	1055	7.77	642	359
5	1203	Waterlogged	1	34	0.25	24	-
		Sub-Total	**140**	**13173**	**97.07**	**11490**	**9683**
		Wetlands (<2.25 ha), mainly Tanks	397	397	2.93	-	-
		Total	**537**	**13570**	**100.00**	**11490**	**9683**

Area under Aquatic Vegetation	1667	3408

Area under turbidity levels		
Low	6805	5114
Moderate	4643	4559
High	42	10

State : Tamil Nadu

WETLAND MAP

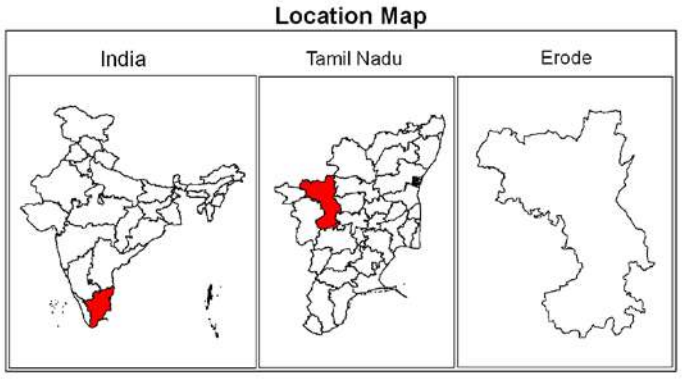
District : Erode

Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25ha)
- Drainage (line)
- Major Roads
- Railway
- Settlements
- Town/Settlements
- District Boundary
- State Boundary
- International Boundary

Location Map



8 4 0 8 16 Kilometers

Data Source :

IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

Prepared By :

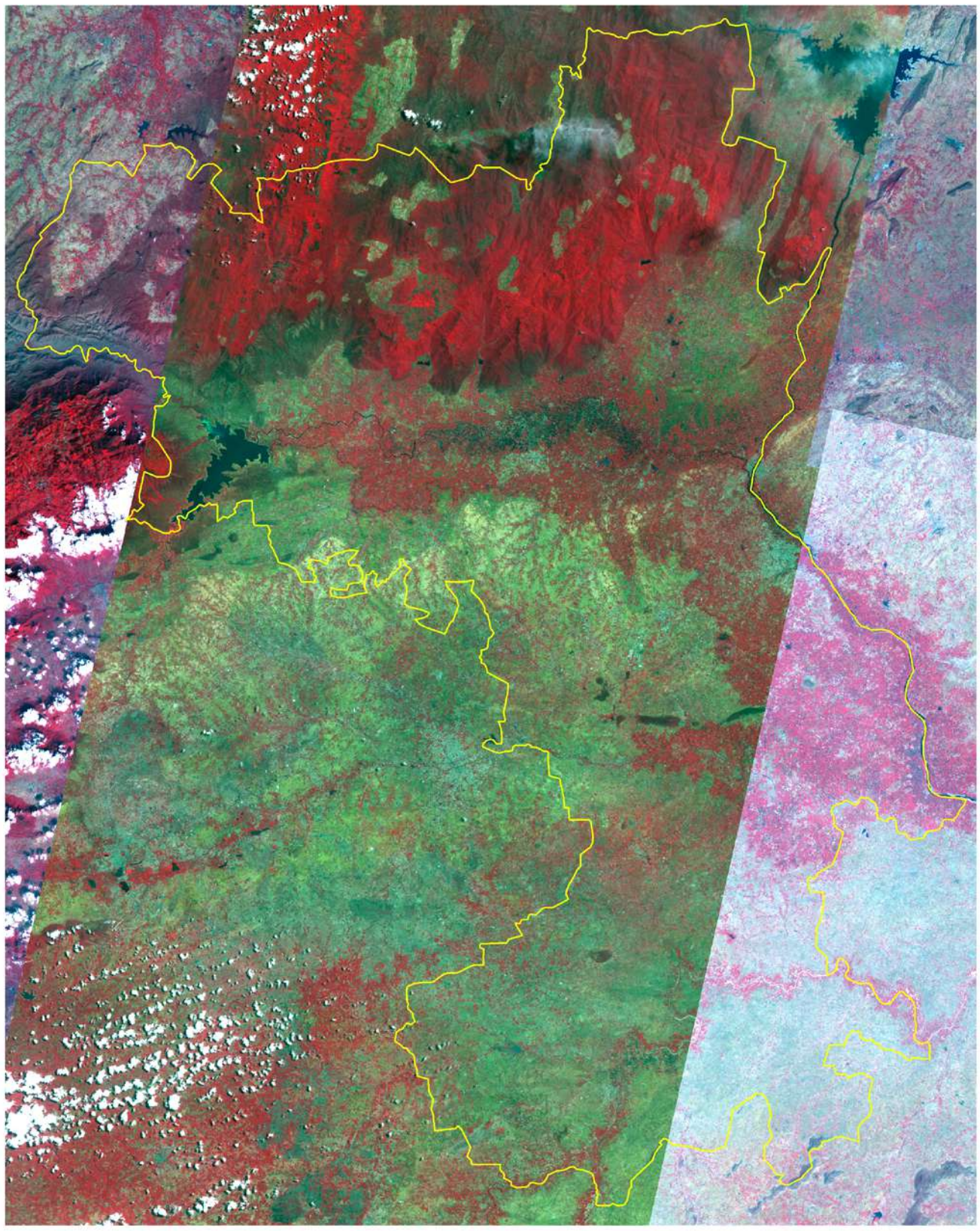
Space Applications Centre (ISRO), Ahmedabad
and
Institute of Remote Sensing, Anna University, Chennai

Sponsored By:

Ministry of Environment and Forests
Government of India

State : Tamil Nadu

District : Erode



IRS P6 LISS-III pre-monsoon data (2006)

7.1.11 The Nilgiris

Nilgiris is a mountainous district of Tamil Nadu bounded on North by Karnataka State, on the West by Coimbatore District, Erode District, South by Coimbatore District and Kerala State and on the East by Kerala State. In Nilgiris District the topography is rolling and steep. About 60% of the cultivable land falls under the slopes ranging from 16 to 35%. The Nilgiri or Blue Mountains are also the name given to a range of mountains panning across the states of Tamil Nadu and Kerala and are part of a larger mountain chain known as the Western Ghats. The highest point is the mountain of Doddabetta, with a height of 2,637 m. The district is mainly contained within this mountain range.

Total geographic area of Nilgiris is 2452.50 km². As per the 2001 census data, the population of the district was 7,64,826 . The density of population was 300 persons per km² and literacy rate of the district was 72.79%. The district offers good many numbers of tourist places owing to its natural and serene environment all around.

Total area under wetland is 3127 ha, which includes 17 small wetland (<2.25 ha). Major wetland types of the district are; Reservoirs (88.68 %) and Tanks/ponds (6.94 %). Details of wetland statistics is given in Table 16.

Aquatic vegetation is observed in Lakes/Ponds, and Tanks/Ponds. The area under aquatic vegetation is more during pre monsoon (511 ha) than that of post monsoon (331 ha). The open water spread significantly lower during pre monsoon (2527 ha) compared to post monsoon (2721 ha).

Table 16: Area estimates of wetlands in The Nilgiris

Area in ha

Sr. No.	Wettcode	Wetland Category	Number of Wetlands	Total Wetland Area	% of wetland area	Open Water	
						Post-monsoon Area	Pre-monsoon Area
	1100	**Inland Wetlands - Natural**					
1	1101	Lakes/Ponds	3	120	3.84	114	91
	1200	**Inland Wetlands -Man-made**					
2	1201	Reservoirs/Barrages	8	2773	88.68	2473	2319
3	1202	Tanks/Ponds	29	217	6.94	134	117
		Sub-Total	**40**	**3110**	**99.46**	**2721**	**2527**
		Wetlands (<2.25 ha), mainly Tanks	17	17	0.54	-	-
		Total	**57**	**3127**	**100.00**	**2721**	**2527**

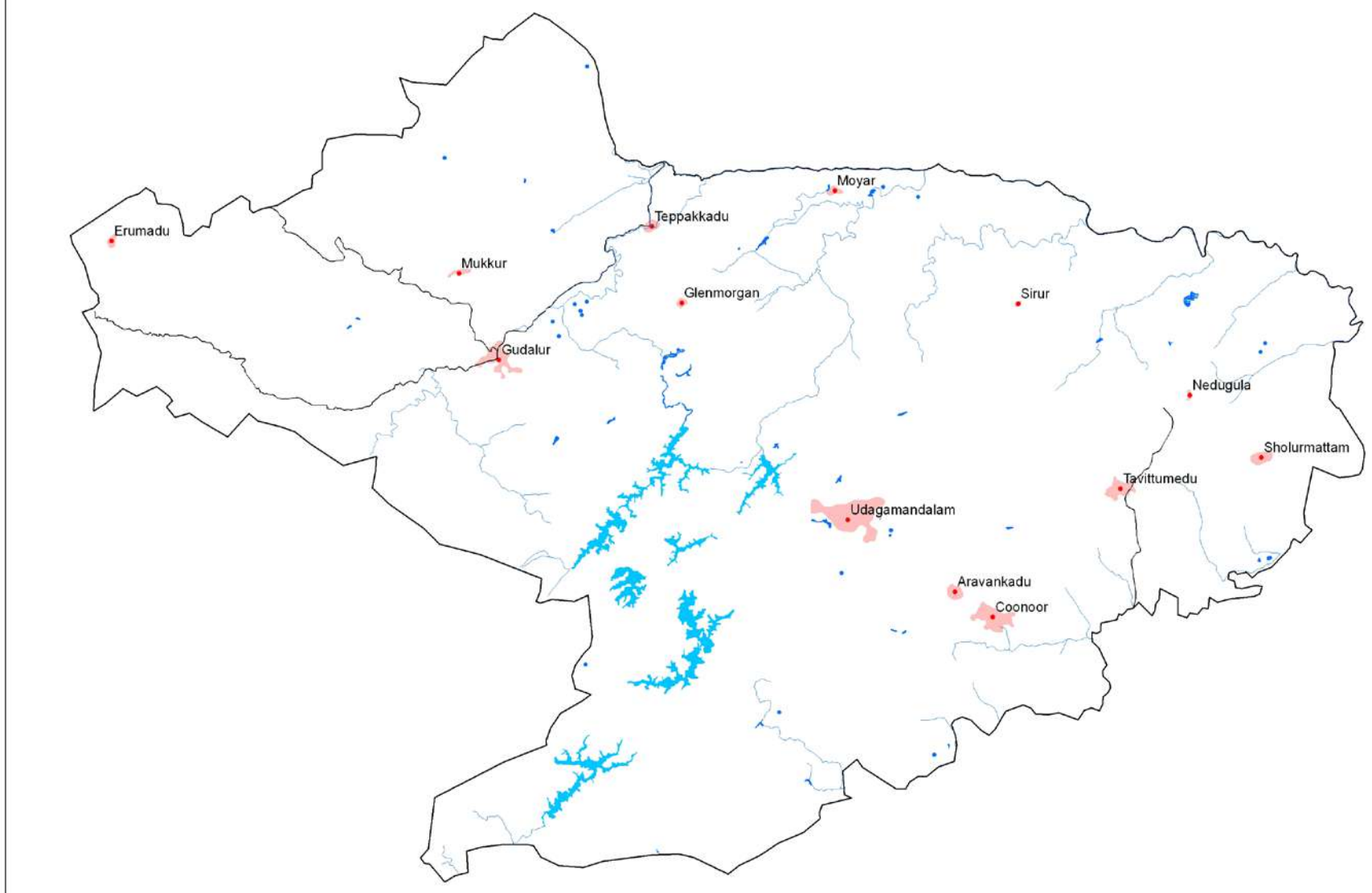
Area under Aquatic Vegetation	331	511

Area under turbidity levels		
Low	2127	1968
Moderate	594	559
High	-	-

State : Tamil Nadu

WETLAND MAP

District : The Nilgiris

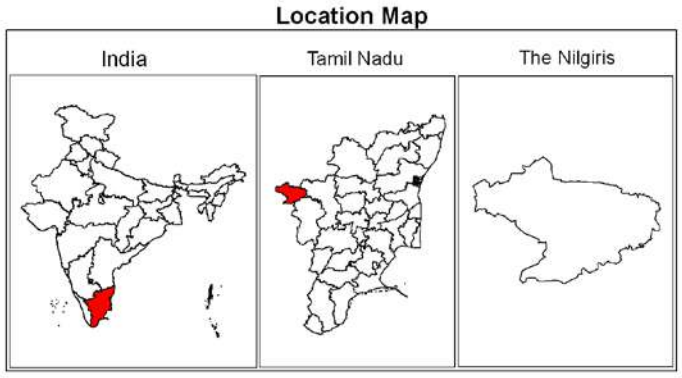


Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25ha)
- Drainage (line)
- Major Roads
- Railway
- Settlements
- Town/Settlements
- District Boundary
- State Boundary
- International Boundary

Location Map



7 3.5 0 7 14 Kilometers

Data Source :

IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

Prepared By :

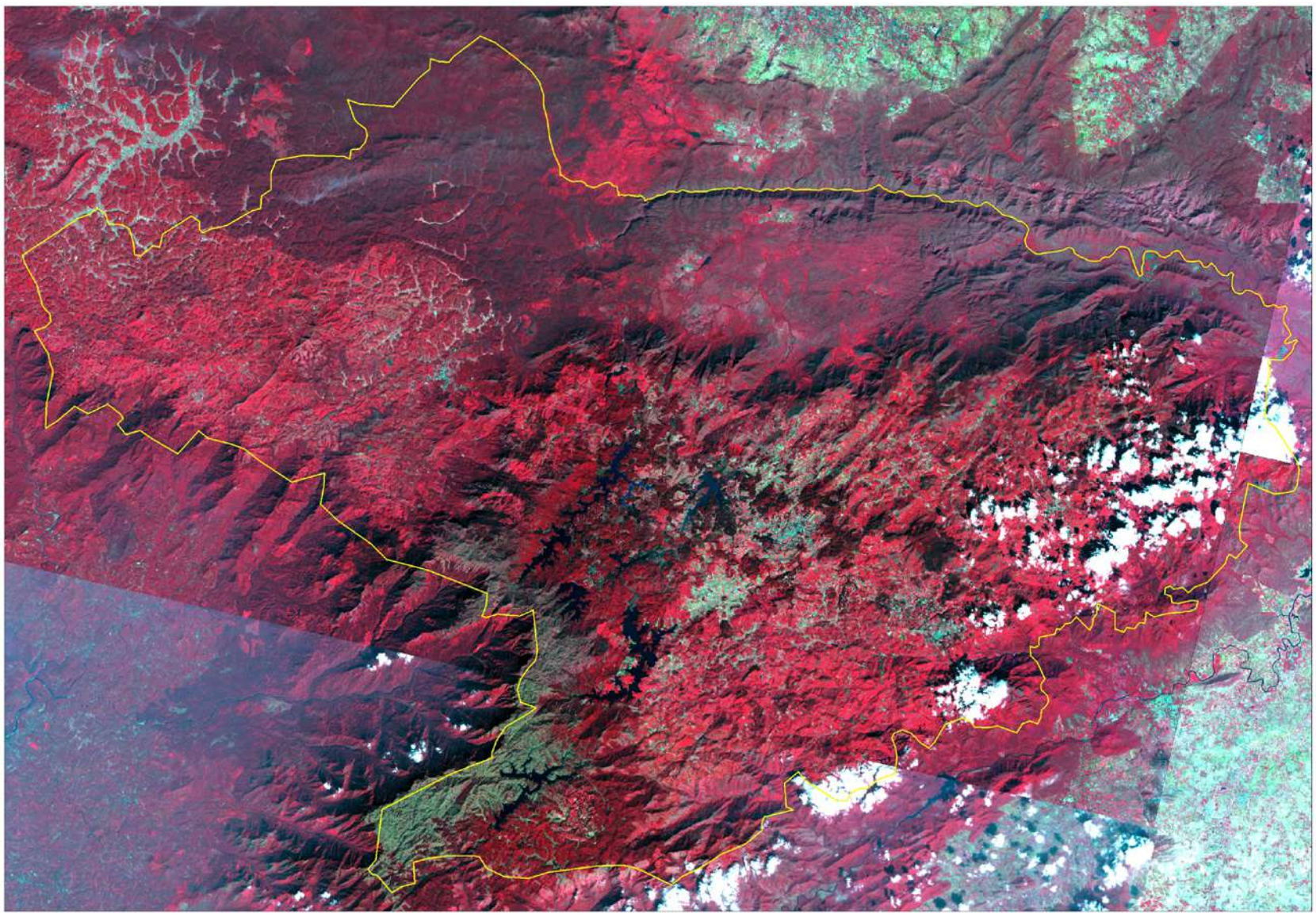
Space Applications Centre (ISRO), Ahmedabad
and
Institute of Remote Sensing, Anna University, Chennai

Sponsored By:

Ministry of Environment and Forests
Government of India

State : Tamil Nadu

District : The Nilgiris



IRS P6 LISS-III Post-monsoon data (2006)

7.1.12 Coimbatore

Coimbatore is the gateway to neighboring Kerala and the ever popular hill station of Udhagamandalam (Ooty). The district is surrounded by mountains on the west, and with reserve forests and river basin (Nilgiri Biosphere Reserve) on the northern side, while the eastern side of the district starting from the city is predominantly dry. The entire western and northern part of the district borders the Western Ghats with Nilgiri biosphere, Anaimalai and Munnar range with a western pass to Kerala popularly referred to as the Palghat Gap providing its boundary. Coimbatore is characterized by dry climate. More than 20% of the district is classified as forest and comprises of mountain range, they lie in west and north. The forests here are abundant in commercially significant items such as teak, sandalwood, rosewood, bamboo etc. The Nilgiris slope viz. the Mettupalayam range is rich in sandalwood trees and bamboo.

Total geographic area of Coimbatore is 7469 km². As per the 2001 census data, the population of the district was 42,71856. The density of population was 572 persons per km² and literacy rate of the district was 68.94%.

Total area under wetland is 8070 ha, which includes 304 small wetland (<2.25 ha). Lakes/Ponds occupies 14.89% of wetland area. The major wetland types are Reservoirs (42.39 %) , River/stream (29.41 %) and Tanks/ponds(9.54 %). The prime attractions of the district are Black Thunder (Water Sports), Amaravathi, Aliyar and Thirumurthi Dams , Monkey Falls, Indira Gandhi Wild Life Sanctuary and Panchalingam Falls. Details of wetland statistics is given in Table 17.

Aquatic vegetation is observed in Lakes/Ponds, and Tanks/Ponds. The area under aquatic vegetation is more during pre monsoon (2941 ha) than that of post monsoon (2310 ha). The open water spread significantly lower during pre monsoon (4729 ha) compared to post monsoon (5418 ha).

Table 17: Area estimates of wetlands in Coimbatore

Area in ha

Sr. No.	Wettcode	Wetland Category	Number of Wetlands	Total Wetland Area	% of wetland area	Open Water	
						Post-monsoon Area	Pre-monsoon Area
	1100	**Inland Wetlands - Natural**					
1	1101	Lakes/Ponds	18	1202	14.89	671	721
2	1106	River/Stream	24	2373	29.41	2366	2078
	1200	**Inland Wetlands -Man-made**					
3	1201	Reservoirs/Barrages	18	3421	42.39	1975	1642
4	1202	Tanks/Ponds	93	770	9.54	406	288
		Sub-Total	**153**	**7766**	**96.23**	**5418**	**4729**
		Wetlands (<2.25 ha), mainly Tanks	304	304	3.77	-	-
		Total	**457**	**8070**	**100.00**	**5418**	**4729**

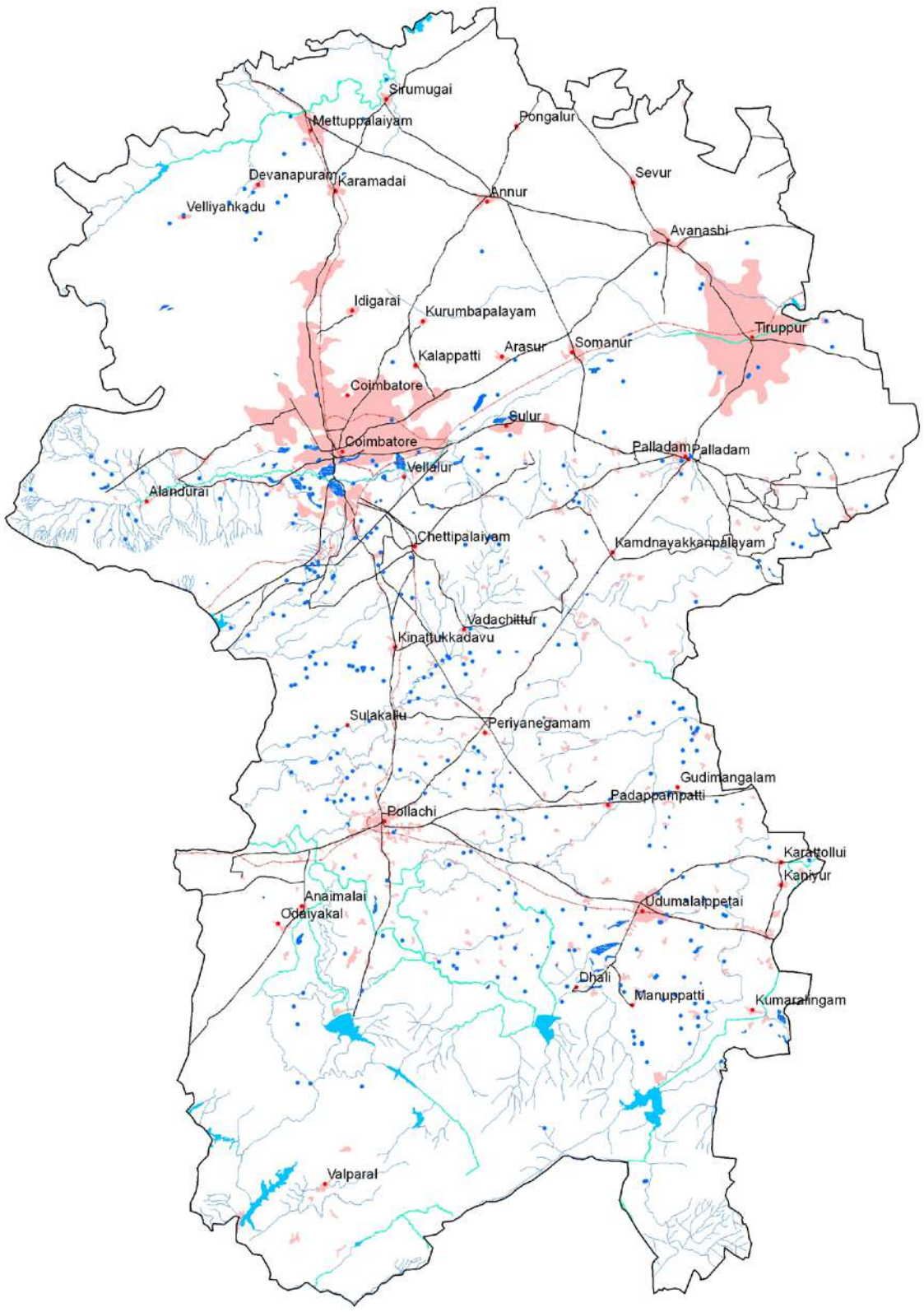
Area under Aquatic Vegetation	2310	2941

Area under turbidity levels		
Low	3087	2776
Moderate	2156	1879
High	175	74

State : Tamil Nadu

WETLAND MAP

District : Coimbatore

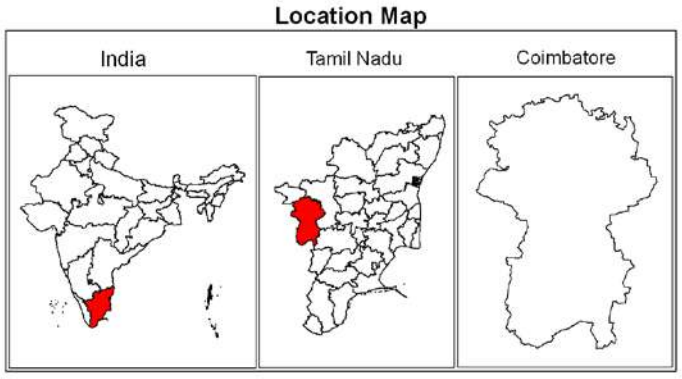


Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25ha)
- Drainage (line)
- Major Roads
- Railway
- Settlements
- Town/Settlements
- District Boundary
- State Boundary
- International Boundary

Location Map



10 5 0 10 20 Kilometers

Data Source :

IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

Prepared By :

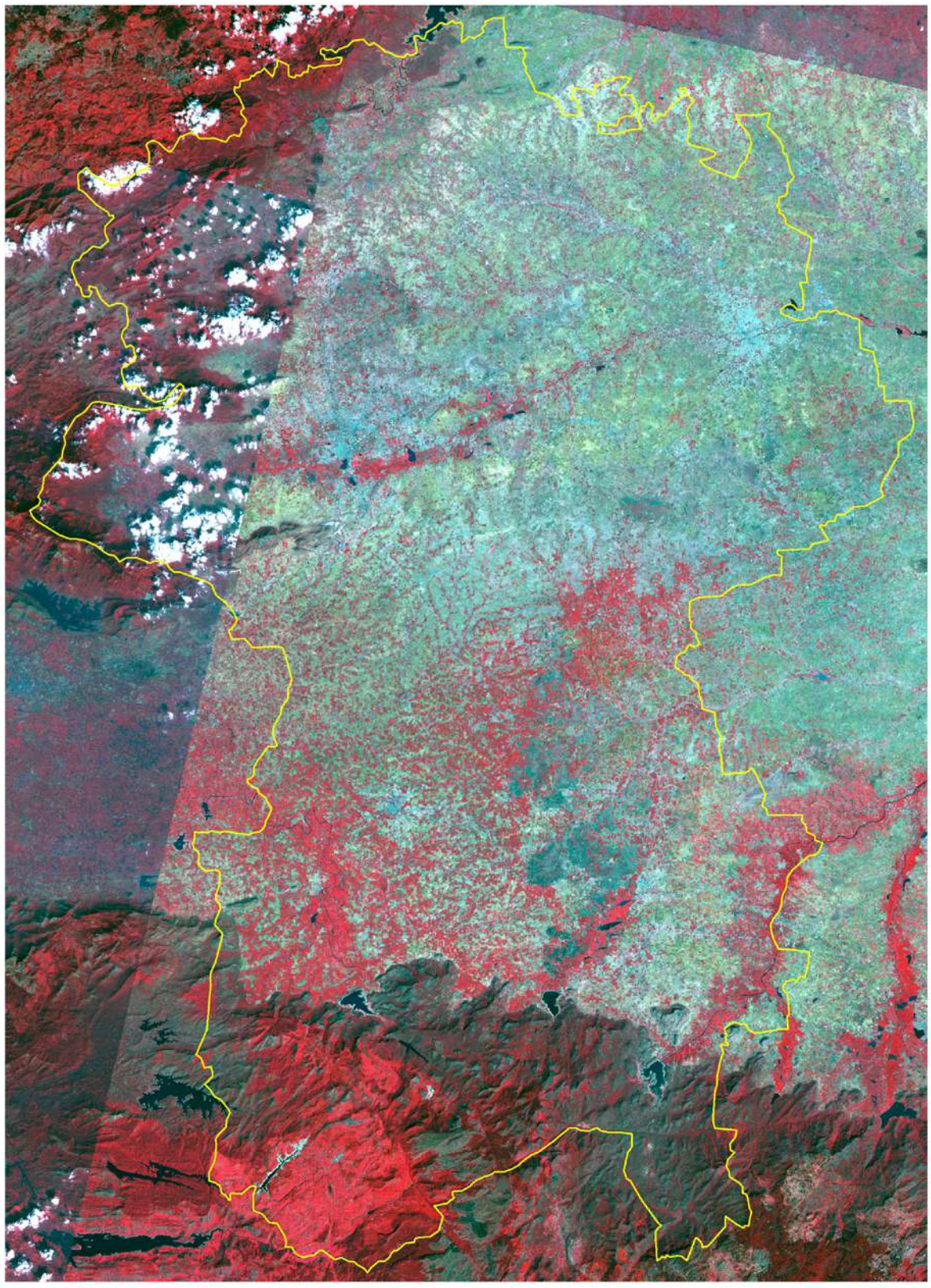
Space Applications Centre (ISRO), Ahmedabad
and
Institute of Remote Sensing, Anna University, Chennai

Sponsored By:

Ministry of Environment and Forests
Government of India

State : Tamil Nadu

District : Coimbatore



IRS P6 LISS-III post-monsoon data (2007)

7.1.13 Dindigul

Dindigul district is bound by Erode, Coimbatore, Karur and Trichy districts on the North, by Sivaganga and Tiruchi District on the East, by Madurai district on the South and by Theni and Coimbatore Districts and Kerala State on the West.

Total geographic area of Dindigul is 6266.64 km². As per the 2001 census data, the population of the district was 19,18,960 . The density of population was 306 persons per km² and literacy rate of the district was 79%.

Total area under wetland is 13815 ha, which includes 964 small wetland (<2.25 ha). Tanks/Ponds occupies 46.08% of wetland area. Other wetland types are Lakes/Ponds (3481 ha), Reservoirs (8.81 %) and River/Stream (12.94 %). Details of wetland statistics is given in Table 18.

Aquatic vegetation is observed in Lakes/Ponds, and Tanks/Ponds. The area under aquatic vegetation is more during pre monsoon (9944 ha) than that of post monsoon (3195 ha). The open water spread significantly lower during pre monsoon (2899 ha) compared to post monsoon (9552 ha).

Table 18: Area estimates of wetlands in Dindigul

Area in ha

Sr. No.	Wettcode	Wetland Category	Number of Wetlands	Total Wetland Area	% of wetland area	Open Water	
						Post-monsoon Area	Pre-monsoon Area
	1100	**Inland Wetlands - Natural**					
1	1101	Lakes/Ponds	69	3481	25.20	2633	474
2	1106	River/Stream	21	1787	12.94	1787	1724
	1200	**Inland Wetlands -Man-made**					
3	1201	Reservoirs/Barrages	4	1217	8.81	1144	443
4	1202	Tanks/Ponds	855	6366	46.08	3988	258
		Sub-Total	**949**	**12851**	**93.02**	**9552**	**2899**
		Wetlands (<2.25 ha), mainly Tanks	964	964	6.98	-	-
		Total	**1913**	**13815**	**100.00**	**9552**	**2899**

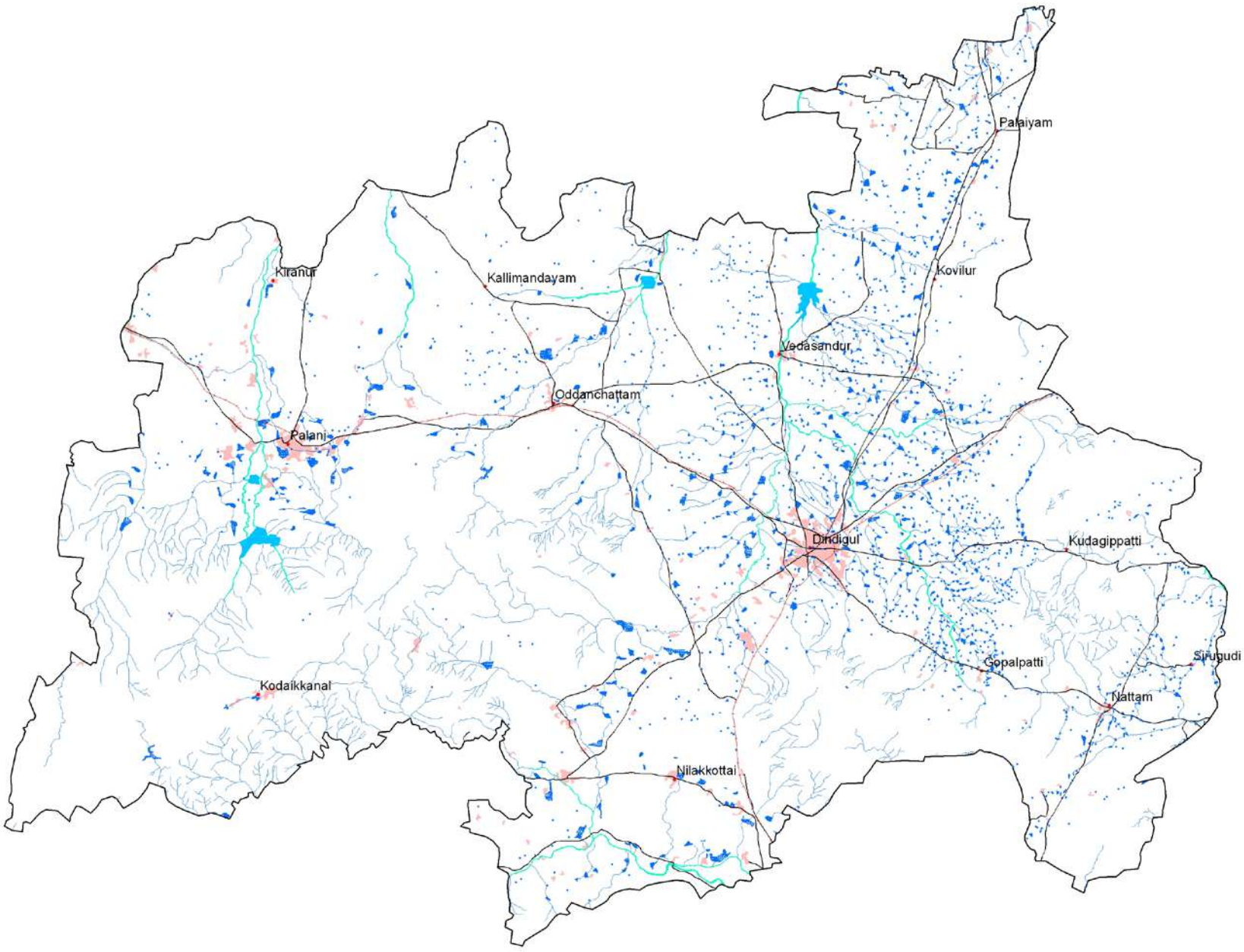
Area under Aquatic Vegetation	3195	9944

Area under turbidity levels		
Low	2565	684
Moderate	5028	2126
High	1959	89

State : Tamil Nadu

WETLAND MAP

District : Dindigul

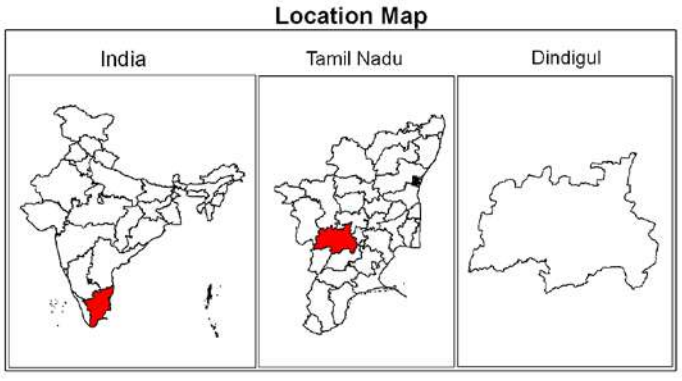


Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25ha)
- Drainage (line)
- Major Roads
- Railway
- Settlements
- Town/Settlements
- District Boundary
- State Boundary
- International Boundary

Location Map



9 4.5 0 9 18 Kilometers

Data Source :

IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

Prepared By :

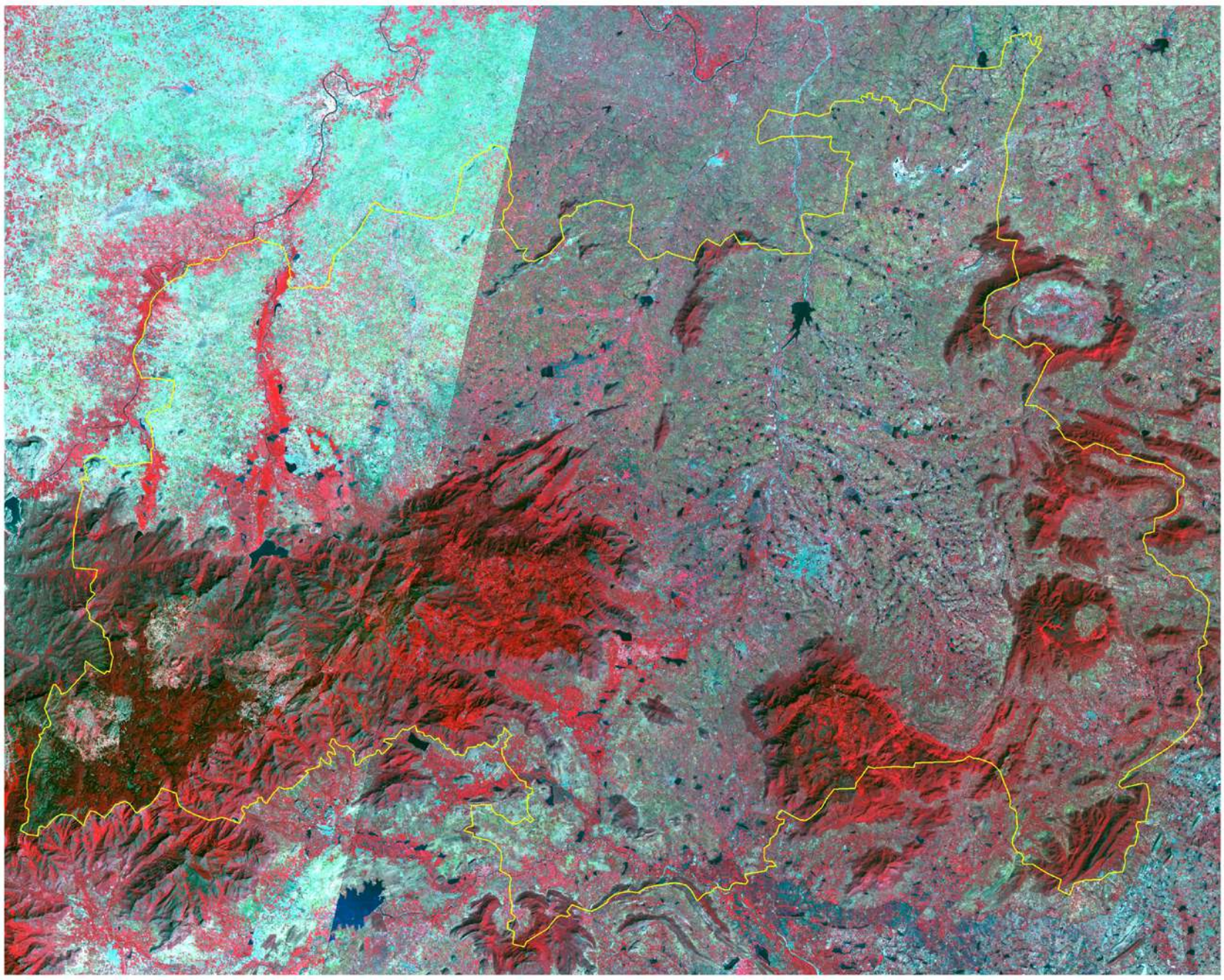
Space Applications Centre (ISRO), Ahmedabad
and
Institute of Remote Sensing, Anna University, Chennai

Sponsored By:

Ministry of Environment and Forests
Government of India

State : Tamil Nadu

District : Dindigul



IRS-P6 LISS-III Post-monsoon data(2006-2007)

7.1.14 Karur

Karur is an ancient city of Tamil Nadu, also an administrative district of the state. It is the most centrally located district of Tamil Nadu. The district is bounded by Namakkal District in the north, the Dindigul District in the south, the Tiruchirappalli District on the east and Erode District on the west. The district is famous for its cottage industries.

Total geographic area of Karur is 2895.57 km². As per the 2001 census data, the population of the district was 935686. The density of population was 323 persons per km² and literacy rate of the district was 68.60 %.

Total area under wetland is 16383 ha, which includes 591 small wetland (<2.25 ha). Major wetland types of the district are River/Stream (11096 ha), Tanks/ponds (2166 ha), and Lakes/ponds (2068 ha). Details of wetland statistics is given in Table 19.

Aquatic vegetation is observed in Lakes/Ponds, and Tanks/Ponds. The area under aquatic vegetation is more during pre monsoon (4432 ha) than that of post monsoon (2414 ha). The open water spread significantly lower during pre monsoon (11348 ha) compared to post monsoon (13355 ha).

Table 19: Area estimates of wetlands in Karur

Area in ha

Sr. No.	Wettcode	Wetland Category	Number of Wetlands	Total Wetland Area	% of wetland area	Open Water	
						Post-monsoon Area	Pre-monsoon Area
	1100	**Inland Wetlands - Natural**					
1	1101	Lakes/Ponds	25	2068	12.62	1190	134
2	1106	River/Stream	8	11096	67.73	11087	11087
	1200	**Inland Wetlands -Man-made**					
3	1201	Reservoirs/Barrages	5	219	1.34	103	20
4	1202	Tanks/Ponds	206	2166	13.22	958	103
5	1203	Waterlogged	1	121	0.74	13	-
		Total - Inland	**245**	**15670**	**95.65**	**13351**	**11344**
	2200	**Coastal Wetlands - Man-made**					
6	2202	Aquaculture ponds	1	122	0.74	4	4
		Total - Coastal	**1**	**122**	**0.74**	**4**	**4**
		Sub-Total	**246**	**15792**	**96.39**	**13355**	**11348**
		Wetlands (<2.25 ha), mainly Tanks	591	591	3.61	-	-
		Total	**837**	**16383**	**100.00**	**13355**	**11348**

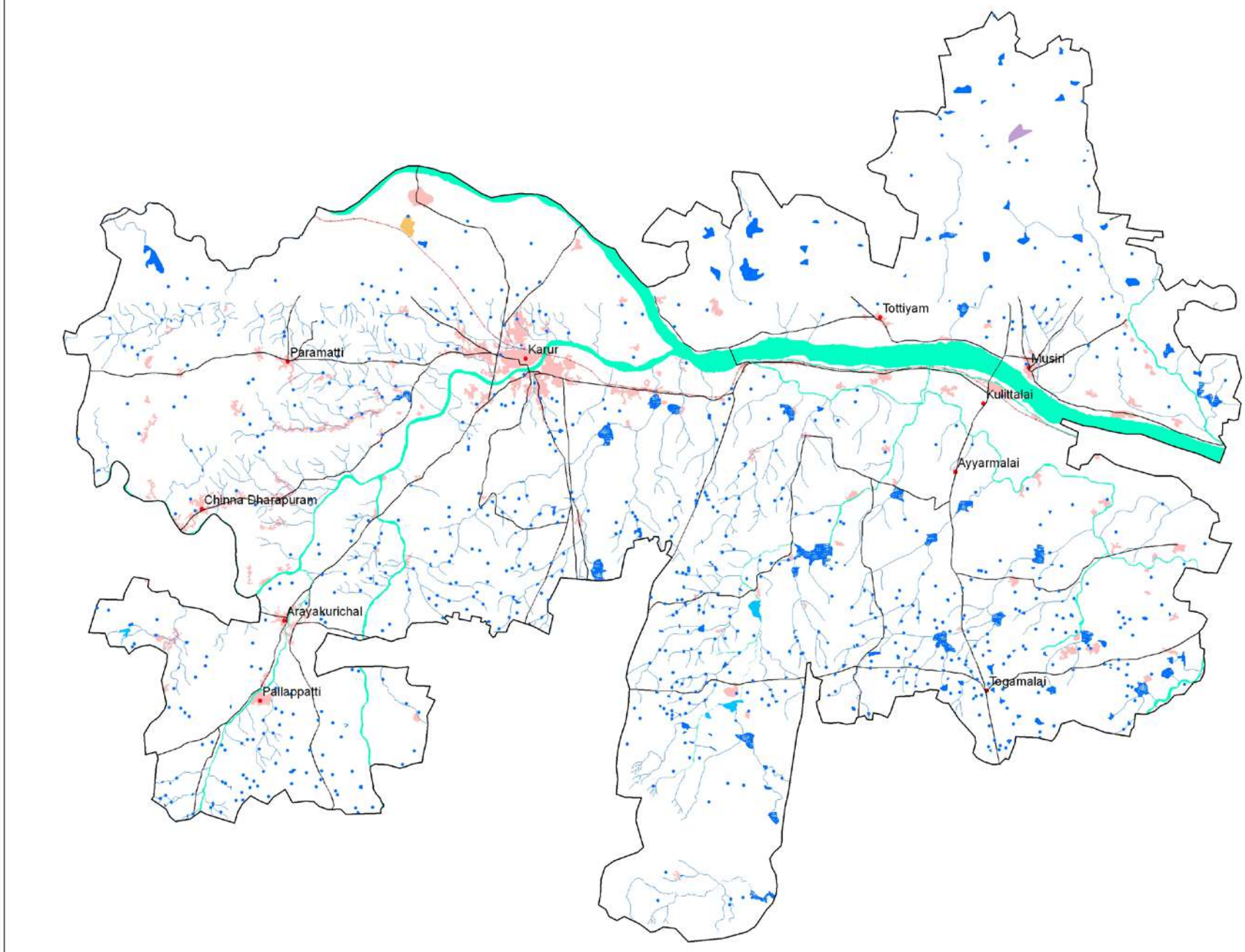
Area under Aquatic Vegetation	2414	4432

Area under turbidity levels		
Low	1438	144
Moderate	11619	11181
High	298	23

State : Tamil Nadu

WETLAND MAP

District : Karur

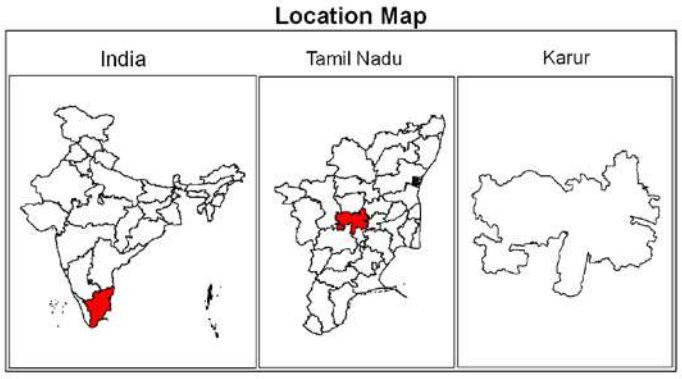


Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25ha)
- Drainage (line)
- Major Roads
- Railway
- Settlements
- Town/Settlements
- District Boundary
- State Boundary
- International Boundary

Location Map



5 2.5 0 5 10 Kilometers

Data Source :

IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

Prepared By :

Space Applications Centre (ISRO), Ahmedabad
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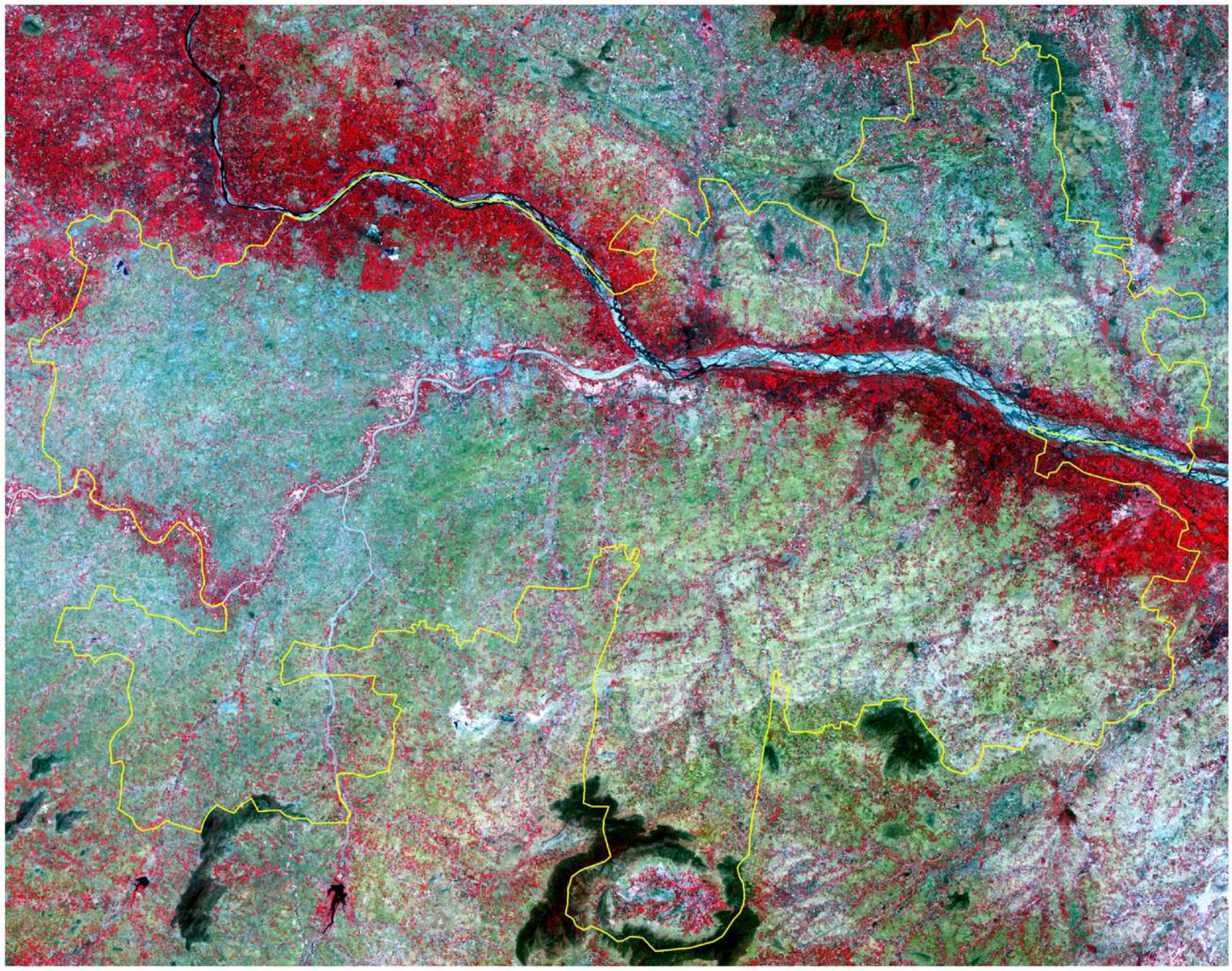
Institute of Remote Sensing, Anna University, Chennai

Sponsored By:

Ministry of Environment and Forests
Government of India

State : Tamil Nadu

District : Karur



IRS P6 LISS-III pre-monsoon data (2006)

7.1.15 Tiruchirappalli

Tiruchirapalli District (also known as Tiruchchirapalli District) is located along the Kaveri River in Tamil Nadu state of India. The main town in Tiruchirapalli District is the city of Tiruchirapalli. It is bounded on the north by Salem District, on the northeast by Perambalur District, on the east by Thanjavur District, on the southeast by Pudukkottai District, on the south by Sivaganga and Madurai districts, on the southwest by Dindigul District, on the west by Karur District, and on the northwest by Namakkal District.

Total geographic area of Tiruchirapalli is 4403.83 km². As per the 2001 census data, the population of the district was 21, 96,473 . The density of population was 499 persons per km² and literacy rate of the district was 59.89 %.

Total area under wetland is 18626 ha, which includes 790 small wetland (<2.25 ha). Tanks/Ponds occupies 28.96% of wetland area. The other wetland types are; River/Stream (7848 ha) and Lakes/ponds (4247 ha). Details of wetland statistics is given in Table 20.

Aquatic vegetation is observed in Lakes/Ponds, and Tanks/Ponds. The area under aquatic vegetation is more during pre monsoon (9233 ha) than that of post monsoon (3815 ha). The open water spread significantly lower during pre monsoon (8551 ha) compared to post monsoon (13941 ha).

Table 20: Area estimates of wetlands in Tiruchirappalli

Area in ha

Sr. No.	Wettcode	Wetland Category	Number of Wetlands	Total Wetland Area	% of wetland area	Open Water	
						Post-monsoon Area	Pre-monsoon Area
	1100	**Inland Wetlands - Natural**					
1	1101	Lakes/Ponds	79	4247	22.80	2856	461
2	1106	River/Stream	18	7848	42.23	7822	7822
	1200	**Inland Wetlands -Man-made**					
3	1201	Reservoirs/Barrages	3	346	1.86	307	44
4	1202	Tanks/Ponds	602	5395	28.96	2956	224
		Sub-Total	**702**	**17836**	**95.85**	**13941**	**8551**
		Wetlands (<2.25 ha), mainly Tanks	790	790	4.24	-	-
		Total	**1492**	**18626**	**100.10**	**13941**	**8551**

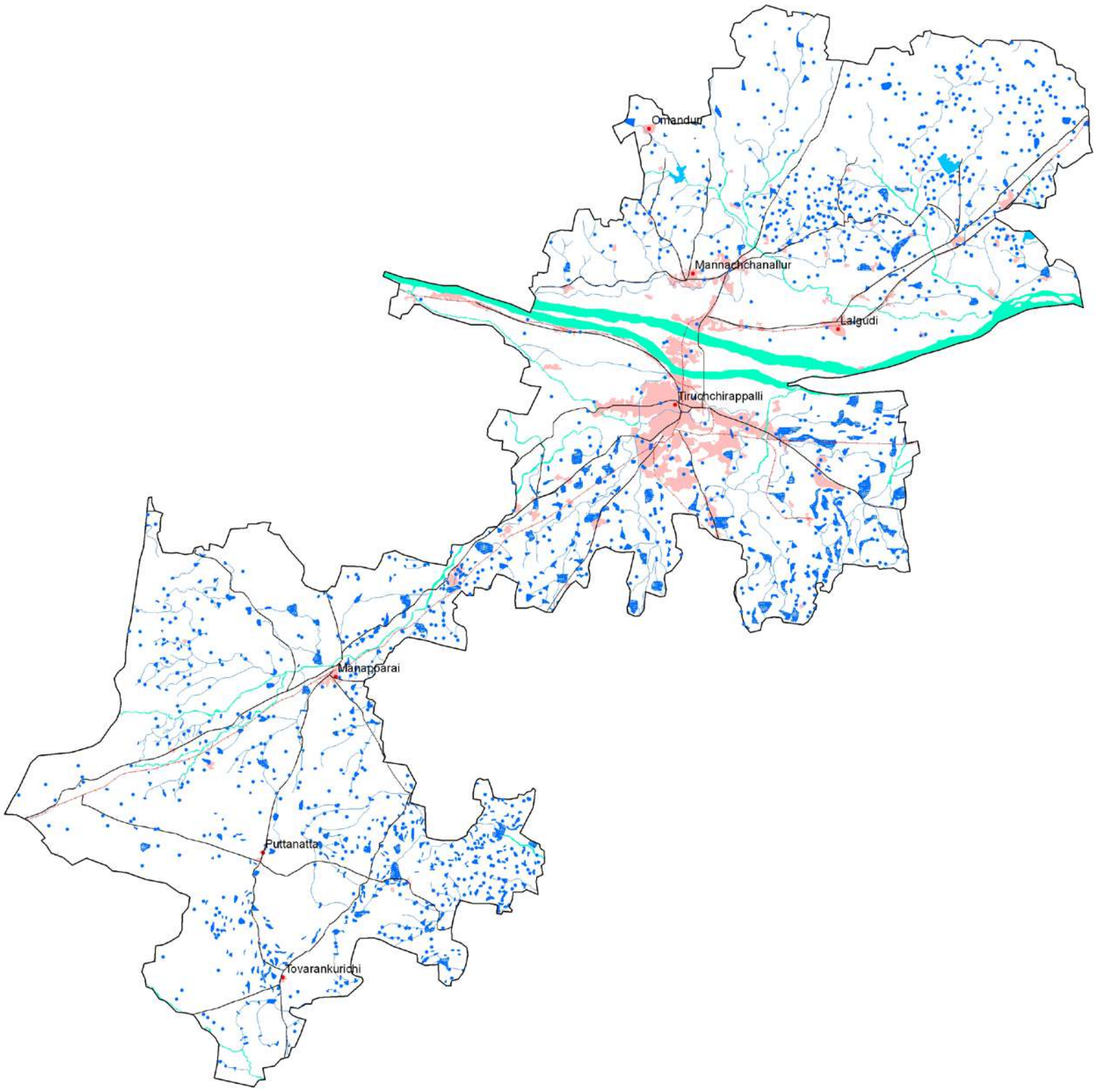
Area under Aquatic Vegetation	3815	9233

Area under turbidity levels		
Low	2273	346
Moderate	10613	8135
High	1055	70

State : Tamil Nadu

WETLAND MAP

District : Tiruchirappalli

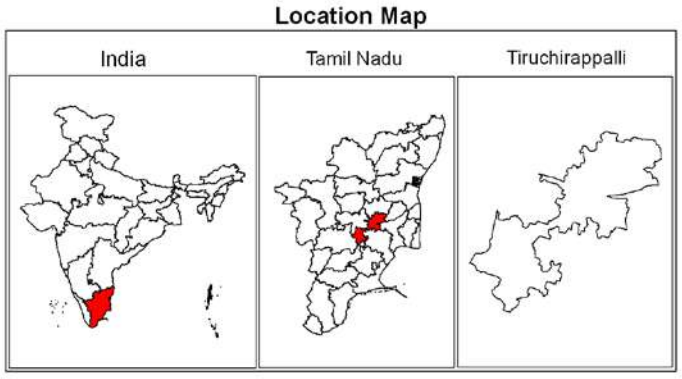


Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25ha)
- Drainage (line)
- Major Roads
- Railway
- Settlements
- Town/Settlements
- District Boundary
- State Boundary
- International Boundary

Location Map



8 4 0 8 16 Kilometers

Data Source :

IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

Prepared By :

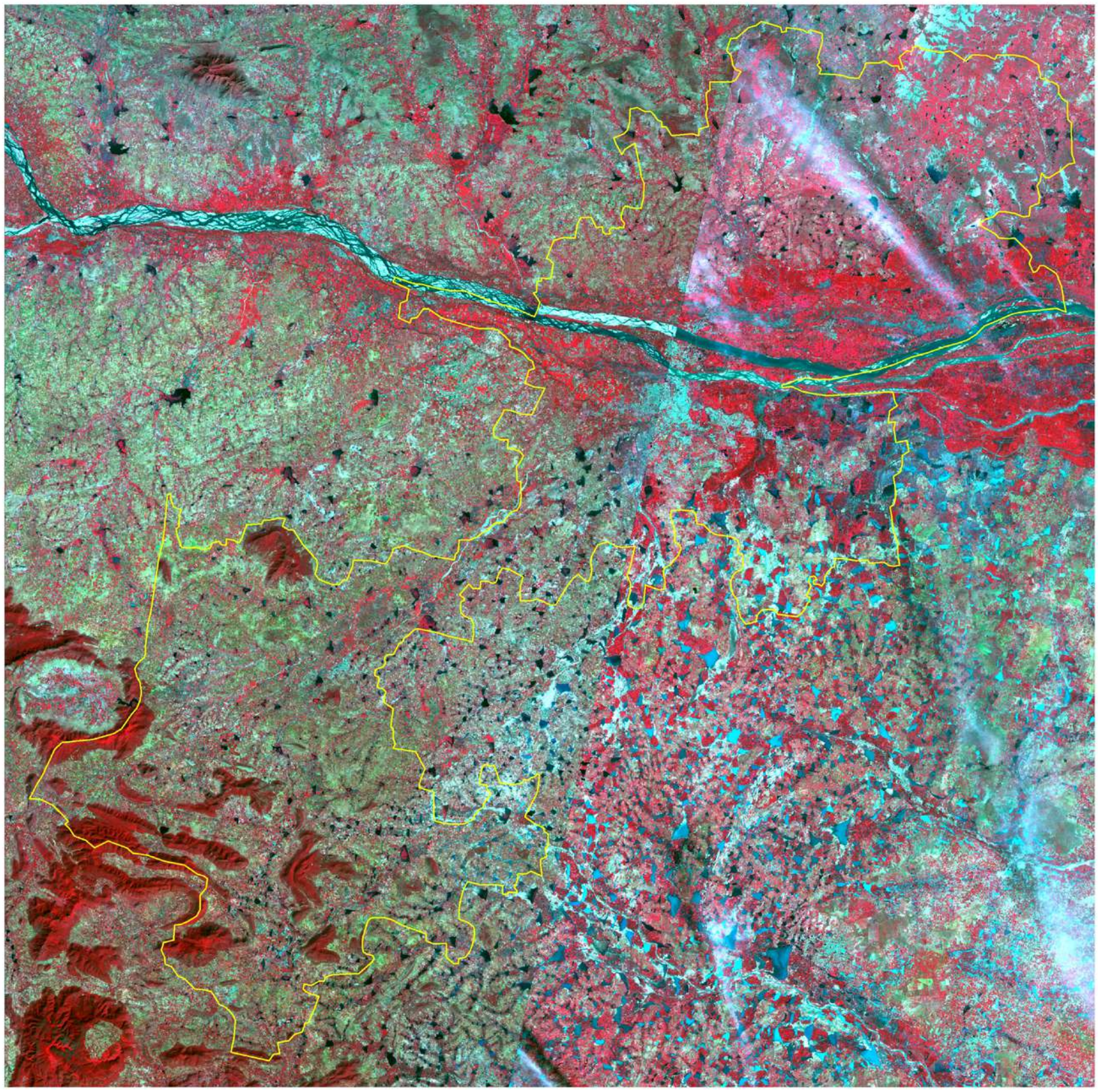
Space Applications Centre (ISRO), Ahmedabad
and
Institute of Remote Sensing, Anna University, Chennai

Sponsored By:

Ministry of Environment and Forests
Government of India

State : Tamil Nadu

District : Tiruchirappalli



IRS P6 LISS-III post-monsoon data (2007)

7.1.16 Perambalur

Perambalur district is located at the centre of the state. The district shares common boundaries with Cuddalore district on the North, Tiruchirappalli district on the South, Thanjavur on the East and Namakkal and Tiruchirappalli districts on the West. The district lies in the Southern plateau & hill zone of Agro-climate regional planning with characteristics of semi arid climate. The soil is predominantly red loamy and black soil. Major tourist attractions in the district include Karaivetti Birds Sanctuary is a major tourist attraction

Total geographic area of Perambalur is 3690.07 km². As per the 2001 census data, the population of the district was 11,81,029. The density of population was 281 persons per km².

Total area under wetland is 8070 ha, which includes 452 small wetland (<2.25 ha). Tanks/Ponds occupies 55.97% of wetland area. The other wetland types are; River/Stream (811 ha), Lakes/ponds (2016 ha) and man-made waterlogged (232 ha). Details of wetland statistics is given in Table 21.

Aquatic vegetation is observed in Lakes/Ponds, and Tanks/Ponds. The area under aquatic vegetation is more during pre monsoon (6437 ha) than that of post monsoon (3137 ha). The open water spread significantly lower during pre monsoon (1180 ha) compared to post monsoon (4291 ha).

Table 21: Area estimates of wetlands in Perambalur

Area in ha

Sr. No.	Wettcode	Wetland Category	Number of Wetlands	Total Wetland Area	% of wetland area	Open Water	
						Post-monsoon Area	Pre-monsoon Area
	1100	**Inland Wetlands – Natural**					
1	1101	Lakes/Ponds	25	2016	24.98	1199	125
2	1106	River/Stream	5	811	10.05	656	811
	1200	**Inland Wetlands -Man-made**					
3	1201	Reservoirs/Barrages	1	42	0.52	38	-
4	1202	Tanks/Ponds	181	4517	55.97	2326	244
5	1203	Waterlogged	3	232	2.87	72	-
		Sub-Total	**215**	**7618**	**94.40**	**4291**	**1180**
		Wetlands (<2.25 ha), mainly Tanks	452	452	5.60	-	-
		Total	**667**	**8070**	**100.00**	**4291**	**1180**

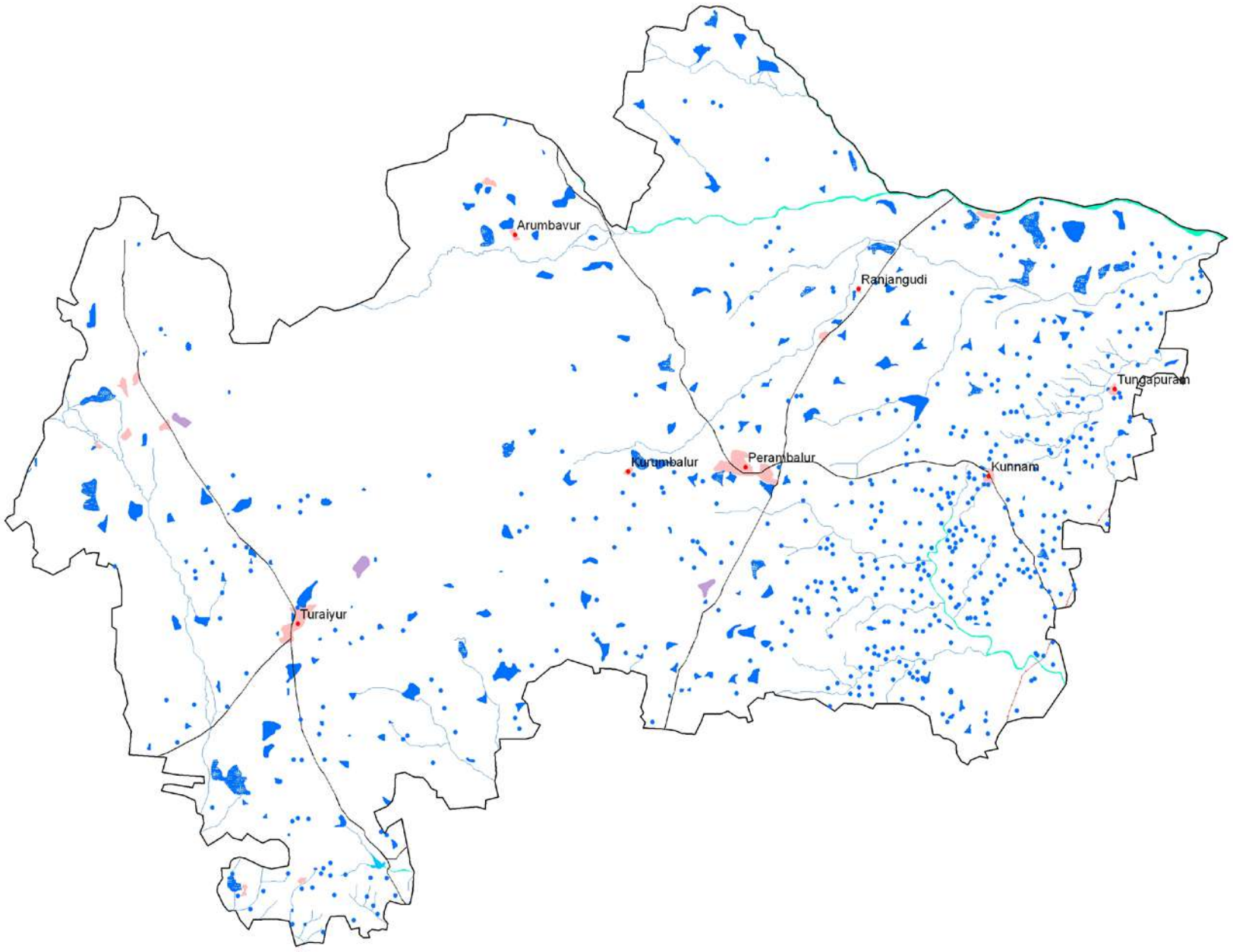
Area under Aquatic Vegetation	3137	6437

Area under turbidity levels		
Low	3593	367
Moderate	692	813
High	6	-

State : Tamil Nadu

WETLAND MAP

District : Perambalur

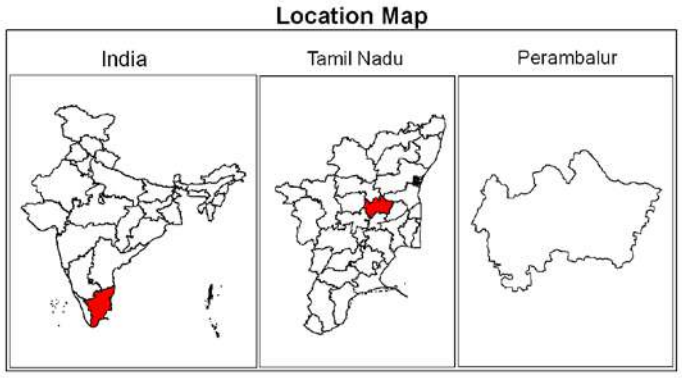


Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25ha)
- Drainage (line)
- Major Roads
- Railway
- Settlements
- Town/Settlements
- District Boundary
- State Boundary
- International Boundary

Location Map



5 2.5 0 5 10 Kilometers

Data Source :

IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

Prepared By :

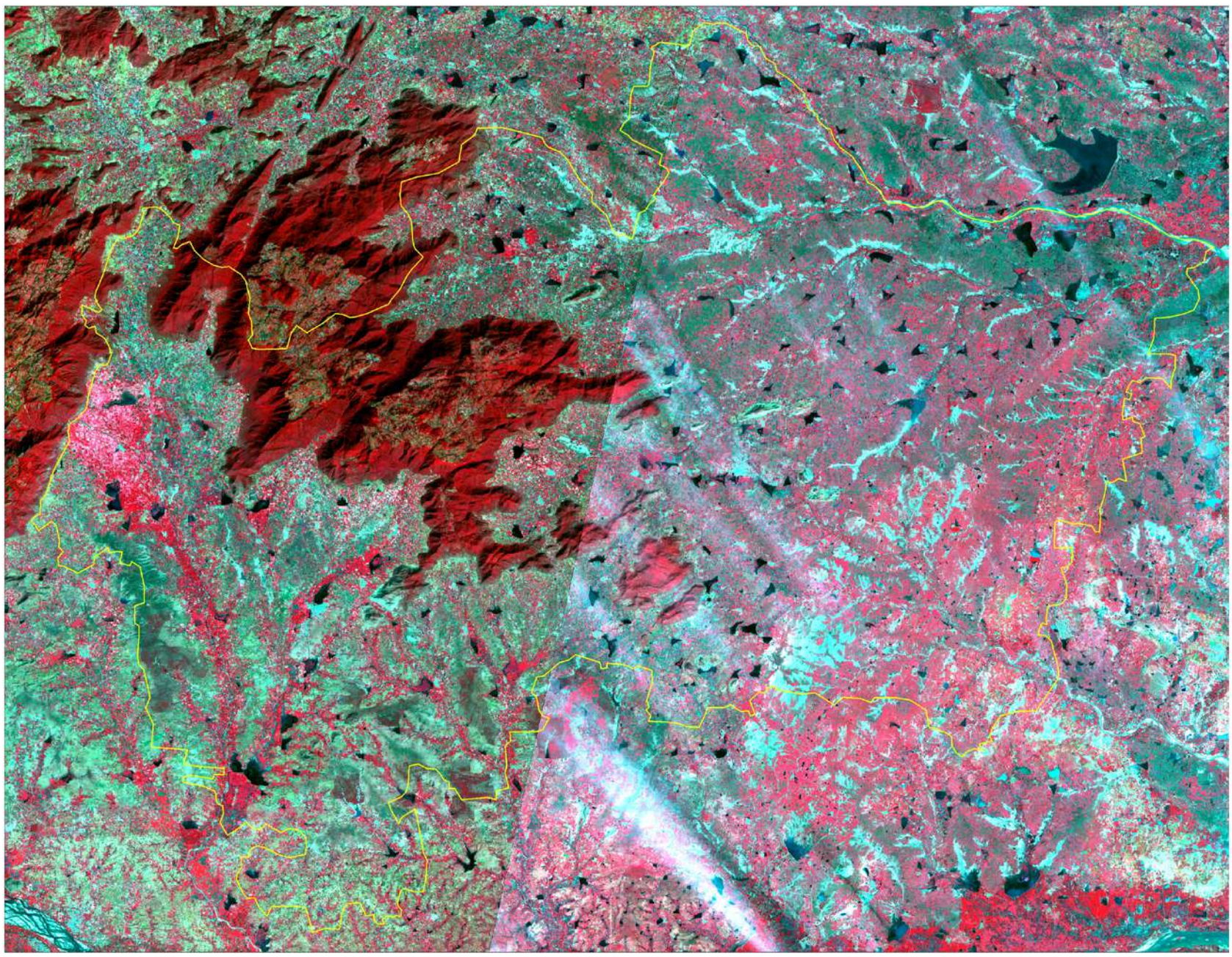
Space Applications Centre (ISRO), Ahmedabad
and
Institute of Remote Sensing, Anna University, Chennai

Sponsored By:

Ministry of Environment and Forests
Government of India

State : Tamil Nadu

District : Perambalur



IRS P6 LISS-III Post-monsoon data (2006)

7.1.17 Ariyalur

Ariyalur district shares common boundaries with Cuddalore district on the North, Thanjavur district on the South, and Perambalur districts on the West. The total geographic area of Ariyalur district is 1946.7 sq km.

Total area under wetland is 11042 ha, which includes 637 small wetland (<2.25 ha). Tanks/Ponds occupies 31.43 % of wetland area. The other wetland types are; River/Stream (4177 ha) and Lakes/ponds (2657 ha). Details of wetland statistics is given in Table 22.

Aquatic vegetation is observed in Lakes/Ponds, and Tanks/Ponds. The area under aquatic vegetation is more during pre monsoon (5647 ha) than that of post monsoon (1918 ha). The open water spread significantly lower during pre monsoon (4533 ha) compared to post monsoon (7900 ha).

Table 22: Area estimates of wetlands in Ariyalur

Area in ha

Sr. No.	Wettcode	Wetland Category	Number of Wetlands	Total Wetland Area	% of wetland area	Open Water	
						Post-monsoon Area	Pre-monsoon Area
	1100	**Inland Wetlands - Natural**					
1	1101	Lakes/Ponds	22	2657	24.06	1708	213
2	1106	River/Stream	5	4177	37.83	3889	4177
	1200	**Inland Wetlands -Man-made**					
3	1201	Reservoirs/Barrages	1	101	0.91	93	29
4	1202	Tanks/Ponds	269	3470	31.43	2210	114
		Sub-Total	**297**	**10405**	**94.23**	**7900**	**4533**
		Wetlands (<2.25 ha), mainly Tanks	637	637	5.77	-	-
		Total	**934**	**11042**	**100.00**	**7900**	**4533**

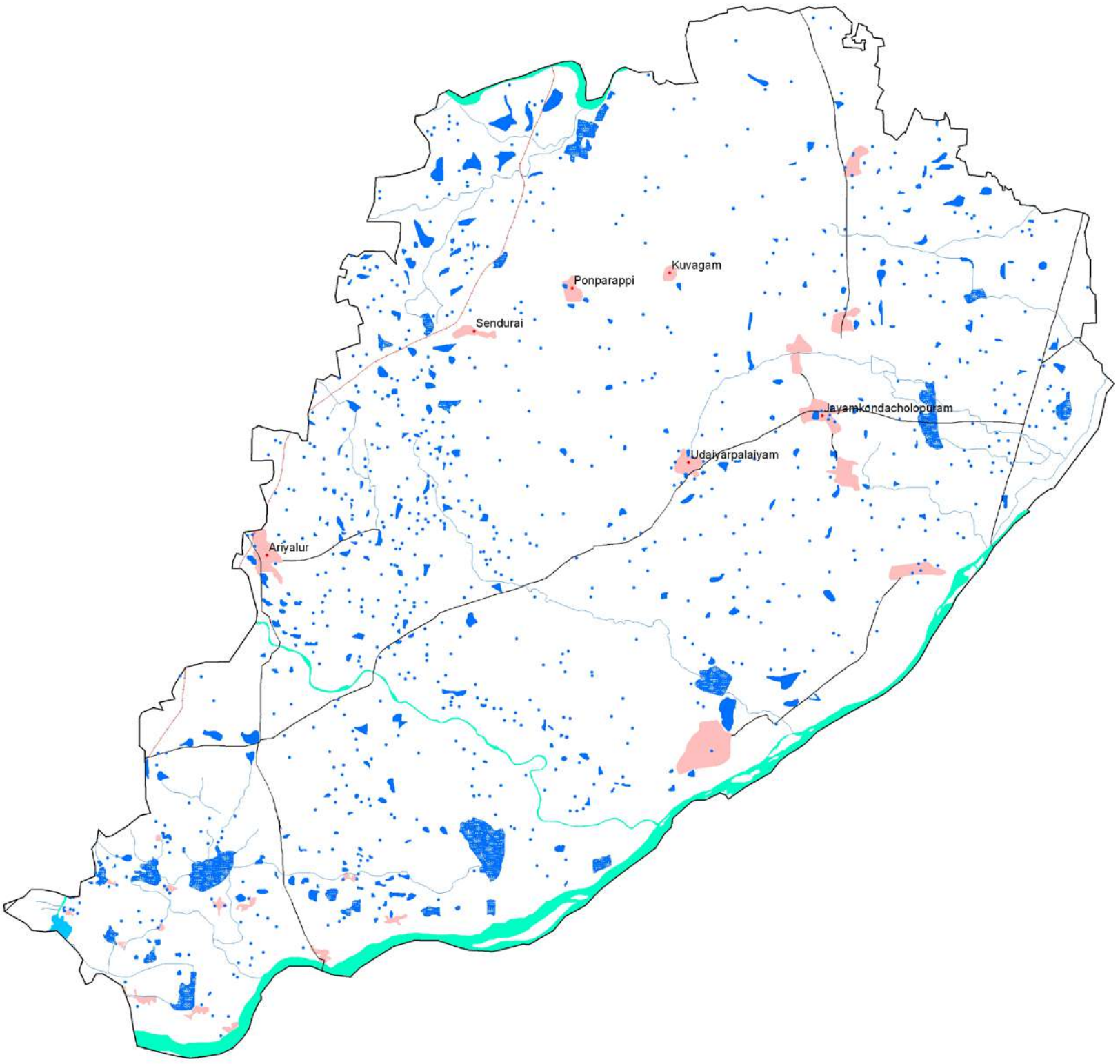
Area under Aquatic Vegetation	1918	5647

Area under turbidity levels		
Low	3570	335
Moderate	4231	4185
High	99	13

State : Tamil Nadu

WETLAND MAP

District : Ariyalur

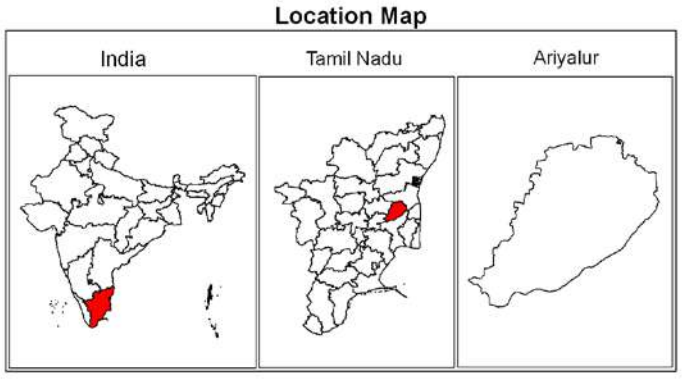


Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25ha)
- Drainage (line)
- Major Roads
- Railway
- Settlements
- Town/Settlements
- District Boundary
- State Boundary
- International Boundary

Location Map



5 2.5 0 5 10 Kilometers

Data Source :

IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

Prepared By :

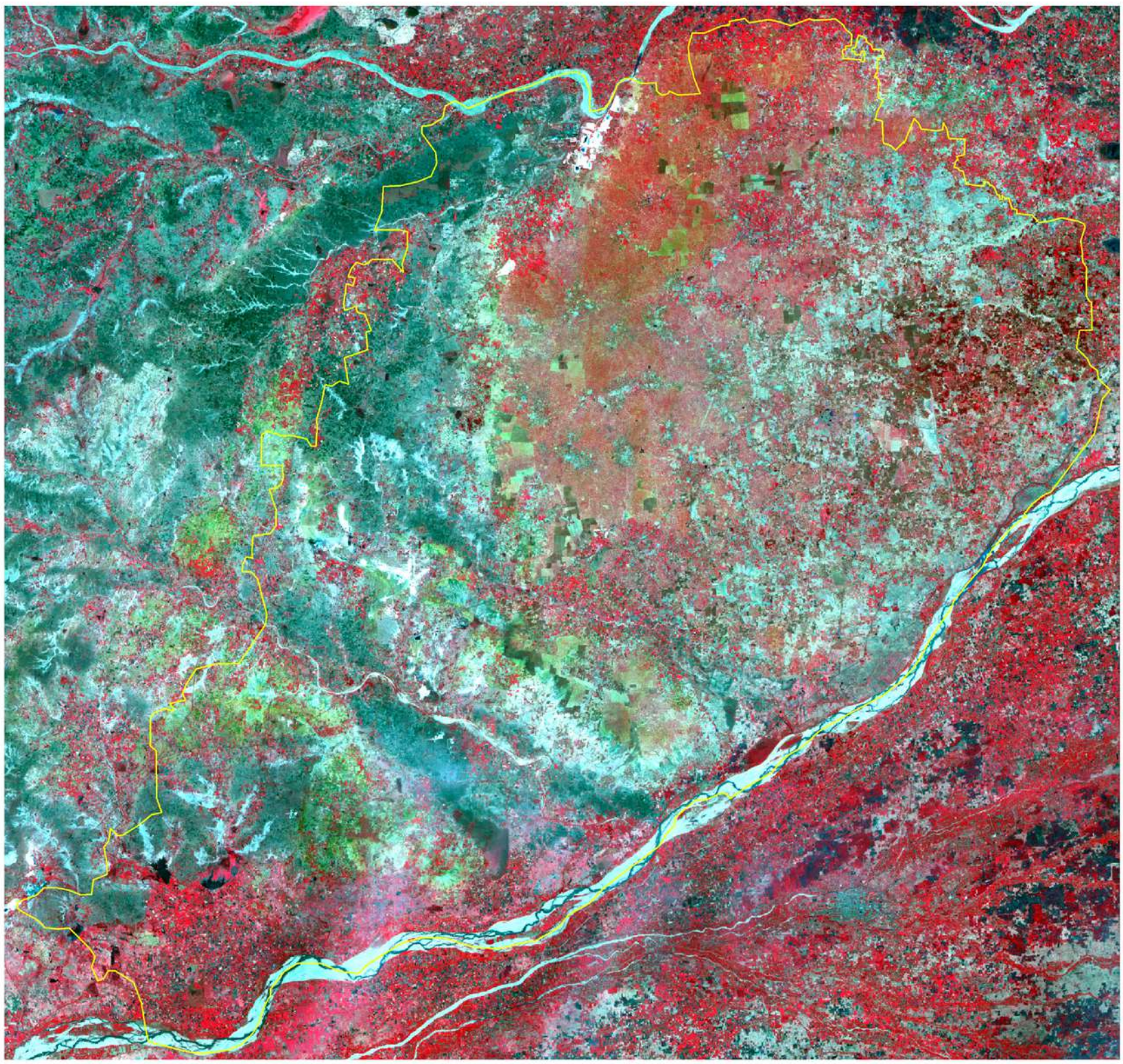
Space Applications Centre (ISRO), Ahmedabad
and
Institute of Remote Sensing, Anna University, Chennai

Sponsored By:

Ministry of Environment and Forests
Government of India

State : Tamil Nadu

District : Ariyalur



IRS P6 LISS-III pre-monsoon data (2006)

7.1.18 Cuddalore

Cuddalore District is predominately an agricultural district with coastal line stretching from Pondicherry Union Territory in the North to the mouth of the River Coleroon in the South. District is having coastal line of 68 kms. The district is bounded on the north by Viluppuram District, on the east by the Bay of Bengal, on the south by Nagapattinam District, and on the west by Perambalur District.

Total geographic area of Cuddalore is 3678 km². As per the 2001 census data, the population of the district was 22,80,530 . The density of population was 620 persons per km² and literacy rate of the district was 63.31%.

Total area under wetland is 28135 ha, which includes 472 small wetland (<2.25 ha). Lanks/Ponds occupies 22.25 % of wetland area. The other wetland types are; River/Stream (8810 ha), Aquaculture ponds (1824 ha), Reservoirs (1612 ha), Salt marsh (1425 ha) and Mangroves (590 ha). Details of wetland statistics is given in Table 23. Pichavaram Mangrove Forest area is an important wetland complex of the district.

Aquatic vegetation is observed in Lakes/Ponds, and Tanks/Ponds. The area under aquatic vegetation is more during pre monsoon (12219 ha) than that of post monsoon (5522 ha). The open water spread significantly lower during pre monsoon (14436 ha) compared to post monsoon (21073 ha).

Table 23: Area estimates of wetlands in Cuddalore

Area in ha

Sr. No.	Wettcode	Wetland Category	Number of Wetlands	Total Wetland Area	% of wetland area	Open Water	
						Post-monsoon Area	Pre-monsoon Area
	1100	**Inland Wetlands - Natural**					
1	1101	Lakes	58	6260	22.25	3880	1658
2	1104	Riverine Wetlands	2	127	0.45	121	41
3	1105	Waterlogged	2	29	0.10	29	19
4	1106	River/Stream	22	8810	31.31	8810	8810
	1200	**Inland Wetlands -Man-made**					
5	1201	Reservoirs/ Barrages	1	1612	5.73	1252	229
6	1202	Tanks/Ponds	242	4590	16.31	2458	206
7	1203	Waterlogged	4	257	0.91	145	15
		Total - Inland	**331**	**21685**	**77.07**	**16695**	**10978**
	2100	**Coastal Wetlands - Natural**					
8	2102	Creeks	6	1168	4.15	1141	1167
9	2103	Sand/Beach	8	723	2.57	-	-
10	2104	Intertidal mud flats	9	248	0.88	-	-
11	2105	Salt Marsh	3	1425	5.06	1426	518
12	2106	Mangroves	13	590	2.10	-	-
	2200	**Coastal Wetlands - Man-made**					
13	2202	Aquaculture ponds	19	1824	6.48	1811	1773
		Total - Coastal	**58**	**5978**	**21.25**	**4378**	**3458**
		Sub-Total	**389**	**27663**	**98.32**	**21073**	**14436**
		Wetlands (<2.25 ha), mainly Tanks	472	472	1.68	-	-
		Total	**861**	**28135**	**100.00**	**21073**	**14436**

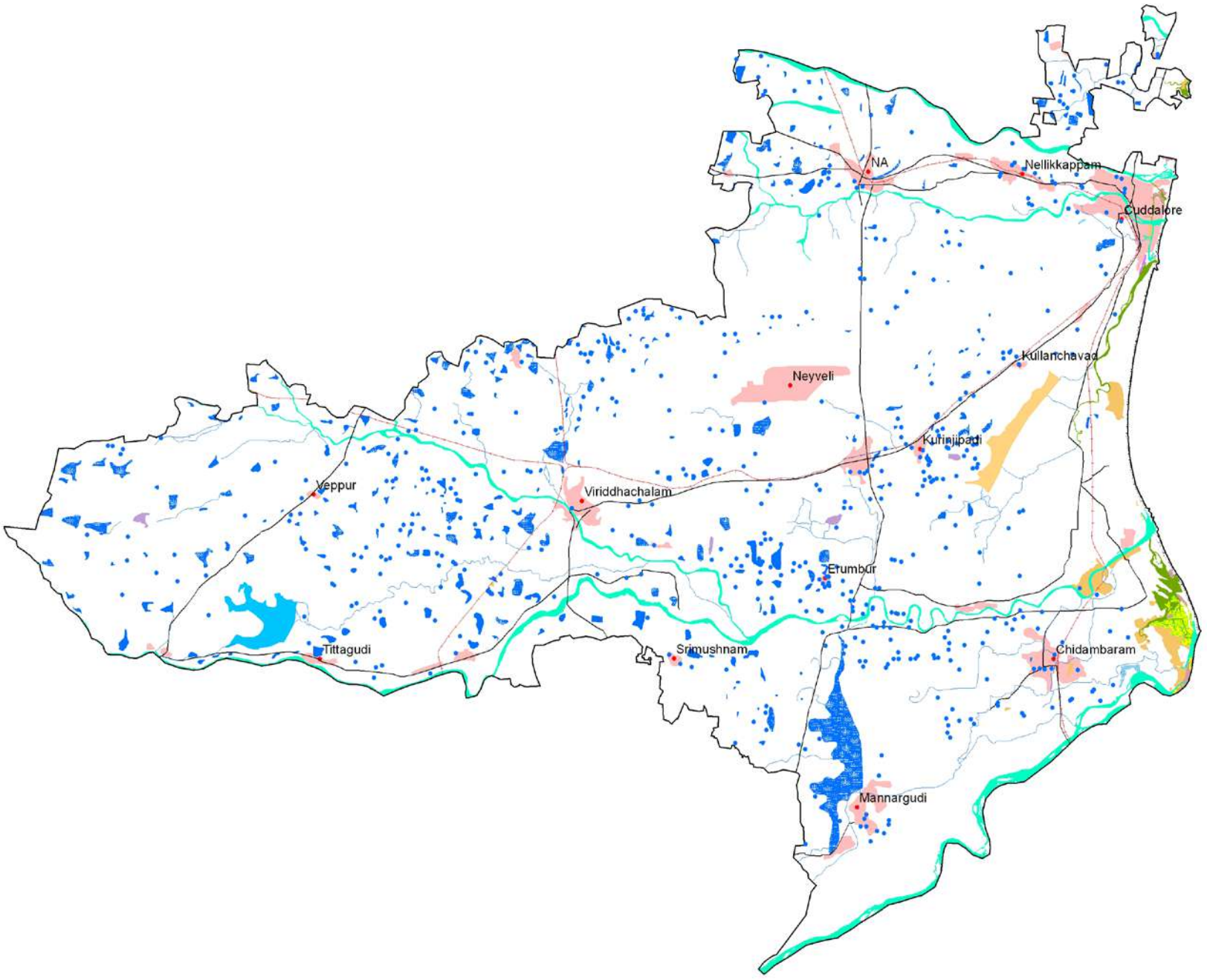
Area under Aquatic Vegetation	5522	12219

Area under turbidity levels		
Low	8578	2885
Moderate	7751	7752
High	4744	3799

State : Tamil Nadu

WETLAND MAP

District : Cuddalore

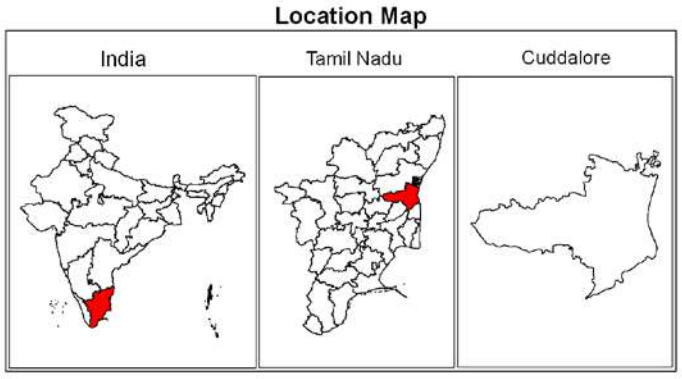


Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25ha)
- Drainage (line)
- Major Roads
- Railway
- Settlements
- Town/Settlements
- District Boundary
- State Boundary
- International Boundary

Location Map



5 2.5 0 5 10 Kilometers

Data Source :

IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

Prepared By :

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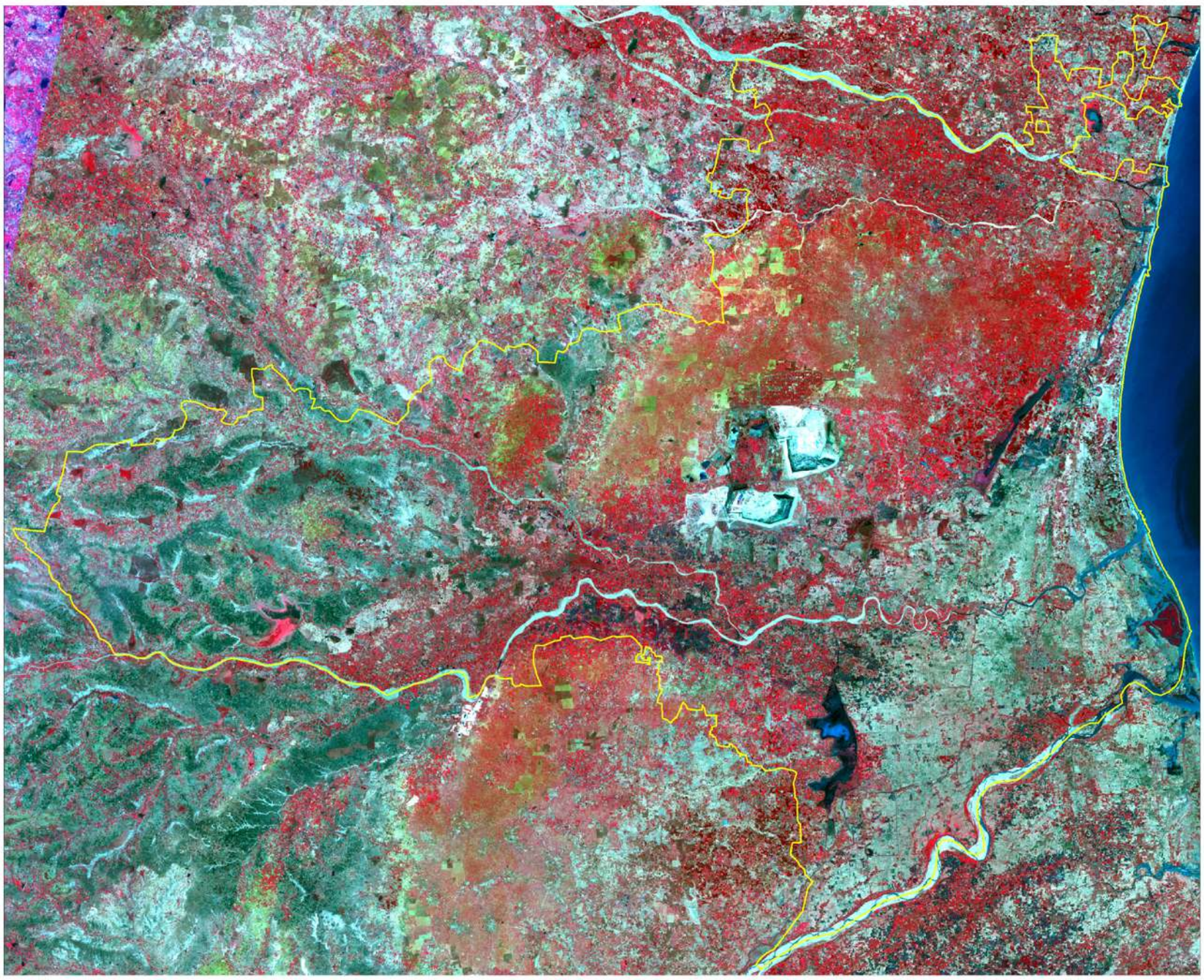
Sponsored By:

Ministry of Environment and Forests
Government of India

State : Tamil Nadu

District : Cuddalore



IRS P6 LISS-III pre-monsoon data (2006)

7.1.19 Nagapattinam

Nagapattinam is one of the 30 administrative districts of Tamil Nadu carved out of the composite Thanjavur district. The length of coastline is 187 kms. The district shares common boundary with Cuddalore district on the North, Thanjavur district on the west, Tiruvarur district on the south and Bay of Bengal on the East.

Total geographic area of Nagapattinam is 2715.83 km². As per the 2001 census data, the population of the district was 14,88,839. The density of population was 548 persons per km².

Total area under wetland is 47833 ha, which includes 376 small wetland (<2.25 ha). Major wetland types of the district are; Inter-tidal mudflats (11868 ha), Lagoons (6362 ha), Man-made waterlogged (8499 ha), River/Stream (4646 ha). Other important wetland areas are Mangroves (2813 ha) and aquaculture ponds (4129 ha). Details of wetland statistics is given in Table 24.

Aquatic vegetation is observed in Lakes/Ponds, and Tanks/Ponds. The area under aquatic vegetation is more during pre monsoon (4723 ha) than that of post monsoon (983 ha). The open water spread significantly lower during pre monsoon (25697 ha) compared to post monsoon (29968 ha).

Table 24: Area estimates of wetlands in Nagapattinam

Area in ha

Sr. No.	Wettcode	Wetland Category	Number of Wetlands	Total Wetland Area	% of wetland area	Open Water	
						Post-monsoon Area	Pre-monsoon Area
	1100	**Inland Wetlands - Natural**					
1	1101	Lakes/Ponds	12	1184	2.48	896	161
2	1105	Waterlogged	4	79	0.17	54	19
3	1106	River/Stream	30	4646	9.71	4499	4513
	1200	**Inland Wetlands -Man-made**					
4	1201	Reservoirs/Barrages	-	-	-	-	-
5	1202	Tanks/Ponds	66	538	1.12	350	84
6	1203	Waterlogged	16	8499	17.77	8309	5632
		Total - Inland	**128**	**14946**	**31.25**	**14108**	**10409**
	2100	**Coastal Wetlands - Natural**					
7	2101	Lagoons	1	6362	13.30	6362	6362
8	2102	Creeks	7	665	1.39	627	665
9	2103	Sand/Beach	9	1851	3.87	-	-
10	2104	Intertidal mud flats	20	11868	24.81	-	-
11	2105	Salt Marsh	2	246	0.51	234	247
12	2106	Mangroves	24	2813	5.88	-	-
	2200	**Coastal Wetlands - Man-made**					
13	2201	Salt pans	3	4577	9.57	4551	4577
14	2202	Aquaculture ponds	60	4129	8.63	4086	3437
		Total - Coastal	**126**	**32511**	**67.97**	**15860**	**15288**
		Sub-Total	**254**	**47457**	**99.21**	**29968**	**25697**
		Wetlands (<2.25 ha), mainly Tanks	376	376	0.79	-	-
		Total	**630**	**47833**	**100.00**	**29968**	**25697**

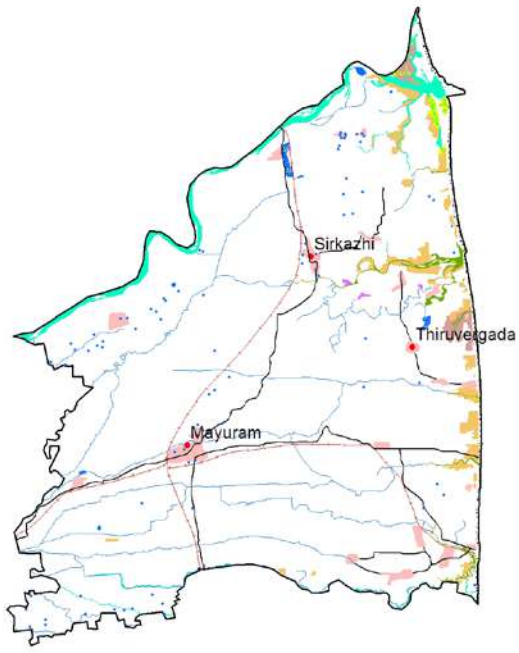
Area under Aquatic Vegetation	983	4723

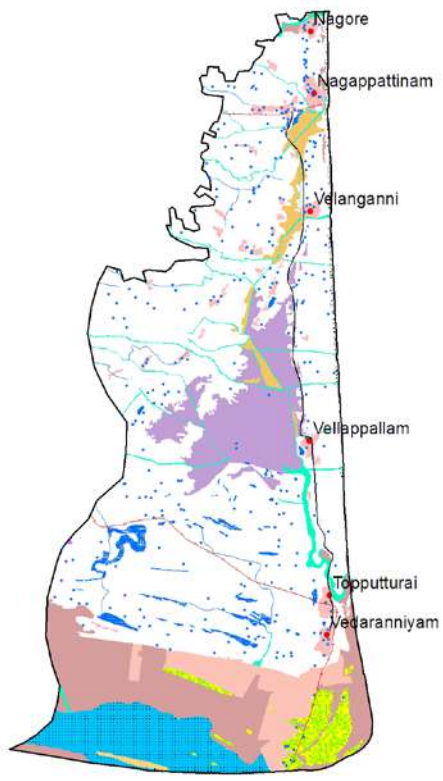
Area under turbidity levels		
Low	5501	4708
Moderate	9333	6570
High	15134	14419

State : Tamil Nadu

WETLAND MAP

District : Nagapattinam



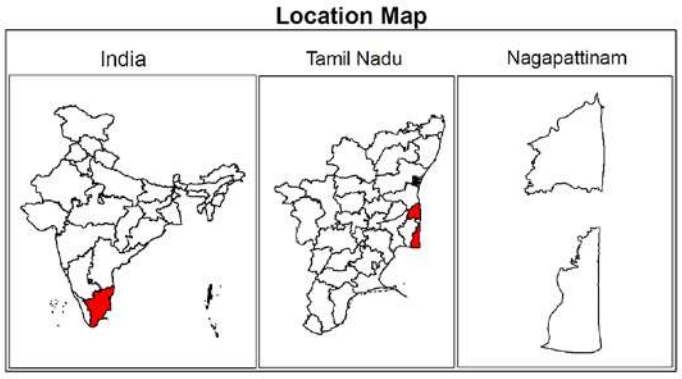


Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25ha)
- Drainage (line)
- Major Roads
- Railway
- Settlements
- Town/Settlements
- District Boundary
- State Boundary
- International Boundary

Location Map



8 4 0 8 16 Kilometers

Data Source :

IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

Prepared By :

Space Applications Centre (ISRO), Ahmedabad
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Institute of Remote Sensing, Anna University, Chennai

Sponsored By:

Ministry of Environment and Forests
Government of India

State : Tamil Nadu

District : Nagapattinam

IRS P6 LISS-III pre-monsoon data (2006)

7.1.20 Thiruvarur

Tiruvarur is lying between Nagapattinam district on the east and Thanjavur district on the west, and is bounded by the Palk Strait on the south. The district headquarters is located at Tiruvarur town. Thiruvarur District is famous for its evergreen paddy fields. The mangrove forests in Muthuppettai, occupies an important place among the nature's beauty of this district, besides the sprawling paddy fields on both sides of rivers, canals and roads. The Birds' sanctuary in Udhayamarthandapuram and Vaduvoor are wonderful places that attract tourists.

Total geographic area of Tiruvarur is 2097.09 km². As per the 2001 census data, the population of the district was 11,69,474. The density of population was 538 persons per km² and literacy rate of the district was 67.40 %.

Total area under wetland is 22591 ha, which includes 1026 small wetland (<2.25 ha). Major wetland types of the district are; Inter-tidal mudflats (6924 ha), Lagoons (4786 ha), River/Stream (5669 ha) and Tanks/ponds (901 ha). Details of wetland statistics is given in Table 25.

Aquatic vegetation is observed in Lakes/Ponds, and Tanks/Ponds. The area under aquatic vegetation is more during pre monsoon (2392 ha) than that of post monsoon (1043 ha). The open water spread significantly lower during pre monsoon (11907 ha) compared to post monsoon (12919 ha).

Table 25: Area estimates of wetlands in Thiruvarur

Area in ha

Sr. No.	Wettcode	Wetland Category	Number of Wetlands	Total Wetland Area	% of wetland area	Open Water	
						Post-monsoon Area	Pre-monsoon Area
	1100	**Inland Wetlands - Natural**					
1	1101	Lakes/Ponds	11	854	3.78	539	16
2	1105	Waterlogged	3	1028	4.55	908	796
3	1106	River/Stream	47	5669	25.09	5611	5611
	1200	**Inland Wetlands -Man-made**					
4	1202	Tanks/Ponds	118	901	3.99	520	155
5	1203	Waterlogged	1	31	0.14	31	14
		Total - Inland	**180**	**8483**	**37.55**	**7609**	**6592**
	2100	**Coastal Wetlands - Natural**					
6	2101	Lagoons	2	4786	21.19	4781	4786
7	2104	Intertidal mud flats	5	6924	30.65	-	-
8	2106	Mangroves	4	843	3.73	-	-
	2200	**Coastal Wetlands - Man-made**					
9	2201	Salt pans	2	529	2.34	529	529
		Total - Coastal	**13**	**13082**	**57.91**	**5310**	**5315**
		Sub-Total	**193**	**21565**	**95.46**	**12919**	**11907**
		Wetlands (<2.25 ha), mainly Tanks	1026	1026	4.54	-	-
		Total	**1219**	**22591**	**100.00**	**12919**	**11907**

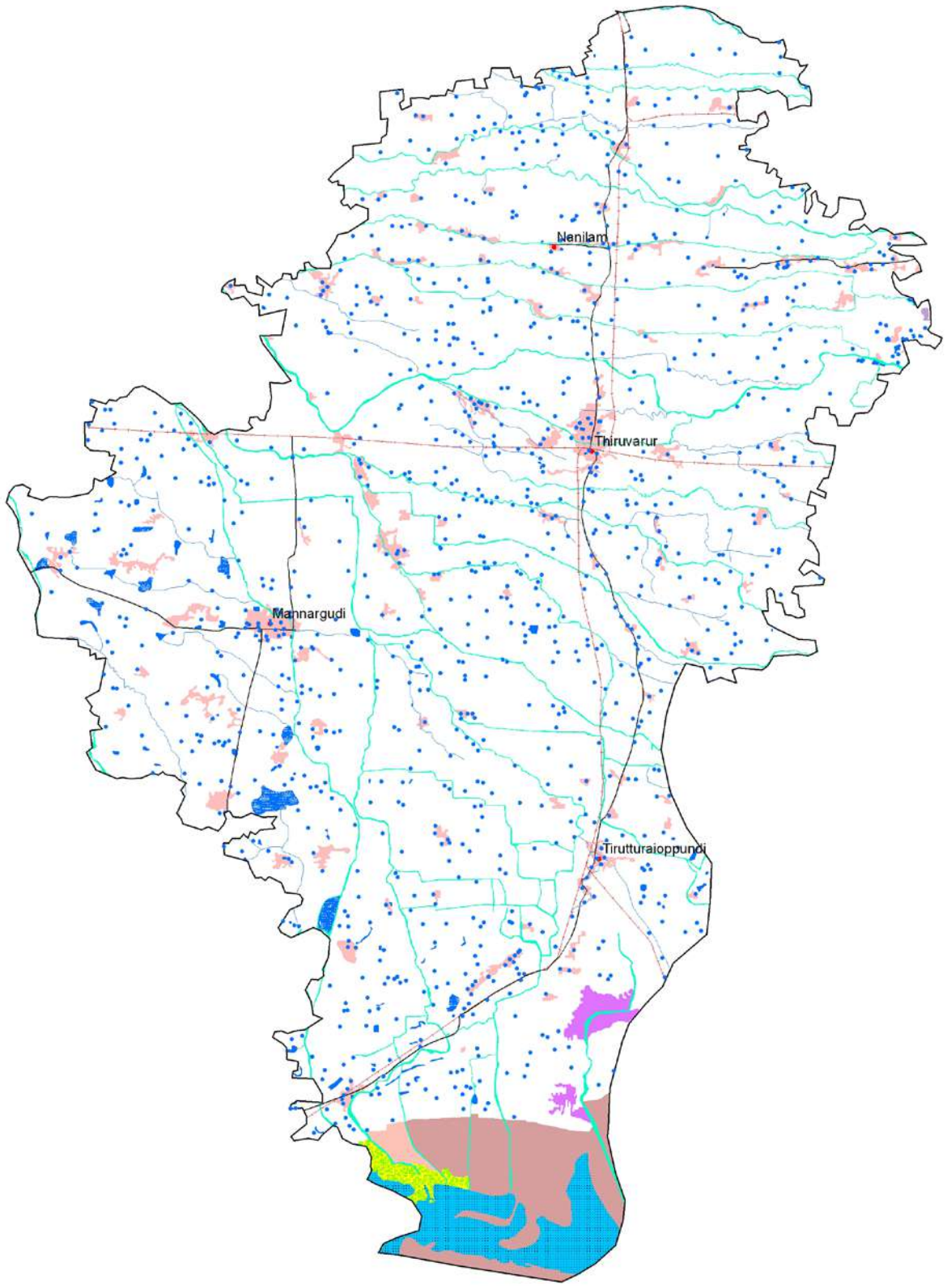
Area under Aquatic Vegetation	1043	2392

Area under turbidity levels		
Low	1395	825
Moderate	6021	5677
High	5503	5405

State : Tamil Nadu

WETLAND MAP

District : Thiruvarur

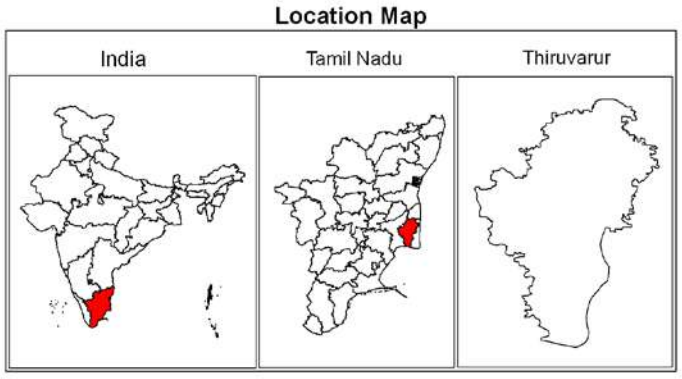


Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25ha)
- Drainage (line)
- Major Roads
- Railway
- Settlements
- Town/Settlements
- District Boundary
- State Boundary
- International Boundary

Location Map



7 3.5 0 7 14 Kilometers

Data Source :

IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

Prepared By :

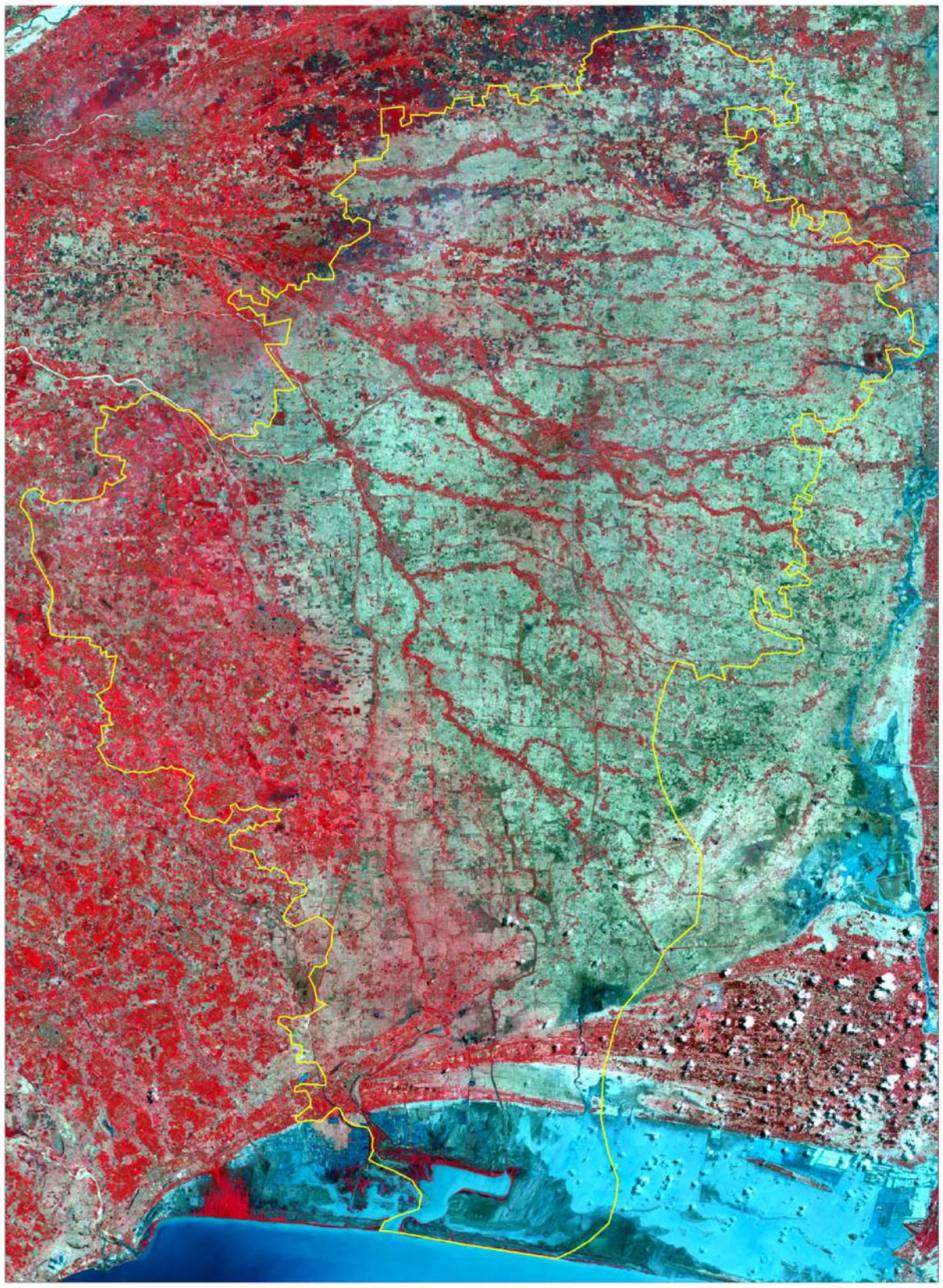
Space Applications Centre (ISRO), Ahmedabad
and
Institute of Remote Sensing, Anna University, Chennai

Sponsored By:

Ministry of Environment and Forests
Government of India

State : Tamil Nadu

District : Thiruvarur



IRS P6 LISS-III pre-monsoon data (2006)

7.1.21 Thanjavur

Thanjavur is one of the thirteen coastal districts of Tamil Nadu lying at the East Coast of the state. The District is bounded on the north by the Coloroon which separate it from Perambalur and Tiruchirappalli district, and on the East it is bounded by the Thiruvarur and Nagapattinam districts and on the South by the Palk Strait and Pudukottai district and on the West by Pudukkottai and Thiruchirappalli districts. Thanjavur District is known as Rice Bowl of Tamil Nadu.

Total geographic area of Thanjavur is 3348.45 km². As per the 2001 census data, the population of the district was 22,05,375. The density of population was 444 persons per km² and literacy rate of the district was 87.88%.

Total area under wetland is 34184 ha, which includes 893 small wetland (<2.25 ha). Lakes/Ponds occupies 17.89% of wetland area. The second major wetland type is Tanks/Ponds. There are 575 Tanks/Ponds with 5555 ha area (16.25%). The other wetland types are: Lagoons (3935 ha), and River/Stream (12738 ha). Details of wetland statistics is given in Table 26.

Aquatic vegetation is observed in Lakes/Ponds, and Tanks/Ponds. The area under aquatic vegetation is more during pre monsoon (12632 ha) than that of post monsoon (3809 ha). The open water spread significantly lower during pre monsoon (19795 ha) compared to post monsoon (27669 ha).

Table 26: Area estimates of wetlands in Thanjavur

Area in ha

Sr. No.	Wettcode	Wetland Category	Number of Wetlands	Total Wetland Area	% of wetland area	Open Water	
						Post-monsoon Area	Pre-monsoon Area
	1100	**Inland Wetlands - Natural**					
1	1101	Lakes/Ponds	95	6117	17.89	4572	312
2	1105	Waterlogged	1	178	0.52	178	12
3	1106	River/Stream	43	12738	39.19	12536	12466
	1200	**Inland Wetlands -Man-made**					
4	1201	Reservoirs/Barrages	1	7	0.02	2	-
5	1202	Tanks/Ponds	575	5555	16.25	3332	281
		Total - Inland	**715**	**24595**	**73.88**	**20620**	**13071**
	2100	**Coastal Wetlands - Natural**					
6	2101	Lagoons	3	3935	11.51	3935	3935
7	2104	Intertidal mud flats	7	305	0.89	-	-
8	2105	salt marsh	2	173	0.51	173	106
9	2106	Mangroves	9	1210	3.54	-	-
	2200	**Coastal Wetlands - Man-made**					
10	2201	Salt pans	14	3046	8.91	2914	2683
11	2202	Aquaculture ponds	1	27	0.08	27	-
		Total - Coastal	**36**	**8696**	**25.44**	**7049**	**6724**
		Sub-Total	**751**	**33291**	**99.31**	**27669**	**19795**
		Wetlands (<2.25 ha), mainly Tanks	893	893	2.61	-	-
		Total	**1644**	**34184**	**101.93**	**27669**	**19795**

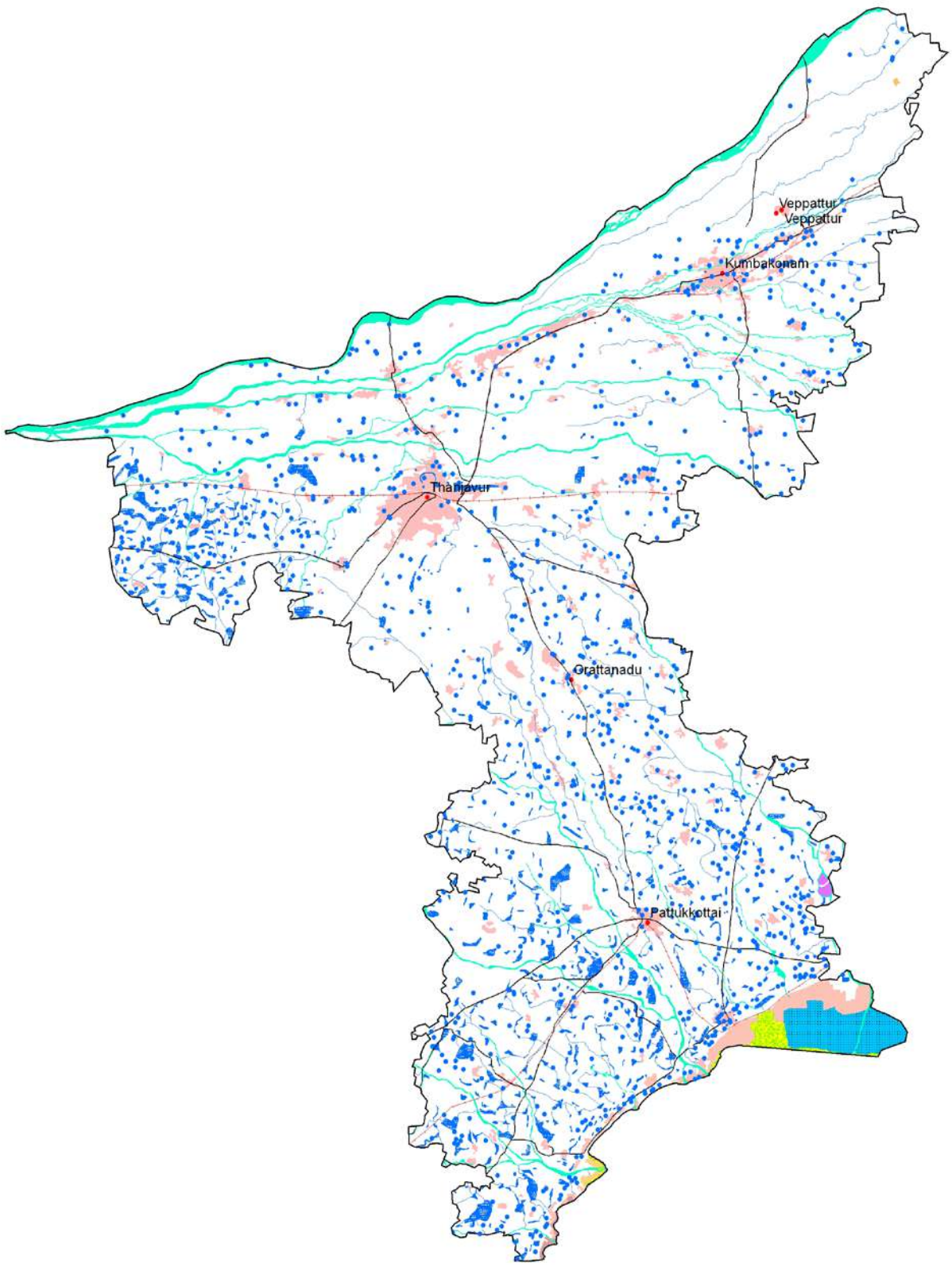
Area under Aquatic Vegetation	3809	12632

Area under turbidity levels		
Low	3642	255
Moderate	16235	12818
High	7792	6722

State : Tamil Nadu

WETLAND MAP

District : Thanjavur

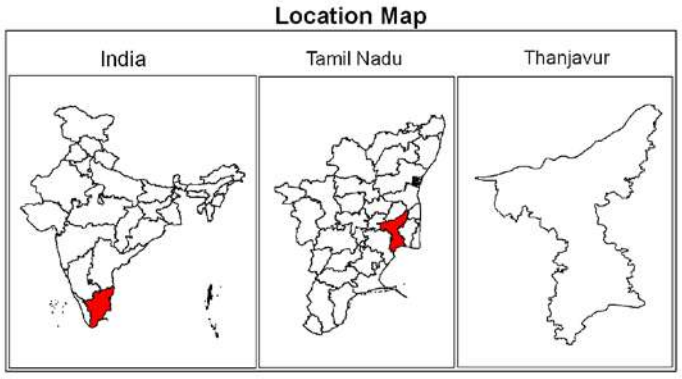


Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25ha)
- Drainage (line)
- Major Roads
- Railway
- Settlements
- Town/Settlements
- District Boundary
- State Boundary
- International Boundary

Location Map



8 4 0 8 16 Kilometers

Data Source :

IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

Prepared By :

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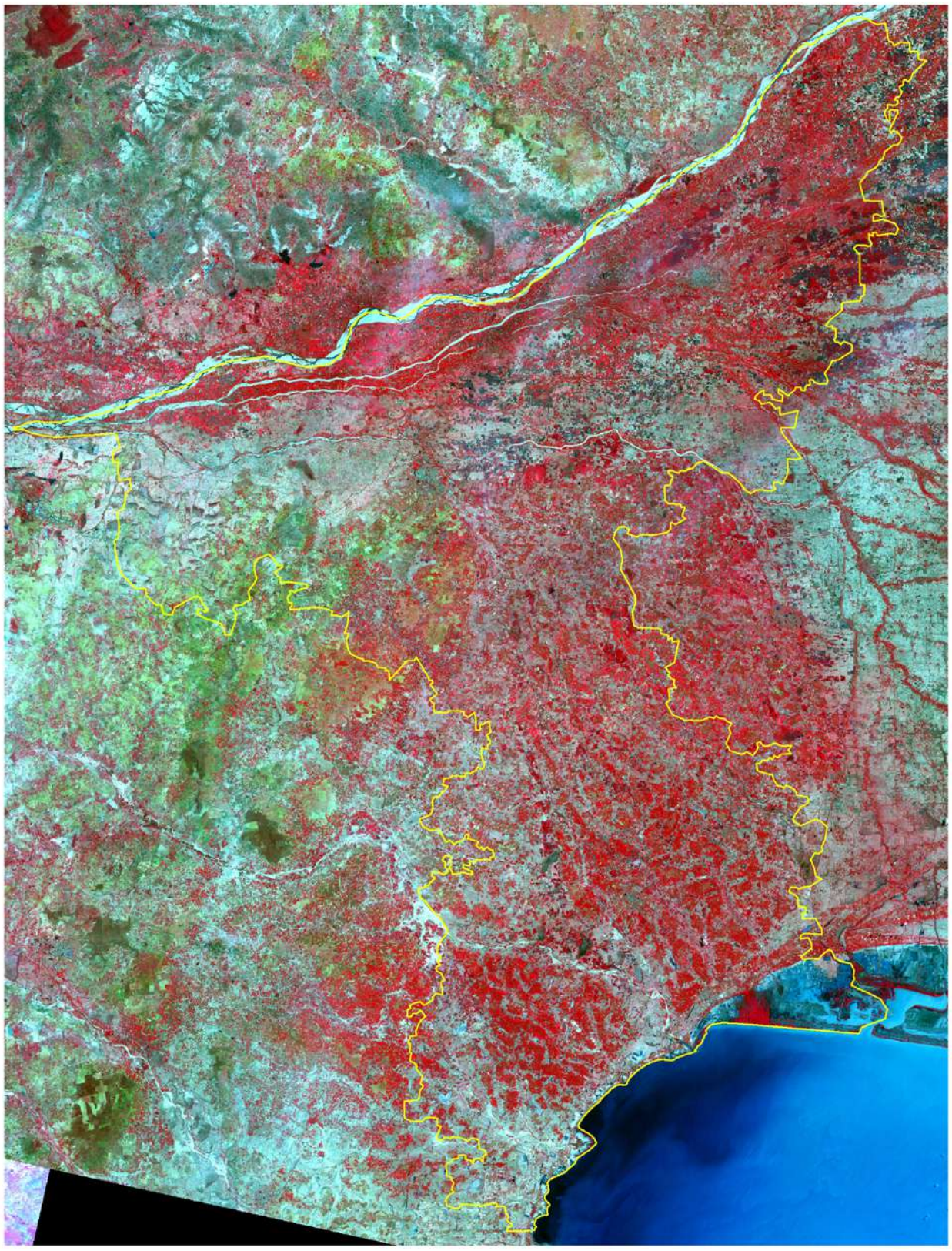
Sponsored By:

Ministry of Environment and Forests
Government of India

State : Tamil Nadu

District : Thanjavur



IRS P6 LISS-III pre-monsoon data (2006)

7.1.21 Pudukkottai

Pudukkottai District is bounded by Tiruchirappalli district in the North and West, Sivaganga district in the South, Bay of Bengal in the East and Thanjavur district in the North East. Most of the part of this district lies in the coastal region. The coastal area extends 39 kms. The Western portion is 600 feet above mean sea level tapers towards the East and reaches the Sea level.

Total geographic area of Pudukkottai is 4663 km². As per the 2001 census data, the population of the district was 14,52,269. The density of population was 312 persons per km² and literacy rate of the district was 63.28%.

Total area under wetland is 72402 ha, which includes 1681 small wetland (<2.25 ha). Lakes/Ponds occupies 53.82% of wetland area. The second major wetland type is Tanks/Ponds. There are 2628 Tanks/Ponds with 26419 ha area (36.49%). The other wetland type is River/Stream (4255 ha). Details of wetland statistics is given in Table 27.

Aquatic vegetation is observed in Lakes/Ponds, and Tanks/Ponds. The area under aquatic vegetation is more during pre monsoon (62692 ha) than that of post monsoon (15254 ha). The open water spread significantly lower during pre monsoon (7057 ha) compared to post monsoon (54383 ha).

Table 27: Area estimates of wetlands in Pudukkottai

Area in ha

Sr. No.	Wettcode	Wetland Category	Number of Wetlands	Total Wetland Area	% of wetland area	Open Water	
						Post-monsoon Area	Pre-monsoon Area
	1100	**Inland Wetlands - Natural**					
1	1101	Lakes/Ponds	543	38966	53.82	31551	2221
2	1105	Waterlogged	2	31	0.04	27	-
3	1106	River/Stream	25	4255	5.88	4255	4197
	1200	**Inland Wetlands -Man-made**					
4	1202	Tanks/Ponds	2628	26419	36.49	18148	608
		Total - Inland	**3198**	**69671**	**96.23**	**53981**	**7026**
	2100	**Coastal Wetlands - Natural**					
5	2101	Lagoons	2	30	0.04	30	-
6	2104	Intertidal mud flats	7	588	0.81	-	-
7	2105	salt marsh	1	5	0.01	5	5
8	2106	Mangroves	5	60	0.08	-	-
	2200	**Coastal Wetlands - Man-made**					
9	2201	Salt pans	3	367	0.51	367	26
		Total - Coastal	**18**	**1050**	**1.45**	**402**	**31**
		Sub-Total	**3216**	**70721**	**97.68**	**54383**	**7057**
		Wetlands (<2.25 ha), mainly Tanks	1681	1681	2.32	-	-
		Total	**4897**	**72402**	**100.00**	**54383**	**7057**

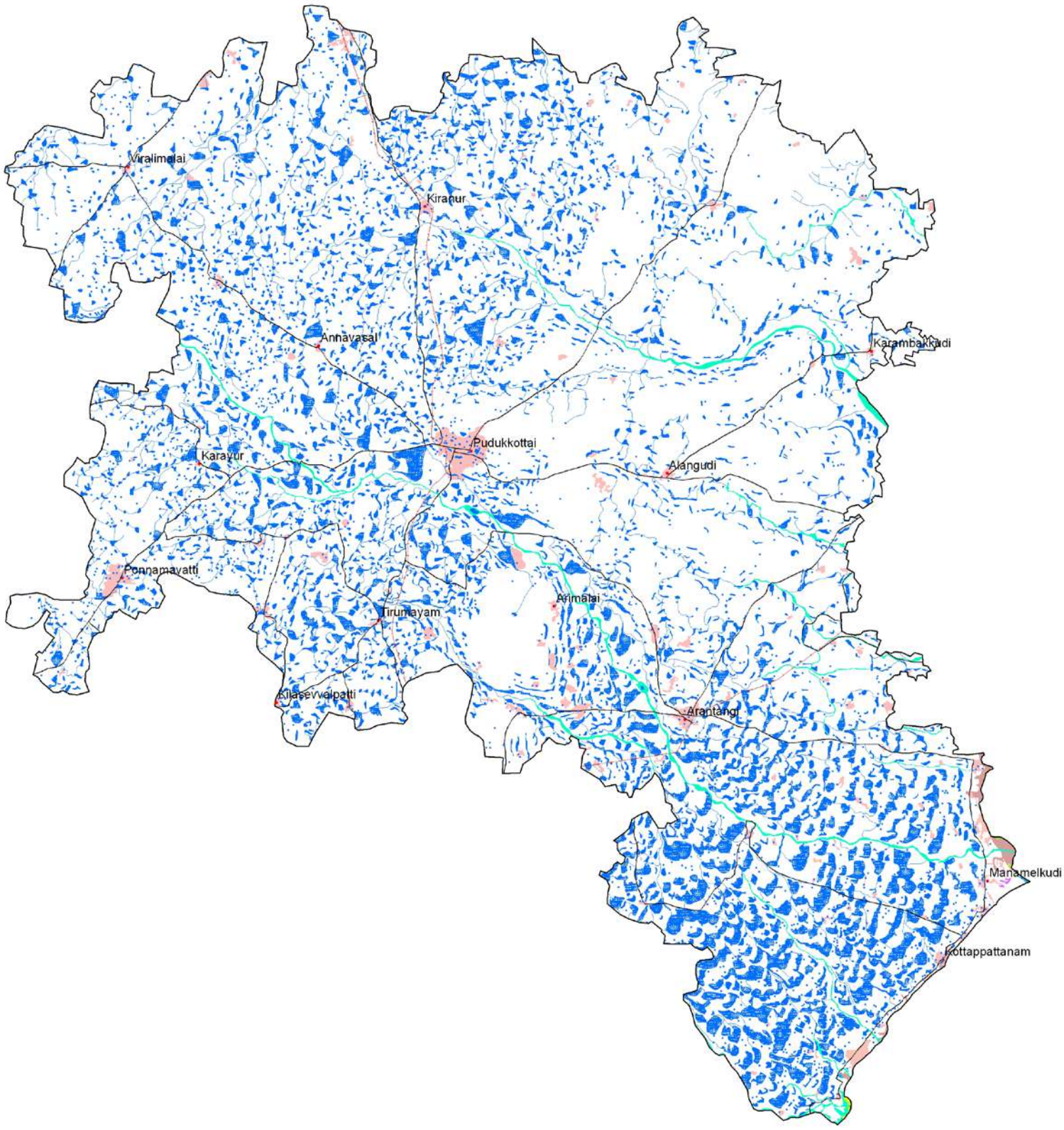
Area under Aquatic Vegetation	15254	62692

Area under turbidity levels		
Low	22437	1637
Moderate	25650	5228
High	6296	192

State : Tamil Nadu

WETLAND MAP

District : Pudukkottai

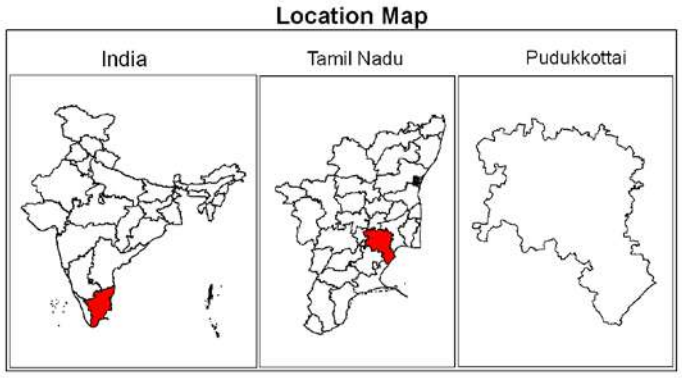


Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25ha)
- Drainage (line)
- Major Roads
- Railway
- Settlements
- Town/Settlements
- District Boundary
- State Boundary
- International Boundary

Location Map



7 3.5 0 7 14 Kilometers

Data Source :

IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

Prepared By :

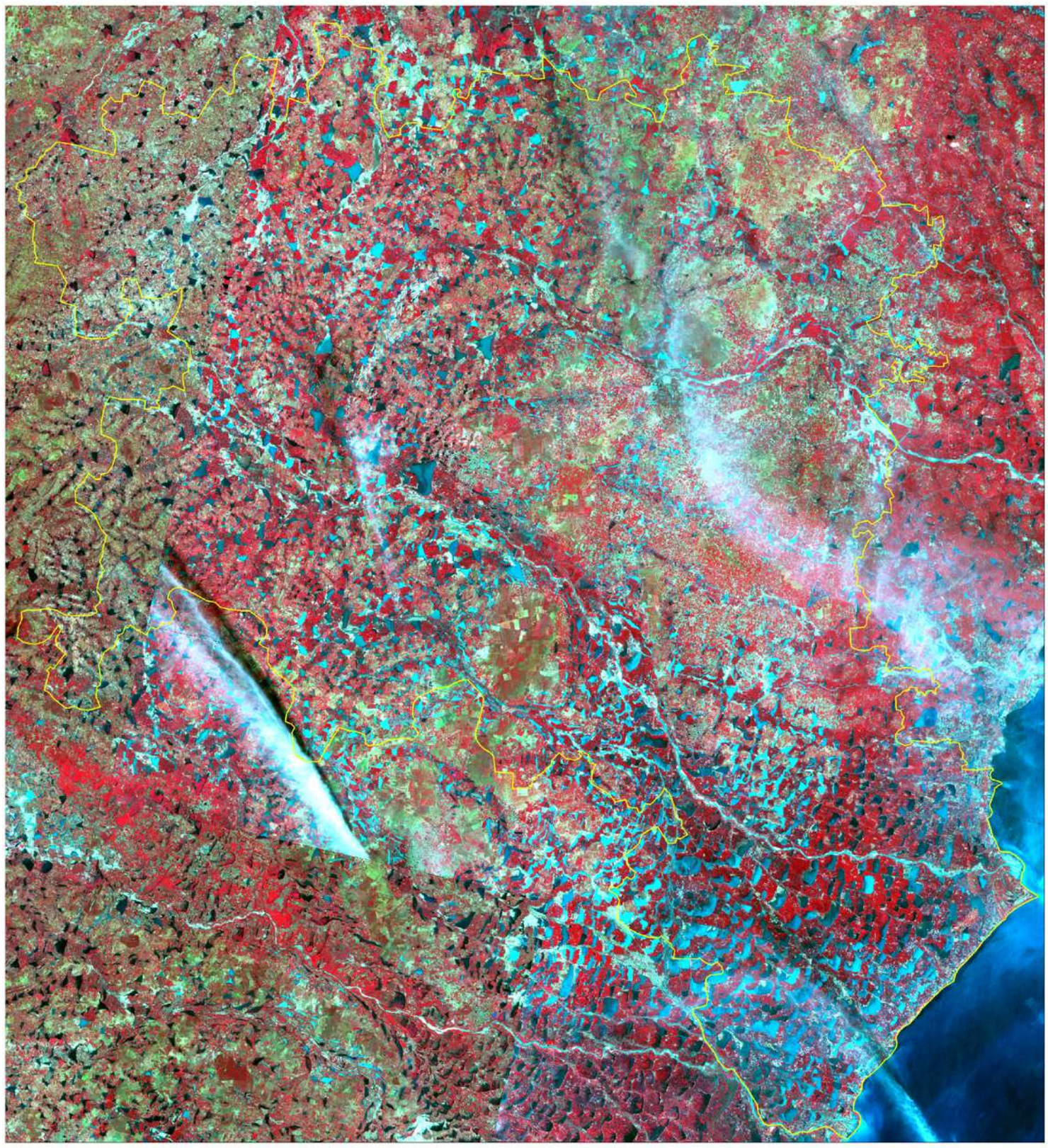
Space Applications Centre (ISRO), Ahmedabad
and
Institute of Remote Sensing, Anna University, Chennai

Sponsored By:

Ministry of Environment and Forests
Government of India

State : Tamil Nadu

District : Pudukkottai



IRS P6 LISS-III Post-monsoon data (2006)

7.1.22 Sivaganga

Shivaganga is an administrative district of Tamil Nadu located in southern India. The district head quarter is located at the same town Shivaganga. It is bounded on the north and northeast by Pudukkottai District, on the southeast and south by Ramanathapuram District, on the southwest by Virudhunagar District, and on the west by Madurai District, and on the northwest by Tiruchirappalli District.

Total geographic area of Shivaganga is 4189 km². As per the 2001 census data, the population of the district was 11,50,753. The density of population was 275 persons per km² and literacy rate of the district was 52.50 %.

Total area under wetland is 67172 ha, which includes 1474 small wetland (<2.25 ha). Lakes/Ponds occupies 53.25 % of wetland area. The second major wetland type is Tanks/Ponds. There are 2230 Tanks/Ponds with 24972 ha area (37.18%). The other wetland type is River/Stream (4956 ha). Details of wetland statistics is given in Table 28.

Aquatic vegetation is observed in Lakes/Ponds, and Tanks/Ponds. The area under aquatic vegetation is more during pre monsoon (60063 ha) than that of post monsoon (18627 ha). The open water spread significantly lower during pre monsoon (5573 ha) compared to post monsoon (46795 ha).

Table 28: Area estimates of wetlands in Sivaganga

Area in ha

Sr. No.	Wettcode	Wetland Category	Number of Wetlands	Total Wetland Area	% of wetland area	Open Water	
						Post-monsoon Area	Pre-monsoon Area
	1100	**Inland Wetlands - Natural**					
1	1101	Lakes/Ponds	633	35770	53.25	25012	765
2	1106	River/Stream	25	4956	7.38	4956	4392
	1200	**Inland Wetlands -Man-made**					
3	1202	Tanks/Ponds	2230	24972	37.18	16827	416
		Sub-Total	**2888**	**65698**	**97.81**	**46795**	**5573**
		Wetlands (<2.25 ha), mainly Tanks	1474	1474	2.19	-	-
		Total	**4362**	**67172**	**100.00**	**46795**	**5573**

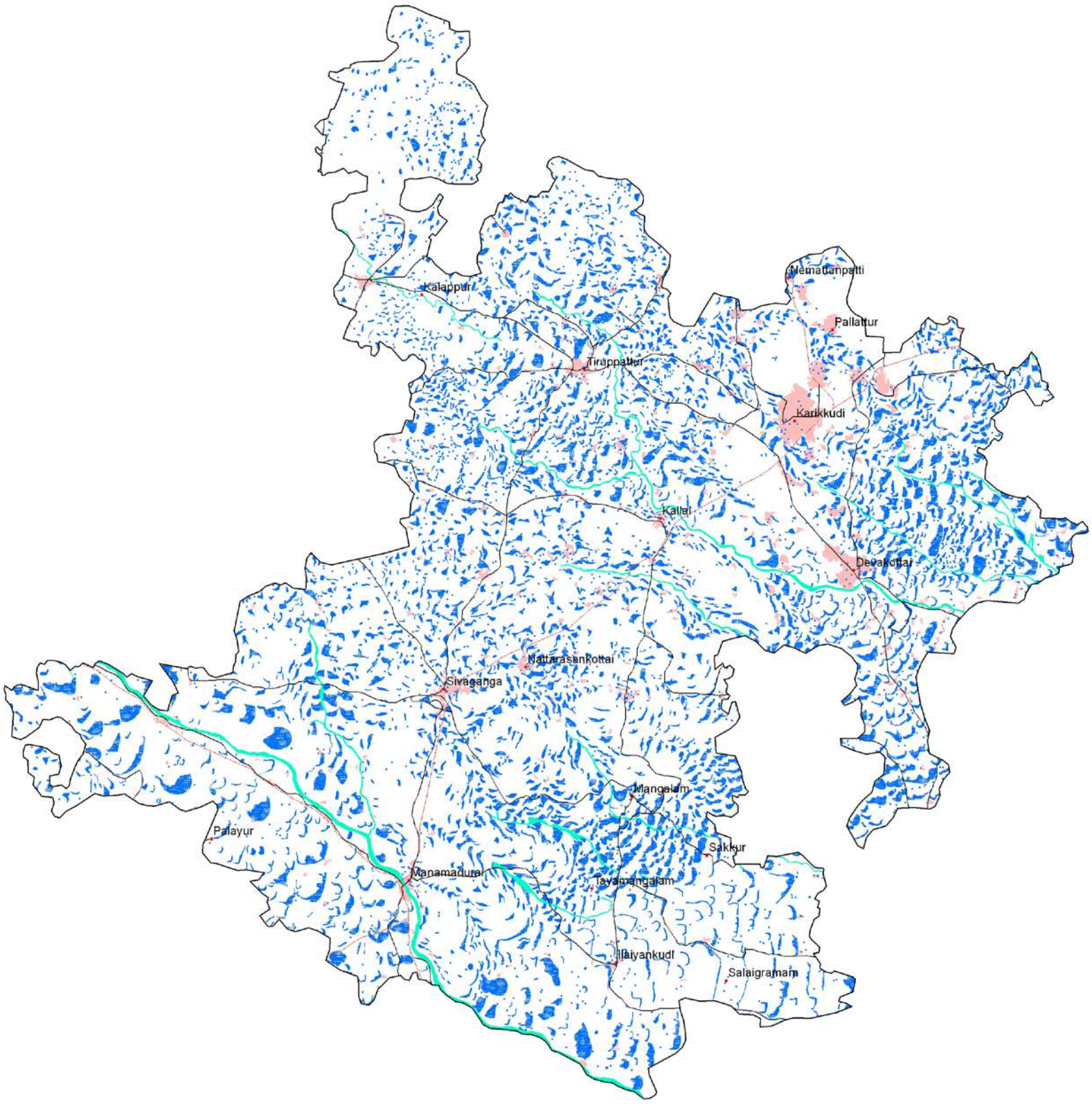
Area under Aquatic Vegetation	18627	60063

Area under turbidity levels		
Low	16259	542
Moderate	26282	4889
High	4254	142

State : Tamil Nadu

WETLAND MAP

District : Sivaganga

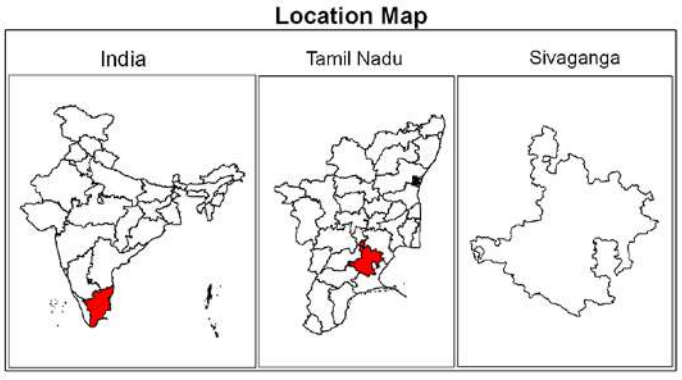


Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25ha)
- Drainage (line)
- Major Roads
- Railway
- Settlements
- Town/Settlements
- District Boundary
- State Boundary
- International Boundary

Location Map



5 2.5 0 5 10 Kilometers

Data Source :

IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

Prepared By :

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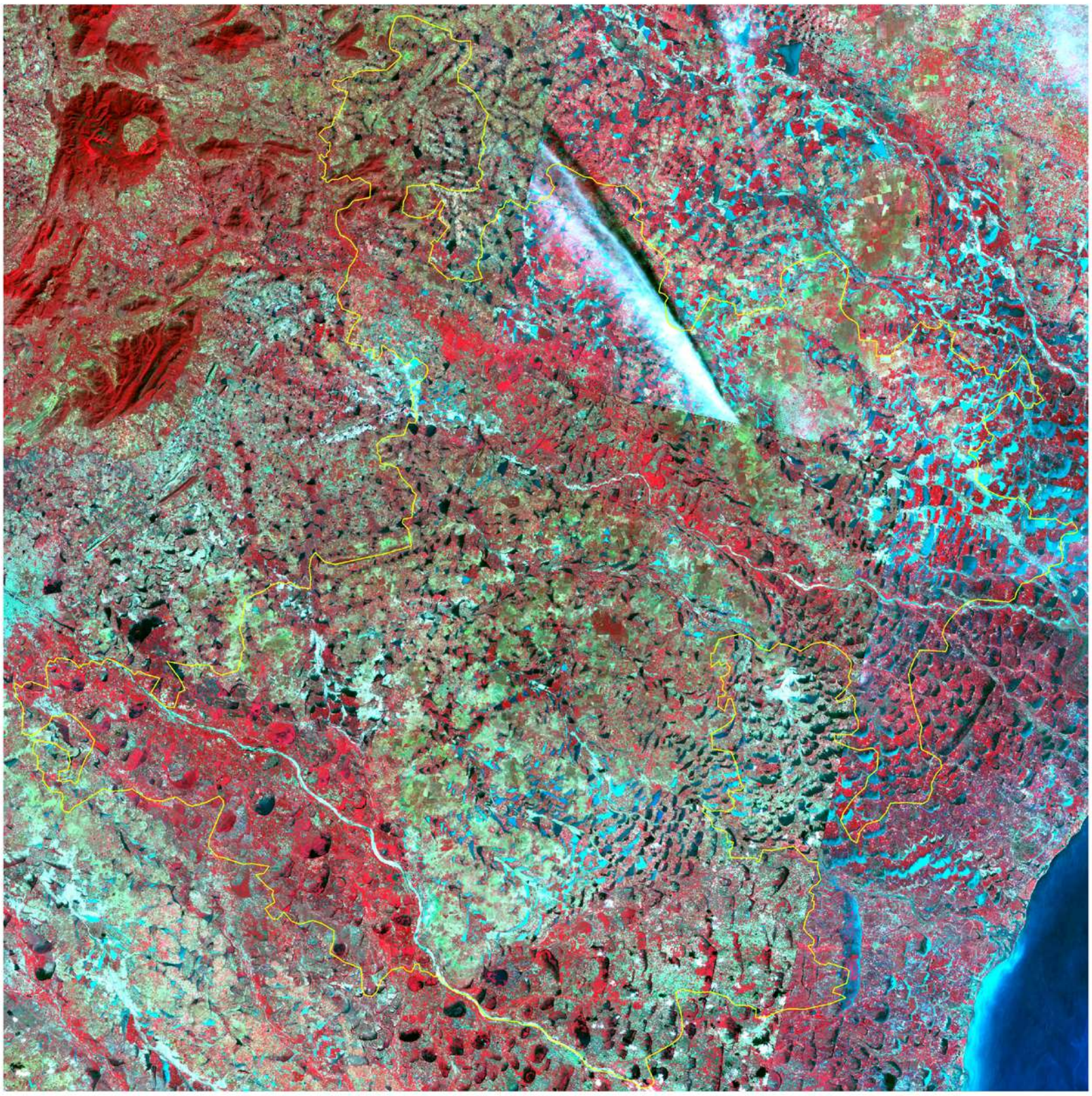
Sponsored By:

Ministry of Environment and Forests
Government of India

State : Tamil Nadu

District : Sivaganga



IRS-P6 LISS-III Post-monsoon data(2006-2007)

7.1.23 Madurai

Madurai district is surrounded by several mountains. It is famous for Jasmine Flowers. Jasmine flowers are transported to other cities of India from Madurai. Madurai is a great pilgrimage for millions of Hindus living in India and abroad. The world famous Sri Meenakshi - Sundareswarar Temple is located here which is widely visited by tourists round the year.

Total geographic area of Madurai is 3741.73 km². As per the 2001 census data, the population of the district was 25,62,279. The density of population was 733 persons per km² and literacy rate of the district was 70%.

Total area under wetland is 24614 ha, which includes 984 small wetland (<2.25 ha). Lakes/Ponds occupies 48.52% of wetland area. The second major wetland type is Tanks/Ponds. There are 1051 Tanks/Ponds with 9732 ha area (39.54%). The other wetland types are River/Stream (1708 ha) and Reservoirs (248 ha). Details of wetland statistics is given in Table 29.

Aquatic vegetation is observed in Lakes/Ponds, and Tanks/Ponds. The area under aquatic vegetation is more during pre monsoon (19561 ha) than that of post monsoon (7485 ha). The open water spread significantly lower during pre monsoon (4058 ha) compared to post monsoon (15868 ha).

Table 29: Area estimates of wetlands in Madurai

Area in ha

Sr. No.	Wettcode	Wetland Category	Number of Wetlands	Total Wetland Area	% of wetland area	Open Water	
						Post-monsoon Area	Pre-monsoon Area
	1100	**Inland Wetlands - Natural**					
1	1101	Lakes/Ponds	193	11942	48.52	8165	1342
2	1106	River/Stream	12	1708	6.94	1619	1708
	1200	**Inland Wetlands -Man-made**					
3	1201	Reservoirs/Barrages	2	248	1.01	206	127
4	1202	Tanks/Ponds	1051	9732	39.54	5878	881
		Sub-Total	**1258**	**23630**	**96.00**	**15868**	**4058**
		Wetlands (<2.25 ha), mainly Tanks	984	984	4.00	-	-
		Total	**2242**	**24614**	**100.00**	**15868**	**4058**

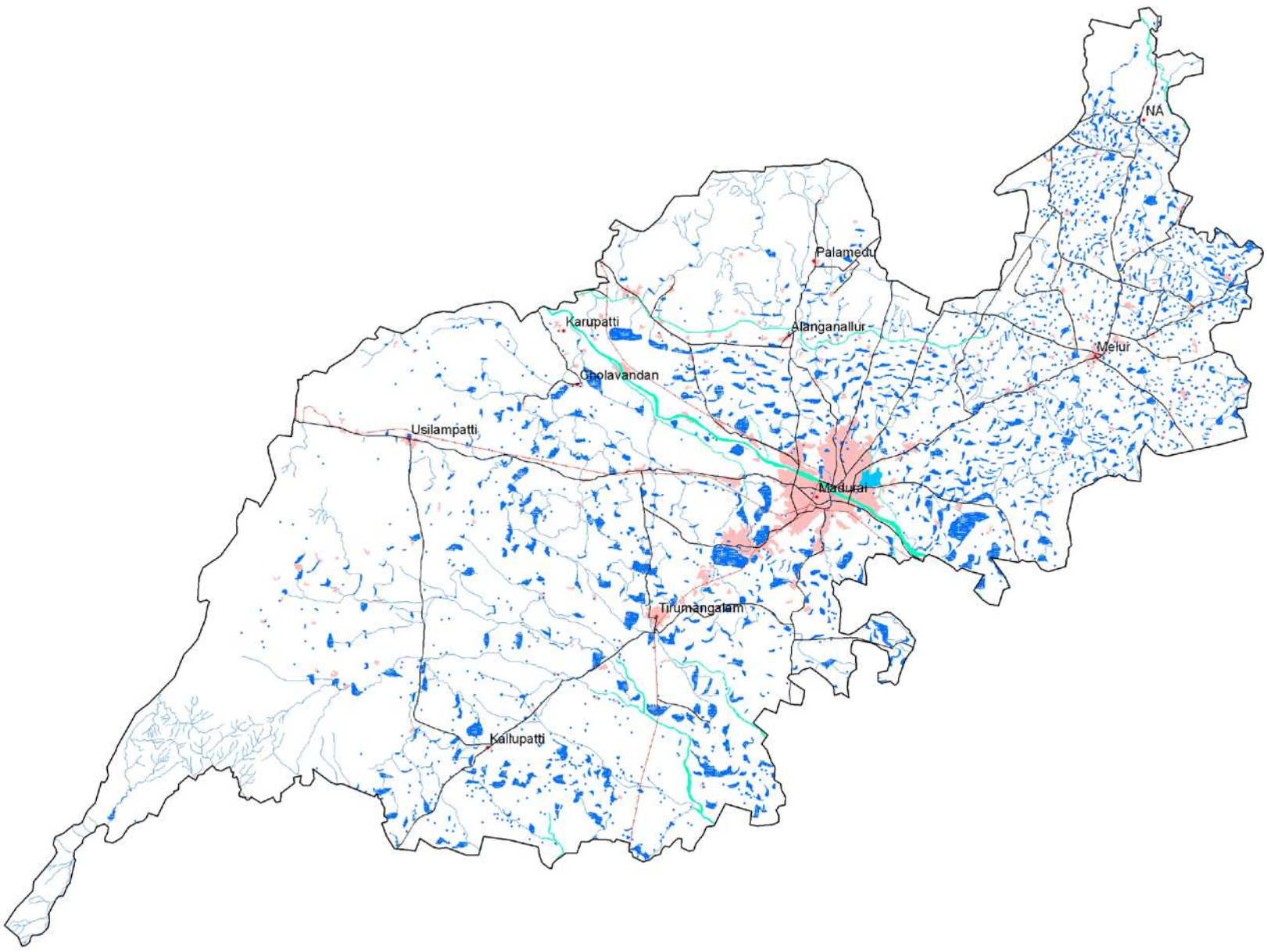
Area under Aquatic Vegetation	7485	19561

Area under turbidity levels		
Low	5671	973
Moderate	8067	2741
High	2130	344

State : Tamil Nadu

WETLAND MAP

District : Madurai

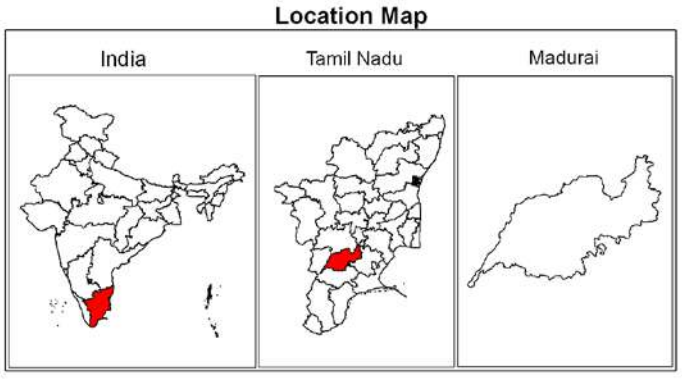


Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25ha)
- Drainage (line)
- Major Roads
- Railway
- Settlements
- Town/Settlements
- District Boundary
- State Boundary
- International Boundary

Location Map



8 4 0 8 16 Kilometers

Data Source :

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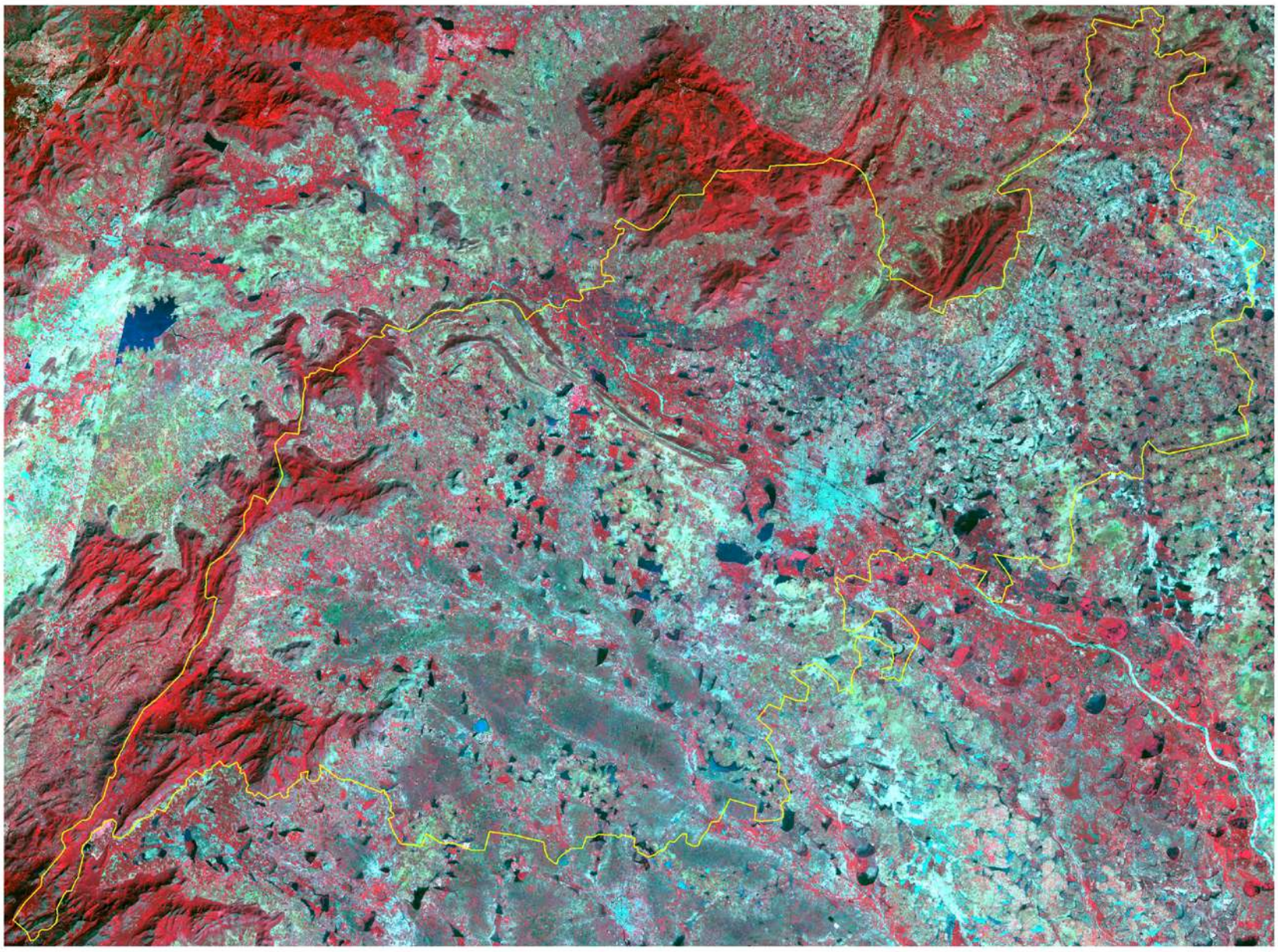
Sponsored By:

Ministry of Environment and Forests
Government of India

State : Tamil Nadu

District : Madurai



IRS-P6 LISS-III Post-monsoon data(2006-2007)

7.1.24 Theni

Theni District is bounded by Dindigul District to the north, Madurai District to the east, Virudhunagar District to the southwest, and Kerala state to the west. The district is known for its salubrious climate, hills and lakes. Its economy is mostly agricultural. Silk, cotton, coffee seeds, cardamom and mango are the main product of the district.

Major Tourist Centres of the district are Vaigai dam, Suruli falls, Megamalai falls(Mayiladumparai) and Tiger falls(Bodi mettu).

Total geographic area of Theni is 3242.3 km². As per the 2001 census data, the population of the district was 10,93,950. The density of population was 337 persons per km² and literacy rate of the district was 50%.

Total area under wetland is 5293 ha, which includes 83 small wetland (<2.25 ha). Lakes/Ponds occupies 21.46% of wetland area. The other wetland types of the district are Tanks/Ponds (994 ha) and Reservoir (1957 ha). Details of wetland statistics is given in Table 30.

Aquatic vegetation is observed in Lakes/Ponds, and Tanks/Ponds. The area under aquatic vegetation is more during pre monsoon (3160 ha) than that of post monsoon (1428 ha). The open water spread significantly lower during pre monsoon (2048 ha) compared to post monsoon (3764 ha).

Table 30: Area estimates of wetlands in Theni

Area in ha

Sr. No.	Wettcode	Wetland Category	Number of Wetlands	Total Wetland Area	% of wetland area	Open Water	
						Post-monsoon Area	Pre-monsoon Area
	1100	**Inland Wetlands - Natural**					
1	1101	Lakes/Ponds	20	1136	21.46	604	294
2	1106	River/Stream	2	1123	21.22	1123	1123
	1200	**Inland Wetlands -Man-made**					
3	1201	Reservoirs/Barrages	1	1957	36.97	1507	430
4	1202	Tanks/Ponds	95	994	18.78	530	201
		Sub-Total	**118**	**5210**	**98.43**	**3764**	**2048**
		Wetlands (<2.25 ha), mainly Tanks	83	83	1.57	-	-
		Total	**201**	**5293**	**100.00**	**3764**	**2048**

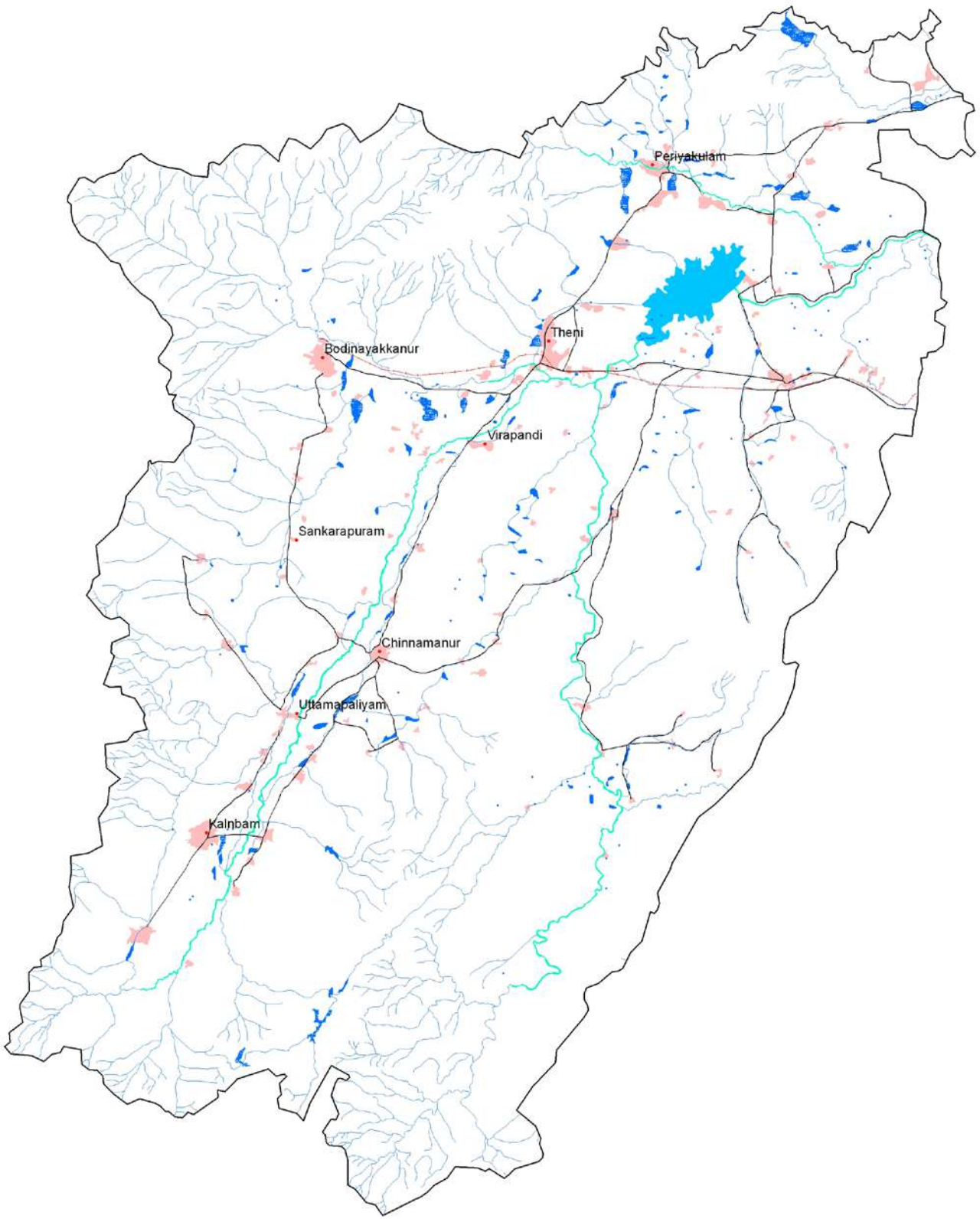
Area under Aquatic Vegetation	1428	3160

Area under turbidity levels		
Low	1895	557
Moderate	1716	1449
High	153	42

State : Tamil Nadu

WETLAND MAP

District : Theni

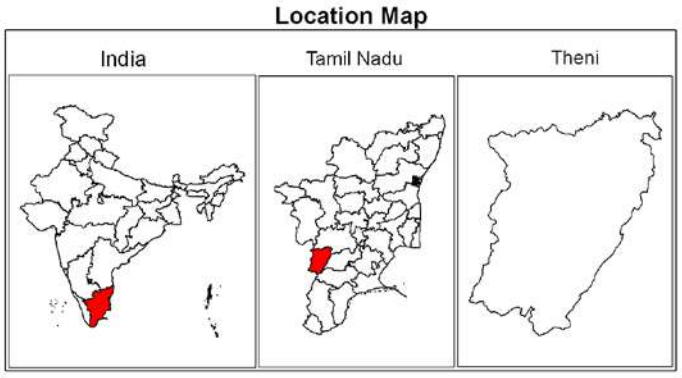


Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25ha)
- Drainage (line)
- Major Roads
- Railway
- Settlements
- Town/Settlements
- District Boundary
- State Boundary
- International Boundary

Location Map



4 2 0 4 8 Kilometers

Data Source :

IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

Prepared By :

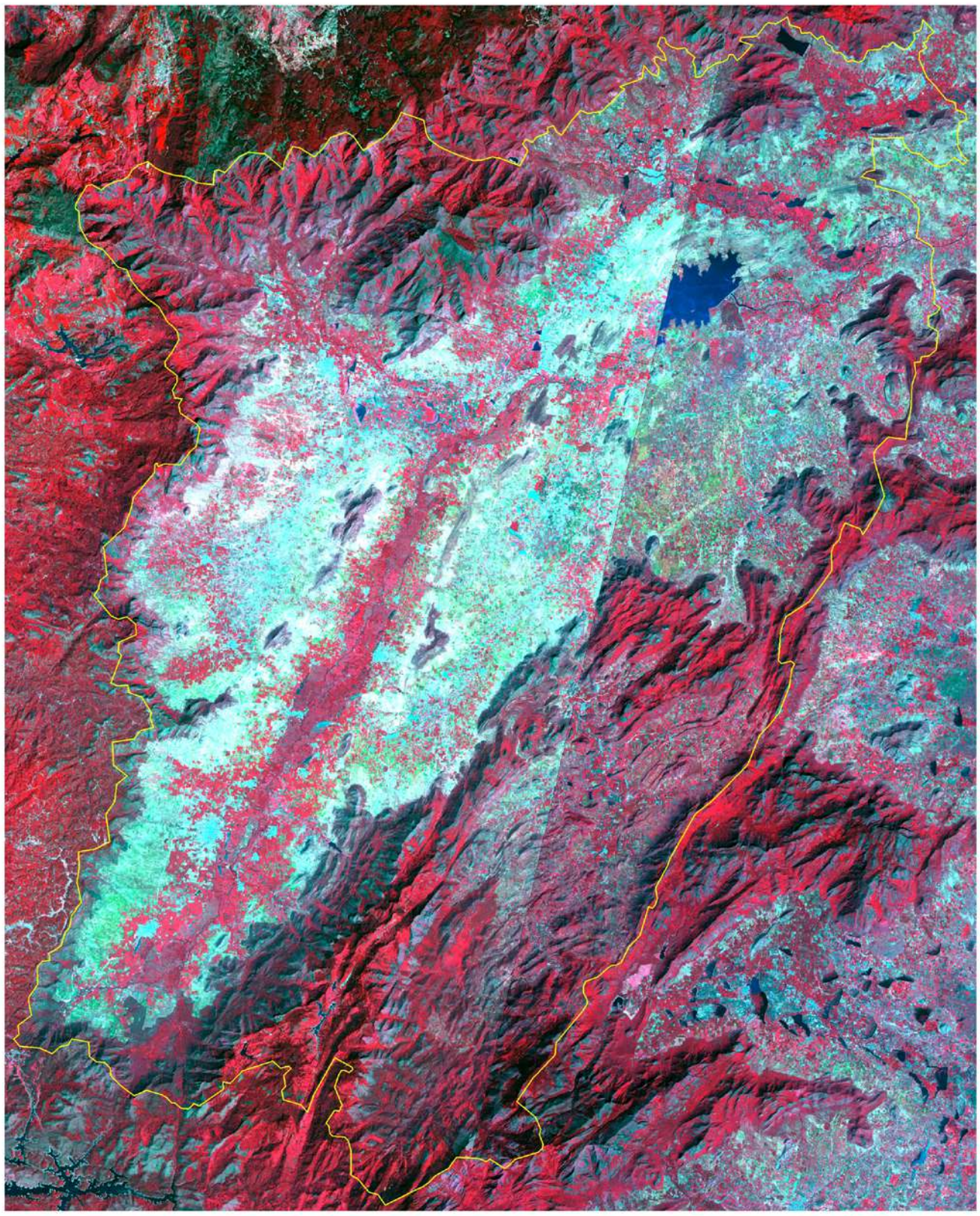
Space Applications Centre (ISRO), Ahmedabad
and
Institute of Remote Sensing, Anna University, Chennai

Sponsored By:

Ministry of Environment and Forests
Government of India

State : Tamil Nadu

District : Theni



IRS-P6 LISS-III Post-monsoon data(2006-2007)

7.1.25 Virudhunagar

Virudhunagar is bounded on the north by Madurai, on the north-east by Sivaganga, on the east by Ramanathapuram and on the south by Tirunelveli and Tuticorin districts. The district head quarter is located at the same town of Virudhunagar. Physiographically it consists of two distinct regions. The eastern slopes of the Western Ghats in Srivilliputtur and Rajapalayam taluks and the black soil plains of Sivakasi, Virudhunagar, Sattur, Aruppukkottai, Tiruchili and Kariapatti.

Total geographic area of Virudhunagar is 4232 km². As per the 2001 census data, the population of the district was 17, 51,548. The density of population was 413 persons per km² and literacy rate of the district was 62.91 %.

Total area under wetland is 29071 ha, which includes 590 small wetland (<2.25 ha). Lakes/Ponds occupies 47.79% of wetland area. The second major wetland type is Tanks/Ponds. There are 738 Tanks/Ponds with 8889 ha area (30.58%). Details of wetland statistics is given in Table 31.

Aquatic vegetation is observed in Lakes/Ponds, and Tanks/Ponds. The area under aquatic vegetation is more during pre monsoon (21771 ha) than that of post monsoon (13166 ha). The open water spread significantly lower during pre monsoon (6707 ha) compared to post monsoon (14973 ha).

Table 31: Area estimates of wetlands in Virudhunagar

Area in ha

Sr. No.	Wettcode	Wetland Category	Number of Wetlands	Total Wetland Area	% of wetland area	Open Water	
						Post-monsoon Area	Pre-monsoon Area
	1100	**Inland Wetlands - Natural**					
1	1101	Lakes/Ponds	227	13893	47.79	6558	1388
2	1106	River/Stream	26	3668	12.62	2063	3576
	1200	**Inland Wetlands -Man-made**					
3	1201	Reservoirs/Barrages	11	2031	6.99	1386	523
4	1202	Tanks/Ponds	738	8889	30.58	4966	1220
		Sub-Total	**1002**	**28481**	**97.97**	**14973**	**6707**
		Wetlands (<2.25 ha), mainly Tanks	590	590	2.03	-	-
		Total	**1592**	**29071**	**100.00**	**14973**	**6707**

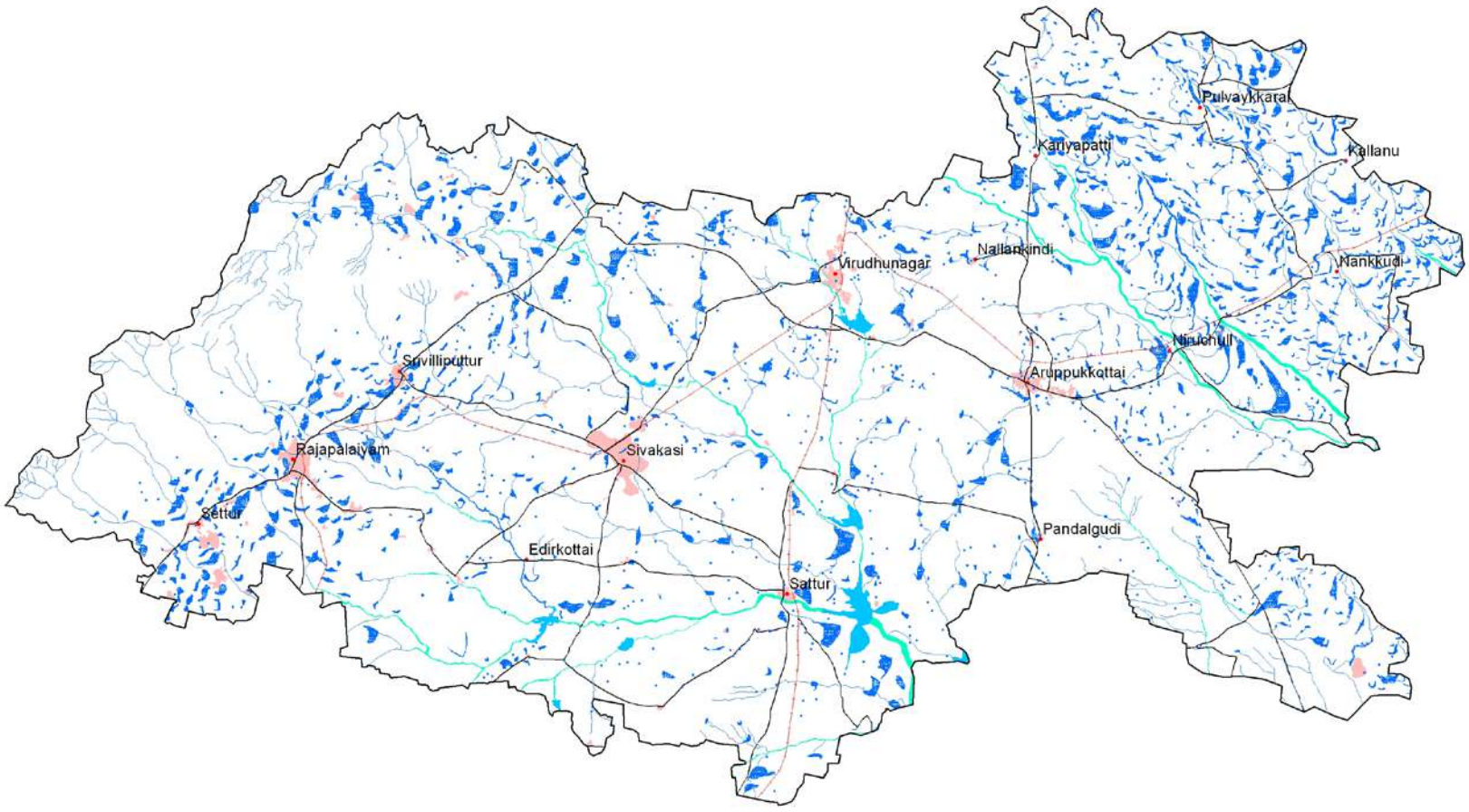
Area under Aquatic Vegetation	13166	21771

Area under turbidity levels		
Low	5600	1569
Moderate	8155	4849
High	1218	289

State : Tamil Nadu

WETLAND MAP

District : Virudhunagar

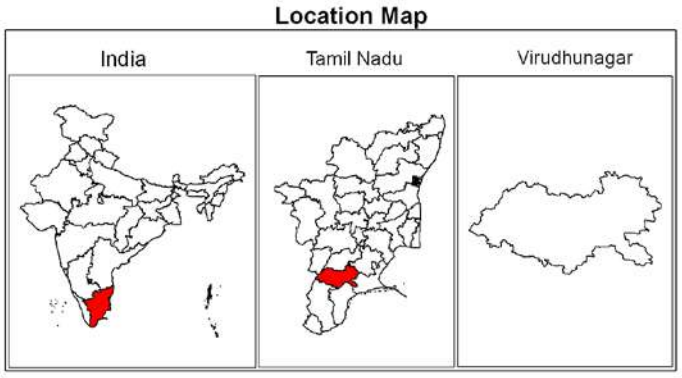


Symbol Typecode	Level I	Level II	Level III
	Inland Wetlands		
		Natural	
1101			Lakes/Ponds
1102			Ox-bow lakes/ Cut-off meanders
1103			High altitude wetlands
1104			Reverine wetlands
1105			Waterlogged
1106			River/Stream
		Man-made	
1201			Reservoirs/Barrages
1202			Tanks/Ponds
1203			Waterlogged
1204			Salt pans
	Coastal Wetlands		
		Natural	
2101			Lagoons
2102			Creeks
2103			Sand/Beach
2104			Intertidal mud flats
2105			Salt marsh
2106			Mangroves
2107			Coral reefs
		Man-made	
2201			Salt pans
2202			Aquaculture ponds

Legend

- Wetlands (<2.25ha)
- Drainage (line)
- Major Roads
- Railway
- Settlements
- Town/Settlements
- District Boundary
- State Boundary
- International Boundary

Location Map



7 3.5 0 7 14 Kilometers

Data Source :

IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

Prepared By :

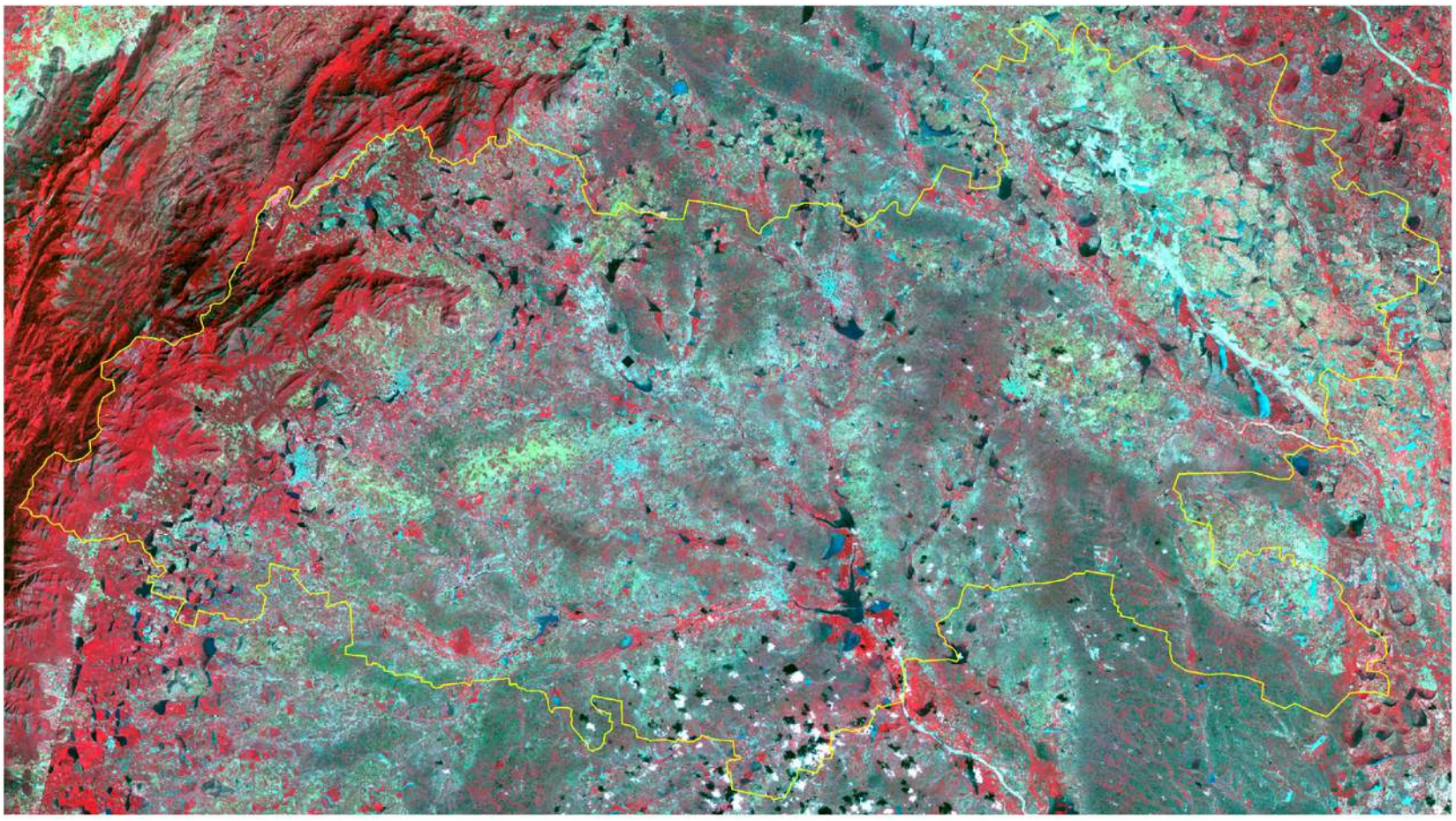
Space Applications Centre (ISRO), Ahmedabad
and
Institute of Remote Sensing, Anna University, Chennai

Sponsored By:

Ministry of Environment and Forests
Government of India

State : Tamil Nadu

District : Virudhunagar



IRS-P6 LISS-III Post-monsoon data(2006-2007)

7.1.26 Ramanathapuram

Ramanathapuram is surrounded by Sivaganga District on the north, Pudukkottai District on the northeast, the Palk Strait on the east, by Gulf of Mannar on the south, by Thoothukudi District on the west, and by Virudhunagar District on the northwest. The district contains the Indian portion of Rama's Bridge, an east-west chain of low islands and shallow reefs that extend between India and the island nation of Sri Lanka, and separate the Palk Strait from the Gulf of Mannar.

Total geographic area of Ramanathapuram is 4089.57 km². As per the 2001 census data, the population of the district was 11,83,321. The density of population was 287 persons per km² and literacy rate of the district was 85%.

Total area under wetland is 73808 ha, which includes 1232 small wetland (<2.25 ha). Lakes/Ponds occupies 56.99% of wetland area. The second major wetland type is Tanks/Ponds. There are 1030 Tanks/Ponds with 12036 ha area (16.31%). The other wetland types are; Rivers/streams, coral reefs (3638 ha) and Lagoons (1487 ha). Details of wetland statistics is given in Table 32.

Aquatic vegetation is observed in Lakes/Ponds, and Tanks/Ponds. The area under aquatic vegetation is more during pre monsoon (56011 ha) than that of post monsoon (15907 ha). The open water spread significantly lower during pre monsoon (8629 ha) compared to post monsoon (49941 ha).

Table 32: Area estimates of wetlands in Ramanathpuram

Area in ha

Sr. No.	Wettcode	Wetland Category	Number of Wetlands	Total Wetland Area	% of wetland area	Open Water	
						Post-monsoon Area	Pre-monsoon Area
	1100	**Inland Wetlands - Natural**					
1	1101	Lakes/Ponds	479	42061	56.99	31165	1077
2	1105	Waterlogged	23	1410	1.91	1246	679
3	1106	River/Stream	30	4696	6.36	4636	4126
	1200	**Inland Wetlands -Man-made**					
4	1202	Tanks/Ponds	1030	12036	16.31	7837	373
		Total - Inland	**1562**	**60203**	**81.57**	**44884**	**6255**
	2100	**Coastal Wetlands - Natural**					
5	2101	Lagoons	4	1487	2.01	1484	1521
6	2103	Sand/Beach	21	1493	2.02	-	-
7	2104	Intertidal mud flats	25	1329	1.80	-	-
8	2105	salt marsh	16	2052	2.78	1326	67
9	2106	Mangroves	10	118	0.16	-	-
10	2107	Coral Reefs	32	3638	4.93	-	-
	2200	**Coastal Wetlands - Man-made**					
11	2201	Salt pans	10	1787	2.42	1789	404
12	2202	Aquaculture ponds	11	469	0.64	458	382
		Total - Coastal	**129**	**12373**	**16.76**	**5057**	**2374**
		Sub-Total	**1691**	**72576**	**98.33**	**49941**	**8629**
		Wetlands (<2.25 ha), mainly Tanks	1232	1232	1.67	-	-
		Total	**2923**	**73808**	**100.00**	**49941**	**8629**

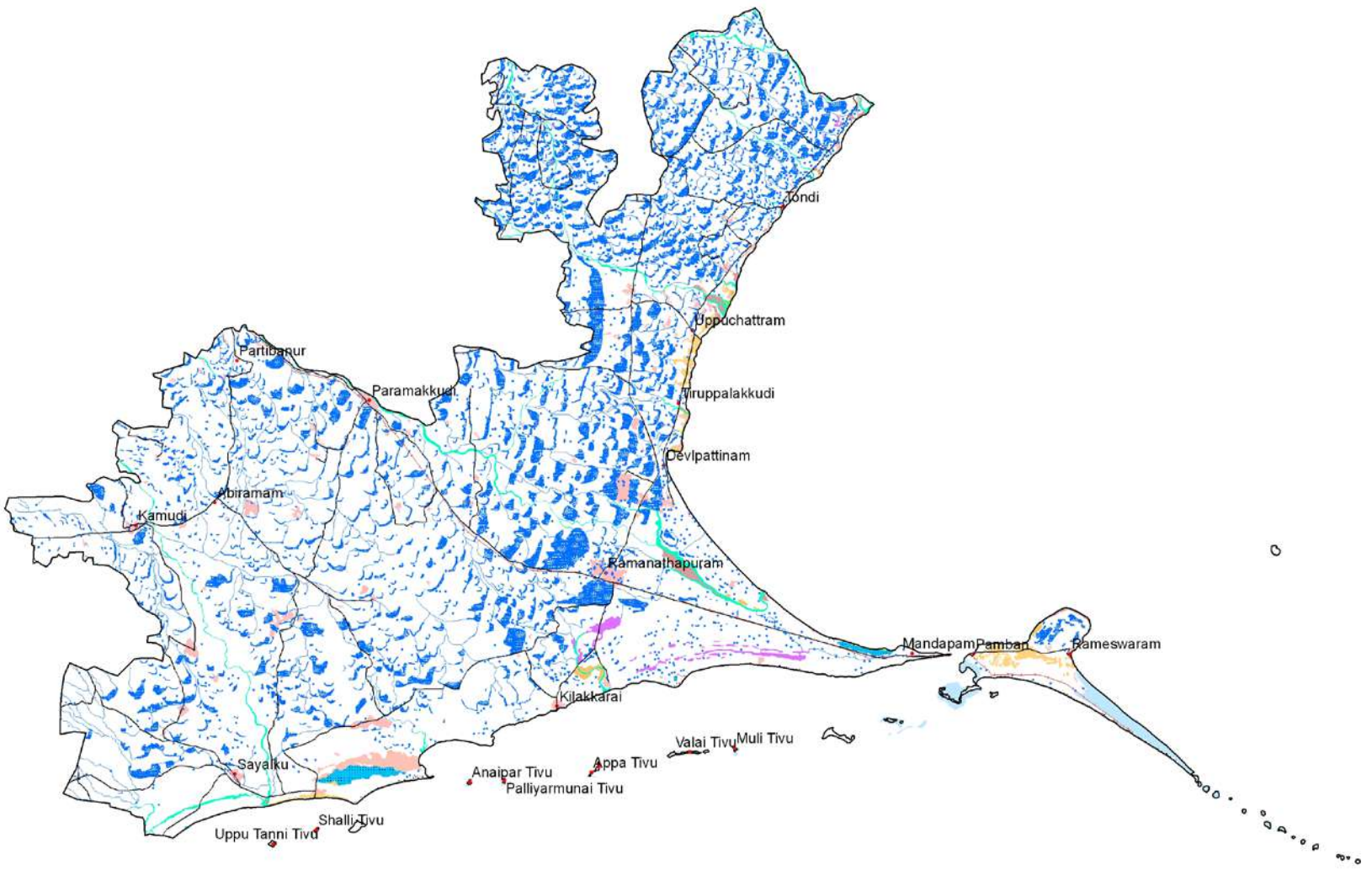
Area under Aquatic Vegetation	15907	56011

Area under turbidity levels		
Low	23881	825
Moderate	20456	5283
High	5604	2521

State : Tamil Nadu

WETLAND MAP

District : Ramanathapuram

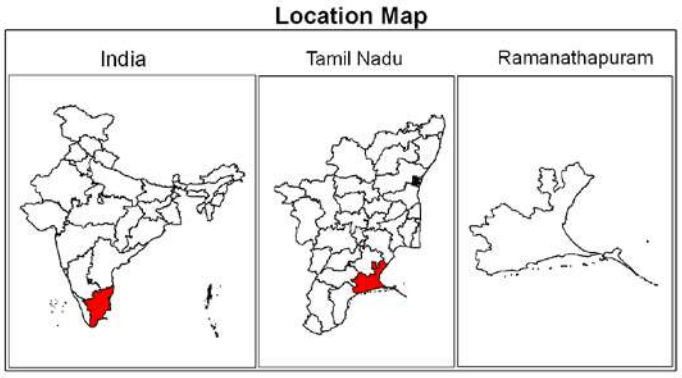


Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25ha)
- Drainage (line)
- Major Roads
- Railway
- Settlements
- Town/Settlements
- District Boundary
- State Boundary
- International Boundary

Location Map



8 4 0 8 16 Kilometers

Data Source :

IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

Prepared By :

Space Applications Centre (ISRO), Ahmedabad
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Institute of Remote Sensing, Anna University, Chennai

Sponsored By:

Ministry of Environment and Forests
Government of India

State : Tamil Nadu

District : Ramanathapuram

IRS-P6 LISS-III Post-monsoon data(2006-2007)

7.1.27 Thoothukkudi

The district of Thoothukudi is situated in the extreme south-eastern corner of Tamil Nadu state. It is bounded on the north by the districts of Tirunelveli, Virudhunagar and Ramanathapuram, on the east and south-east by Gulf of Mannar and on the west and south-west by the district of Tirunelveli. The administrative headquarters is an urban agglomeration. Thoothukudi also known as Tuticorin is also known as "Pearl City". It is a seaport which serves southern Tamil Nadu including the inland cities of Coimbatore, Madurai and Tirunelveli.

Total geographic area of Thoothukudi is 4621 km². As per the 2001 census data, the population of the district was 15, 65,743 . The density of population was 339 persons per km² and literacy rate of the district was 87 %.

Total area under wetland is 37810 ha, which includes 576 small wetland (<2.25 ha). Lakes/Ponds occupies 28.07% of wetland area. The second major wetland type is Salt pans (6635 ha). The other wetland types Tanks/ponds, Rivers/stream, Salt marsh and Aquaculture ponds. Details of wetland statistics is given in Table 33.

Aquatic vegetation is observed in Lakes/Ponds, and Tanks/Ponds. The area under aquatic vegetation is more during pre monsoon (12525 ha) than that of post monsoon (10420 ha). The open water spread significantly lower during pre monsoon (22001 ha) compared to post monsoon (24378 ha).

Table 33: Area estimates of wetlands in Thoothukkudi

Area in ha

Sr. No.	Wettcode	Wetland Category	Number of Wetlands	Total Wetland Area	% of wetland area	Open Water	
						Post-monsoon Area	Pre-monsoon Area
	1100	**Inland Wetlands - Natural**					
1	1101	Lakes/Ponds	133	10612	28.07	4950	4663
2	1105	Waterlogged	1	681	1.80	505	624
3	1106	River/Stream	30	6005	15.88	5548	5900
	1200	**Inland Wetlands -Man-made**					
4	1201	Reservoirs/Barrages	17	963	2.55	355	185
5	1202	Tanks/Ponds	561	5642	14.92	2743	1480
6	1203	Waterlogged	4	852	2.25	229	116
		Total - Inland	**746**	**24755**	**65.47**	**14330**	**12968**
	2100	**Coastal Wetlands - Natural**					
7	2101	Lagoons	1	417	1.10	417	417
8	2103	Sand/Beach	14	992	2.62	-	-
9	2104	Intertidal mud flats	9	720	1.90	-	-
10	2105	Salt Marsh	17	1558	4.12	1558	1041
11	2106	Mangroves	9	400	1.06	-	-
12	2107	Coral Reefs	4	261	0.69	-	-
	2200	**Coastal Wetlands - Man-made**					
13	2201	Salt pans	9	6635	17.55	6635	6146
14	2202	Aquaculture ponds	11	1496	3.96	1438	1429
		Total - Coastal	**74**	**12479**	**33.00**	**10048**	**9033**
		Sub-Total	**820**	**37234**	**98.48**	**24378**	**22001**
		Wetlands (<2.25 ha), mainly Tanks	576	576	1.52	-	-
		Total	**1396**	**37810**	**100.00**	**24378**	**22001**

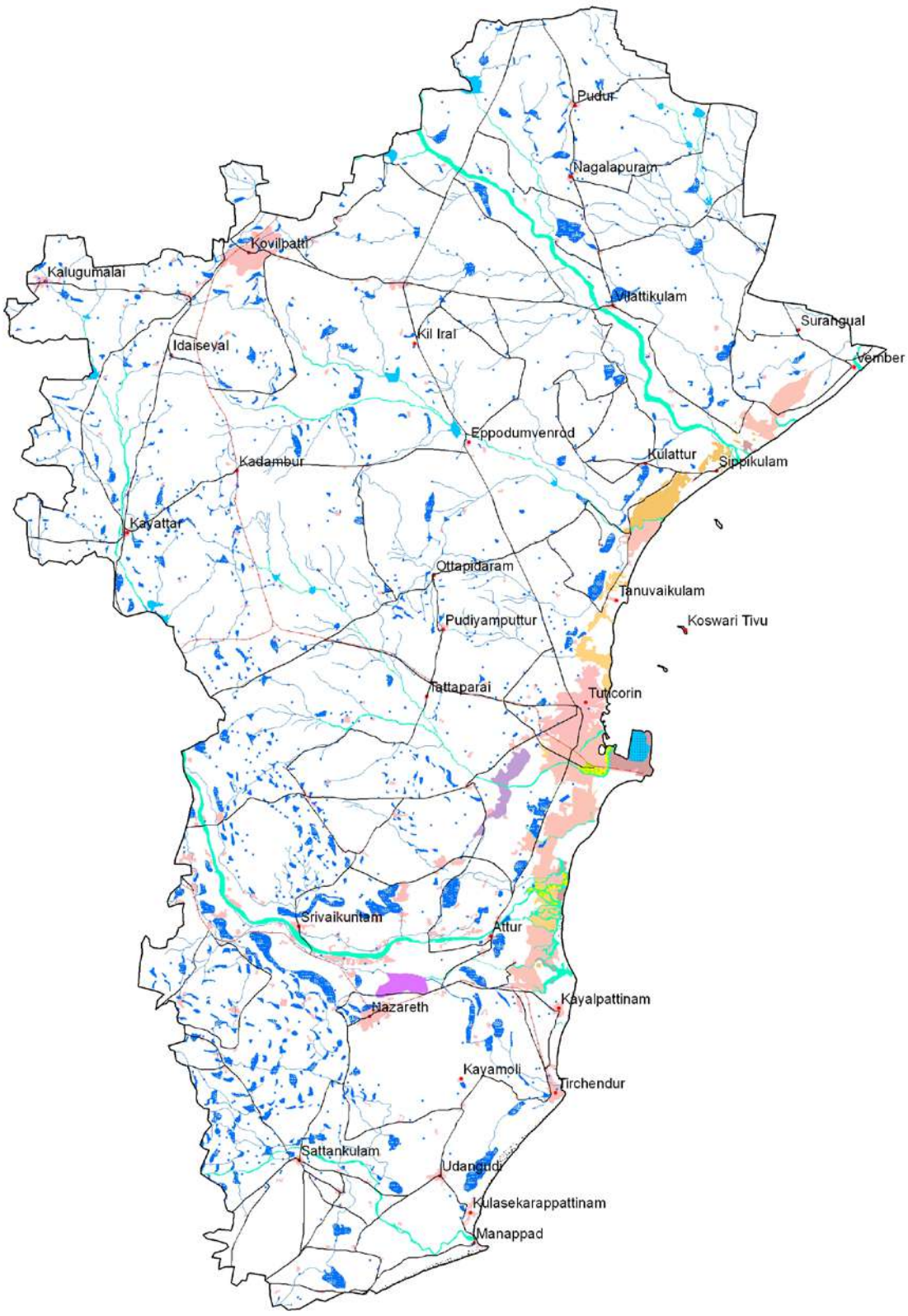
Area under Aquatic Vegetation	10420	12525

Area under turbidity levels		
Low	4822	4987
Moderate	10243	8539
High	9313	8475

State : Tamil Nadu

WETLAND MAP

District : Thoothukkudi

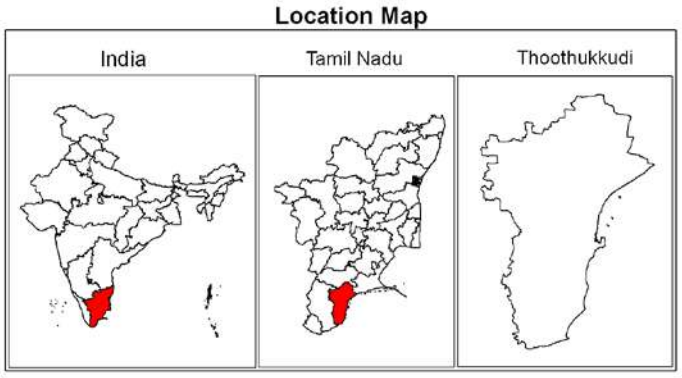


Symbol Typecode	Level I	Level II	Level III
	Inland Wetlands		
		Natural	
1101			Lakes/Ponds
1102			Ox-bow lakes/ Cut-off meanders
1103			High altitude wetlands
1104			Reverine wetlands
1105			Waterlogged
1106			River/Stream
		Man-made	
1201			Reservoirs/Barrages
1202			Tanks/Ponds
1203			Waterlogged
1204			Salt pans
	Coastal Wetlands		
		Natural	
2101			Lagoons
2102			Creeks
2103			Sand/Beach
2104			Intertidal mud flats
2105			Salt marsh
2106			Mangroves
2107			Coral reefs
		Man-made	
2201			Salt pans
2202			Aquaculture ponds

Legend

- Wetlands (<2.25ha)
- Drainage (line)
- Major Roads
- Railway
- Settlements
- Town/Settlements
- District Boundary
- State Boundary
- International Boundary

Location Map



6 3 0 6 12 Kilometers

Data Source :

IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

Prepared By :

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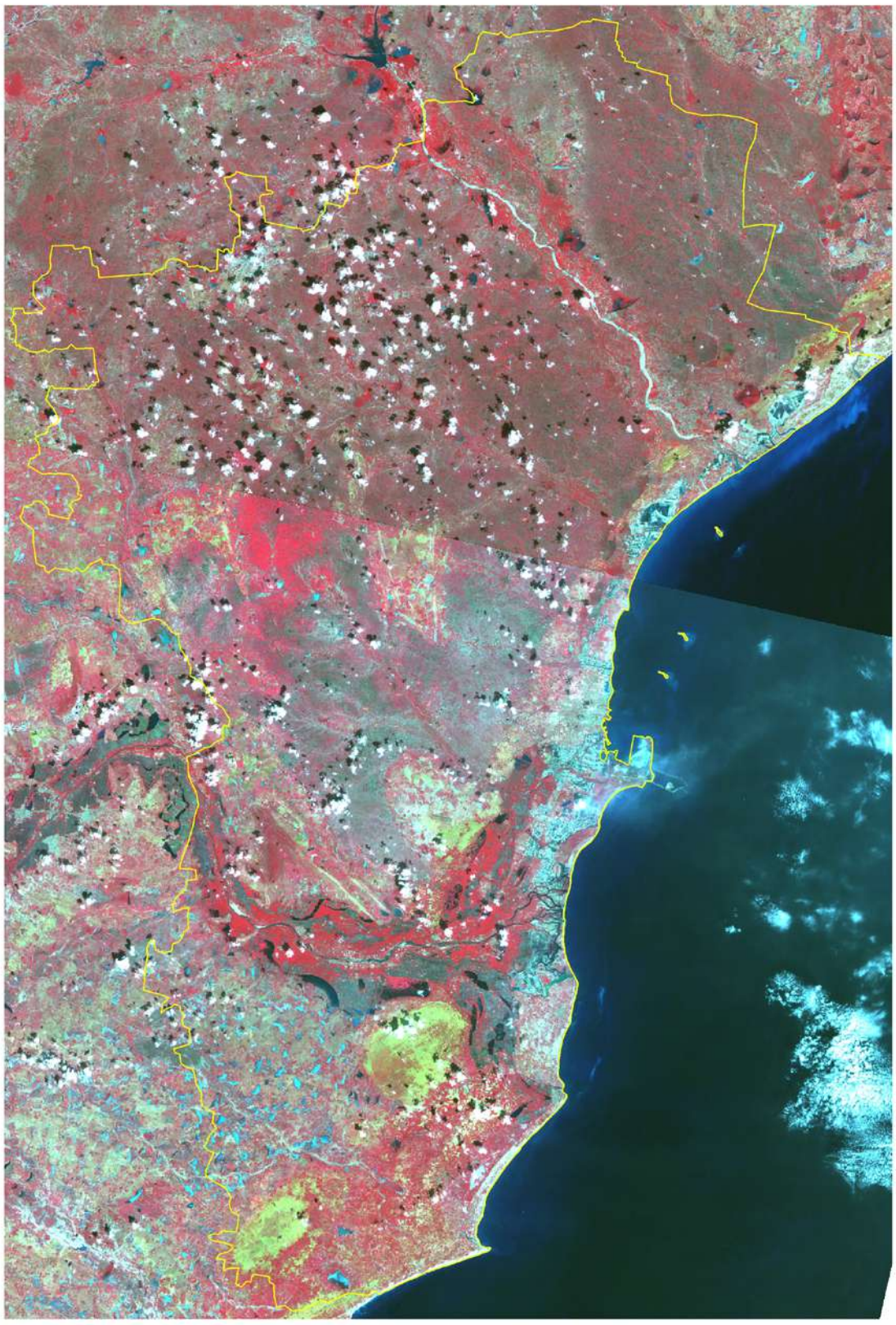
Sponsored By:

Ministry of Environment and Forests
Government of India

State : Tamil Nadu

District : Thoothukkudi



IRS-P6 LISS-III Post-monsoon data(2006-2007)

7.1.28 Tirunelveli

Tirunelveli is a southern most district of Tamil Nadu bordered by the State of Kerala, Gulf of Mannar and the districts of Virudhunagar, Thoothukudi and Kanniyakumari from different directions. The district has diverse geographical and physical features such as lofty mountains and low plains, rivers and cascades, seacoast and thick inland forest, sandy soils and fertile alluvium, a variety of flora, fauna, and protected wild life. The district is known for its paddy fields.

Total geographic area of Tirunelveli is 6823 km². As per the 2001 census data, the population of the district was 13,72,082 . The density of population was 201 persons per km² and literacy rate of the district was 68.44 %.

Total area under wetland is 36998 ha, which includes 1042 small wetland (<2.25 ha). Lakes/Ponds occupies 40.68% of wetland area. The second major wetland type is Tanks/Ponds. There are 1368 Tanks/Ponds with 14509 ha area (39.22%). Major Tourist Spots are Mundanthurai tiger reserve wild life sanctuaries, birds sanctuary at Koonthankulam and Manjolai hill station. Details of wetland statistics is given in Table 34.

Aquatic vegetation is observed in Lakes/Ponds, and Tanks/Ponds. The area under aquatic vegetation is more during pre monsoon (18575 ha) than that of post monsoon (16229 ha). The open water spread significantly lower during pre monsoon (16404 ha) compared to post monsoon (19671 ha).

Table 34: Area estimates of wetlands in Tirunelveli

Area in ha

Sr. No.	Wettcode	Wetland Category	Number of Wetlands	Total Wetland Area	% of wetland area	Open Water	
						Post-monsoon Area	Pre-monsoon Area
	1100	**Inland Wetlands - Natural**					
1	1101	Lakes/Ponds	255	15049	40.68	6975	5863
2	1106	River/Stream	24	4315	11.66	3819	4150
	1200	**Inland Wetlands -Man-made**					
3	1201	Reservoirs/Barrages	9	2083	5.63	1579	1392
4	1202	Tanks/Ponds	1368	14509	39.22	7298	4999
		Total - Inland	**1656**	**35956**	**97.18**	**19671**	**16404**
	2100	**Coastal Wetlands - Natural**					
5	2103	Sand/Beach	5	711	1.92	-	-
		Total - Coastal	**5**	**711**	**1.92**	-	-
		Sub-Total	**1661**	**35956**	**97.18**	**19671**	**16404**
		Wetlands (<2.25 ha), mainly Tanks	1042	1042	2.82	-	-
		Total	**2703**	**36998**	**100.00**	**19671**	**16404**

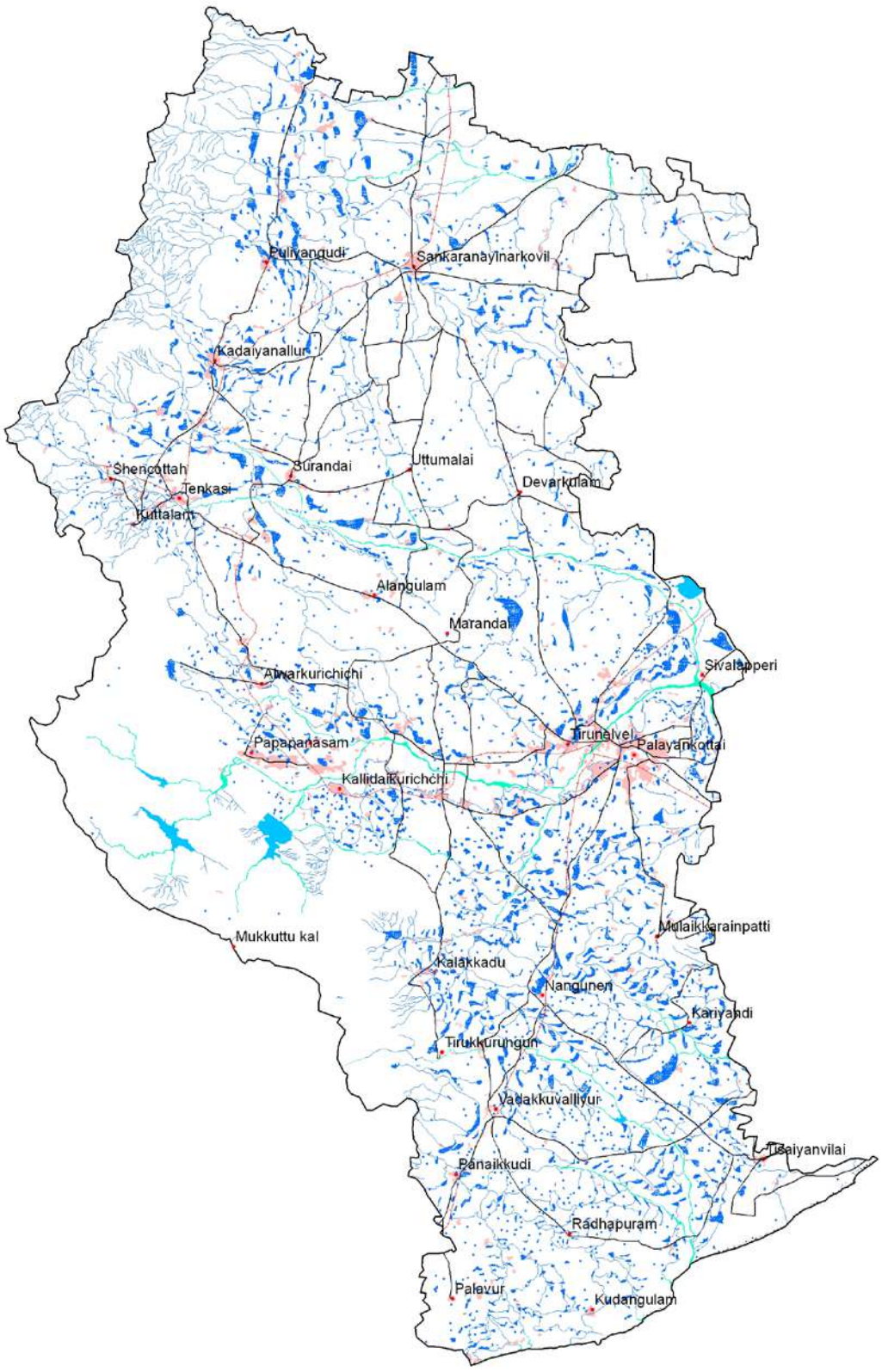
Area under Aquatic Vegetation	16229	18575

Area under turbidity levels		
Low	6123	5397
Moderate	11025	9428
High	2523	1579

State : Tamil Nadu

WETLAND MAP

District : Tirunelveli

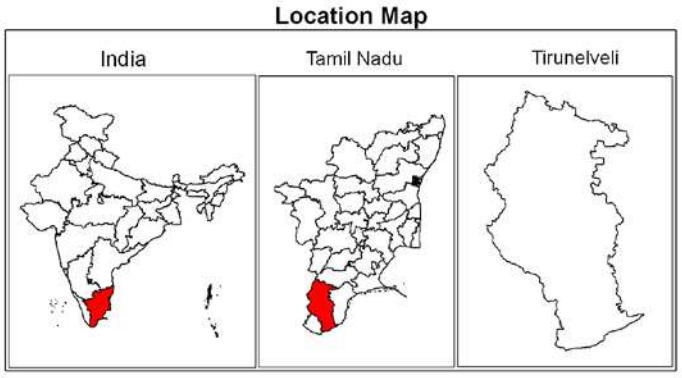


Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25ha)
- Drainage (line)
- Major Roads
- Railway
- Settlements
- Town/Settlements
- District Boundary
- State Boundary
- International Boundary

Location Map



8 4 0 8 16 Kilometers

Data Source :

IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

Prepared By :

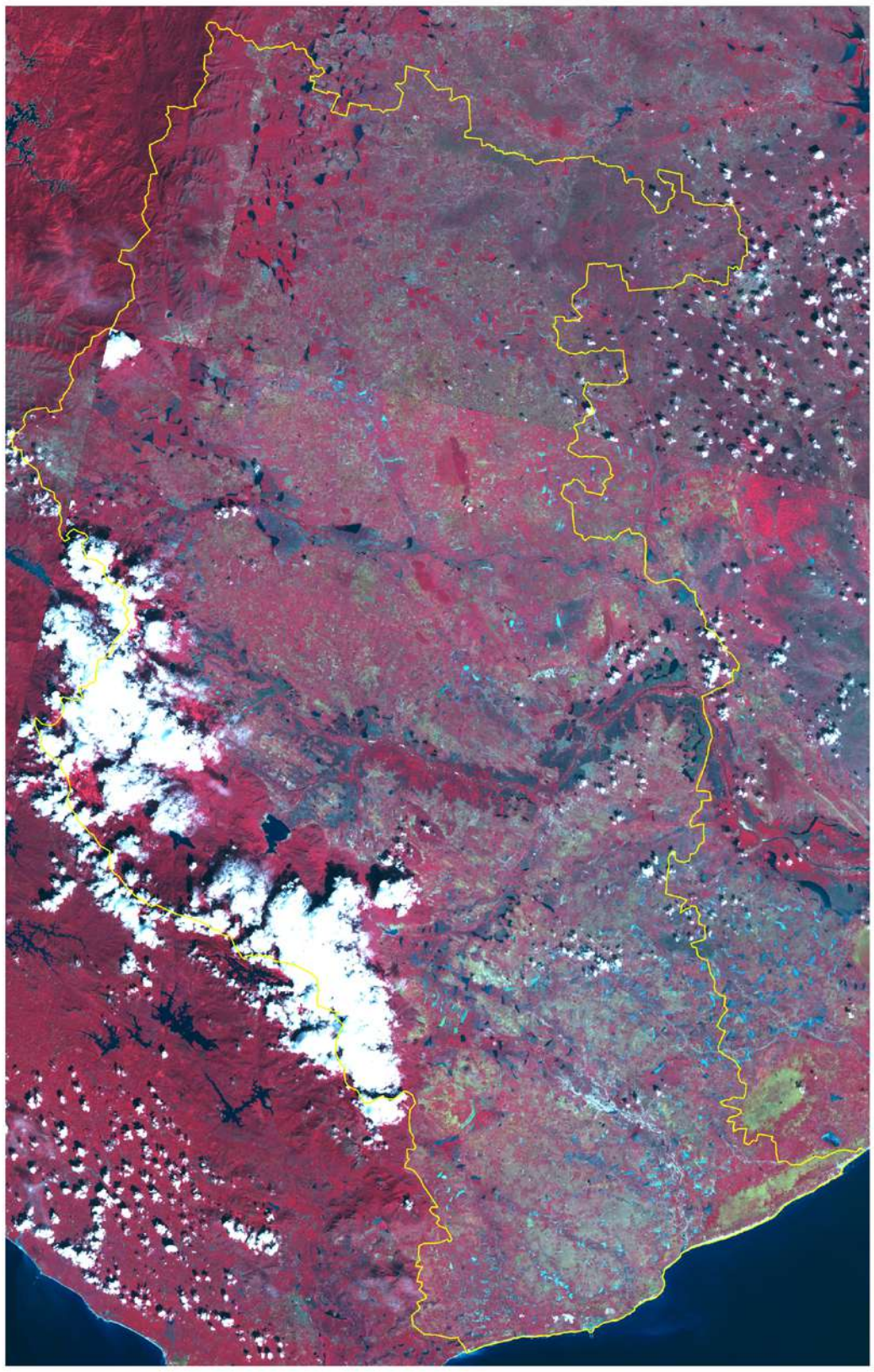
Space Applications Centre (ISRO), Ahmedabad
and
Institute of Remote Sensing, Anna University, Chennai

Sponsored By:

Ministry of Environment and Forests
Government of India

State : Tamil Nadu

District : Tirunelveli



IRS-P6 LISS-III Post-monsoon data(2006-2007)

7.1.29 Kanniyakumari

Kanyakumari district is located in the southern most region of the state. The district shares common boundary with Tirunelveli District on the North and east. The South Eastern boundary is the Gulf of Mannar. On the South and the South West, the boundaries are the Indian Ocean and the Arabian Sea. On the West and North West it is bounded by Kerala state.

The district offers undulating valleys and plains between the mountainous terrain and the sea - coast. Major tourist attractions in the district include Pechiparai dam, Tirparappu water falls, Muttom beach, Sanguthurai beach, Chothavilai beach, and Bay watch (water theme amusement park).

Total geographic area of Kanyakumari is 1672 km². As per the 2001 census data, the population of the district was 16,76,034. The density of population was 990 persons per km² and literacy rate of the district was 90%.

Total area under wetland is 7937 ha, which includes 654 small wetland (<2.25 ha). Major wetland types of the district are Reservoirs (3747 ha), Tanks/ponds (1109 ha), River/Stream (799 ha) and Inter-tidal mudflats (409 ha). Details of wetland statistics is given in Table 35.

Aquatic vegetation is observed in Lakes/Ponds, and Tanks/Ponds. The area under aquatic vegetation is more during pre monsoon (2499 ha) than that of post monsoon (524 ha). The open water spread significantly lower during pre monsoon (3549 ha) compared to post monsoon (5609 ha).

Table 35: Area estimates of wetlands in Kanniyakumari

Area in ha

Sr. No.	Wettcode	Wetland Category	Number of Wetlands	Total Wetland Area	% of wetland area	Open Water	
						Post-monsoon Area	Pre-monsoon Area
	1100	**Inland Wetlands - Natural**					
1	1101	Lakes/Ponds	7	359	4.52	270	217
2	1106	River/Stream	8	799	10.07	790	782
	1200	**Inland Wetlands -Man-made**					
3	1201	Reservoirs/Barrages	6	3747	47.21	3744	1907
4	1202	Tanks/Ponds	135	1109	13.97	672	497
		Total - Inland	**156**	**6014**	**75.77**	**5476**	**3403**
	2100	**Coastal Wetlands - Natural**					
5	2101	Lagoons	1	3	0.04	2	3
6	2103	Sand/Beach	5	714	9.00	-	-
7	2104	Intertidal mud flats	6	409	5.15	-	-
	2200	**Coastal Wetlands - Man-made**					
8	2202	Aquaculture ponds	2	143	1.80	131	143
		Total - Coastal	**14**	**1269**	**15.99**	**133**	**146**
		Sub-Total	**170**	**7283**	**91.76**	**5609**	**3549**
		Wetlands (<2.25 ha), mainly Tanks	654	654	8.24	-	-
		Total	**824**	**7937**	**100.00**	**5609**	**3549**

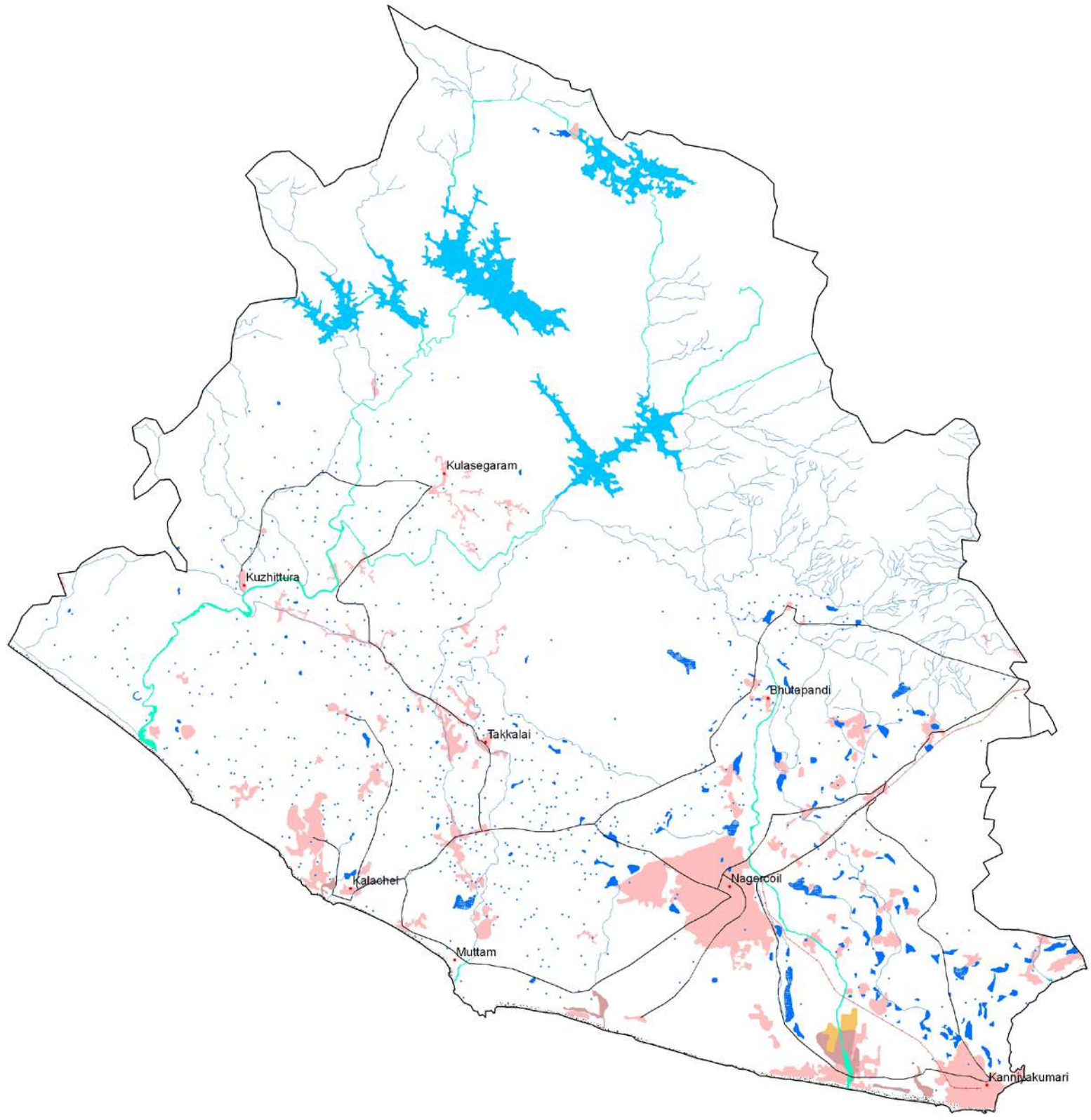
Area under Aquatic Vegetation	524	2499

Area under turbidity levels		
Low	4026	2119
Moderate	1201	1086
High	382	344

State : Tamil Nadu

WETLAND MAP

District : Kanniyakumari

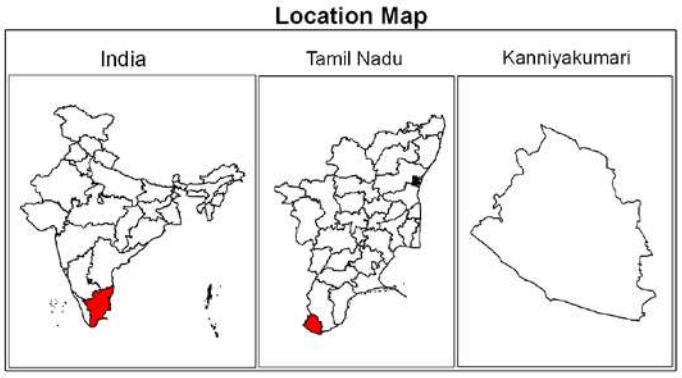


Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25ha)
- Drainage (line)
- Major Roads
- Railway
- Settlements
- Town/Settlements
- District Boundary
- State Boundary
- International Boundary

Location Map



4 2 0 4 8 Kilometers

Data Source :

IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

Prepared By :

Space Applications Centre (ISRO), Ahmedabad
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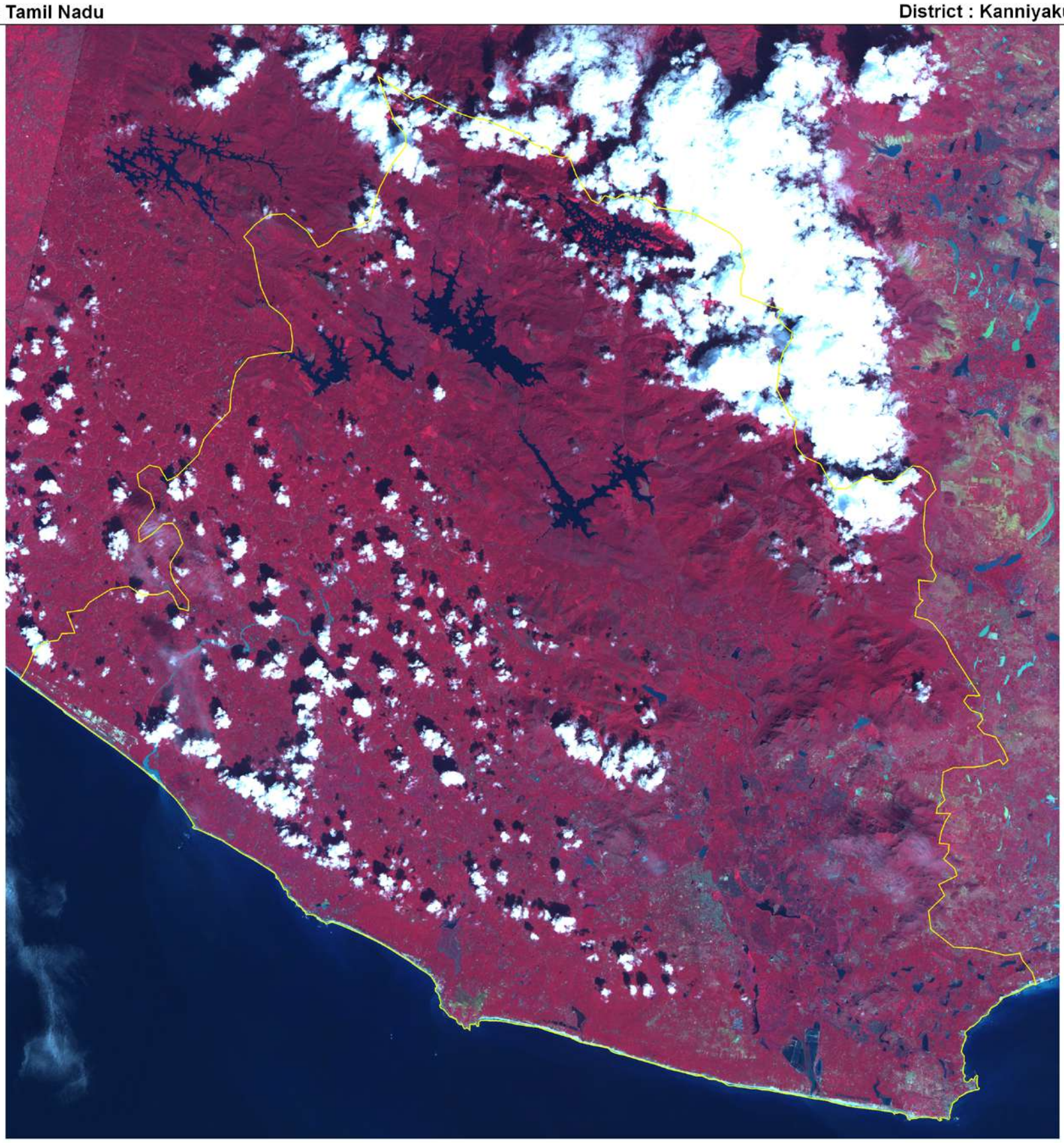
Sponsored By:

Ministry of Environment and Forests
Government of India

State : Tamil Nadu

District : Kanniyakumari



IRS-P6 LISS-III Post-monsoon data(2006-2007)

MAJOR WETLAND TYPES

8.0 MAJOR WETLAND TYPES OF TAMILNADU

Major wetland types observed in the state are Tanks/Ponds, Mud flats Salt pans. Details are given in Plates 1a and 1b. Ground truth data was collected for selected wetland sites. The standard proforma was used to record the field data. Field photographs are also taken to record the water quality (subjective), status of aquatic vegetation and water spread. The location of the features was recorded using GPS. Field photographs of different wetland types are shown in Plates 2a-2g.

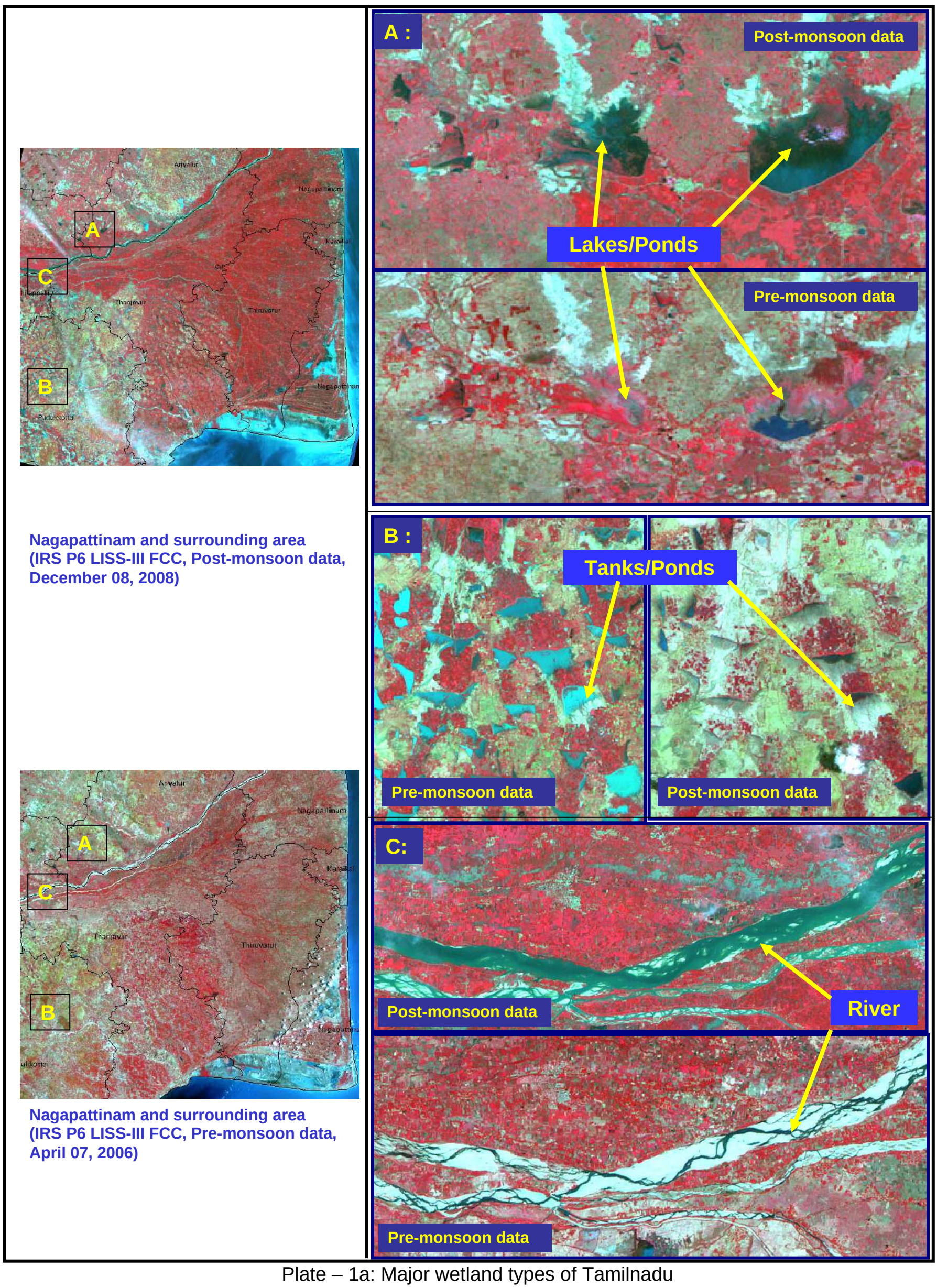
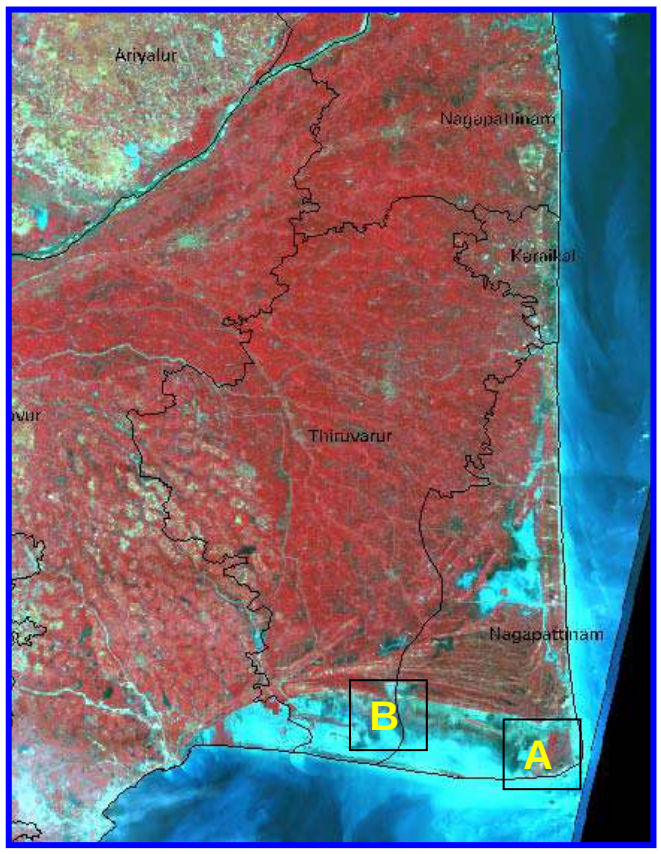
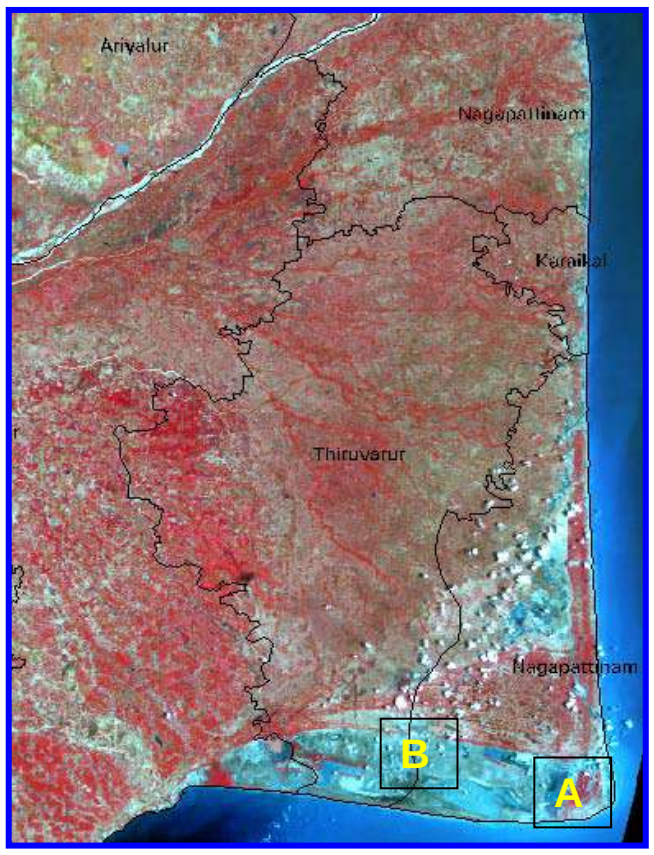


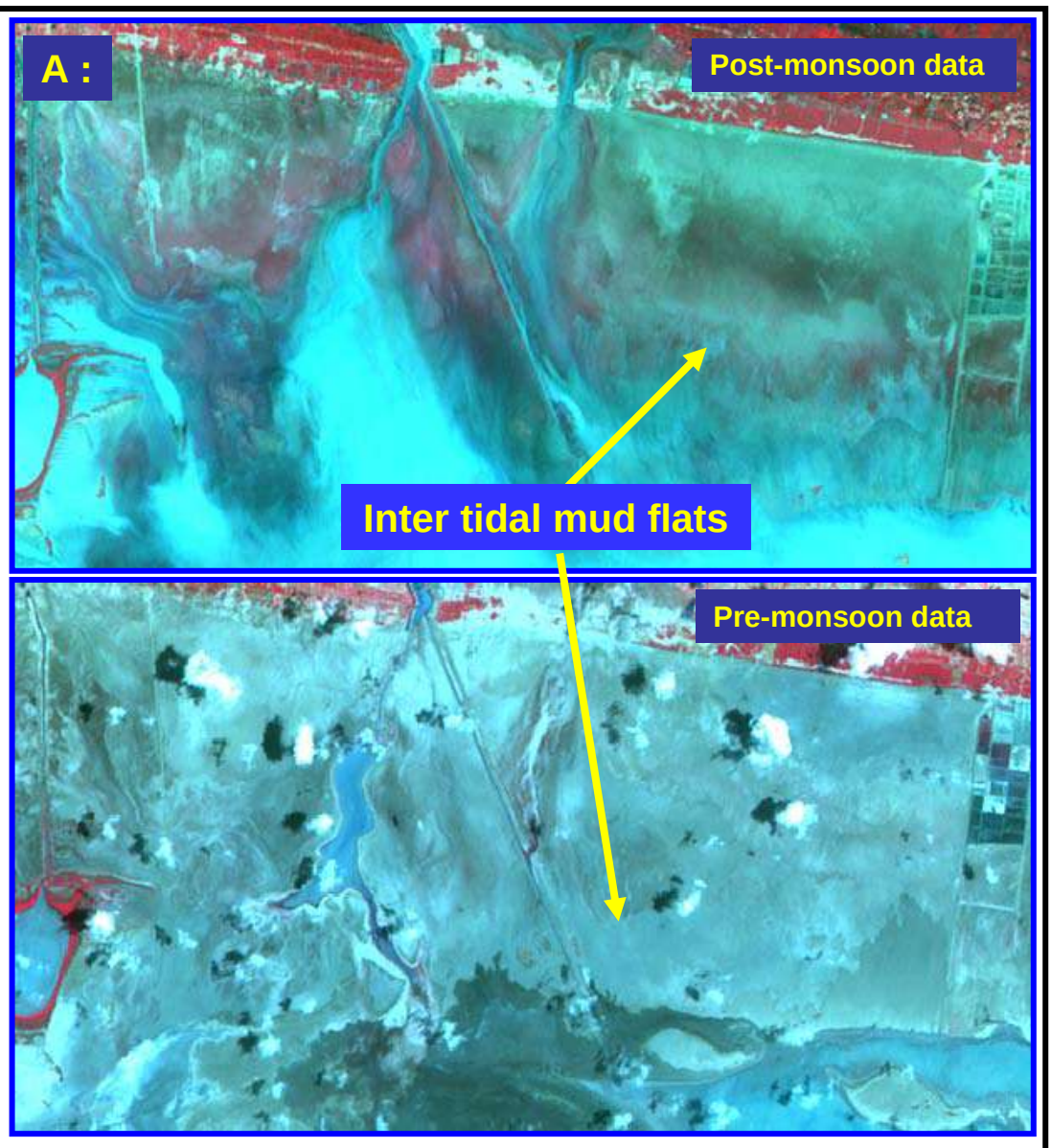
Plate – 1a: Major wetland types of Tamilnadu



Nagapattinam and surrounding area
(IRS P6 LISS-III FCC, Post-monsoon data, December 08, 2008)



Nagapattinam and surrounding area
(IRS P6 LISS-III FCC, Pre-monsoon data, April 07, 2006)



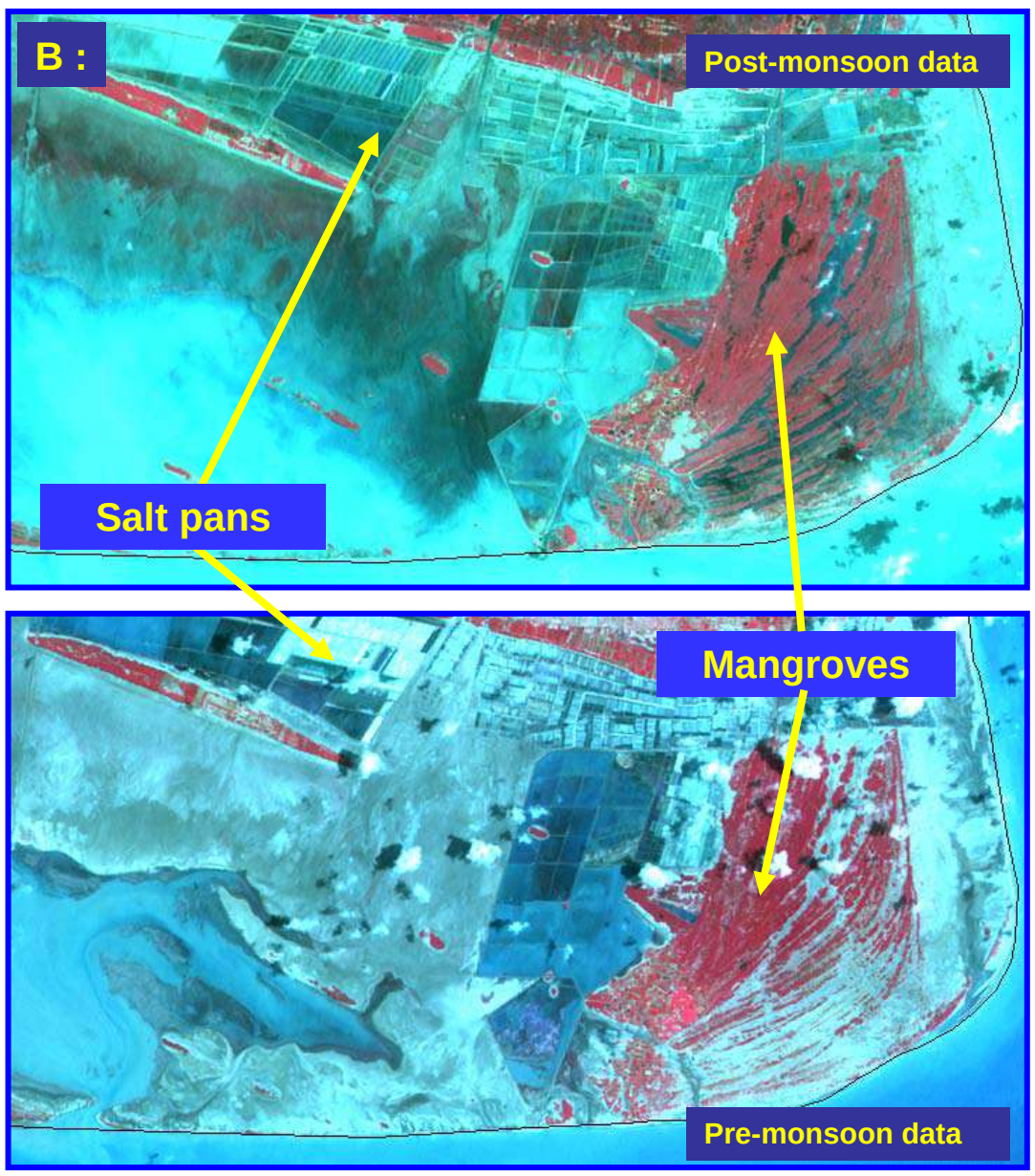


Plate – 1b: Major wetland types of Tamilnadu

Sr. No	Description	Field Photograph
1	**Wetland Type**: Lake (Pulicat Lake) **Location**: Latitude : 09º 14' 56.74" N Longitude : 79º 12' 30.38" E **Aquatic vegetation**: Present (Floating) **Turbidity**: Low	
2	**Wetland Type**: Tanks/Ponds **Location**: Latitude : 13º 08' 53.87" N Longitude : 80º 12' 54.08" E **Aquatic vegetation**: Present (Floating) **Turbidity**: Low	
3	**Wetland Type**: Estuary (Adyar Estuary) **Location**: Latitude : 13º 00' 43.95" N Longitude : 80º 16' 38.10" E **Aquatic vegetation**: Present (Floating) **Turbidity**: Low	
4	**Wetland Type**: Reservoir/Barrages (Kullur Santhai) **Location**: Latitude : 09º 32' 48.0" N Longitude : 77º 58' 38.8" E **Aquatic vegetation**: Nil **Turbidity**: Low	

Plate 2a: Field photographs and ground truth data of different wetland types in Tamilnadu

Sr. No	Description	Field Photograph
5	**Wetland Type**: Mangroves (Pichavaram) **Location**: Latitude : 11º 25' 54.8" N Longitude : 79º 46' 52.3" E **Aquatic vegetation**: Present **Turbidity**: Moderate	
6	**Wetland Type**: Salt pans **Location**: Latitude : 10º 20' 35.6" N Longitude : 79º 49' 36.0" E **Aquatic vegetation**: Nil **Turbidity**: Low	
7	**Wetland Type**: Lake (Ooty) **Location**: Latitude : 11º 24' 27.0" N Longitude : 76º 40' 49.8" E **Aquatic vegetation**: Present (Submerged) **Turbidity**: High	
8	**Wetland Type**: Tanks/Ponds (Birds sanctuary) **Location**: Latitude : 08º 29' 45.4" N Longitude : 77º 45' 33.0" E **Aquatic vegetation**: Nil **Turbidity**: Moderate	

Plate 2b: Field photographs and ground truth data of different wetland types in Tamilnadu

Sr. No	Description	Field Photograph
9	**Wetland Type**: Reservoir/Barrages (Sathanur) **Location**: Latitude : 12º 11' 50.28" N Longitude : 78º 51' 19.44" E **Aquatic vegetation**: Nil **Turbidity**: Low	
10	**Wetland Type**: Tanks/Ponds (Cemparambakkam Tank) **Location**: Latitude : 13º 01' 20.00" N Longitude : 80º 01' 01.00" E **Aquatic vegetation**: Present (Floating) **Turbidity**: Low	
11	**Wetland Type**: Estuary (Kliveli Tank) **Location**: Latitude : 12º 12' 08.51" N Longitude : 79º 57' 43.60" E **Aquatic vegetation**: Present (Floating) **Turbidity**: Low	
12	**Wetland Type**: Lake (Osteri Lake) **Location**: Latitude : 11º 56 19.3" N Longitude : 79º 45' 00.0" E **Aquatic vegetation**: Present **Turbidity**: High	

Plate 2c: Field photographs and ground truth data of different wetland types in Tamilnadu

Sr. No	Description	Field Photograph
13	**Wetland Type**: Reservoir/Barrages (Bhavani Sagar) **Location**: Latitude : 13º 00' 44.63" N Longitude : 77º 03' 14.76" E **Aquatic vegetation**: Present (Emergent and Floating) **Turbidity**: High	
14	**Wetland Type**: Kursadi Island **Location**: Latitude : 09º 14' 56.74" N Longitude : 79º 12' 30.38" E **Aquatic vegetation**: Nil	
15	**Wetland Type**: Tank (Birds Sanctuary) **Location**: Latitude : 09º 21' 28.04" N Longitude : 78º 28' 56.27" E **Aquatic vegetation**: Nil	
16	**Wetland Type**: Tank (Birds Sanctuary) **Location**: Latitude : 10º 05' 58.5" N Longitude : 78º 30 45.36" E **Aquatic vegetation**: Nil **Turbidity**: Moderate	

Plate 2d: Field photographs and ground truth data of different wetland types in Tamilnadu

Sr. No	Description	Field Photograph
17	**Wetland Type**: Reservoir/Barrages (Alliyar Dam) **Location**: Latitude : 10º 28'44.8" N Longitude : 76º 57'37.2" E **Aquatic vegetation**: Nil **Turbidity**: Low	
18	**Wetland Type**: River (Vaigai River) **Location**: Latitude : 10º 2' 58.6" N Longitude : 77º 35' 32.8" E **Aquatic vegetation**: Present (Floating) **Turbidity**: Moderate	
19	**Wetland Type**: Reservoir/Barrages (Manjalar Reservoir) **Location**: Latitude : 10º 11' 39.7" N Longitude : 77º 37' 58.3" E **Aquatic vegetation**: Nil **Turbidity**: Low	
20	**Wetland Type**: Tanks/Ponds (Sengulathu kanmai) **Location**: Latitude : 10º 09' 01.4" N Longitude : 77º 40' 13.7" E **Aquatic vegetation**: Present (Floating) **Turbidity**: Low	

Plate 2e: Field photographs and ground truth data of different wetland types in Tamilnadu

Sr. No	Description	Field Photograph
21	**Wetland Type**: Lake (Kodaikanal Lake) **Location**: Latitude : 10º 14' 15.0" N Longitude : 77º 29' 20.1" E **Aquatic vegetation**: Nil **Turbidity**: Low	
22	**Wetland Type**: Tanks/Ponds (Vaiyapurikulam) **Location**: Latitude : 10º 26' 51.0" N Longitude : 77º 30' 54.1" E **Aquatic vegetation**: Nil **Turbidity**: Low	
23	**Wetland Type**: Reservoir/Barrages (Pykara Reservoir) **Location**: Latitude : 11º 27' 20.0" N Longitude : 76º 35' 56.4" E **Aquatic vegetation**: Nil **Turbidity**: Moderate	
24	**Wetland Type**: River/Stream **Location**: Latitude : 08º 16' 28.2" N Longitude : 77º 09' 40.7" E **Aquatic vegetation**: Present (Floating) **Turbidity**: Moderate	

Plate 2f: Field photographs and ground truth data of different wetland types in Tamilnadu

Sr. No	Description	Field Photograph
25	**Wetland Type**: Oxbow Lake **Location**: Latitude : 08º 15' 53.6" N Longitude : 77º 09' 31.4" E **Aquatic vegetation**: Present (Emergent and Floating) **Turbidity**: High	
26	**Wetland Type**: Sand/Beach **Location**: Latitude : 08º 07' 27.2" N Longitude : 77º 18' 47.7" E **Aquatic vegetation**: Nil	
27	**Wetland Type**: Salt pans **Location**: Latitude : 08º 07' 03.4" N Longitude : 77º 29' 15.0" E **Aquatic vegetation**: Nil	
28	**Wetland Type**: River (Thamirabarani) **Location**: Latitude : 08º 42' 30.5" N Longitude : 77º 22' 00.6" E **Aquatic vegetation**: Nil **Turbidity**: Moderate	

Plate 2g: Field photographs and ground truth data of different wetland types in Tamilnadu

IMPORTANT WETLANDS OF TAMILNADU

9.0 IMPORTANT WETLANDS OF TAMILNADU

The state has a number of rivers, estuaries and lagoons. The rivers flow west to east towards the Bay of Bengal. Some of the important rivers are Kaveri, Vaigai, Tampraparni, Periyar, Pennar. The River Kaveri is the major estuary in Tamil Nadu and the minor estuaries include Vellar, Pazhayar, Adyar etc. Pulicat Lake, Pichavaram Mangrove, Point Calimere Wildlife and Bird Sanctuary, Chembarambakam Tank, Kaliveli Tank, Sathanur Reservoir, Bhavanisagar Reservoir, Gulf of Mannar Marine National Park, Siruthavur Tank, Vedanthangal Tank, Vettakudi-Karavetti Reservoir, Madurai Tanks, Vettangudi Tanks, and Karungulam Tank are some of the important wetland sites of Tamilnadu.

Extensive field work was carried out for these wetland areas. Wetland maps have been prepared for 5km buffer area of each wetland sites. Details of the wetlands and wetland maps of 5 km buffer area are shown in plates 3 to 26.

Pichavaram Mangroves: Pichavaram mangrove situated near Killai and Chidambaram, Cuddalore district, and about 200 km South of Chennai City. The forest occurs on 51 islets and the total area of the Vellar-Pichavaram Coleroon estuarine complex is more than 2300 ha of which only 570.75 ha is occupied by mangrove vegetation. The southern part near the Coleroon estuary is predominantly, mangrove vegetation, while the northern part near the Vellar estuary is dominated by mud-flats. The depth of the water-ways ranges from about 0.3 to 3 m.

Point Calimere Wildlife and Bird Sanctuary: Declared as Ramsar site on *19/08/02.* The Point Calimere region was first identified as an area of high significance in conservation of birds by the late Dr. Salim Ali in 1962. The Sanctuary may be divided into three divisions: The Point Calimere Forest, The Great Vedaranyam Swamp, which includes the mangrove forests at Muthupet; and the mangroves of Talaignayar Reserve Forest. A coastal area consisting of shallow waters, shores, and long sand bars, intertidal flats and intertidal forests, chiefly mangrove, and seasonal, often-saline lagoons, as well as human-made salt exploitation sites. Wetland site supports large number of species of waterfowl (both resident and migratory) in large numbers. The site serves as the breeding ground or nursery for many commercially important species of fish, as well as for prawns and crabs. The spread of *Prosopis chilensis* (Chilean mesquite), increasingly brackish groundwater caused by expansion of the historical salt works, and decreasing inflow of freshwater are all seen as potential causes for concern. Visitors come to the site both for recreation and for pilgrimage, as it is associated with Lord Rama.

Pulicat lake : It straddles the border of Tamil Nadu and Andhra Pradesh states on the Coromandal Coast in South India. Approximately 84% of the lagoon lies in the state of Andhra Pradesh and the rest in Tamil Nadu (5324 ha). It is an extensive brackish to saline lagoon with associated marshes and a massive fresh to brackish swamp to the north. Pulicat is the second largest salt-water lagoon in India. It is fed by two rivers, one at the southern tip (Arani river), and the other from the northwest (Kalangi river). The eastern boundary of the lagoon is formed by the spindle-shaped Sriharikotta Island, which separates the lagoon from the Bay of Bengal. A navigation channel, the Buckingham Canal, runs through the lagoon on the western side of this island. The lagoon is shallow, with large areas of mudflats and sandflats. There are two connections with the sea; in general, sea water enters the lagoon through the channel at the north end of Sriharikotta Island, and flows back into the Bay of Bengal through the channel at the south end. There are two large islands, Irrukam and Venadu, and several smaller islands in the northern part of the lagoon. Wetland support wide variety of resident and migratory waterfowl.

Gulf of Mannar Marine National park : A Chain of twenty small islands along with two large, shallow, sea bays, Palk Bay and the Gulf of Mannar are called the Gulf of Mannar Marine National Park. The relatively calm and silt-free waters between the coastline and offshore coral reefs offer ideal conditions for the growth of luxuriant meadows of sea-grass. These meadows support a dwindling population of the dugong (*Dugong dugon*), the conservation of which is one of the principal aims of the National Park. The Park contains impressive fringing reefs and the best coral formations on the east coast of India. There is only one reef in Palk Bay, which lies in an east-west direction along the mainland at Mandapam and Rameshwaram island, The reef formation in the Gulf of Mannar is of fringing type, developed around a chain of 20 islands from Tuticorin to Shingle island. In addition, a 2 km shore reef, the only one known so far in the Gulf of Mannar, exists at Kilakkarai.

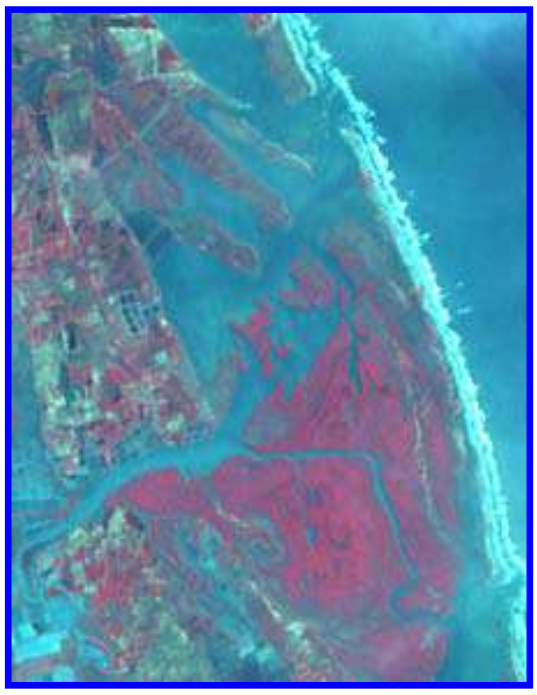
Madurai Tanks: The wetland area extents 2064.97 ha near Madurai city. Wetland site supports large number of species of waterfowl (both resident and migratory) in large numbers.

Other than above, Sathanur Reservoir (2203.81 ha), Kullur Santhai Reservoir (741.3 ha) and Koothakulam and near by tanks (105.05 ha) are some of the important wetlands.

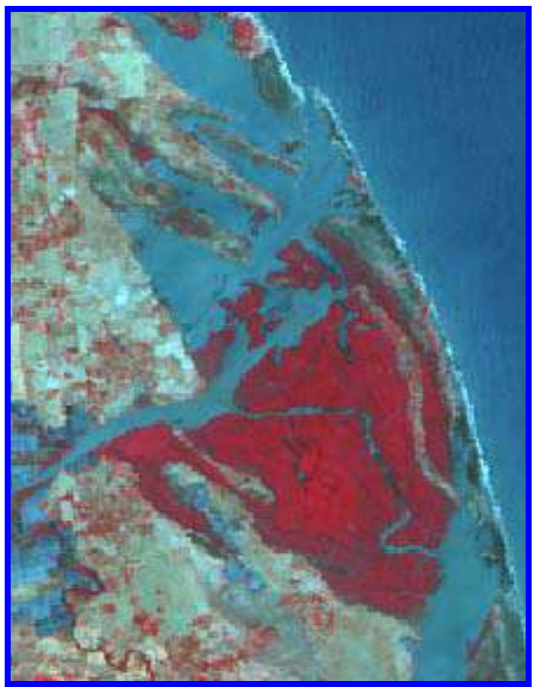
Extensive field work was carried out for these wetland areas. Wetland maps have been prepared for 5km buffer area of each wetland sites. Details of each wetland and wetland map of 5 km buffer area are shown in plates 3 to 26.

9.1 Pichavaram Mangroves

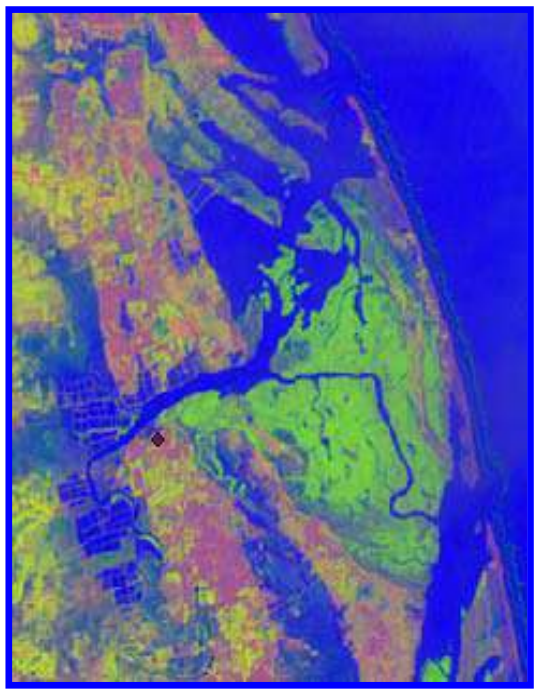
Name	Pichavaram Mangroves
Location	79^{o} 46' E to 79^{o} 48' E longitude and 11^{o} 24' N to 11^{o} 26' N latitude Situated 14 km from Chidambaram in the Cuddalore District, Tamilnadu
Area	570.75 ha
Wetland Type	Natural wetland - Mangrove
Climate	Tropical monsoon climate. The temperature varied from 28 to 33°C in atmosphere and 26 to 30°C in water. Annual rainfall is 1200 mm.
Vegetation	The mangrove forest trees are permanently rooted in a few feet of water. More than 20 Seaweed and seagrass species observed in the wetland area. Mangrove species like *Acanthus ilicifolius,Lumnitzera racemosa, Aegiceras corniculatum, Rhizophora annamalayana, Avicennia marina, R. apiculata, A. officinalis R. mucronata, Bruguiera cylindrical, Sonneratia apetala, Ceriops decandra and Xylocarpus mekongensis exists in large numbers.*
Fauna	Pichavaram is an extremely important area for a wide variety of resident and migratory waterfowl. Numerous birds like Water snips, Cormorants, Egrets, Storks, Herons, Spoonbills and Pelicans have been observed.



Post monsoon data (2005)



Pre monsoon data (2007)



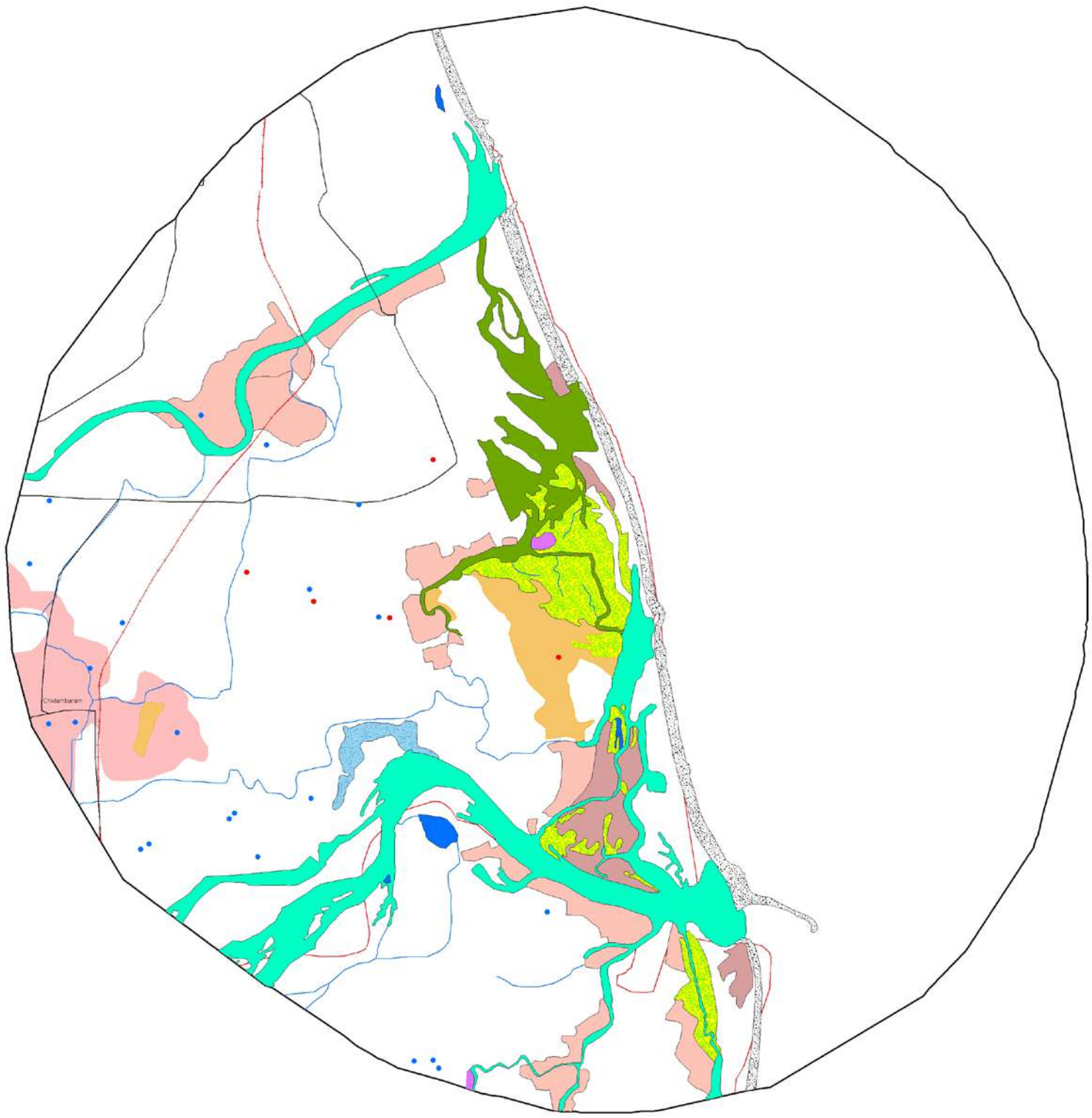
Indices image
Post monsoon data (2005)

Plate 3: Pichavaram Mangroves

State : Tamil Nadu

WETLAND MAP

Pichavaram Mangroves

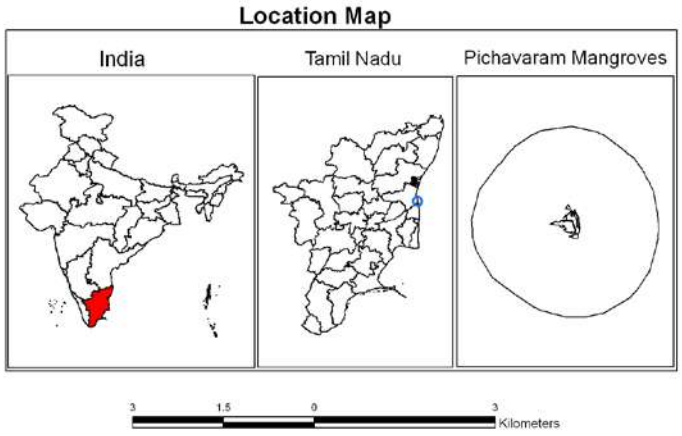


Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25ha)
- Roads
- Railway
- Drainage (line)
- Settlements
- Town/Settlements
- District Boundary

Location Map



Data Source :

IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

Prepared By :

Space Applications Centre (ISRO), Ahmedabad
and
Institute of Remote Sensing, Anna University, Chennai

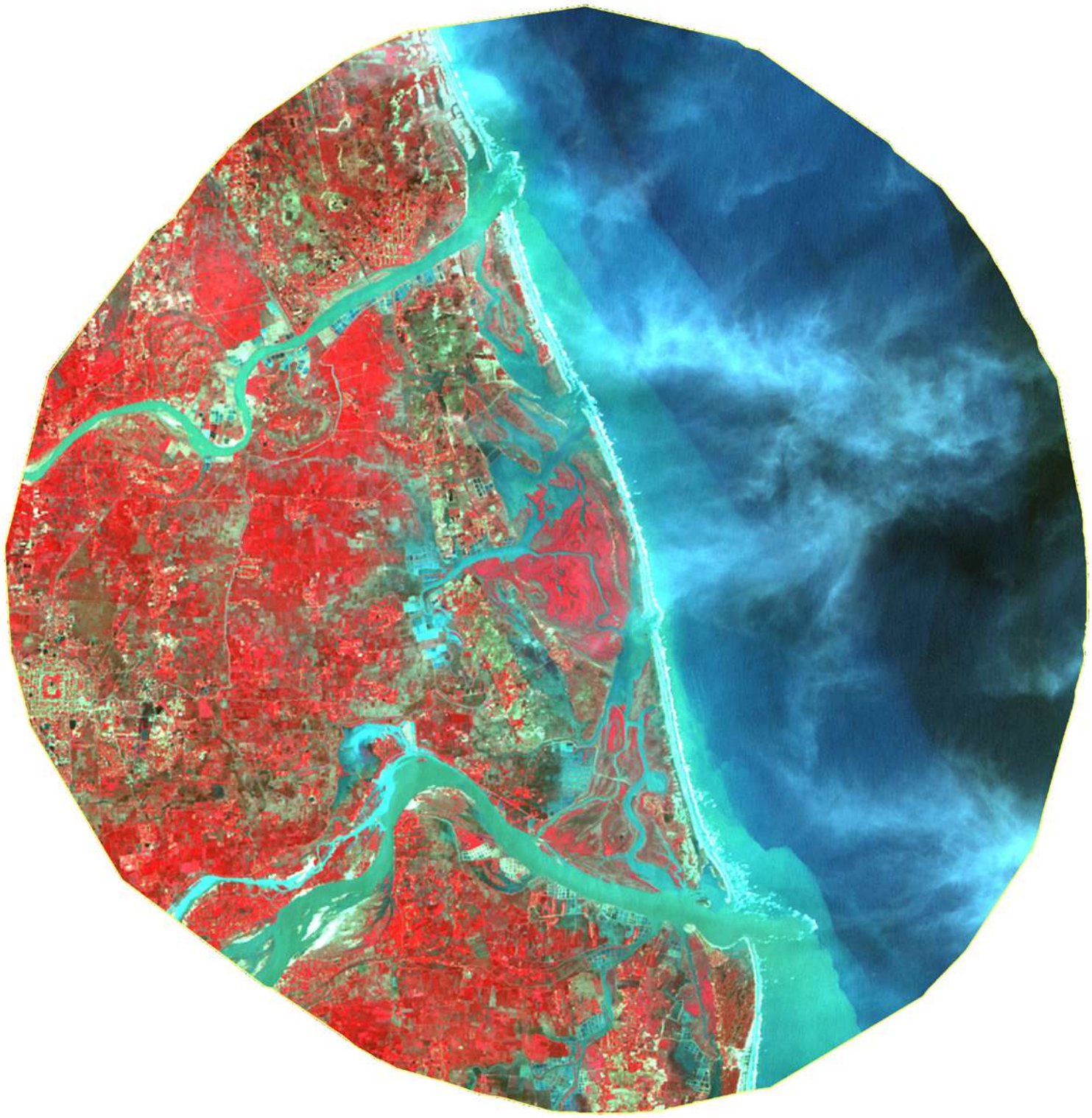
Sponsored By:

Ministry of Environment and Forests
Government of India

Plate 4: Wetland map - 5 km buffer area of Pichavaram Mangroves

State : Tamil Nadu

Pichavaram Mangroves



IRS P6 LISS-III post-monsoon data (2006)

Plate 5: IRS LISS III FCC - 5 km buffer area of Pichavaram Mangroves

9.2 Point Calimere Wildlife and Bird Sanctuary

Name	Point Calimere Wildlife and Bird Sanctuary
Location	79^{o} 21' E to 79^{o} 53' E longitude and 10^{o} 17' N to 10^{o} 25' N latitude
Area	32010 ha (Lagoon : 15084 ha, Inter tidal mud flats:15626 ha, Salt marsh:454 ha, Mangroves:3433 ha and Salt pans:6972 ha, Others:441 ha)
Wetland Type	Lagoon, Inter tidal mud flats, Mangroves and Salt Pans
Climate	Average annual rainfall 1300 mm. The temperature varied from 25 to 34°C
Vegetation	The dominant trees of the forest are *Manilkara hexandra (*locally called Palai, is the most important dry evergreen species) and *Salvadora persica* in the open areas*.* Insectivorous plants such as *Drosera burmanii* and *D. indica* are also present in the grassland habitat. *Avicennia marina* is the dominant mangrove species in the area. The shrub layer is made up of *Suaeda maritima* and *S. monoica. Excoecaria agallocha* occurs on the river banks, and *Aegiceras corniculatum* and *Acanthus ilicifolius* at the edges, where the tidal influence is pronounced. *Suaeda maritima* and *Excoecharia agallocha* dominate in the back-mangrove areas*.*
Fauna	Wetland is the spawning and / or nursing ground for commercially important prawns (mainly White Prawn *Penaeus indicus* and Tiger Prawn *P. monodon*), crabs (Marsh Crab *Scylla serrata*) and fishes. Number of species of mammals have been reported from the Sanctuary. The larger mammals are the Blackbuck *Antilope cervicapra*, Spotted Deer *Axis axis,* Wild Boar *Sus scrofa* and Jackal *Canis aureus.* The Flying Fox *Pteropus giganteus*roosts in large flocks on trees in the Point Calimere forest and the mangrove forest at Muthupet. The Common Dolphin *Delphinus delphis* is seen near the shore during the monsoon.
	Point Calimere is well known for wide variety of resident and migratory birds.

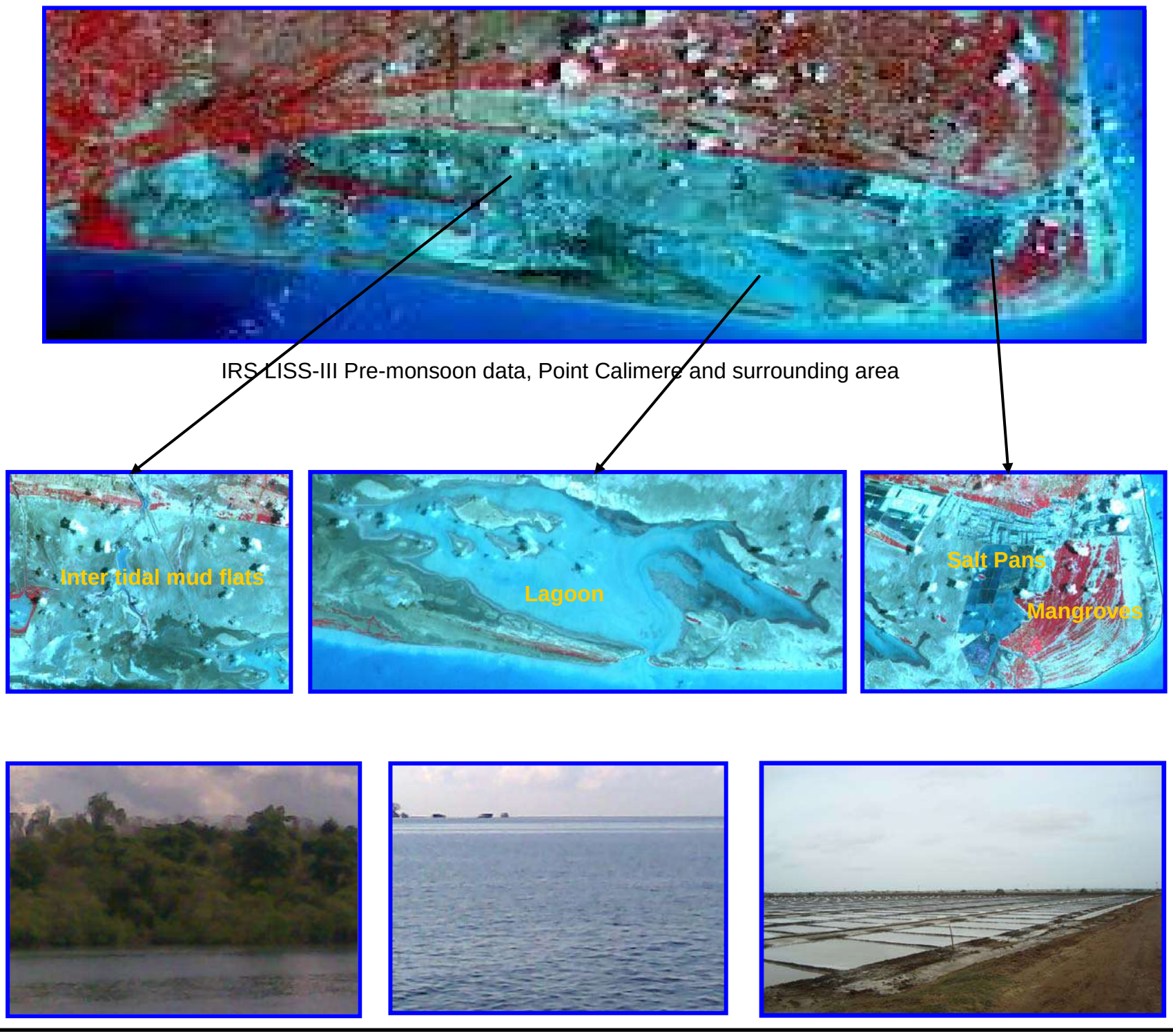
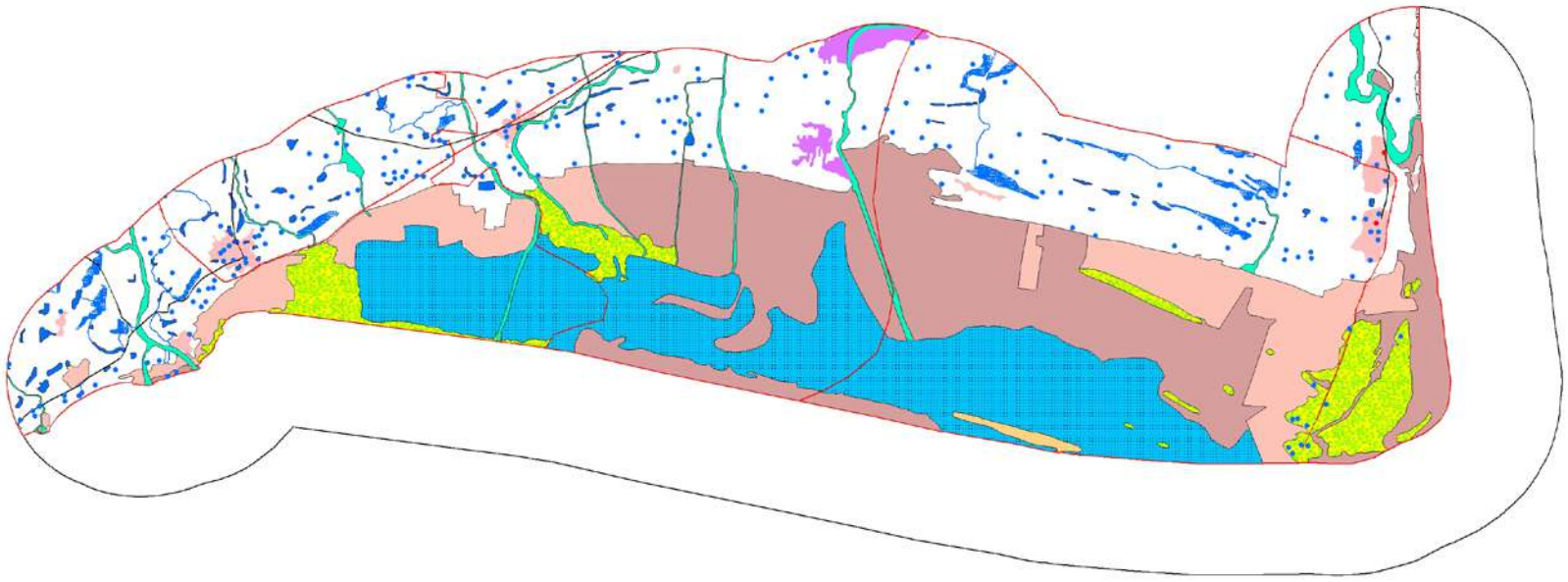


Plate 6: Point Calimere Wildlife and Bird Sanctuary

State : Tamil Nadu

WETLAND MAP

Point Calimere Wildlife and Bird Sanctuary

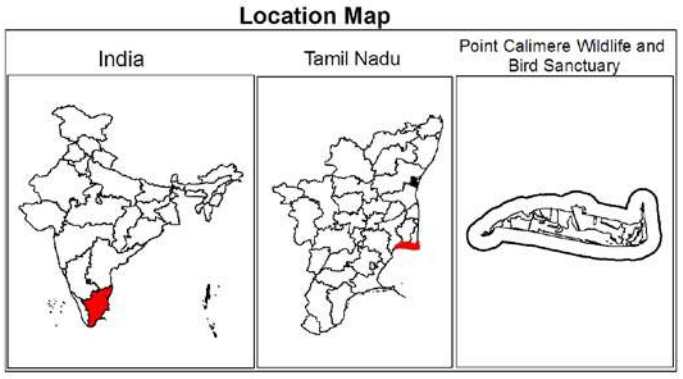


Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25ha)
- Roads
- Railway
- Drainage (line)
- Settlements
- Town/Settlements
- District Boundary

Location Map



10 5 0 10 Kilometers

Data Source :

IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

Prepared By :

Space Applications Centre (ISRO), Ahmedabad
and
Institute of Remote Sensing, Anna University, Chennai

Sponsored By:

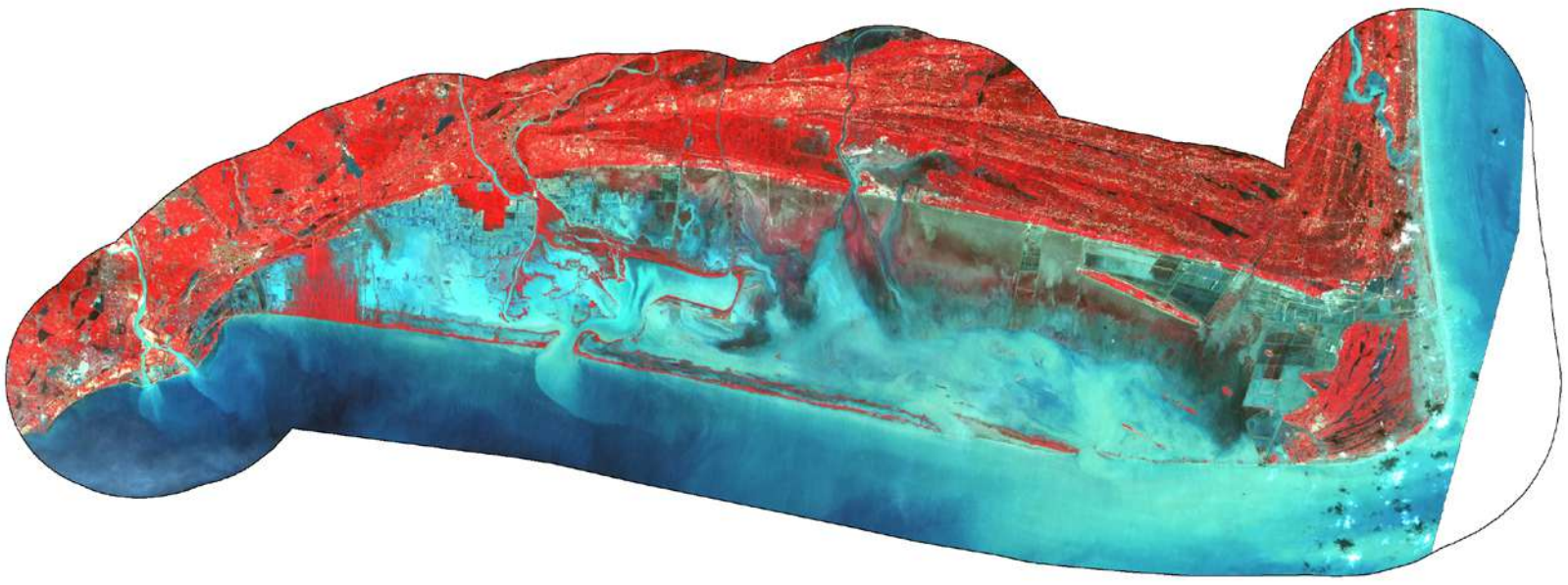
Ministry of Environment and Forests
Government of India

Plate 7: Wetland map - 5 km buffer area of Point Calimere Wildlife and Bird Sanctuary

State : Tamil Nadu

WETLAND MAP

Point Calimere Wildlife and Bird Sanctuary



IRS LISS-III Post-monsoon data (2005)

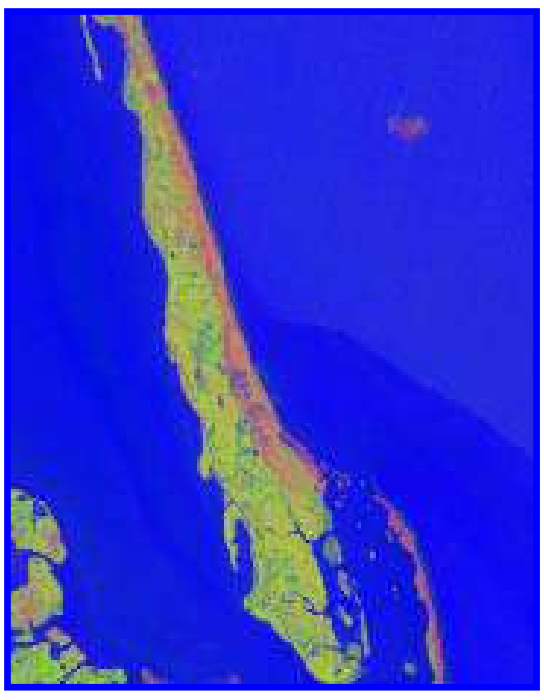
Plate 8: IRS LISS III FCC - 5 km buffer area of Point Calimere Wildlife and Bird Sanctuary

9.3 Pulicat Lake

Name	Pulicat Lake
Location	80^{o} 14' E to 80^{o} 20' E longitude and 13^{o} 23' N to 13^{o} 33' N latitude It straddles the border of Tamil Nadu and Andhra Pradesh states on the Coromandal Coast in South India (approximately 16% of the lagoon lies in the state of Tamilnadu and remaining area lies in the Andhra Pradesh state.
Area	5324 ha (in Tamil Nadu)
Wetland Type	Natural Lake
Climate	Average annual rainfall : 900 mm. The air temperature varied from 15 to 45°C.
Vegetation	The wetland support large number of Algae species including eight Cyanophyceae, seven Chlorphyceae and two Rhodophyceae.and 42 Bacillariophyceae have been recorded. Large areas of the surrounding plains have been invaded by *Prosopis juliflora. Spirulina major, Oscillatoria* spp., *Anabaena* spp., *Rhizosolenia castracanei, Eucampia cornuta,* and *Climacodium fravenfeldianum* are the common phytoplankton.
Turbidity	Low
Fauna	An extremely important area for a wide variety of resident and migratory waterfowl, notably pelicans, herons and egrets, storks, flamingos, ducks, shorebirds, gulls, and terns. Pulicat is the third-most important wetland for migratory shorebirds on the eastern sea- board of India, and is especially important during the spring and autumn migration seasons. The area is rich in birds of prey; *Haliaeetus leucogaster* breeds, and *Pandion haliaetus, Circus* spp., and *Falco peregrinus* appear in winter.
Threats	Siltation causing variation of the lake mouth results in reduction of tidal inflows and consequent decline in stocking of commercially important species of prawns and mullets

Post monsoon data (2005)

Pre monsoon data (2006)



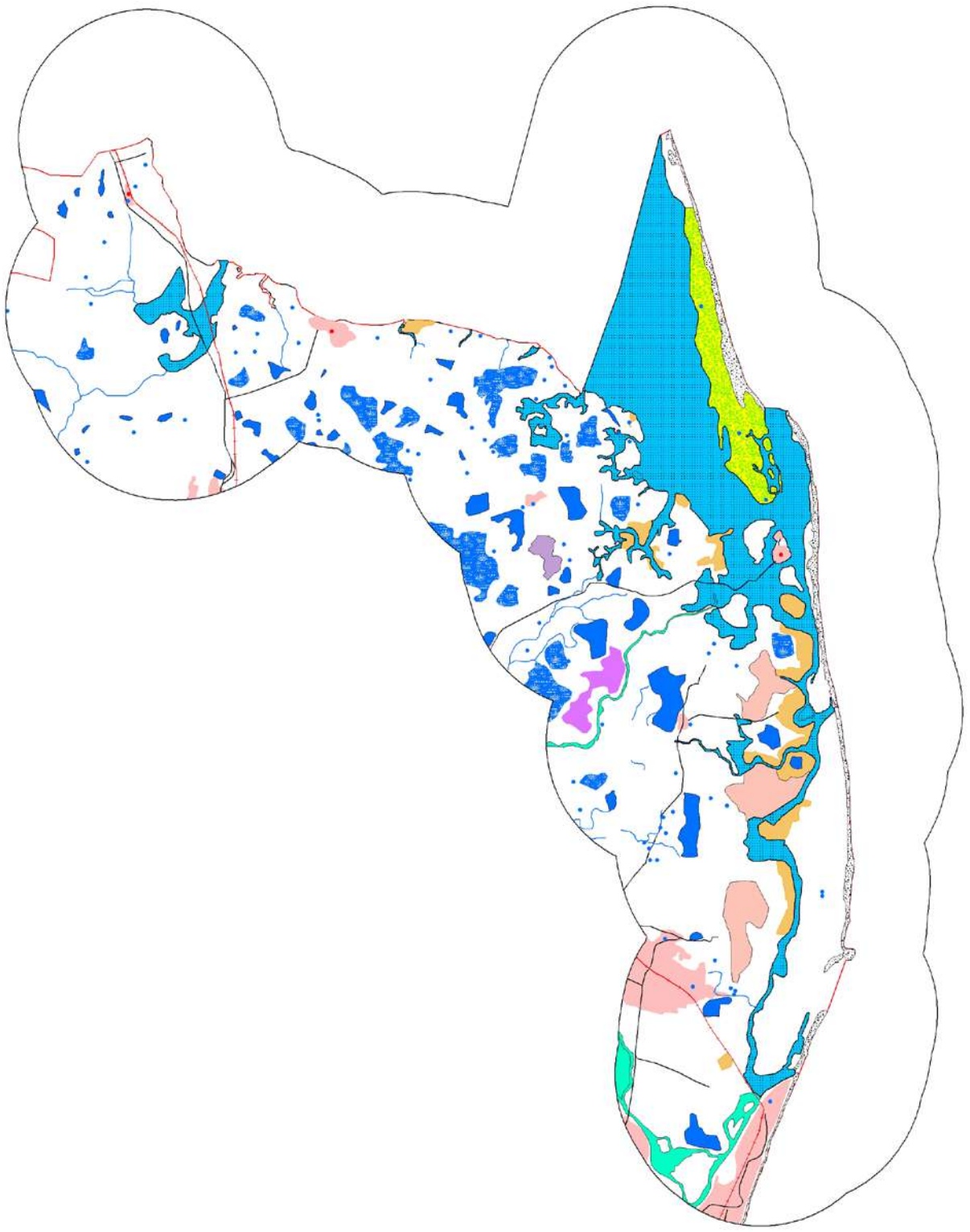
Indices image: Post monsoon data

Plate 9: Pulicat Lake

State : Tamil Nadu

WETLAND MAP

Pulicat Lake

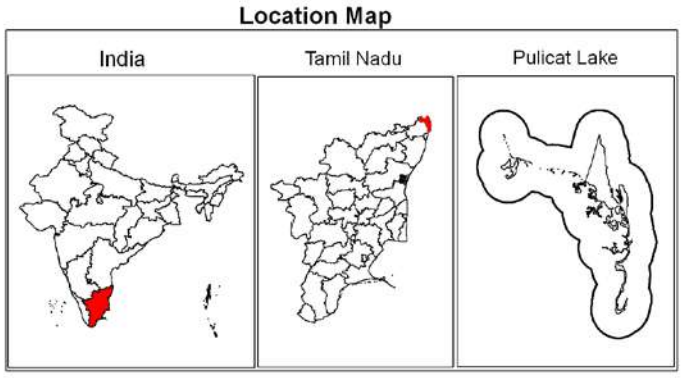


Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25ha)
- Roads
- Railway
- Drainage (line)
- Settlements
- Town/Settlements
- District Boundary

Location Map



8 4 0 8 Kilometers

Data Source :

IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

Prepared By :

Space Applications Centre (ISRO), Ahmedabad
and
Institute of Remote Sensing, Anna University, Chennai

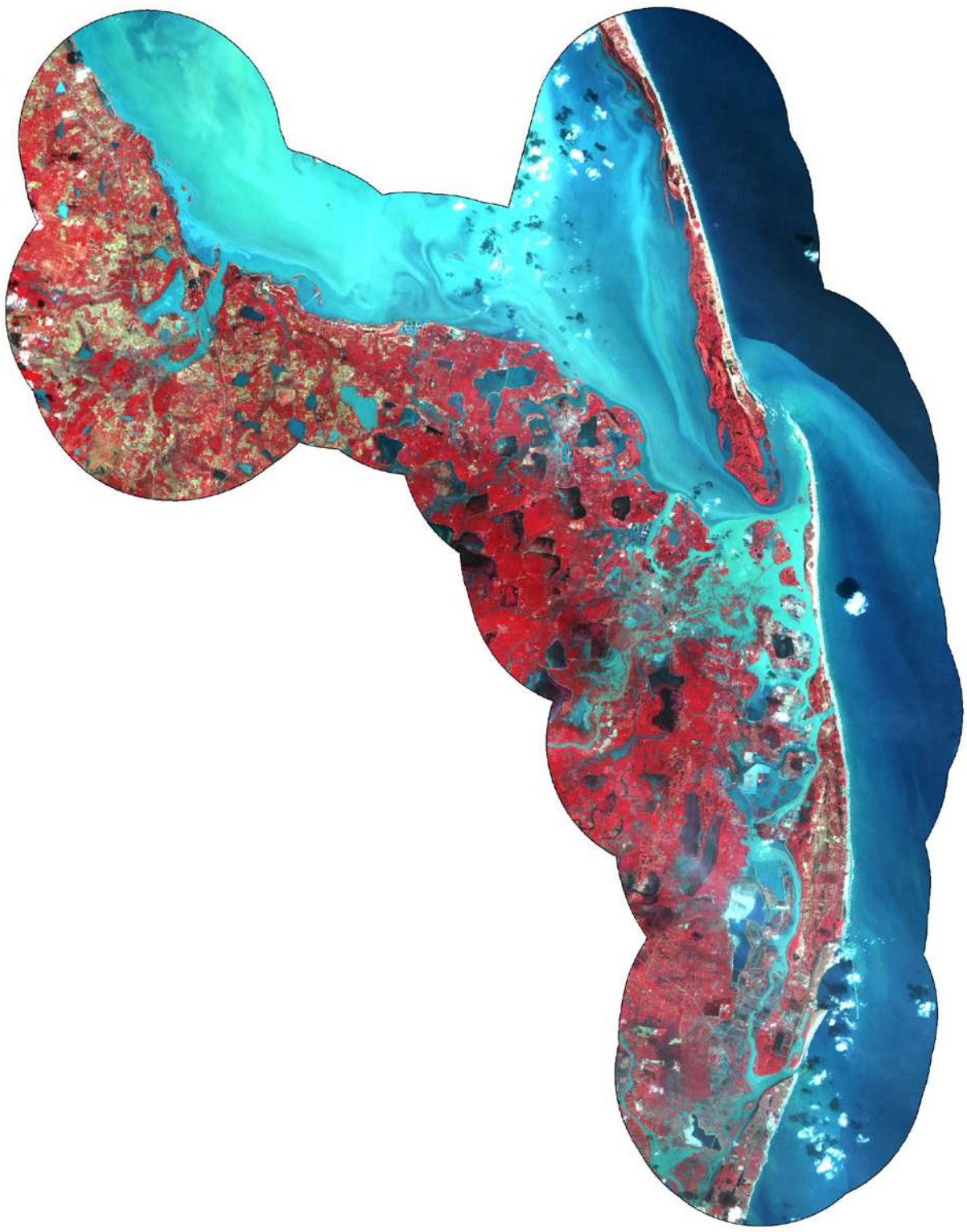
Sponsored By:

Ministry of Environment and Forests
Government of India

Plate 10: Wetland map - 5 km buffer area of Pullicat Lake

State : Tamil Nadu

Pulicat Lake

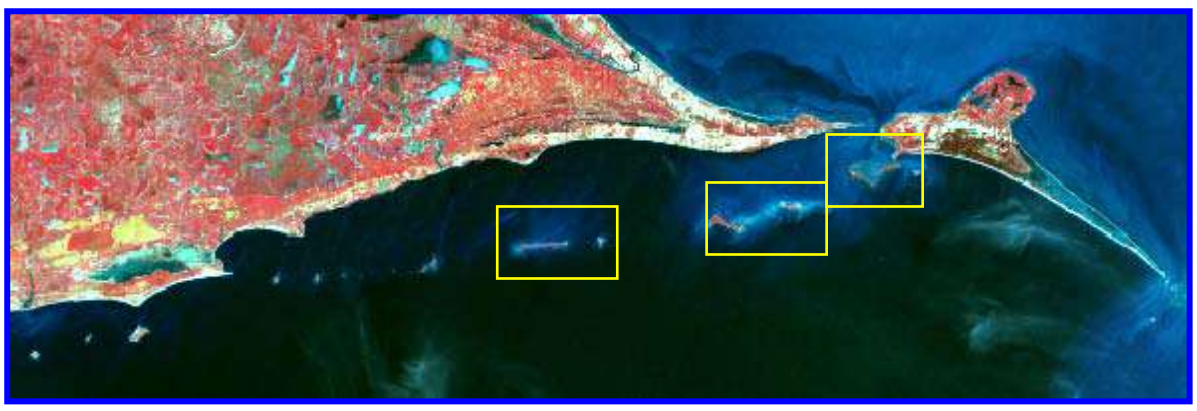


IRS P6 LISS-III Post-monsoon data (2006)

Plate 11: IRS LISS III FCC - 5 km buffer area of Pullicat Lake

9.4 Gulf of Mannar Marine National park

Name	Gulf of Mannar Marine National park
Location	78^{o} 10' E to 79^{o} 32' E longitude and 8^{o} 48' N to 9^{o} 24' N latitude Extends from Rameswaram Island to Tuticorin in a NE-SW direction, cluster of 21 islands
Description	A Chain of twenty small islands along with two large, shallow, sea bays, Palk Bay and the Gulf of Mannar are called the Gulf of Mannar Marine National Park. The relatively calm and silt-free waters between the coastline and offshore coral reefs offer ideal conditions for the growth of luxuriant meadows of sea-grass. These meadows support a dwindling population of the dugong (*Dugong dugon*), the conservation of which is one of the principal aims of the National Park. The Park contains impressive fringing reefs and the best coral formations on the east coast of India. There is only one reef in Palk Bay, which lies in an east-west direction along the mainland at Mandapam and Rameshwaram island, The reef formation in the Gulf of Mannar is of fringing type, developed around a chain of 20 islands from Tuticorin to Shingle island. In addition, a 2 km shore reef, the only one known so far in the Gulf of Mannar, exists at Kilakkarai.
Wetland Type	Island
Climate	Average annual rainfall : 800 mm, Mostly occurring during sep to November.
Vegetation	Vegetation in Gulf of Mannar coastal area is not uniformly spread and in general thorny scrubs that can be said to correspond to group four littoral and swamp forests according to the classification of Champion and Seth (1968). It is characterized by species like *Thespesia Populnea, Acacia Planifrons, Tamarix, Vi-tex negundo* etc. Mangroves and their associated species are seen in Shingle, Kursadi, Kovi, Pumurichan, Manalli and Manalliputti Islands.
Fauna	The Gulf of Mannar is famous for its chank fisheries and pearl fisheries. There are about ten pearl banks in the region.
Threats	The degradation of coral reefs in the Gulf of Mannar has been well noticed.



IRS LISS-III Post monsoon data : Gulf of Mannar Marine National Park

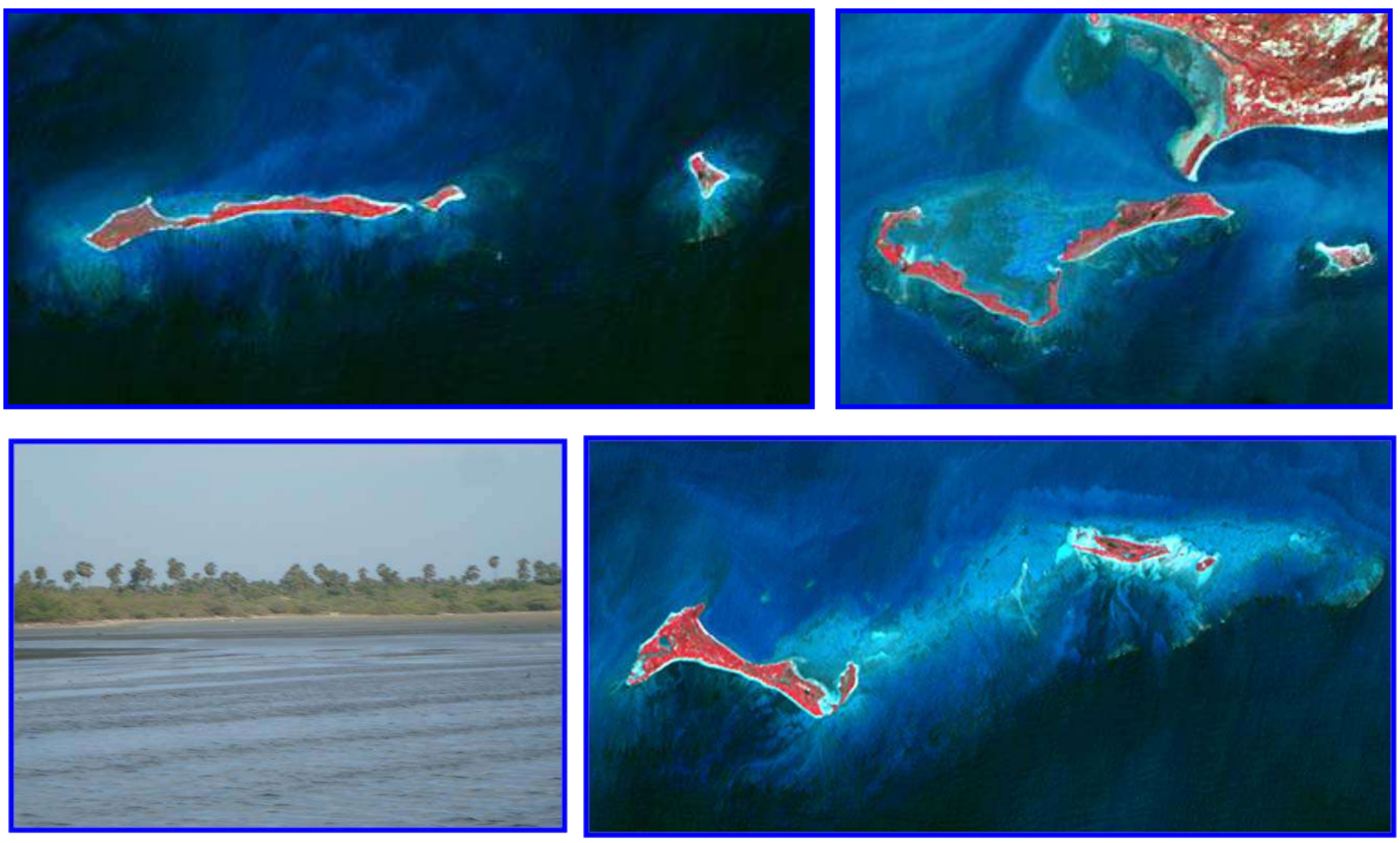
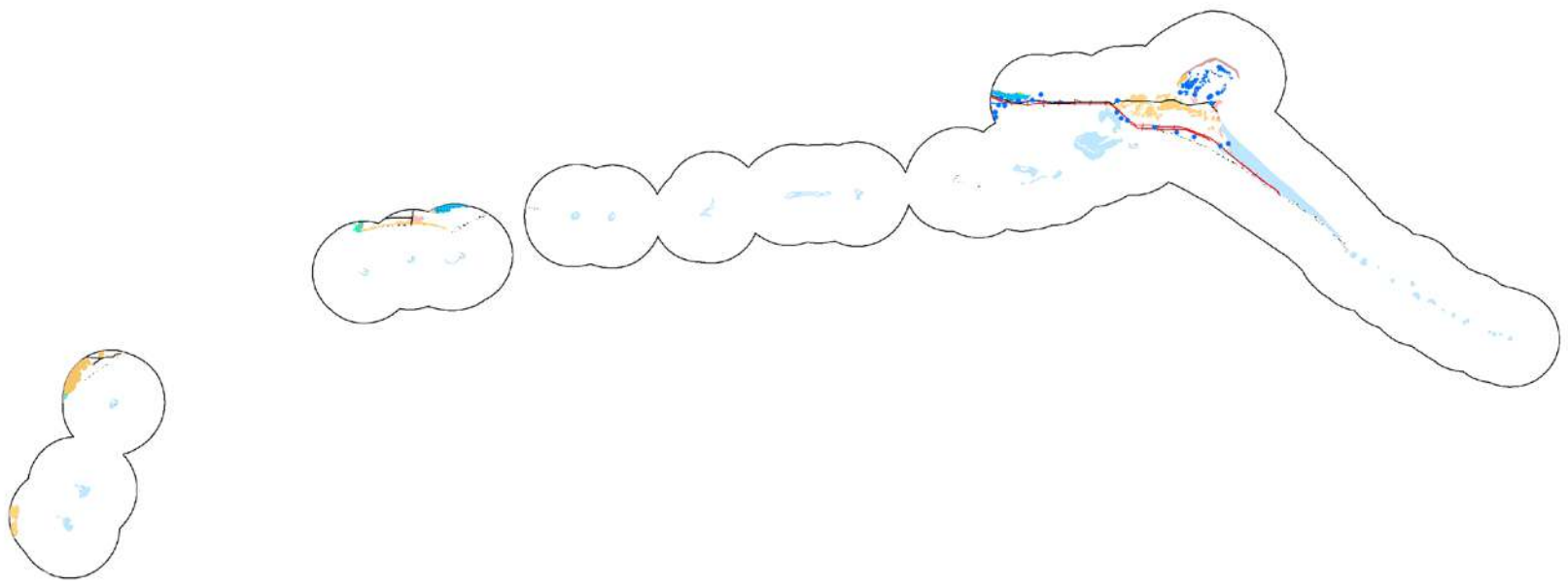


Plate 12: Gulf of Mannar Marine National Park

State : Tamil Nadu

WETLAND MAP

Gulf of Mannar Marine National Park

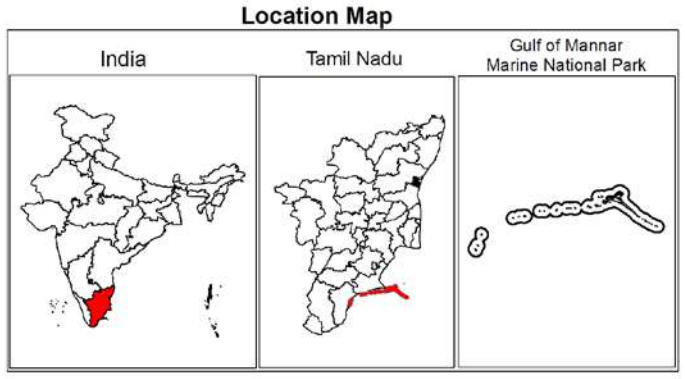


Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25ha)
- Roads
- Railway
- Drainage (line)
- Settlements
- Town/Settlements
- District Boundary

Location Map



20 10 0 20 Kilometers

Data Source :

IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

Prepared By :

Space Applications Centre (ISRO), Ahmedabad
and
Institute of Remote Sensing, Anna University, Chennai

Sponsored By:

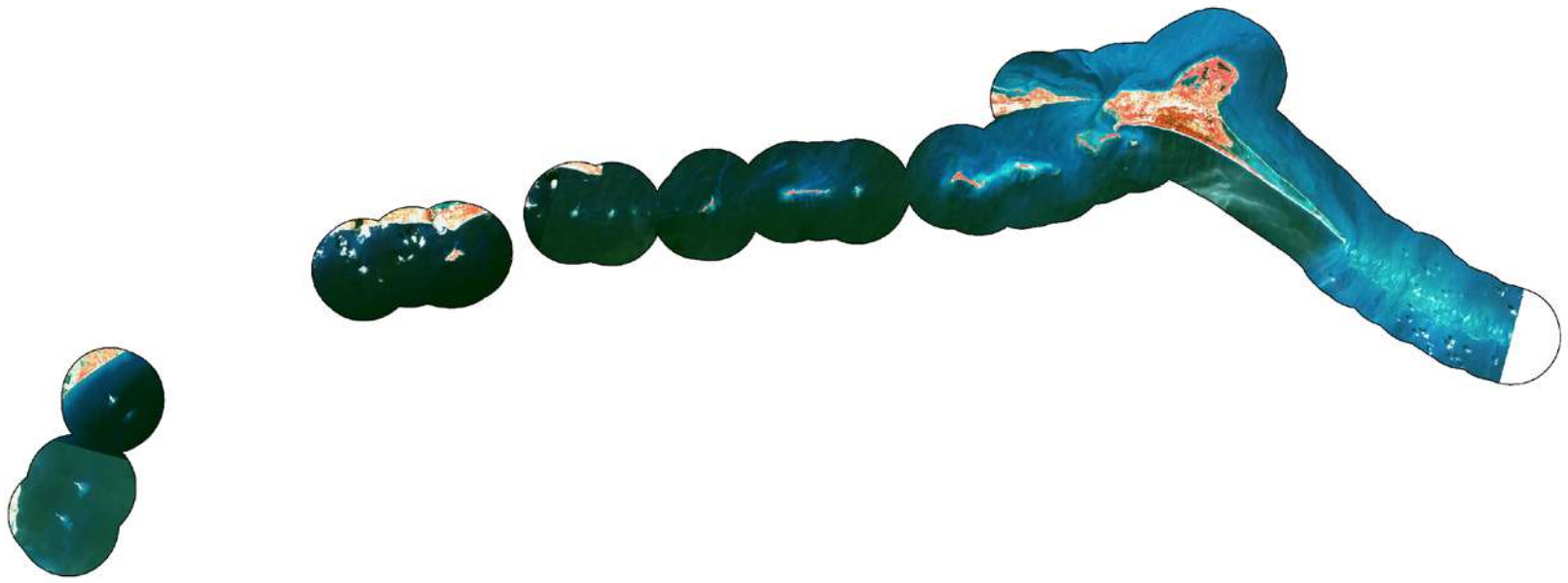
Ministry of Environment and Forests
Government of India

Plate 13: Wetland map - 5 km buffer area of Gulf of Mannar Marine National Park

State : Tamil Nadu

WETLAND MAP

Gulf of Mannar Marine National Park

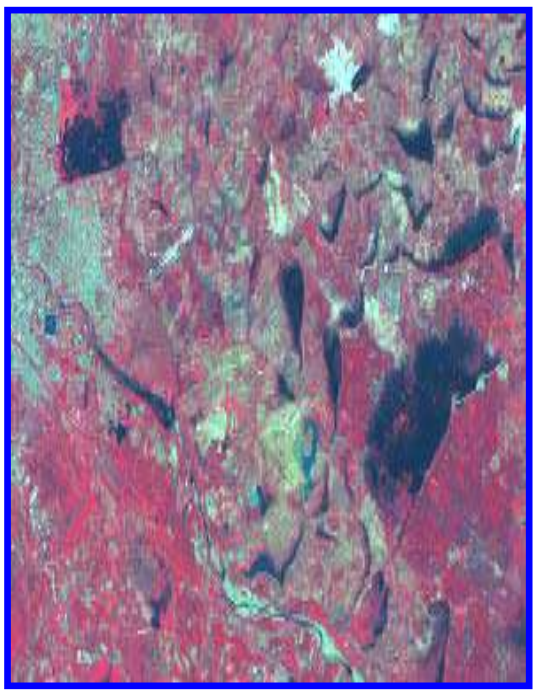


IRS LISS-III Post-monsoon data (2005)

Plate 14: IRS LISS III FCC - 5 km buffer area of Gulf of Mannar Marine National Park

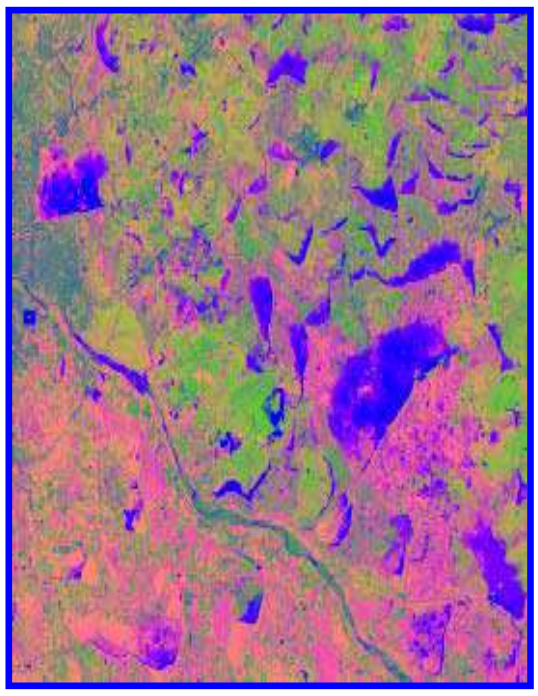
9.5 Madurai Tanks

Name	Madurai Tanks
Location	09^{o} 55’ 48” N 07^{o} 08’ 54” E
Area	2064.97 ha
Wetland Type	Tanks/Ponds
Climate	Tropical monsoon climate, with an average annual rainfall of 881.6 mm, received during the northeast and southwest monsoon seasons. Maximum temperature is around 33.7°C and minimum around 23.8°C. Water is alkaline with a pH ranging from 7.5 to 7.7.
Vegetation	Wild variety of rice, along with other monocots. The dominant wetland weeds are: horse purselane (*Trianthema protulacastrum*), sticky cleome (*Cleome viscosa*), nut grass (*Cyperus rotundus*), and barnyard *grass* (*Echinochloa crusgalli*). The principal shrubs are madar (*Calotropis gigantea*) and mesquite (*Prosopis chilensis*). Important tree species include neem (*Azadirachta indica*), raintree (*Samanea saman*), copper *pod* (*Peltophorum pterocarpum*), Manila tamarind (*Pithecelobium dulce*), and a few banyan trees (*Ficus benghalensis*). The lesser Indian reed mace (*Typha angustata*) grows extensively in the water tank, and the banks are blanketed by para grass (*Brachiaria mutica*).
Fauna	Wetland site supports large number of species of waterfowl (both resident and migratory) in large numbers. Notable species are little grebe, pond heron, and coots. There is also a large resident population of peacocks.
Turbidity	Low
	Nearly 90% of tanks in Madurai are manmade. The main sources of irrigation in Madurai district are Tanks, Wells and Canal system



Post monsoon data (2006)

Pre monsoon data (2007)



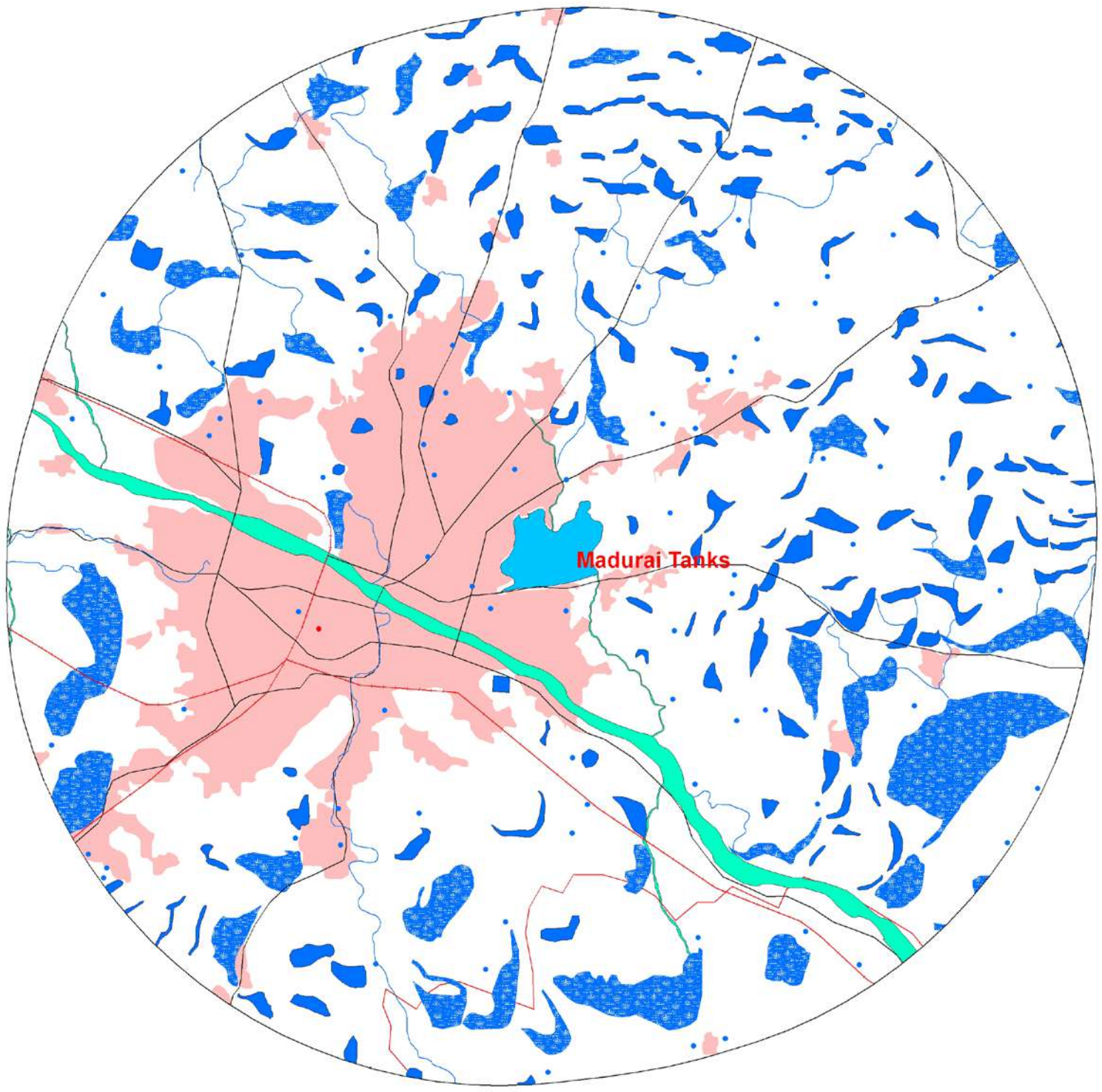
Indices image : Post monsoon data

Plate 15: Madurai Tanks

State : Tamil Nadu

WETLAND MAP

Madurai Tanks

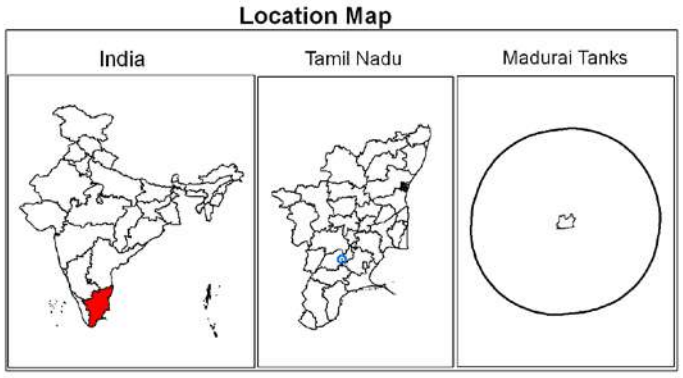


Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25ha)
- Roads
- Railway
- Drainage (line)
- Settlements
- Town/Settlements
- District Boundary

Location Map



3 1.5 0 3 Kilometers

Data Source :

IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

Prepared By :

Space Applications Centre (ISRO), Ahmedabad
and
Institute of Remote Sensing, Anna University, Chennai

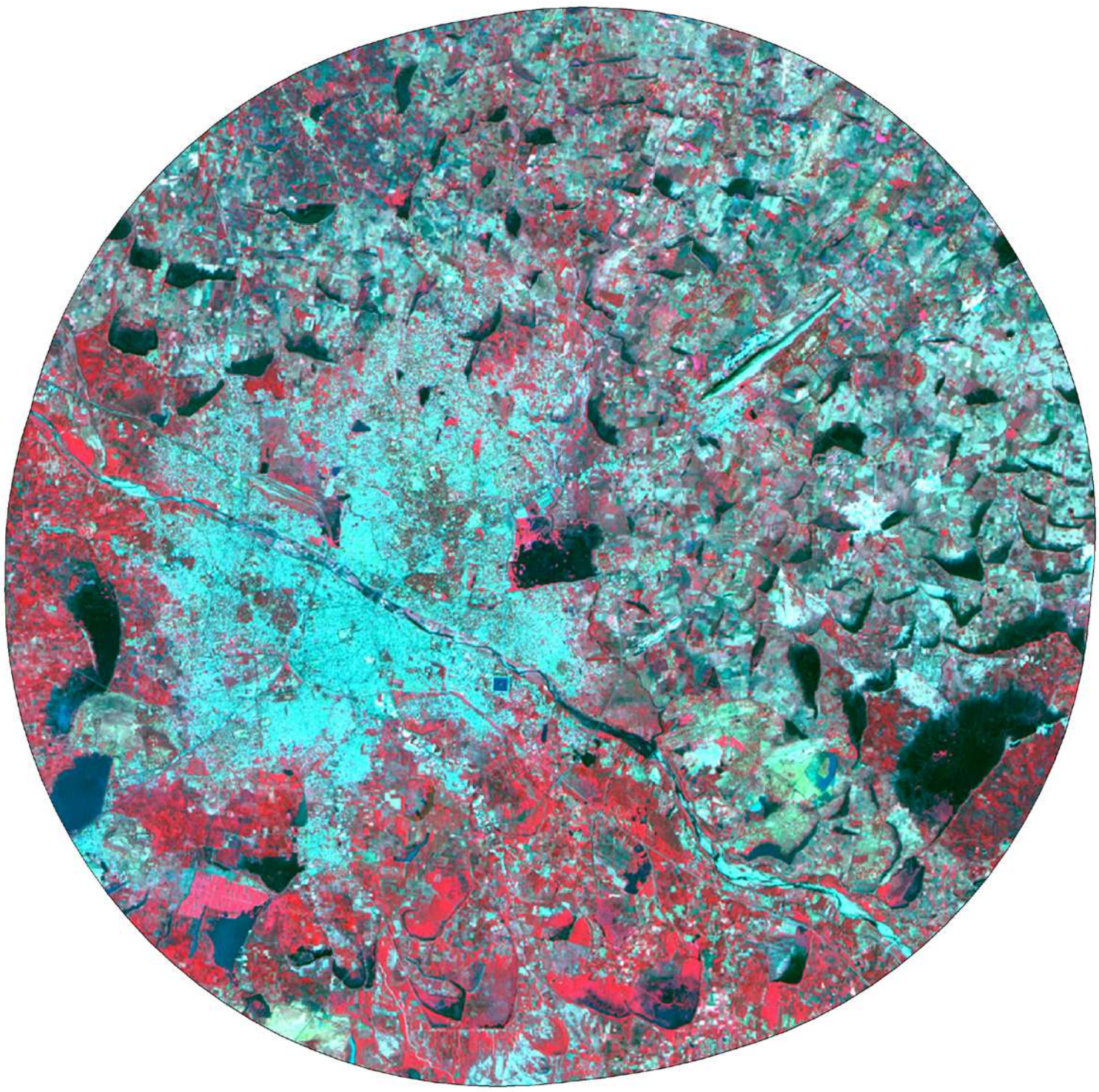
Sponsored By:

Ministry of Environment and Forests
Government of India

Plate 16: Wetland map - 5 km buffer area of Madurai Tanks

State : Tamil Nadu

Madurai Tanks

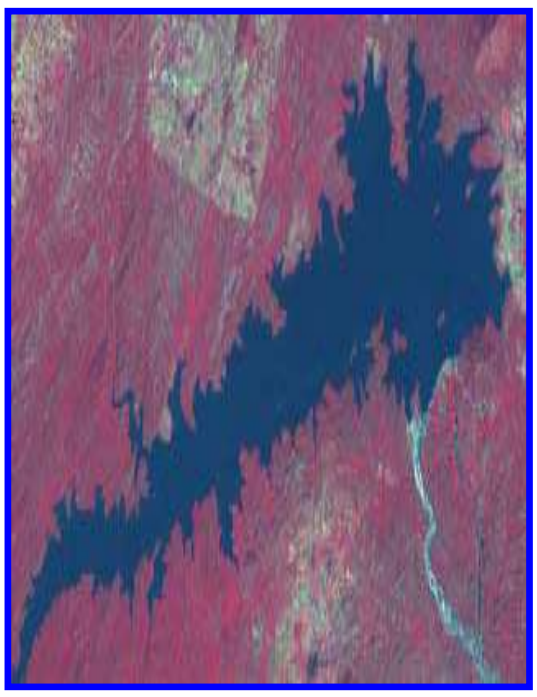


IRS P6 LISS-III Post-monsoon data (2006)

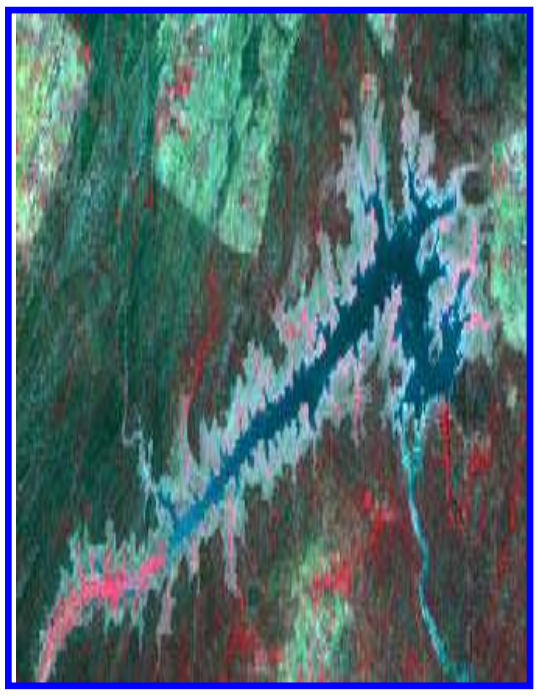
Plate 17: IRS LISS III FCC - 5 km buffer area of Madurai Tanks

9.6 Sathanur Reservoir

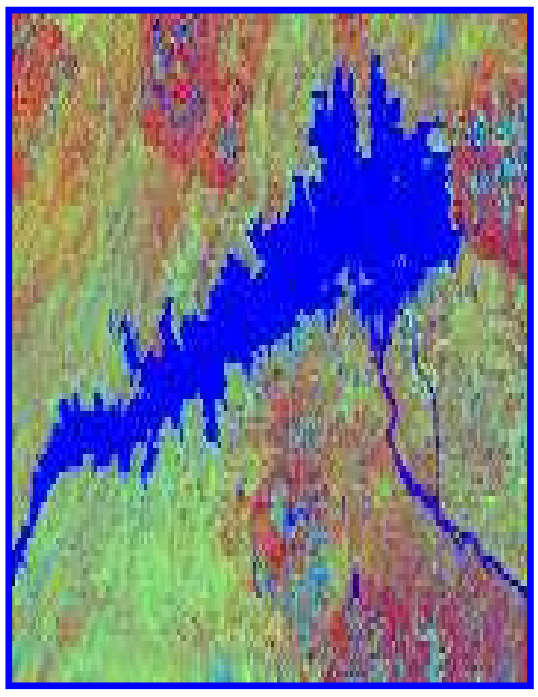
Name	Sathanur Reservoir
Location	12º 11' 50" N 78º 51' 19" E
Area	2203.81 ha
Wetland Type	Reservoir
Climate	Average annual rainfall : 900 mm. Maximum temperature of 38°C and minimum temperature of 24°C.
Fauna	The reservoir attracts several bird species. Some of the species are *Phalacrocorax Niger, Anhinga rufa, Ardeola grayii, and Bubulcus ibis*. The fish species include *Labeo fimbriatus, L. Calbassu, Wallago attu*, and several catfishes. In the surrounding forests, spotted deer (*Axis*) and wild boar (*Sus scrota*) are found in considerable numbers. The reservoir is utilized for irrigation and fisheries.
Turbidity	Low
Threats	Owing to the high rate of deforestation in the catchment area and high rate of siltation are major threat to this wetland.



Post monsoon data (2006)



Pre monsoon data (2006)



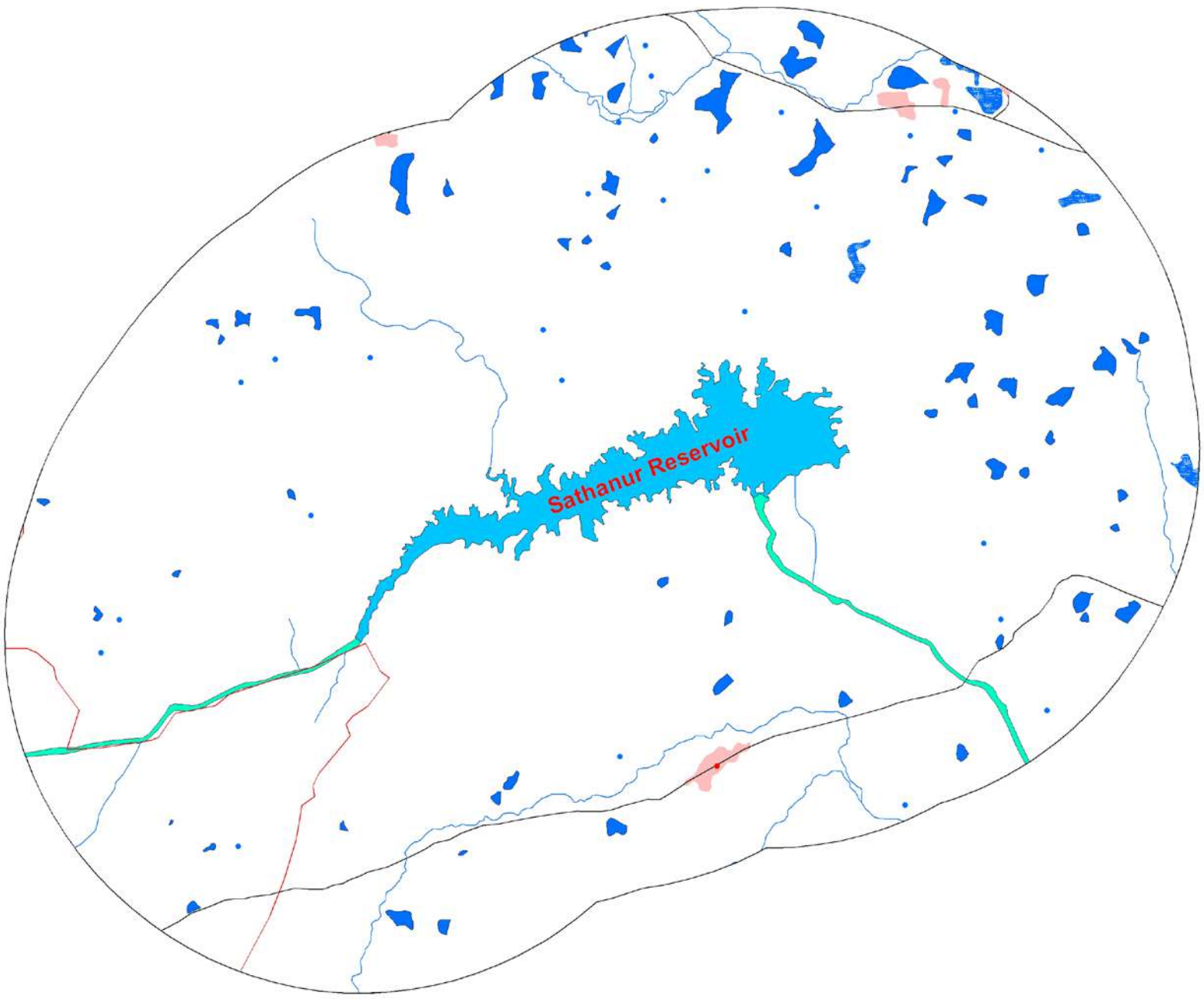
Indices image
Post monsoon data (2006)

Plate 18: Sathanur Reservoir

State : Tamil Nadu

WETLAND MAP

Sathanur Reservoir

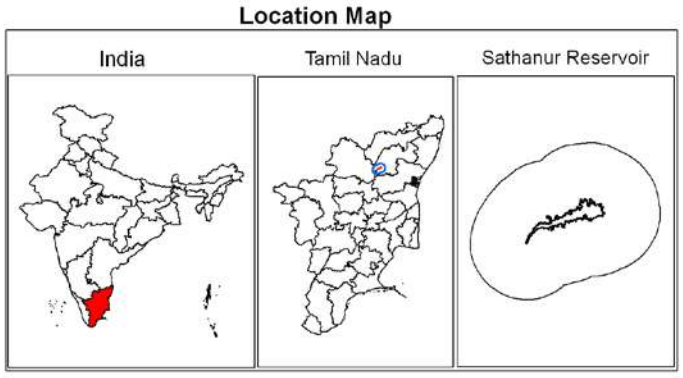


Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25ha)
- Roads
- Railway
- Drainage (line)
- Settlements
- Town/Settlements
- District Boundary

Location Map



3 1.5 0 3 Kilometers

Data Source :

IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

Prepared By :

Space Applications Centre (ISRO), Ahmedabad
and
Institute of Remote Sensing, Anna University, Chennai

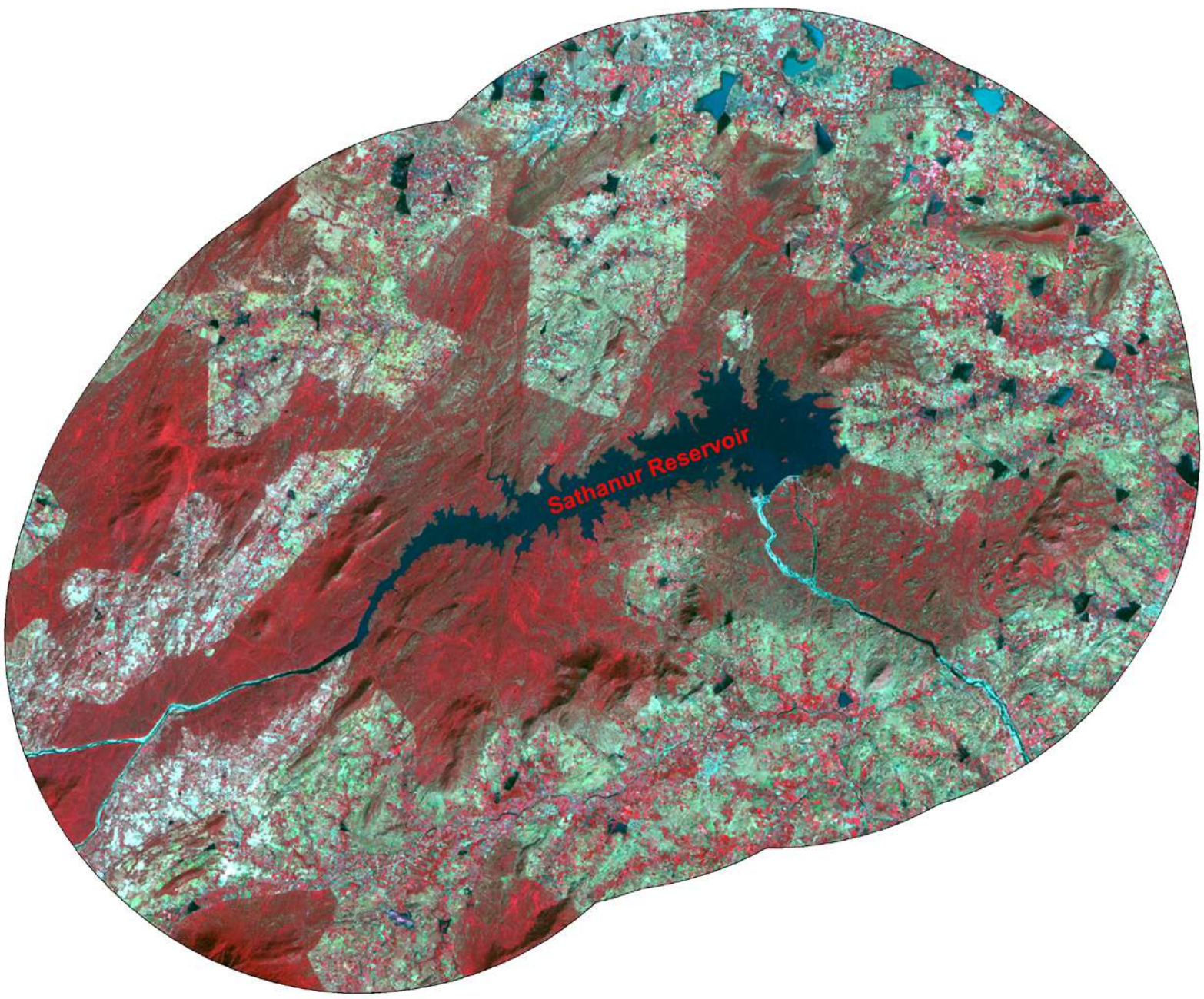
Sponsored By:

Ministry of Environment and Forests
Government of India

Plate 19: Wetland map - 5 km buffer area of Sathanur Reservoir

State : Tamil Nadu

Sathanur Reservoir

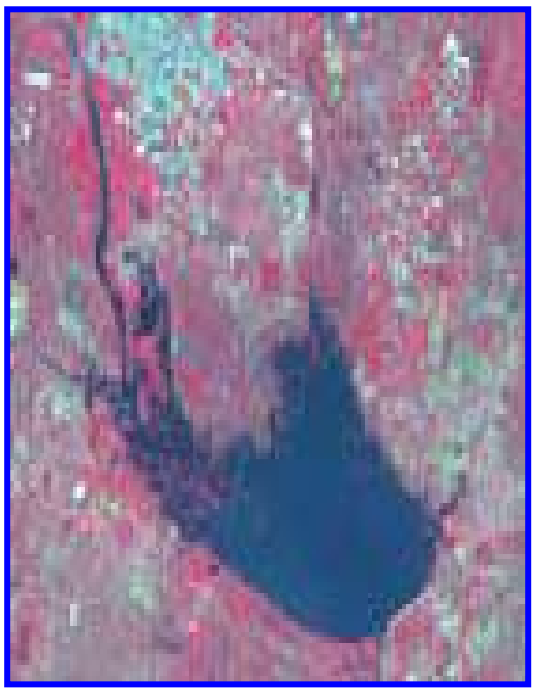


IRS P6 LISS-III Post-monsoon data (2006)

Plate 20: IRS LISS III FCC - 5 km buffer area of Sathanur Reservoir

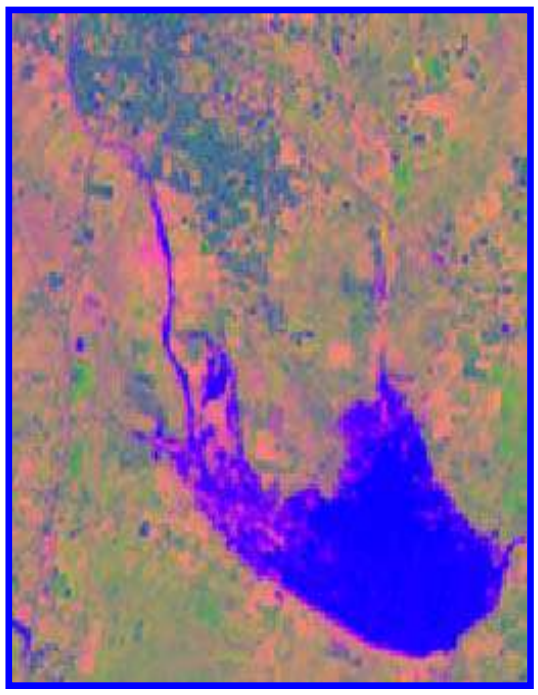
9.7 Kullur Santhai Reservoir

Name	Kullur Santhai Reservoir
Location	09^{o} 32’ 48” N 77° 58’ 38” E
Area	741.3 ha
Wetland Type	Reservoir
Climate	Average annual rainfall : 812 mm, mostly occurring during September to November
Turbidity	Low



Post monsoon data (2006)

Pre monsoon data (2007)



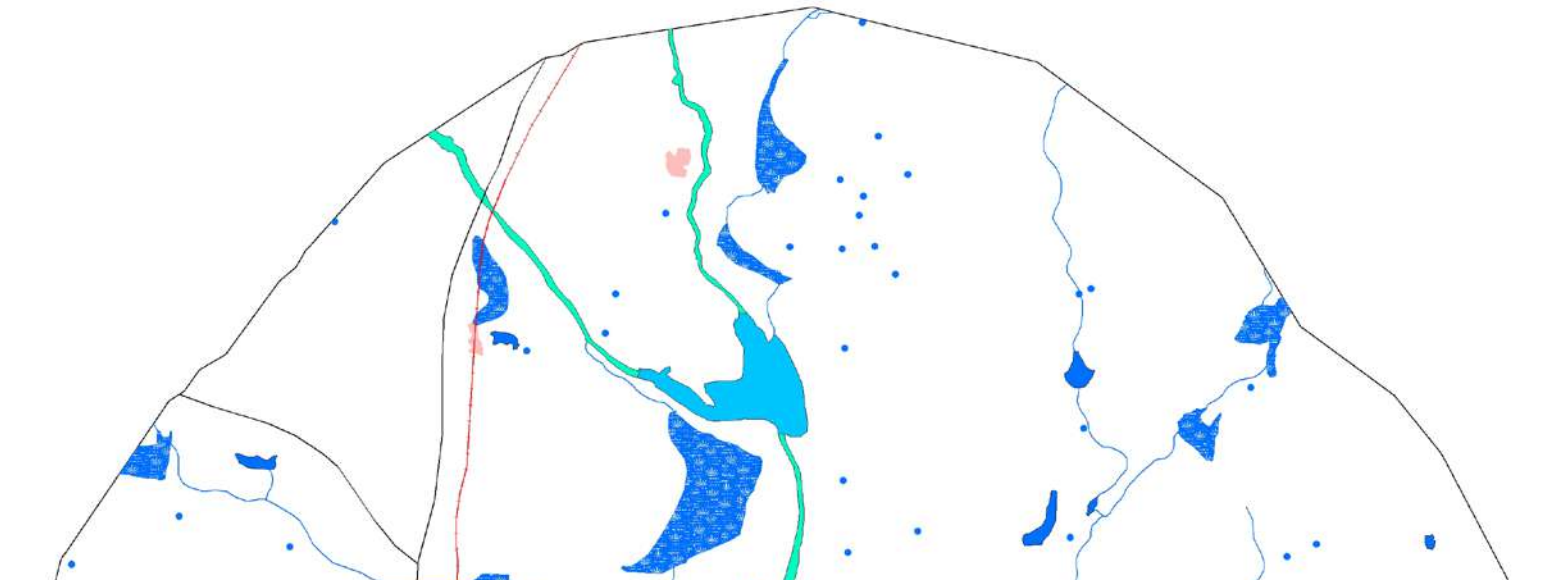
Indices image
Post monsoon data (2006)

Plate 21: Kullur Santhai Reservoir

State : Tamil Nadu

WETLAND MAP

Kullur Santhai Reservoir

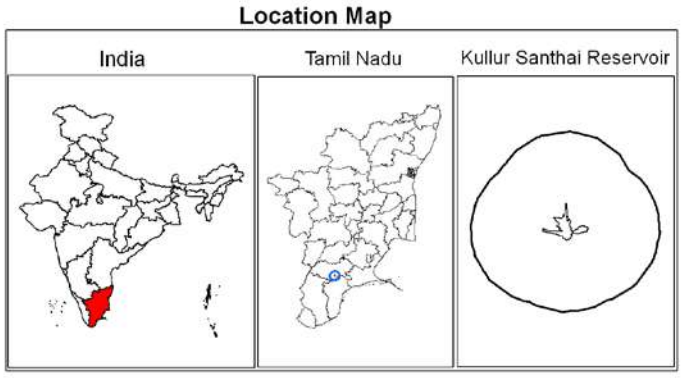


Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25ha)
- Roads
- Railway
- Drainage (line)
- Settlements
- Town/Settlements
- District Boundary

Location Map



3 1.5 0 3 Kilometers

Data Source :

IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

Prepared By :

Space Applications Centre (ISRO), Ahmedabad
and
Institute of Remote Sensing, Anna University, Chennai

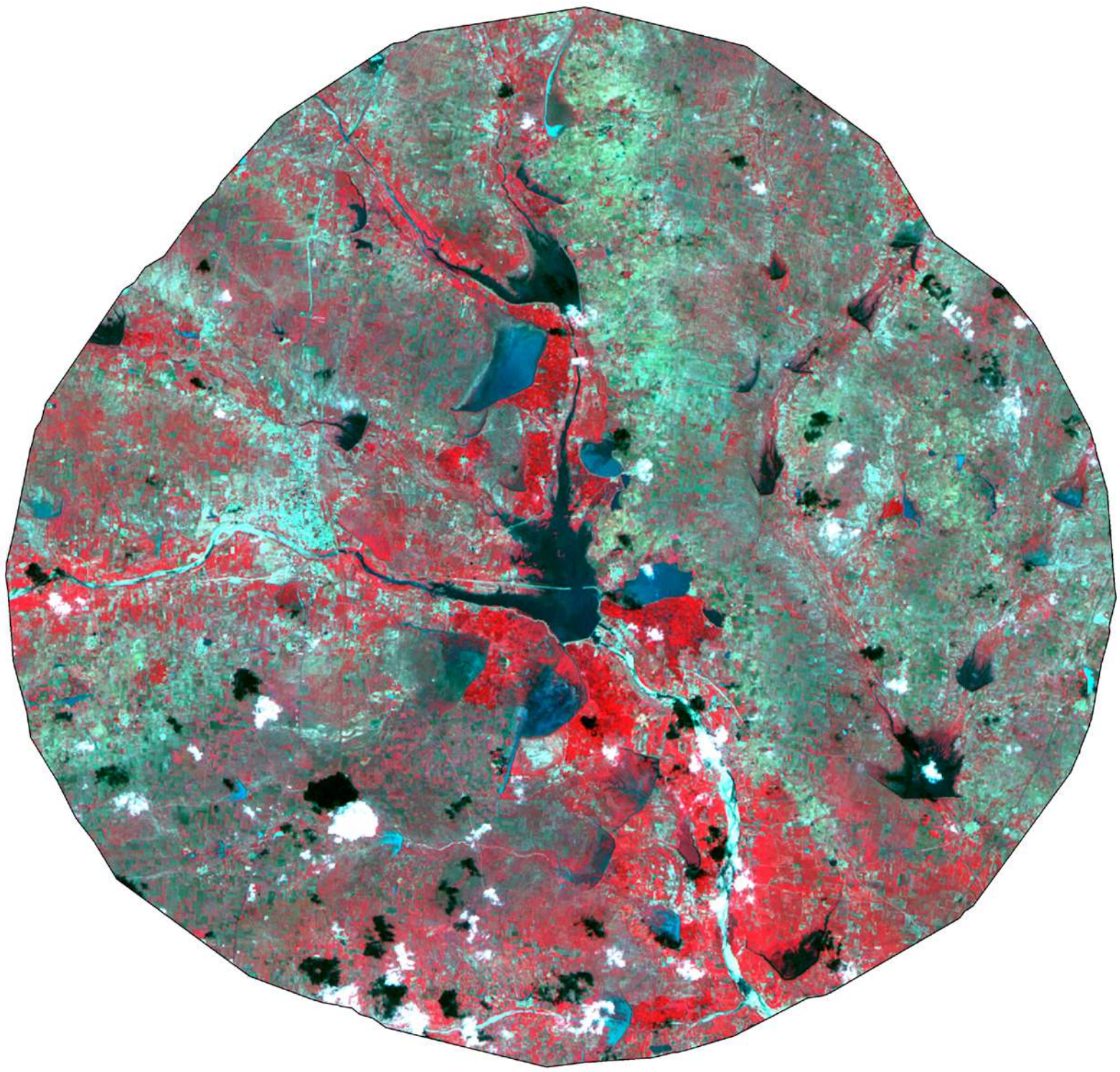
Sponsored By:

Ministry of Environment and Forests
Government of India

Plate 22: Wetland map - 5 km buffer area of Kullur Santhai Reservoir

State : Tamil Nadu

Kullur Santhai Reservoir

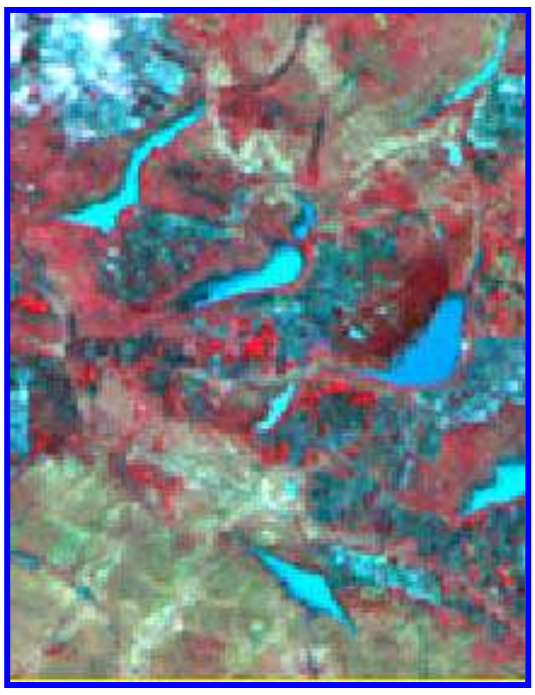


IRS P6 LISS-III Post-monsoon data (2006)

Plate 23: IRS LISS III FCC - 5 km buffer area of Kullur Santhai Reservoir

9.8 Koothakulam and near by tanks

Name	Koothakulam and near by tanks
Location	08°29’ 45” N 77° 45’33” E Naguneri Taluk Tirunelveli District.
Area	105.05 ha
Wetland Type	Tanks/Ponds
Climate	Average annual rainfall : 2500 mm, mostly occurring during June to September
Fauna	Large number of migratory birds start coming by December and fly away to their northern homes by June or July.
Turbidity	Low to Moderate
	The excreta of birds and silt from the tanks is collected by villagers in summer and applied as fertilizer to their fields**.** Koothakulam is protected area declared as a sanctuary in 1994.



Post monsoon data (2005)

Pre monsoon data (2007)

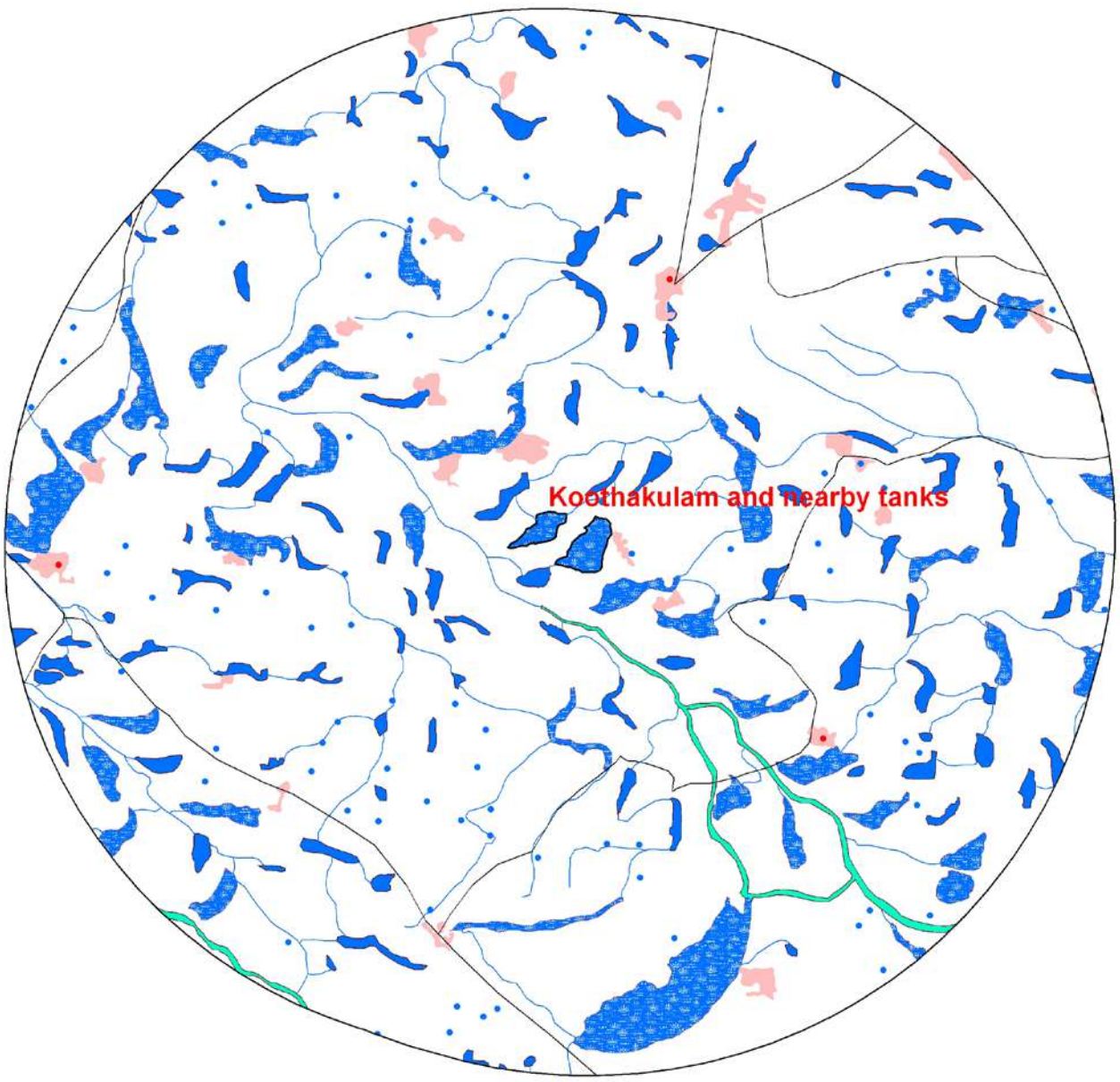
Indices image
Pre monsoon data (2007)

Plate 24: Koothakulam and near by tanks

State : Tamil Nadu

WETLAND MAP

Koothakulam and nearby tanks

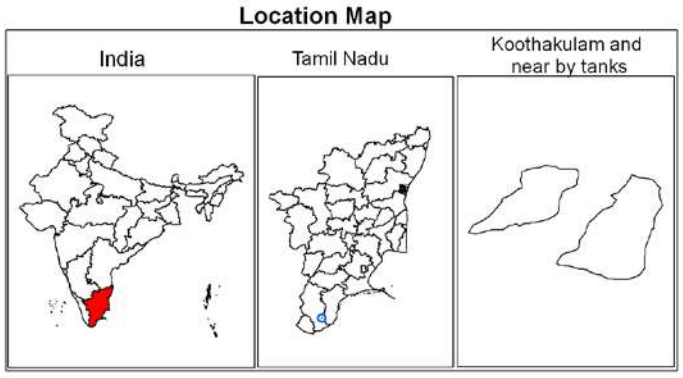


Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25ha)
- Roads
- Railway
- Drainage (line)
- Settlements
- Town/Settlements
- District Boundary

Location Map



3 1.5 0 3 Kilometers

Data Source :

IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

Prepared By :

Space Applications Centre (ISRO), Ahmedabad
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Institute of Remote Sensing, Anna University, Chennai

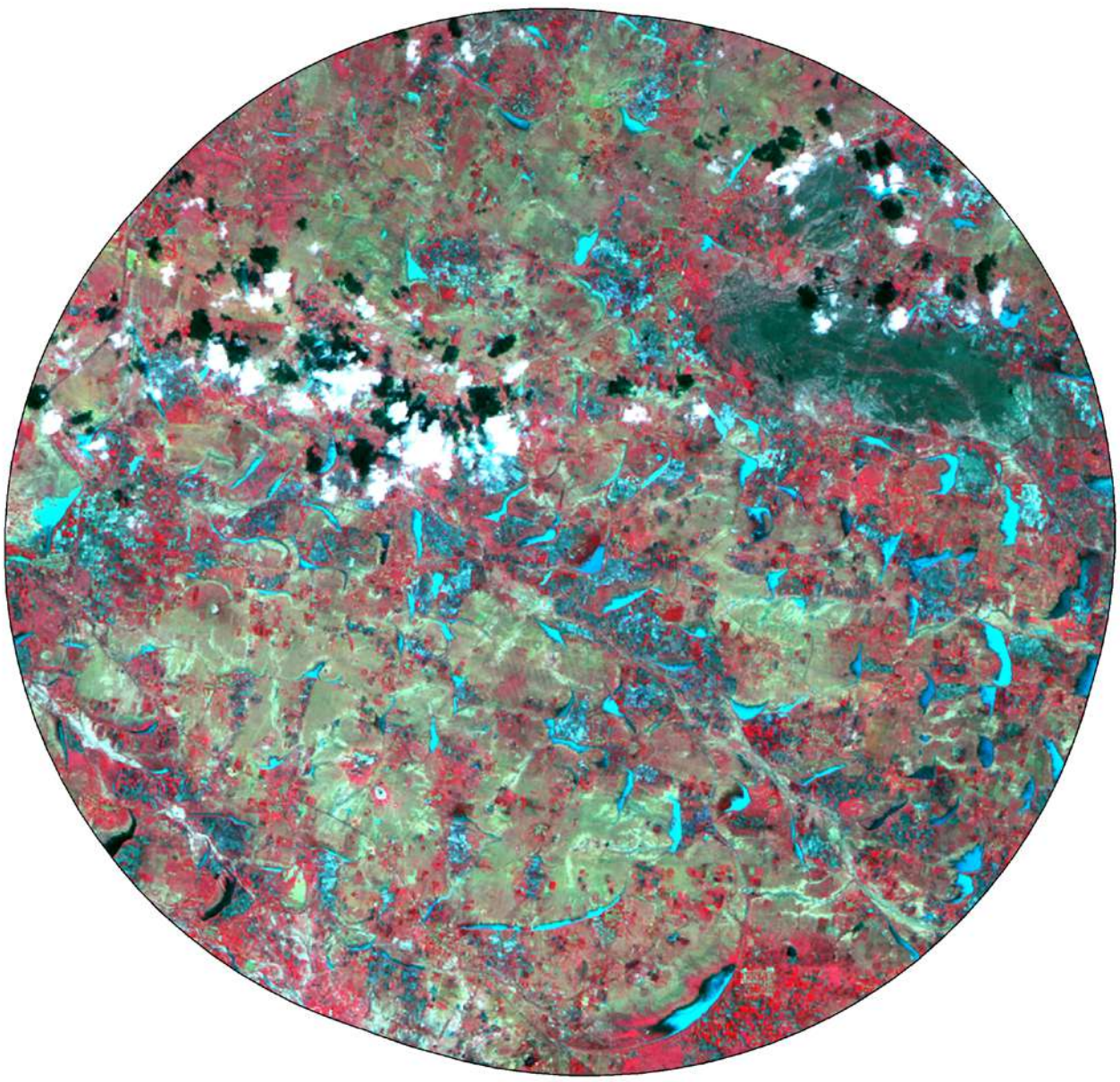
Sponsored By:

Ministry of Environment and Forests
Government of India

Plate 25: Wetland map - 5 km buffer area of Koothakulam and near by tanks

State : Tamil Nadu

Koothakulam and nearby tanks



IRS P6 LISS-III Post-monsoon data (2006)

Plate 26: IRS LISS III FCC - 5 km buffer area of Koothakulam and near by tanks

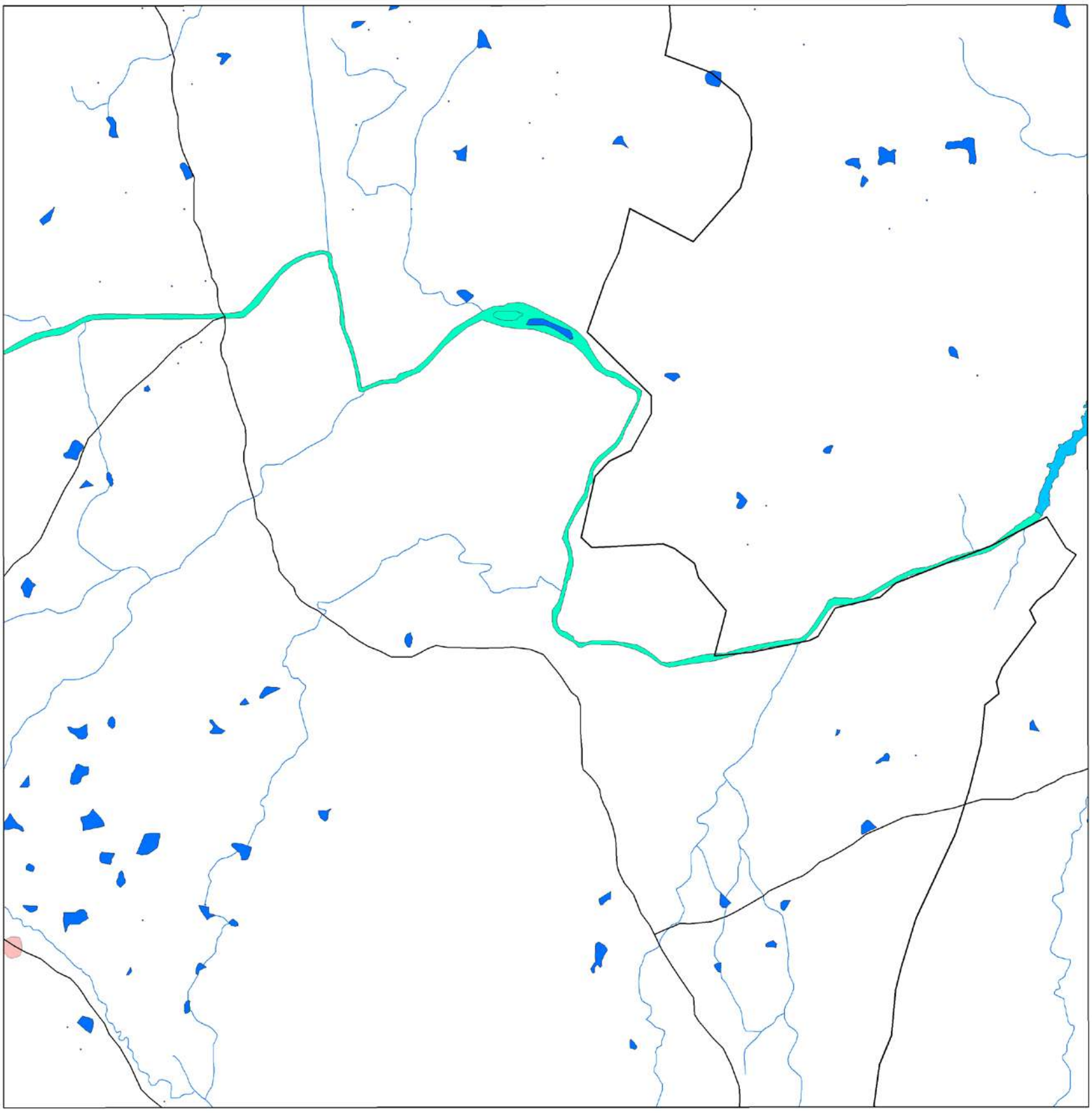
SOI MAP SHEET-WISE WETLAND MAPS

(Selected)

State : Tamilnadu

WETLAND MAP

Map No. : 57L/12

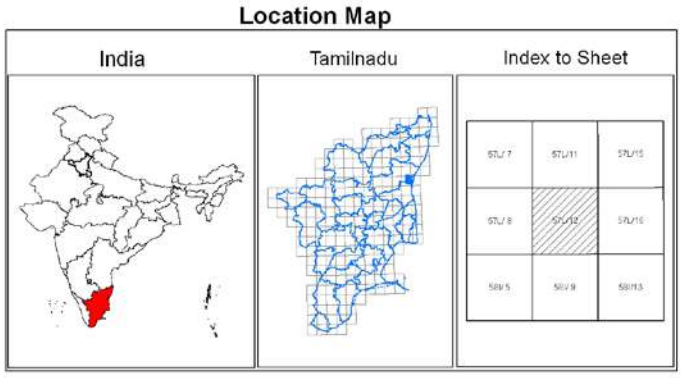


Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25 ha)
- Settlements
- Drainage (line)
- Canal
- Roads
- Railways
- Town/Settlements
- District Boundary
- State Boundary
- International Boundary

Location Map



0 1 2 4 6 Kilometers

Data Source :

IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

Prepared By :

Space Applications Centre (ISRO), Ahmedabad
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Institute of Remote Sensing (IRS), Anna University

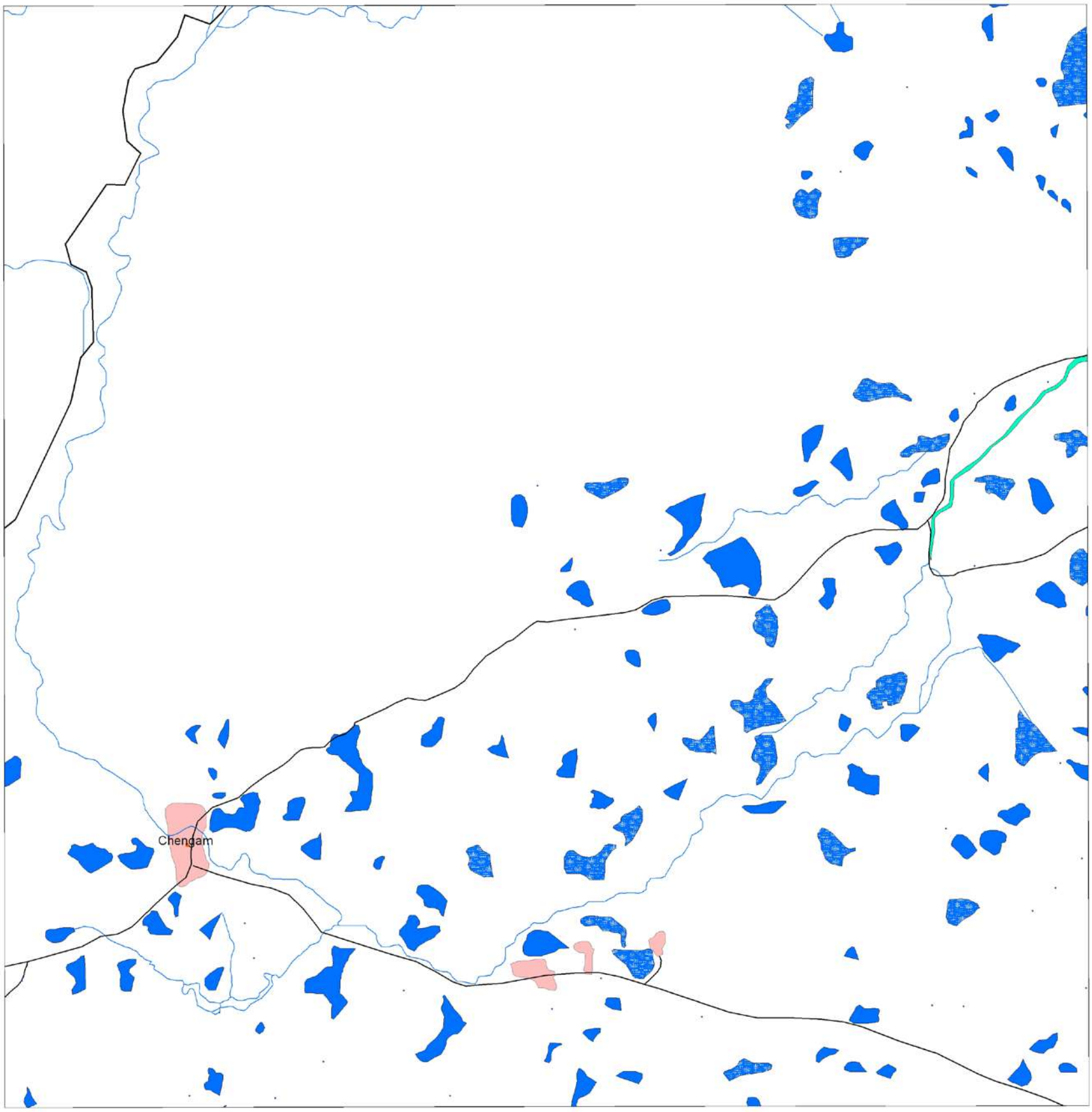
Sponsored By :

Ministry of Environment and Forests
Government of India

State : Tamilnadu

WETLAND MAP

Map No. : 57L/15



Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
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			Man-made	
	1201			Reservoirs/Barrages
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	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

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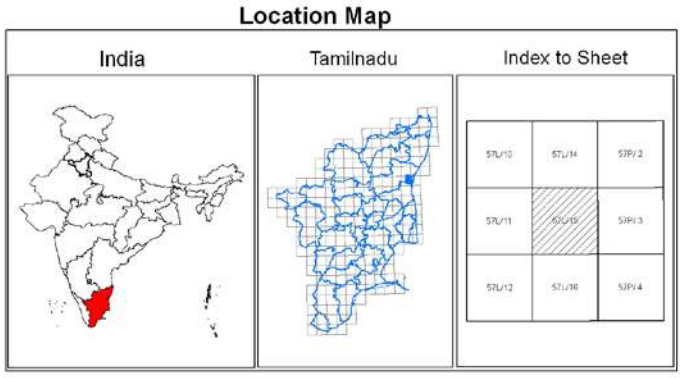
- Settlements
- Drainage (line)
- Canal
- Roads
- Railways
- Town/Settlements
- District Boundary
- State Boundary
- International Boundary

Location Map



Data Source :

IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

Prepared By :

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Institute of Remote Sensing (IRS), Anna University

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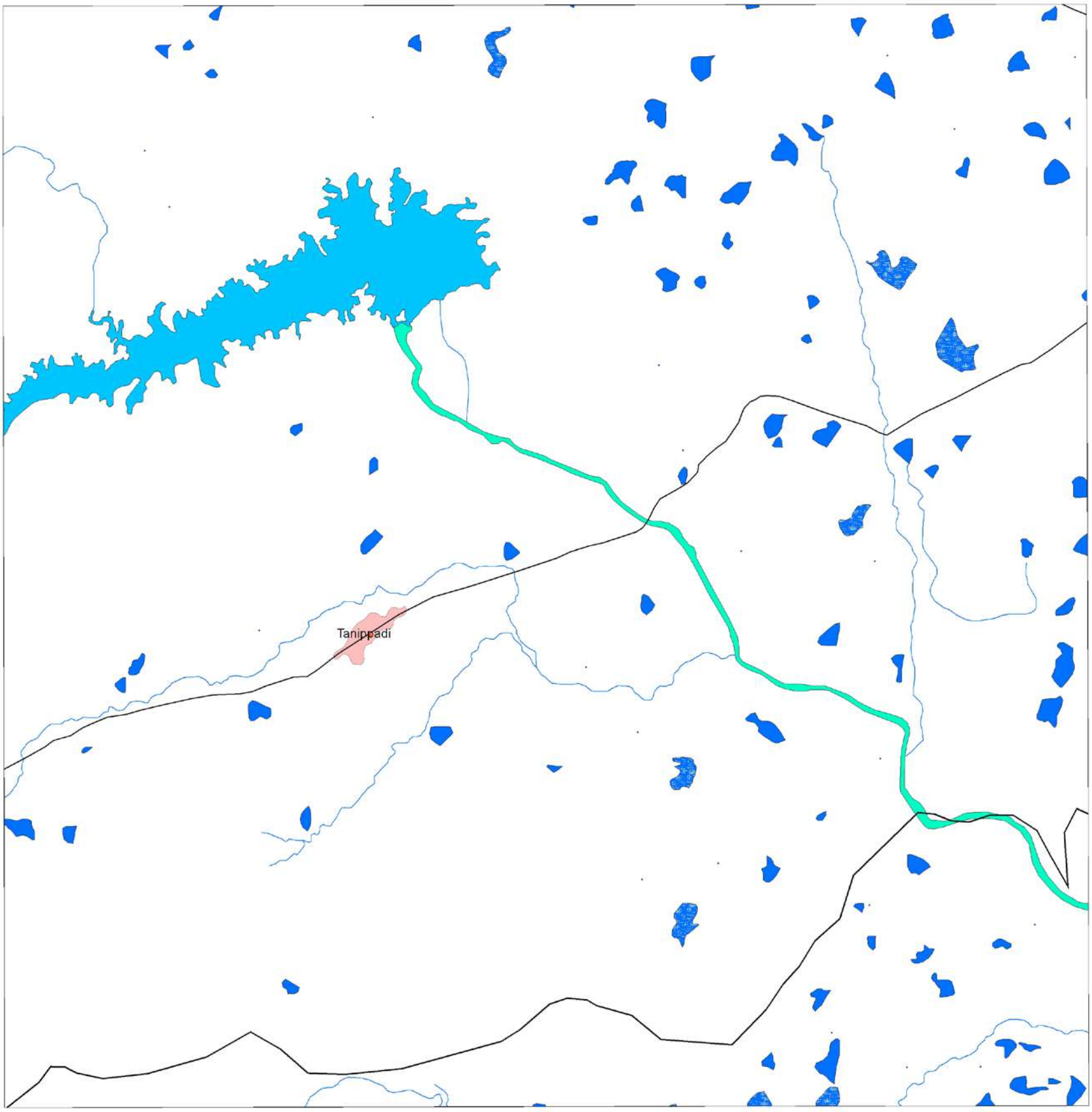
Government of India

State : Tamilnadu

WETLAND MAP

Map No. : 57L/16



Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
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	1202			Tanks/Ponds
	1203			Waterlogged
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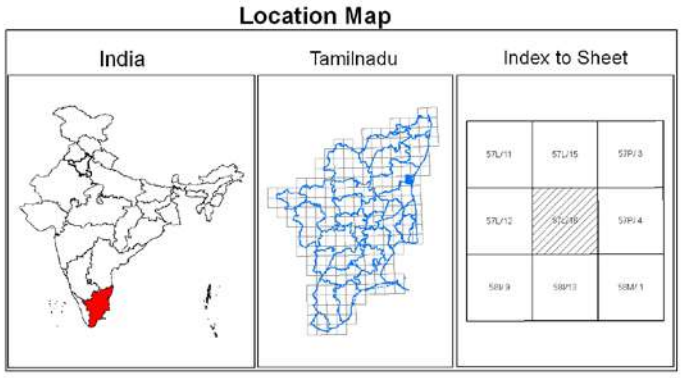
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25 ha)
- Settlements
- Drainage (line)
- Canal
- Roads
- Railways
- Town/Settlements
- District Boundary
- State Boundary
- International Boundary

Location Map



Data Source :

IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

Prepared By :

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Institute of Remote Sensing (IRS), Anna University

Sponsored By :

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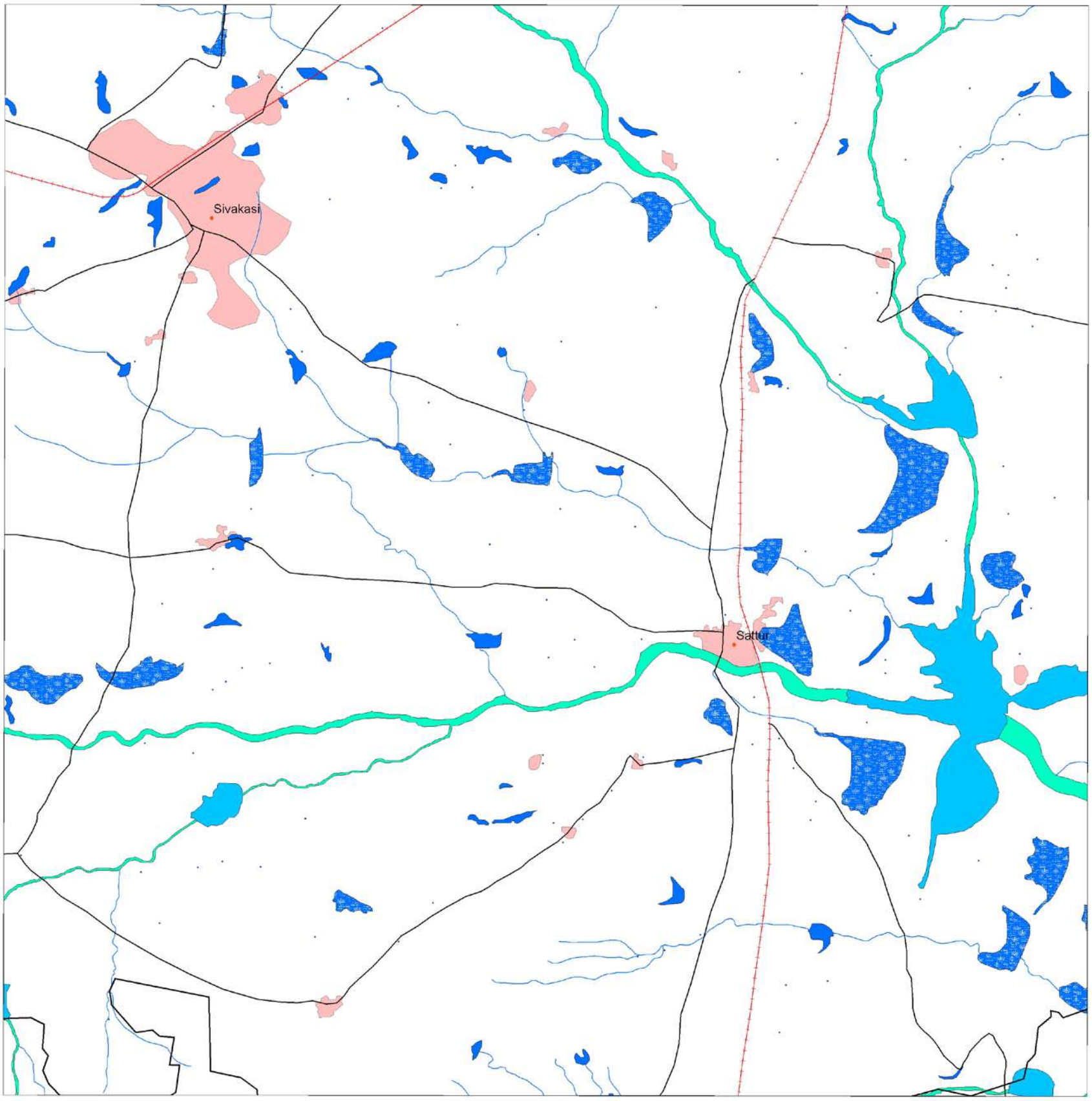
Government of India

State : Tamilnadu

WETLAND MAP

Map No. : 58G/15



Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
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	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25 ha)
- Settlements
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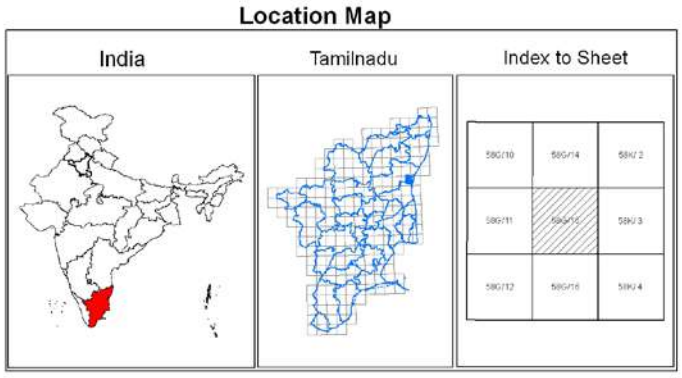
- Canal
- Roads
- Railways
- Town/Settlements
- District Boundary
- State Boundary
- International Boundary

Location Map



0 1 2 4 6 Kilometers

Data Source :

IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

Prepared By :

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Sponsored By :

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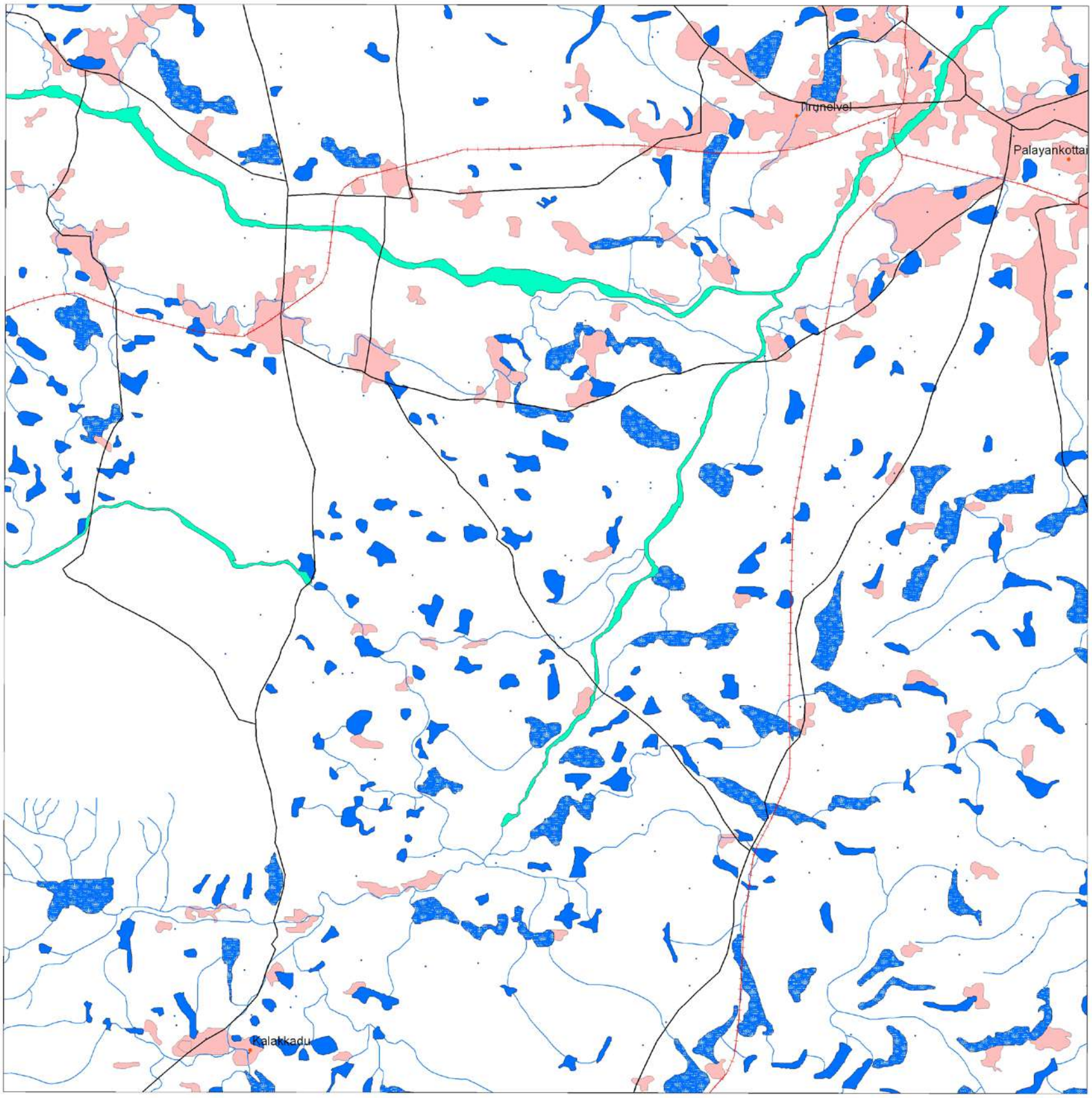
Government of India

State : Tamilnadu

WETLAND MAP

Map No. : 58H/10

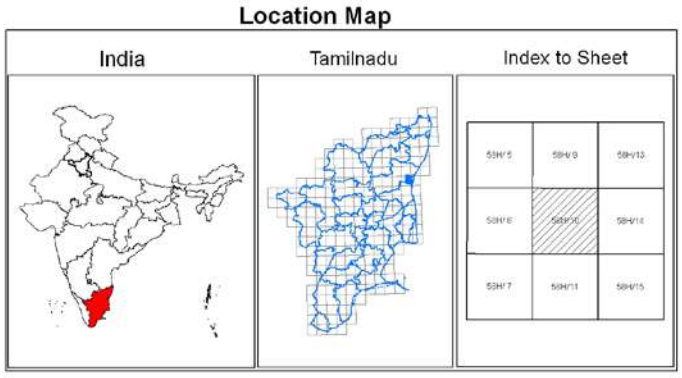


Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25 ha)
- Settlements
- Drainage (line)
- Canal
- Roads
- Railways
- Town/Settlements
- District Boundary
- State Boundary
- International Boundary

Location Map



Data Source :

IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

Prepared By :

Space Applications Centre (ISRO), Ahmedabad
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Institute of Remote Sensing (IRS), Anna University

Sponsored By :

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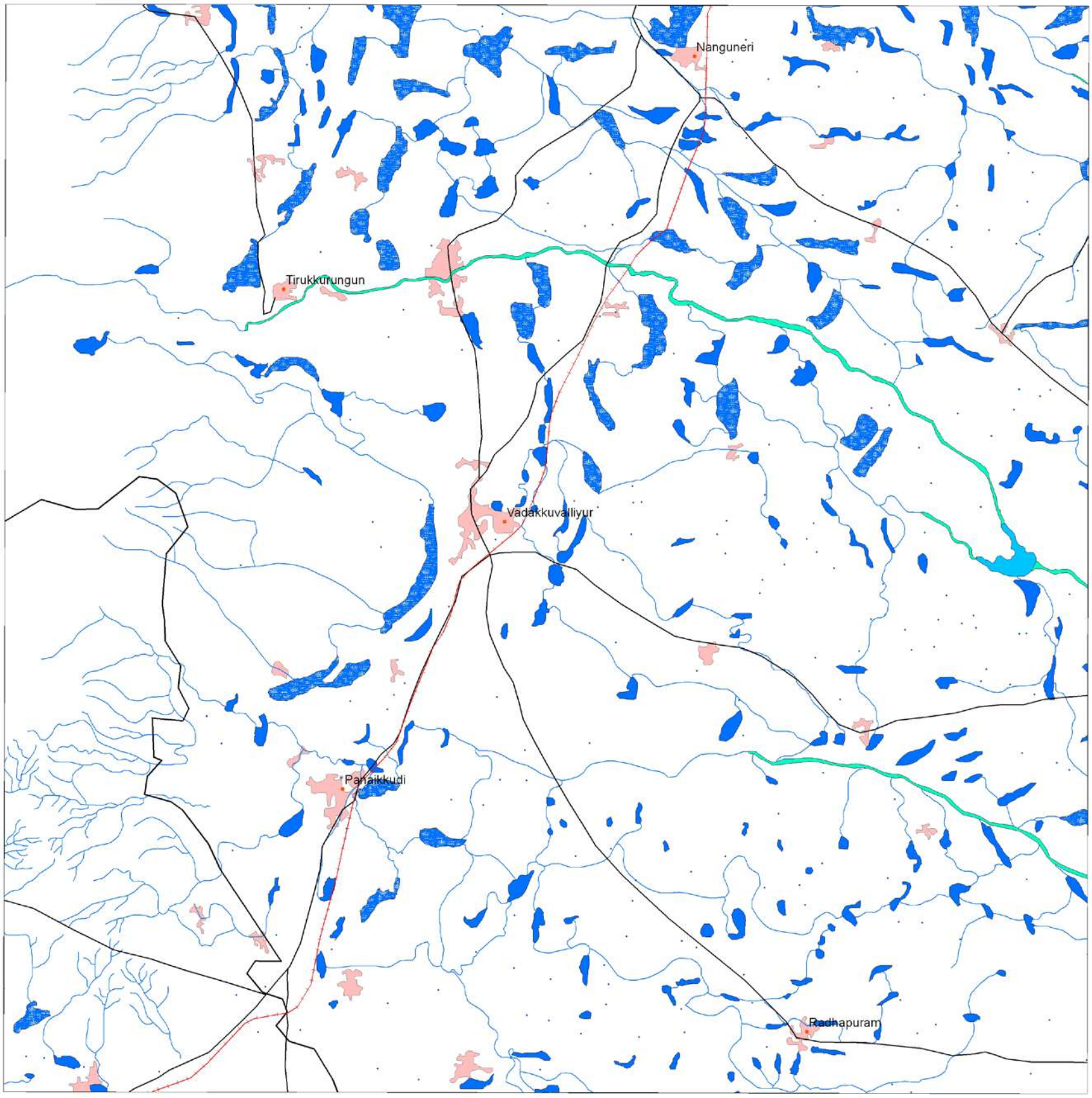
Government of India

State : Tamilnadu

WETLAND MAP

Map No. : 58H/11



Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
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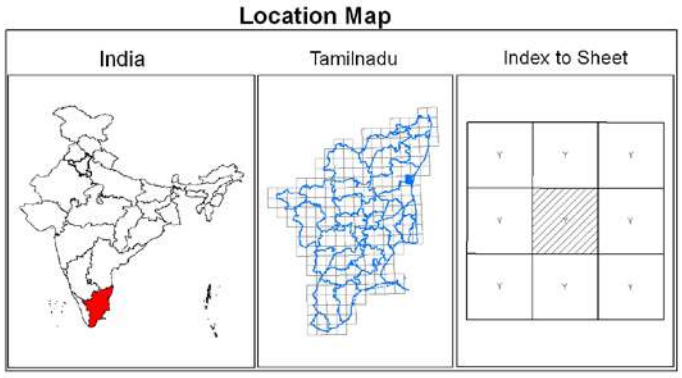
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25 ha)
- Settlements
- Drainage (line)
- Canal
- Roads
- Railways
- Town/Settlements
- District Boundary
- State Boundary
- International Boundary

Location Map



Data Source :

IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

Prepared By :

Space Applications Centre (ISRO), Ahmedabad
and
Institute of Remote Sensing (IRS), Anna University

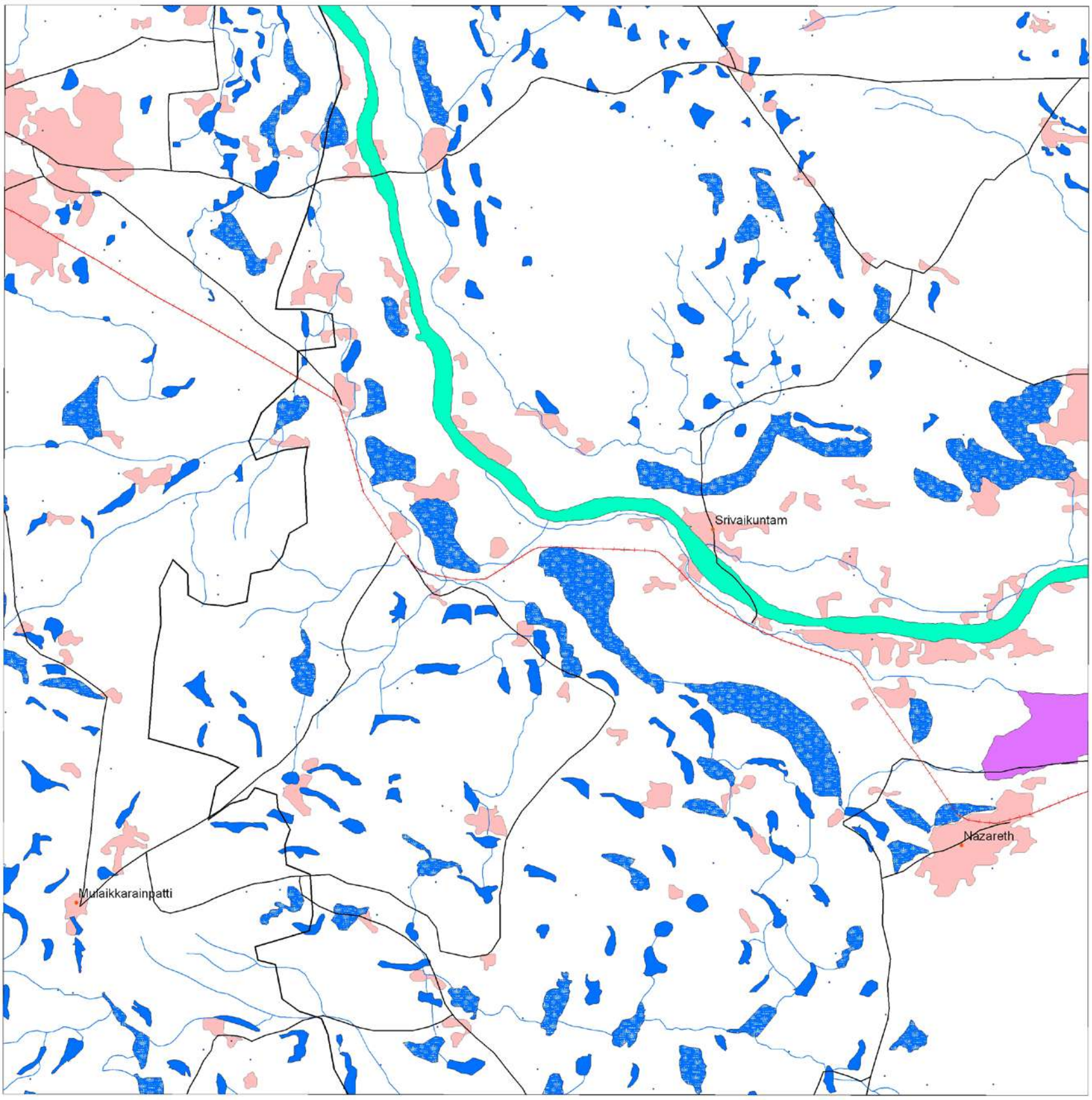
Sponsored By :

Ministry of Environment and Forests
Government of India

State : Tamilnadu

WETLAND MAP

Map No. : 58H/14



Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
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		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
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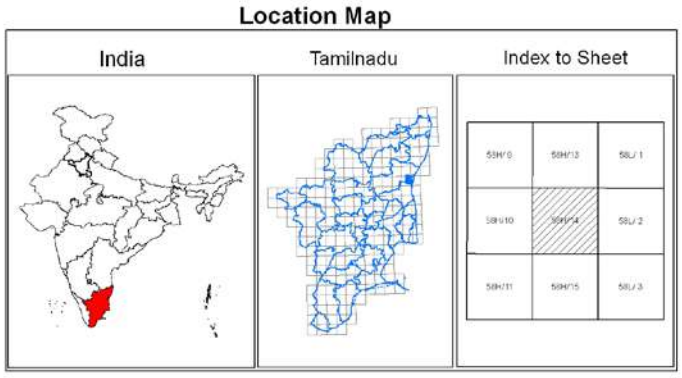
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25 ha)
- Settlements
- Drainage (line)
- Canal
- Roads
- Railways
- Town/Settlements
- District Boundary
- State Boundary
- International Boundary

Location Map



Data Source :

IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

Prepared By :

Space Applications Centre (ISRO), Ahmedabad
and
Institute of Remote Sensing (IRS), Anna University

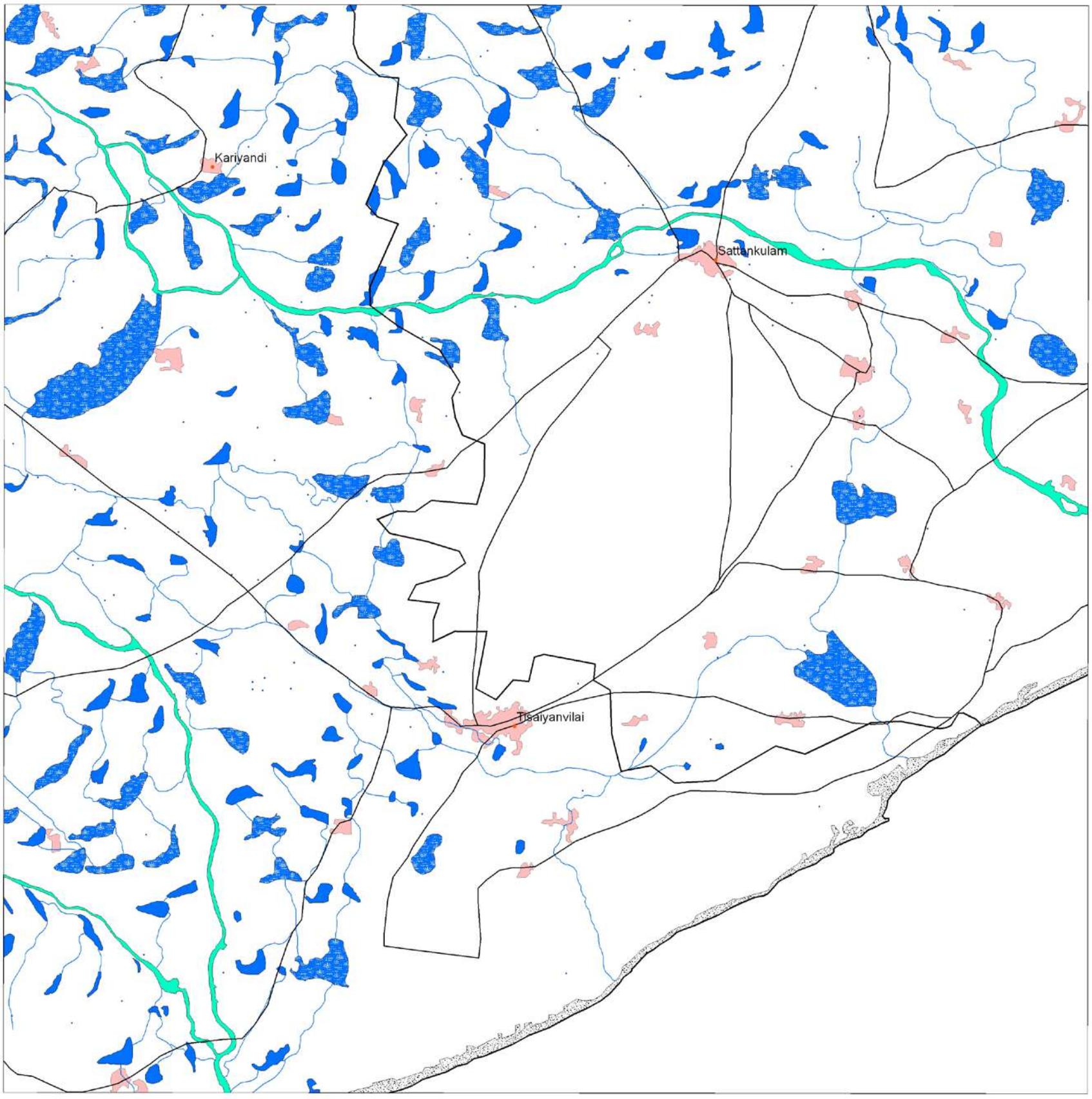
Sponsored By :

Ministry of Environment and Forests
Government of India

State : Tamilnadu

WETLAND MAP

Map No. : 58H/15



Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
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	2101			Lagoons
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	2105			Salt marsh
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	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25 ha)
- Settlements
- Drainage (line)
- Canal
- Roads
- Railways
- Town/Settlements
- District Boundary
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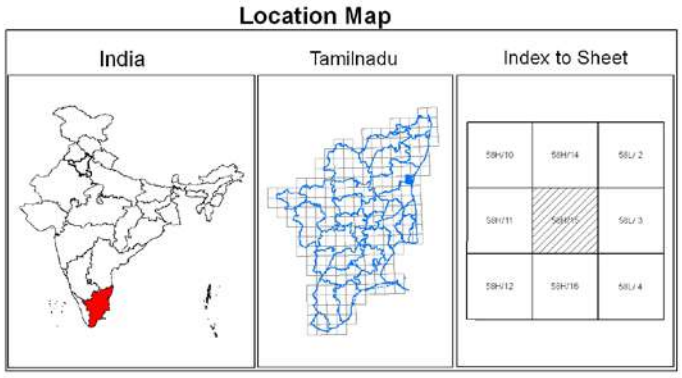
- International Boundary

Location Map



Data Source :

IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

Prepared By :

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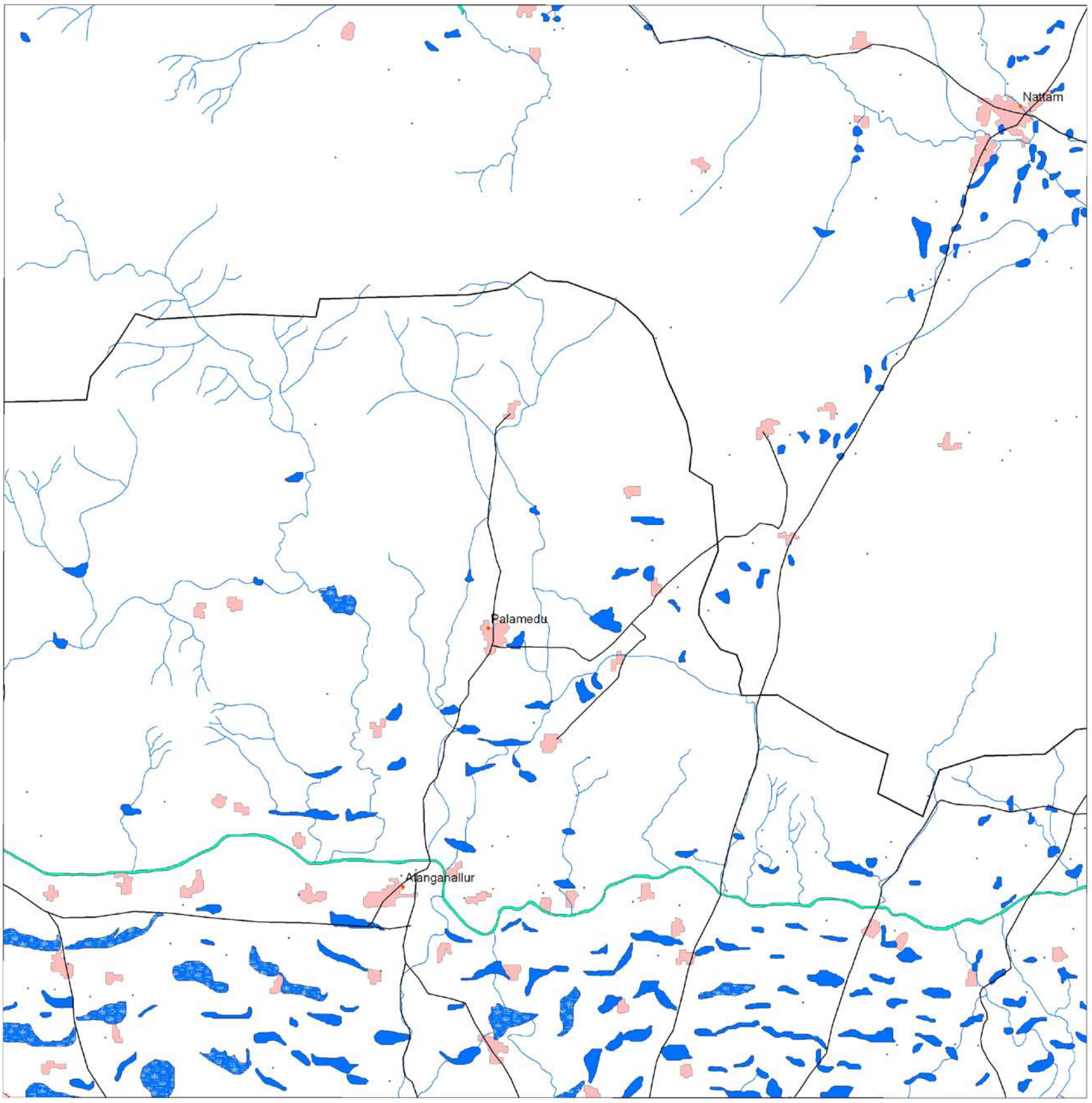
Government of India

State : Tamilnadu

WETLAND MAP

Map No. : 58J/4

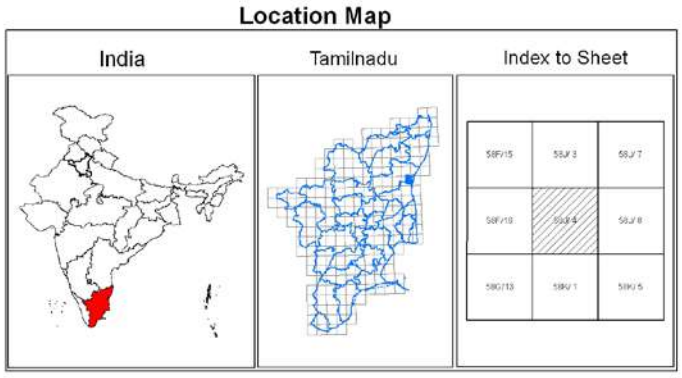


Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25 ha)
- Settlements
- Drainage (line)
- Canal
- Roads
- Railways
- Town/Settlements
- District Boundary
- State Boundary
- International Boundary

Location Map



Data Source :

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Institute of Remote Sensing (IRS), Anna University

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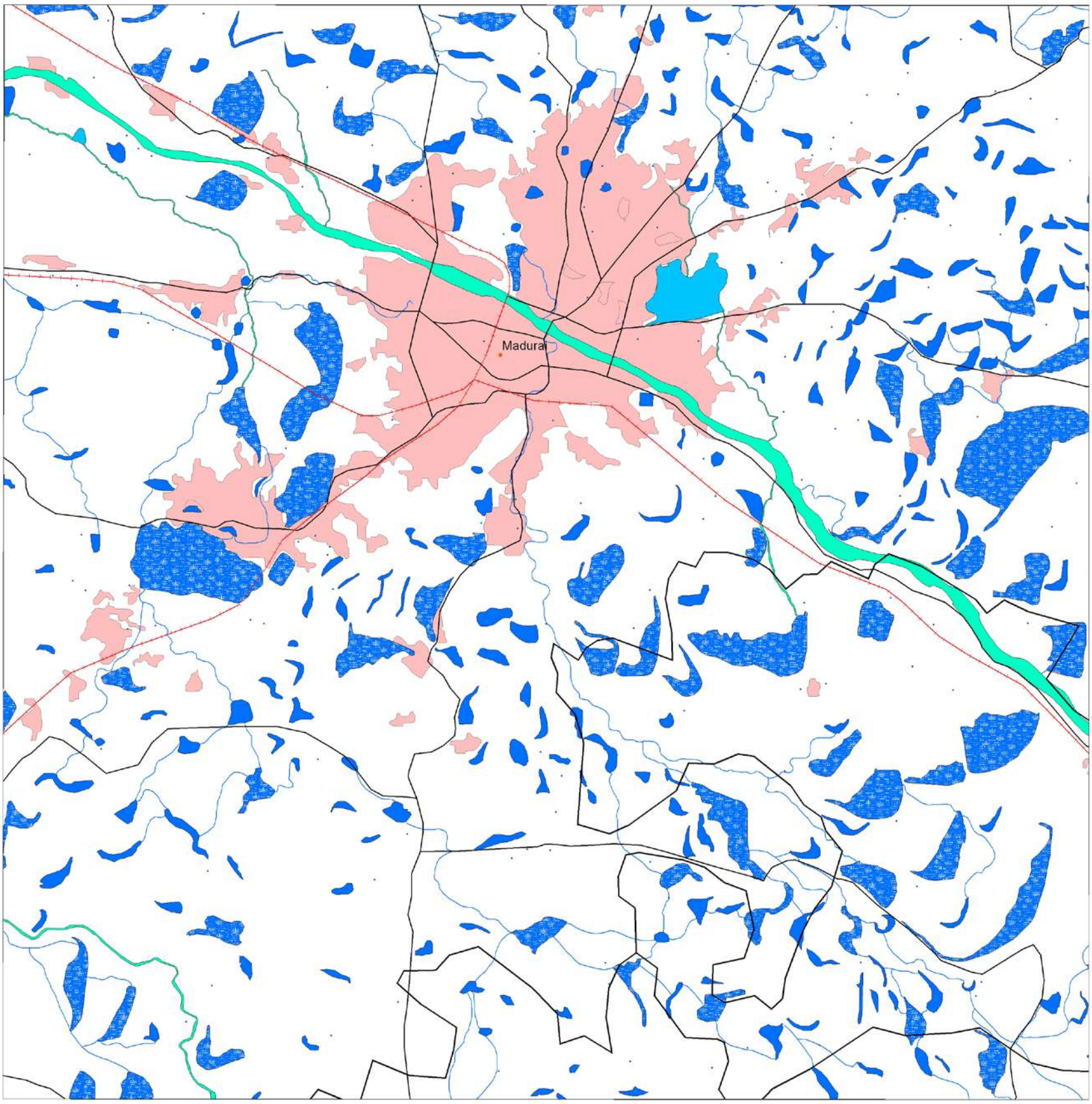
Government of India

State : Tamilnadu

WETLAND MAP

Map No. : 58K/1

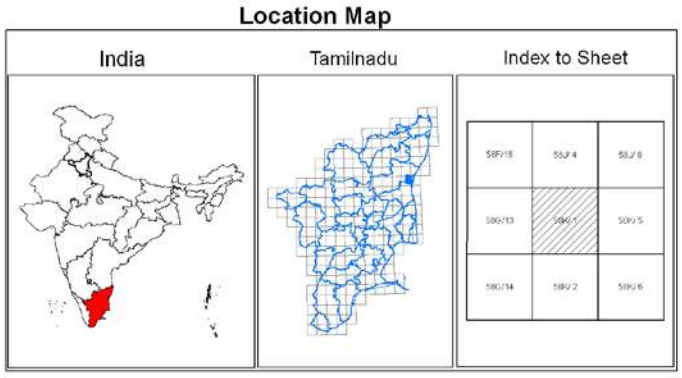


Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25 ha)
- Settlements
- Drainage (line)
- Canal
- Roads
- Railways
- Town/Settlements
- District Boundary
- State Boundary
- International Boundary

Location Map



Data Source :

IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

Prepared By :

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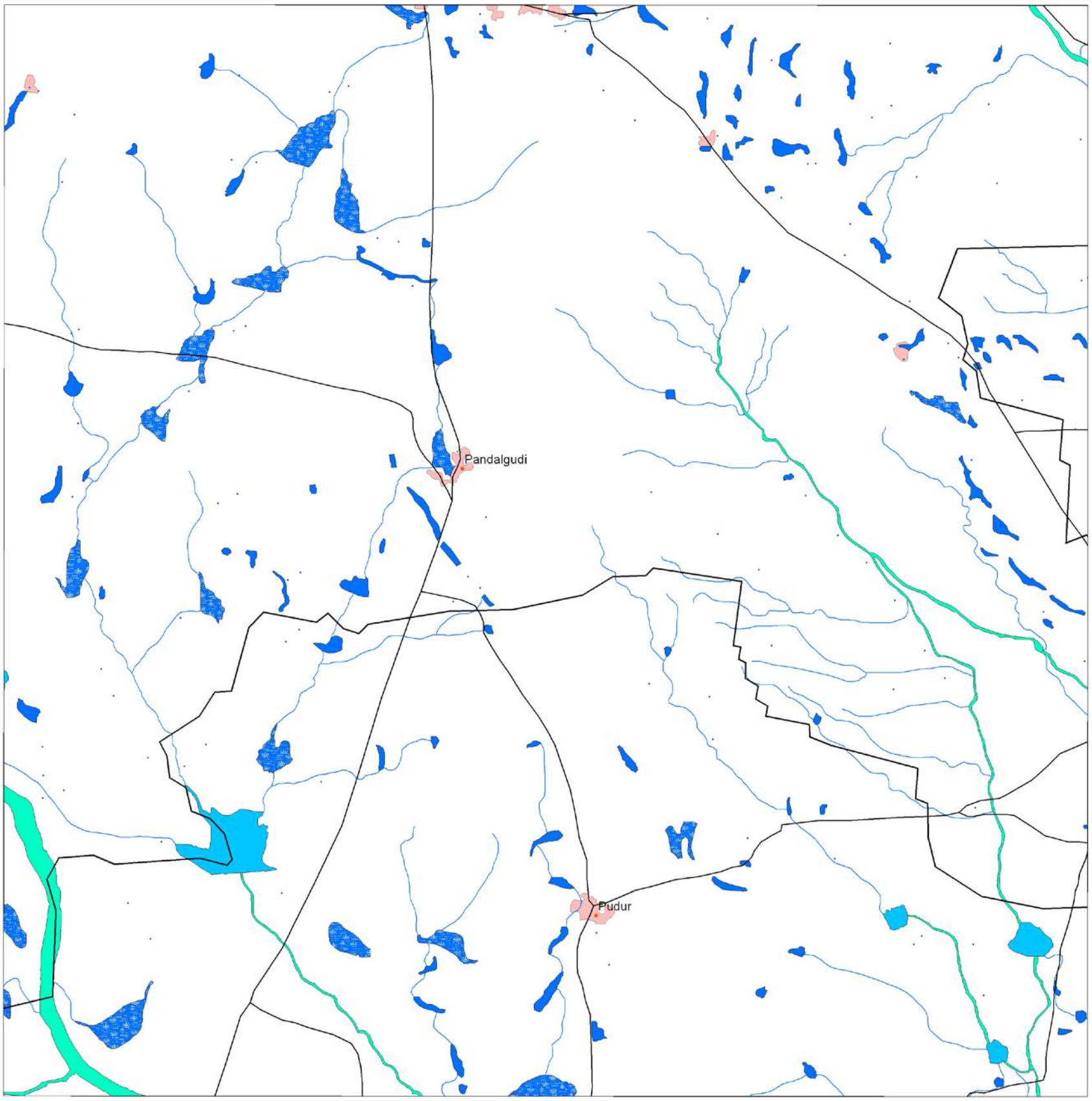
State : Tamilnadu

WETLAND MAP

Map No. : 58K/3



Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
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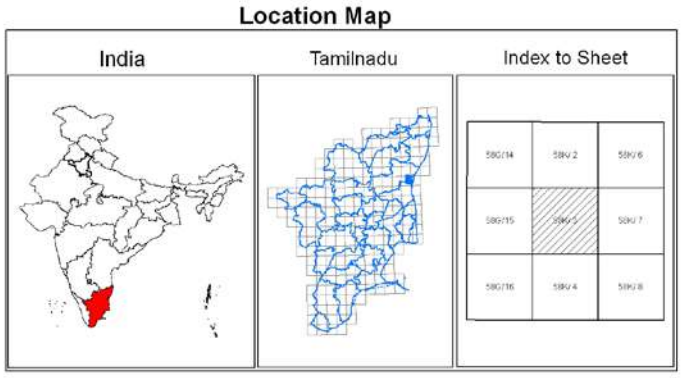
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25 ha)
- Settlements
- Drainage (line)
- Canal
- Roads
- Railways
- Town/Settlements
- District Boundary
- State Boundary
- International Boundary

Location Map



Data Source :

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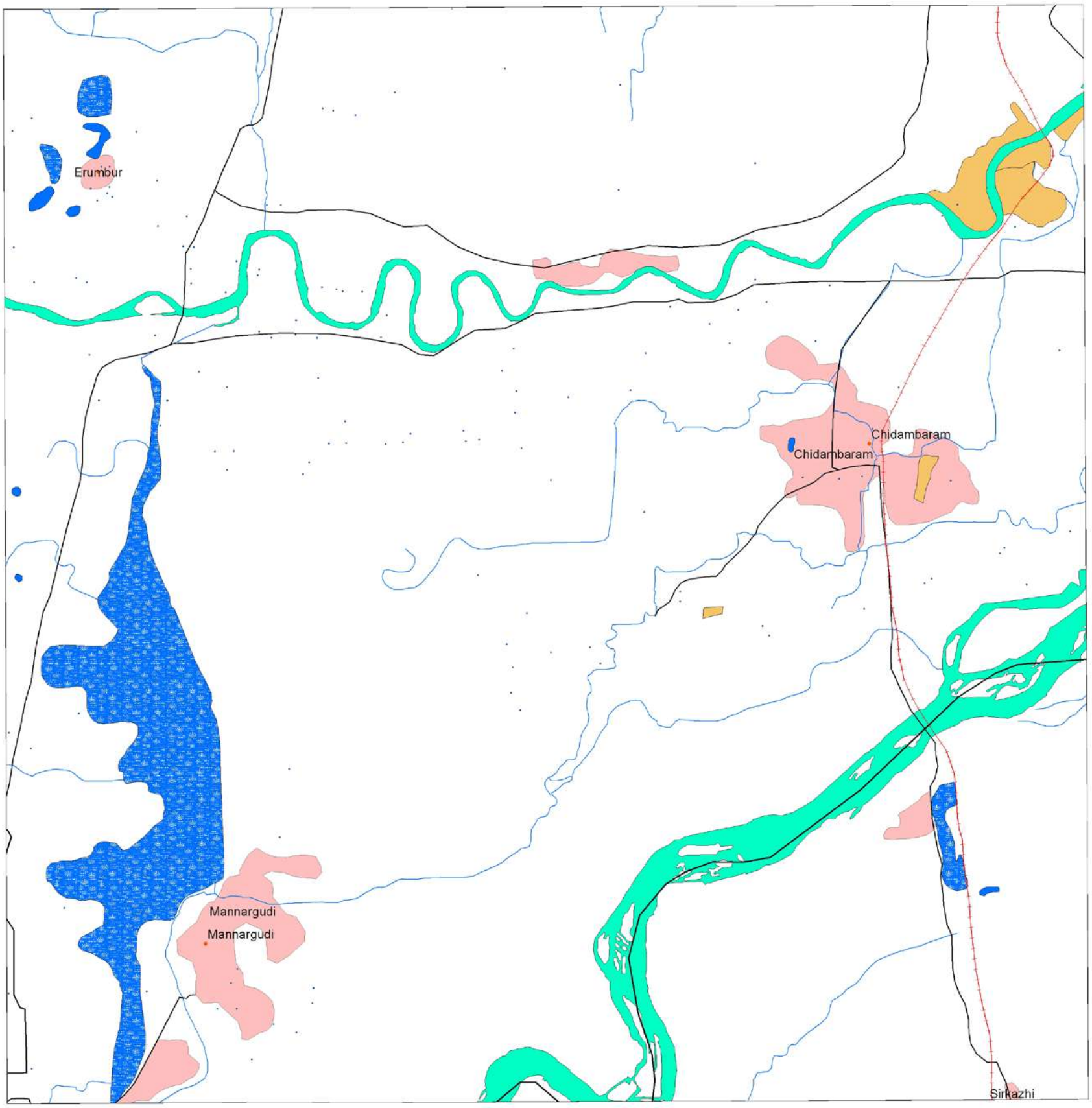
State : Tamilnadu

WETLAND MAP

Map No. : 58M/11

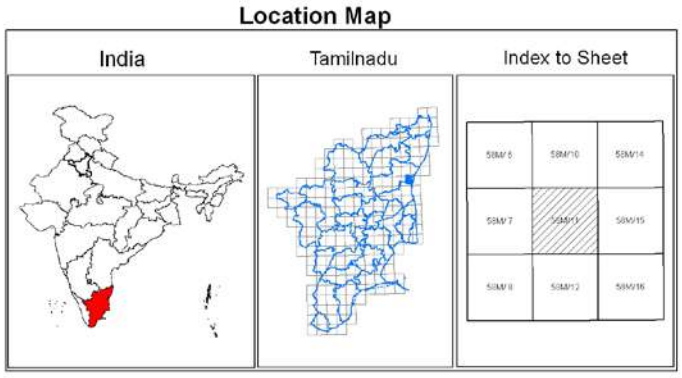


Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25 ha)
- Settlements
- Drainage (line)
- Canal
- Roads
- Railways
- Town/Settlements
- District Boundary
- State Boundary
- International Boundary

Location Map



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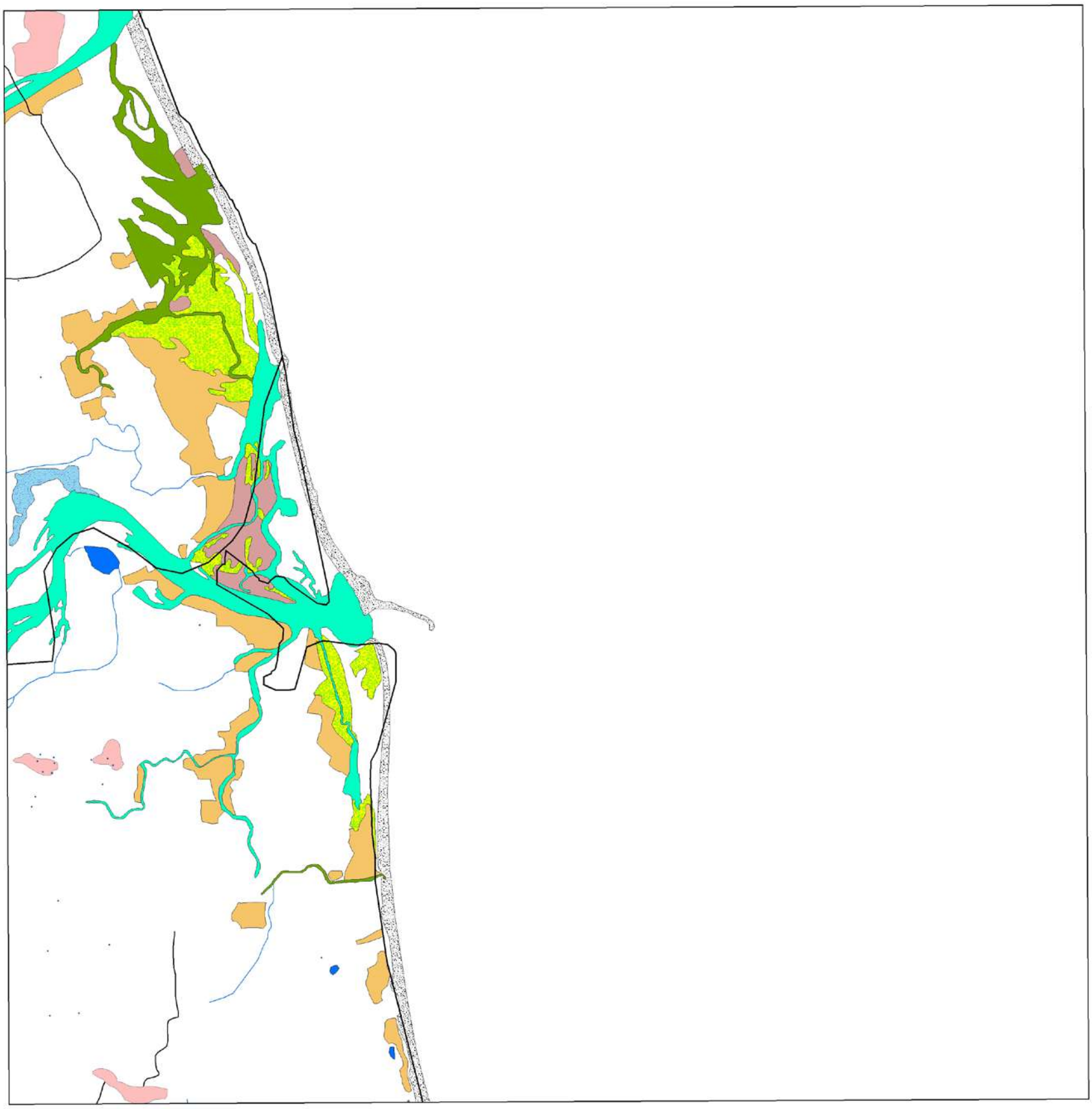
WETLAND MAP

Map No. : 58M/15



Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
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			Natural	
	2101			Lagoons
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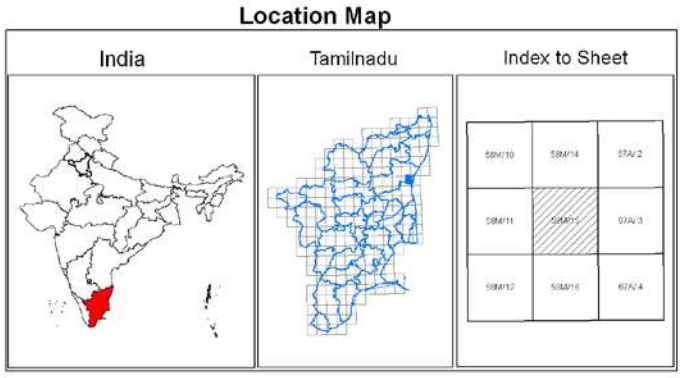
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25 ha)
- Settlements
- Drainage (line)
- Canal
- Roads
- Railways
- Town/Settlements
- District Boundary
- State Boundary
- International Boundary

Location Map



Data Source :

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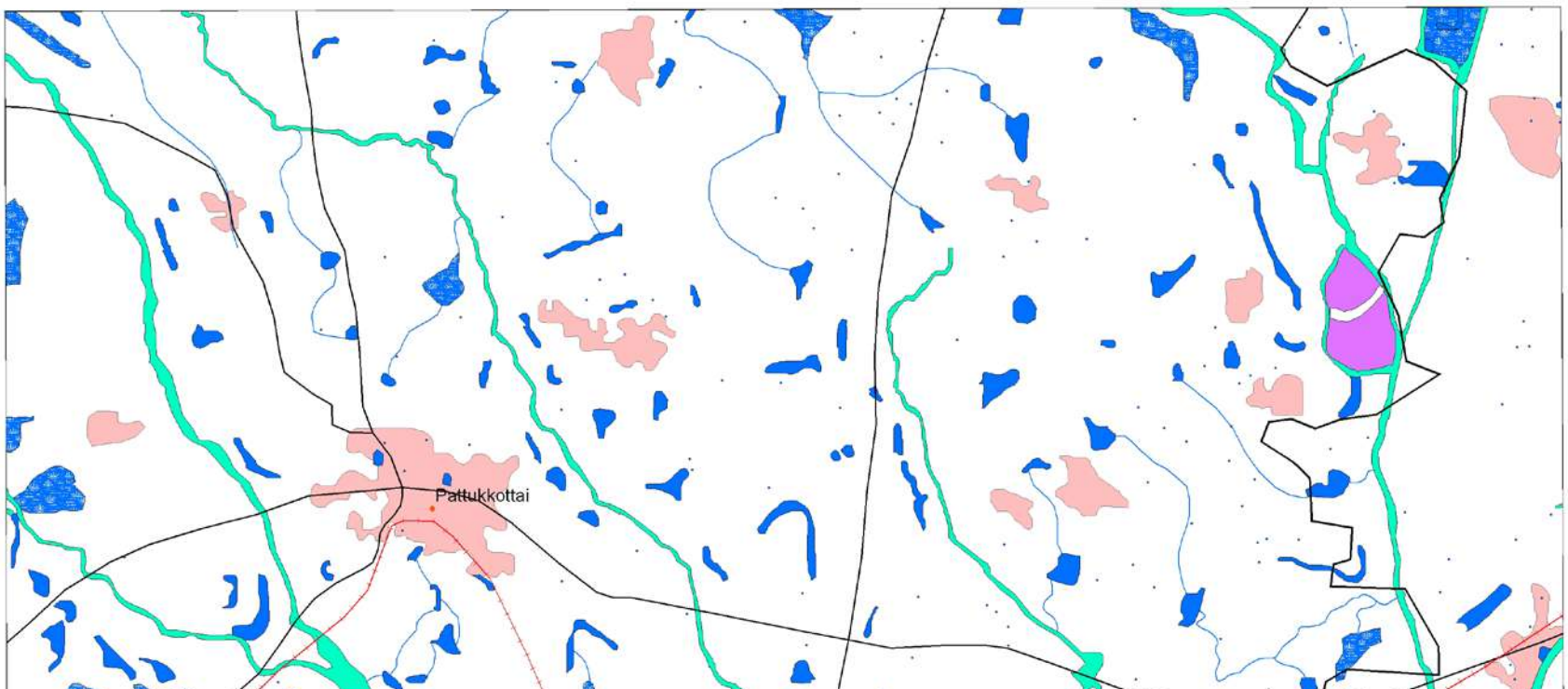
State : Tamilnadu

WETLAND MAP

Map No. : 58N/7



Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
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		Coastal Wetlands		
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	2101			Lagoons
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			Man-made	
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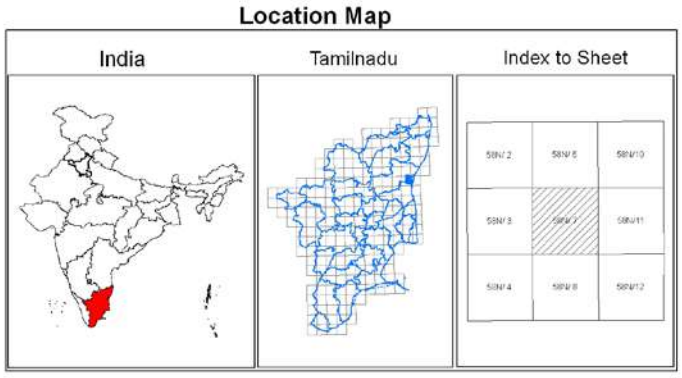
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25 ha)
- Settlements
- Drainage (line)
- Canal
- Roads
- Railways
- Town/Settlements
- District Boundary
- State Boundary
- International Boundary

Location Map



Data Source :

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Prepared By :

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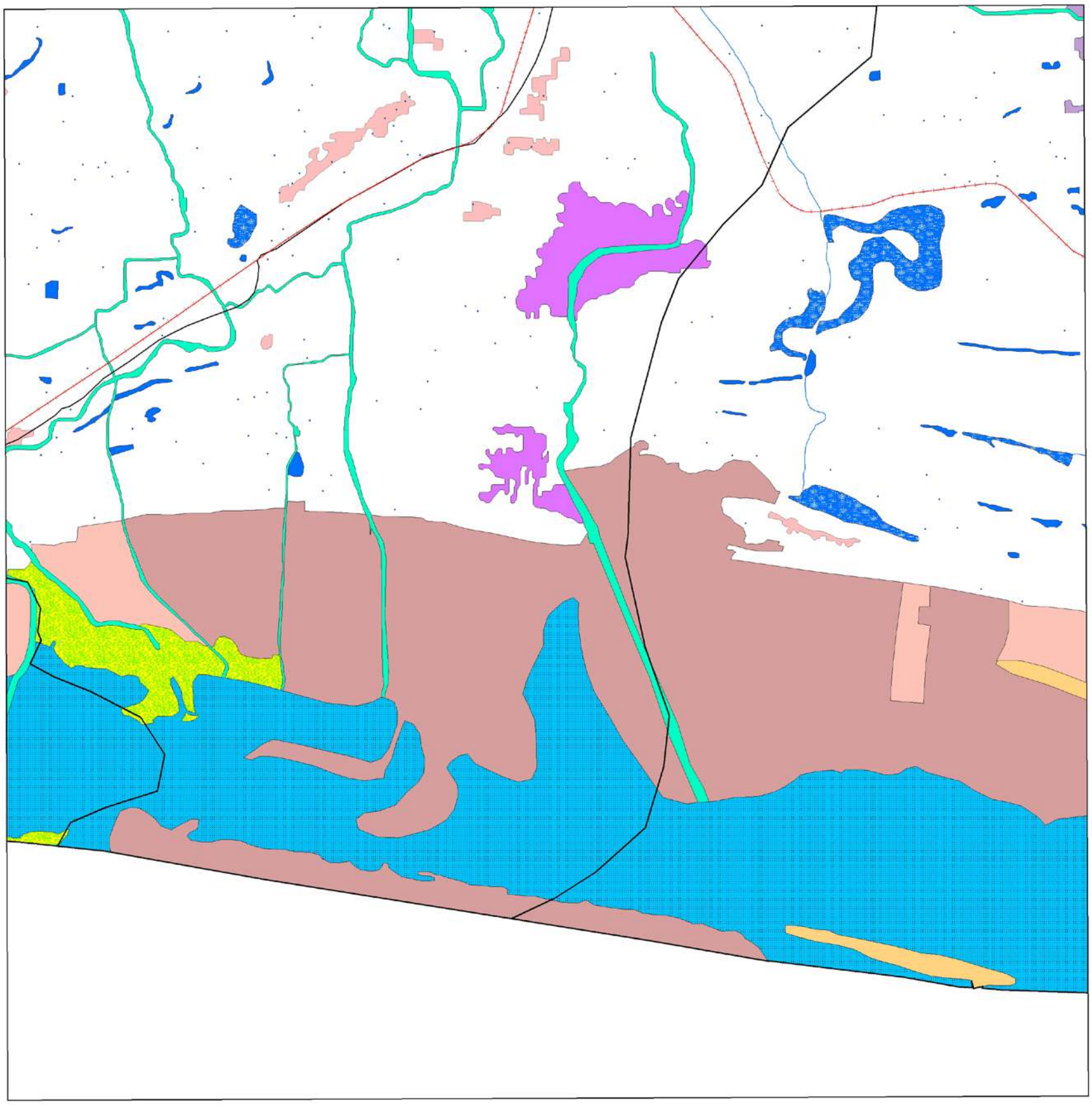
Government of India

State : Tamilnadu

WETLAND MAP

Map No. : 58N/11



Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
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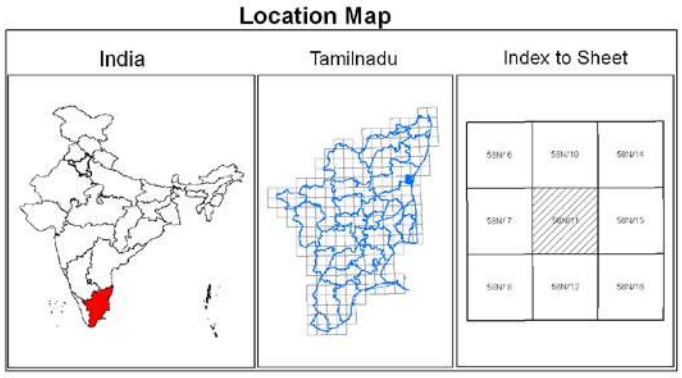
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25 ha)
- Settlements
- Drainage (line)
- Canal
- Roads
- Railways
- Town/Settlements
- District Boundary
- State Boundary
- International Boundary

Location Map



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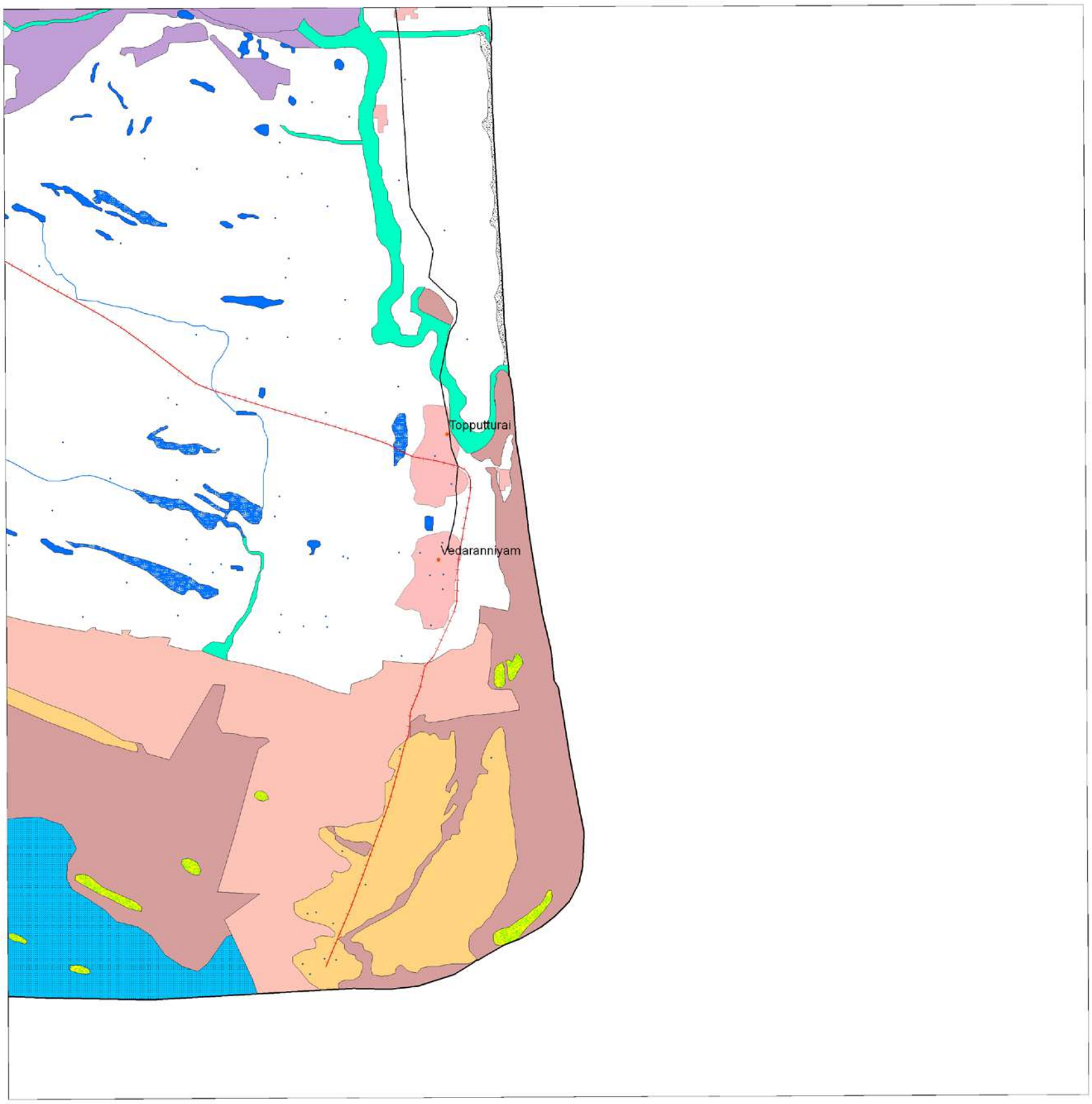
Government of India

State : Tamilnadu

WETLAND MAP

Map No. : 58N/15



Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
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	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
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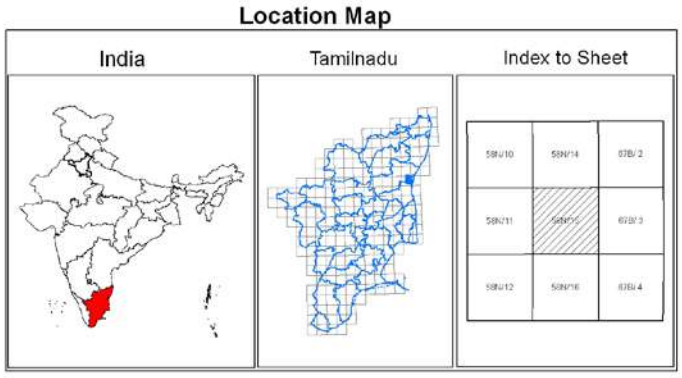
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25 ha)
- Settlements
- Drainage (line)
- Canal
- Roads
- Railways
- Town/Settlements
- District Boundary
- State Boundary
- International Boundary

Location Map



Data Source :

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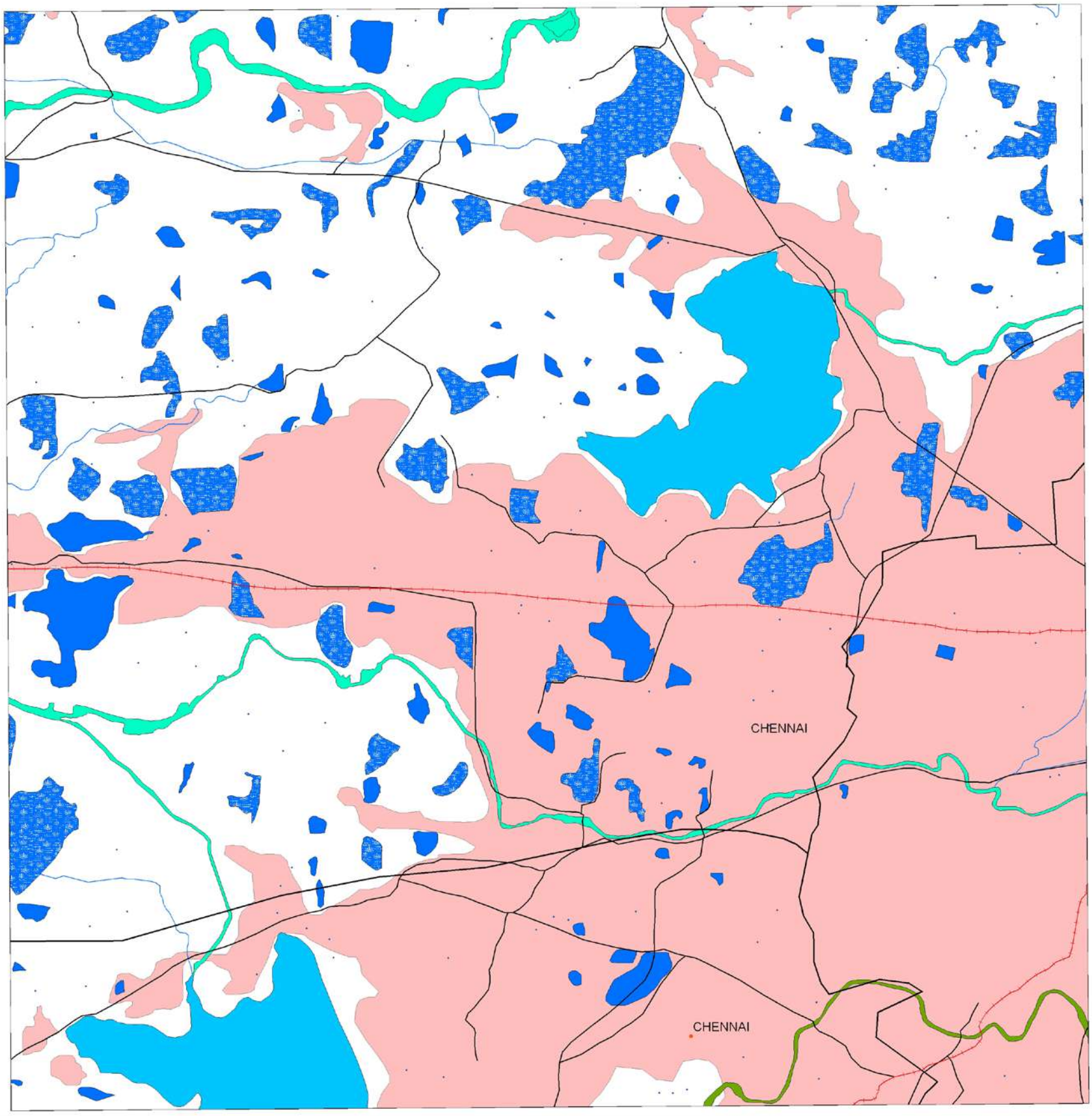
State : Tamilnadu

WETLAND MAP

Map No. : 66C/04



Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
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	2101			Lagoons
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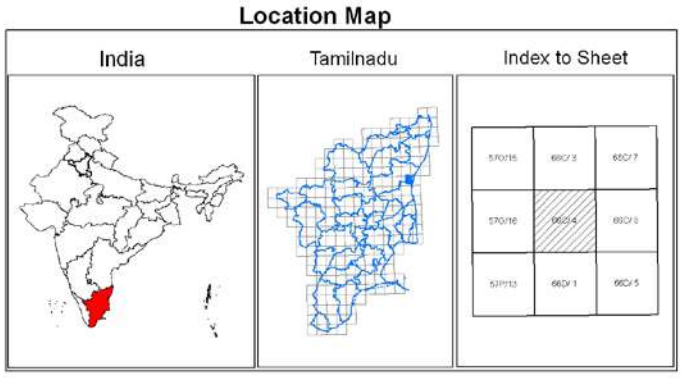
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25 ha)
- Settlements
- Drainage (line)
- Canal
- Roads
- Railways
- Town/Settlements
- District Boundary
- State Boundary
- International Boundary

Location Map



Data Source :

IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

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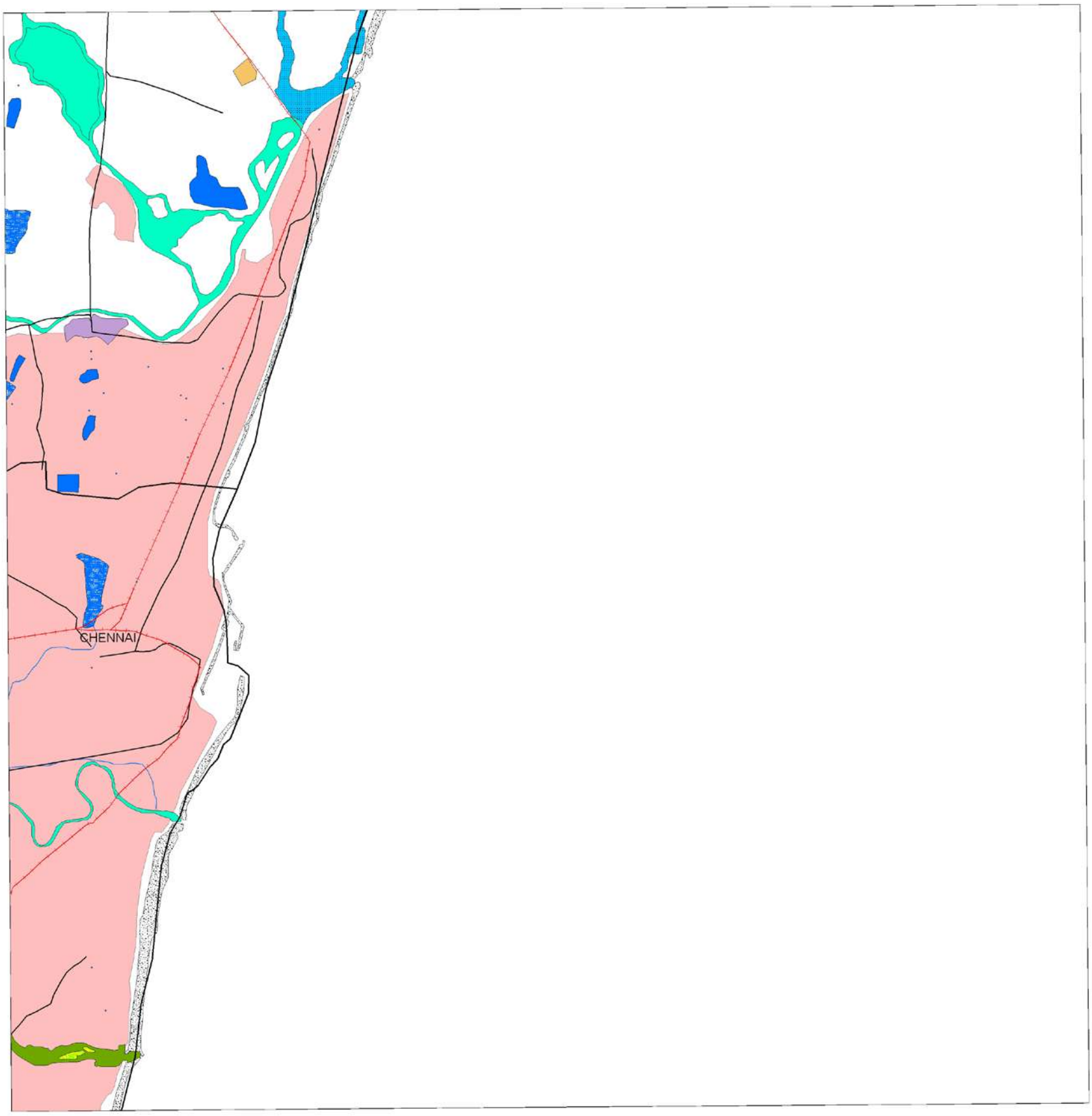
Government of India

State : Tamilnadu

WETLAND MAP

Map No. : 66C/8



Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
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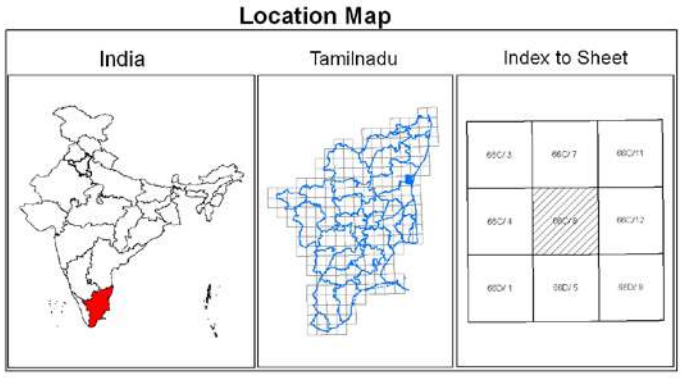
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25 ha)
- Settlements
- Drainage (line)
- Canal
- Roads
- Railways
- Town/Settlements
- District Boundary
- State Boundary
- International Boundary

Location Map



Data Source :

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Prepared By :

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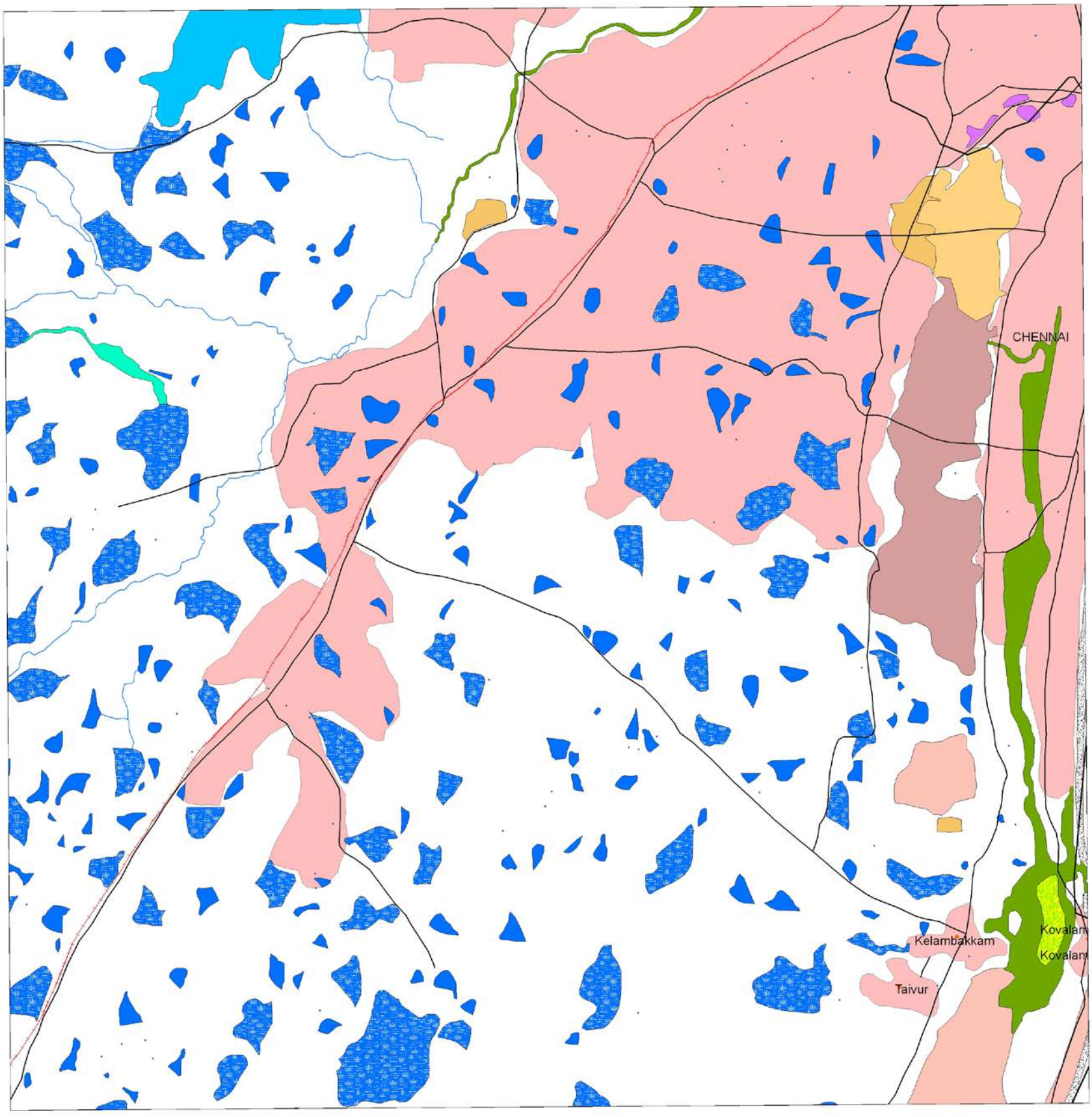
Government of India

State : Tamilnadu

WETLAND MAP

Map No. : 66D/1



Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
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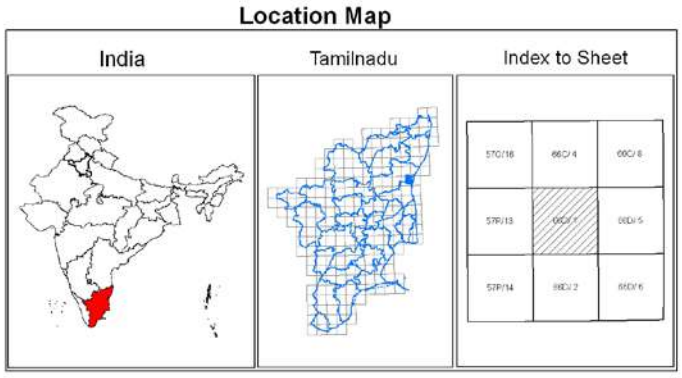
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25 ha)
- Settlements
- Drainage (line)
- Canal
- Roads
- Railways
- Town/Settlements
- District Boundary
- State Boundary
- International Boundary

Location Map



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Government of India

REFERENCES

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Annexure I
Definitions of wetland categories used in the project

For ease of understanding, definitions of wetland categories and their typical appearance on satellite imagery is given below:

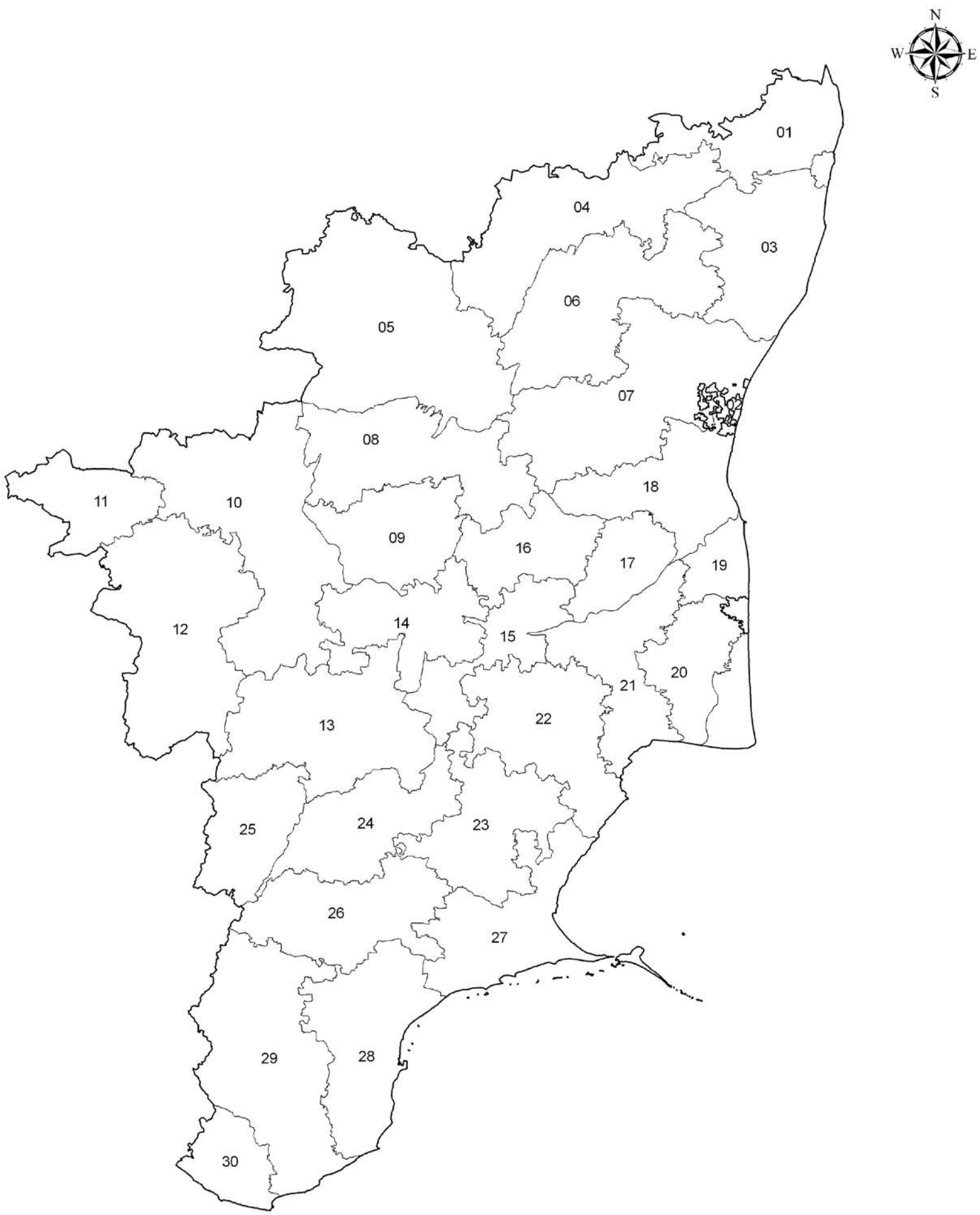
Wetland type code	Definition and description
1000	**Inland Wetlands**
1100	**Natural**
1101	**Lakes**: Larger bodies of standing water occupying distinct basins (Reid *et al*, 1976). These wetlands occur in natural depressions and normally fed by streams/rivers. On satellite images lakes appear in different hues of blue interspersed with pink (aquatic vegetation), islands (white if unvegetated, red in case of terrestrial vegetation). Vegetation if scattered make texture rough.
1102	**Ox-bow lakes/ Cut off meanders**: A meandering stream may erode the outside shores of its broad bends, and in time the loops may become cut-off, leaving basins. The resulting shallow crescent-shaped lakes are called oxbow lakes (Reid *et al*, 1976). On the satellite image Ox-bow lakes occur near the rivers in plain areas. Some part of the lake normally has aquatic vegetation (red/pink in colour) during pre-monsoon season.
1103	**High Altitude lakes:** These lakes occur in the Himalayan region. Landscapes around high lakes are characterized by hilly topography. Otherwise they resemble lakes in the plain areas. For keeping uniformity in the delineation of these lakes contour line of 3000 m above msl will be taken as reference and all lakes above this contour line will be classified as high altitude lakes.
1104	**Riverine Wetlands**: Along the major rivers, especially in plains water accumulates leading to formation of marshes and swamp. **Swamps** are 'Wetland dominated by trees or shrubs' (U.S. Definition). In Europe, a forested fen (a peat accumulating wetland that has no significant inflows or outflows and supports acidophilic mosses, particularly *Sphagnum*) could be called a swamp. In some areas reed grass - dominated wetlands are also called swamps). (Mitsch and Gosselink, 1986). **Marsh**: A frequently or continually inundated wetland characterised by emergent herbaceous vegetation adapted to saturated soil conditions. In European terminology a marsh has a mineral soil substrate and does not accumulate peat (Mitsch and Gosselink, 1986). Tone is grey blue and texture is smooth. **Comment**: Using satellite data it is difficult to differentiate between swamp and marsh. Hence, both have been clubbed together.
1105	**Waterlogged:** Said of an area in which water stands near, at, or above the land surface, so that the roots of all plants except hydrophytes are drowned and the plants die (Margarate *et al*, 1974). Floods or unlined canal seepage and other irrigation network may cause waterlogging. Spectrally, during the period when surface water exists, waterlogged areas appear more or less similar to lakes/ponds. However, during dry season large or all parts of such areas dry up and give the appearance of mud/salt flats (grey bluish).
1106	**River/stream:** Rivers are linear water features of the landscape. Rivers that are wider than the mapping unit will be mapped as polygons. Its importance arises from the fact that many stretches of the rivers in Indo-Gangetic Plains and peninsular India are declared important national and international wetlands (Ex. The river Ganga between Brajghat and Garh Mukteshwar, is a Ramsar site, Ranganthattu on the Cavery river is a bird sanctuary etc.). Wherever, rivers are wide and features like sand bars etc. are visible, they will be mapped.
1200	**Man-made**
1201	***Reservoir****: A pond or lake built for the storage of water, usually by the construction of a dam across a river (Margarate et al, 1974). On RS images, reservoirs have irregular boundary behind a prominent dyke. Wetland boundary in case of reservoir incorporates water, aquatic vegetation and footprint of water as well. In the accompanying images aquatic vegetation in the reservoir is seen in bright pink tone. Tone is dark blue in deep reservoirs while it is ink blue in case of shallow reservoirs or reservoirs with high silt load. These will be annotated as Reservoirs/Dam.* **Barrage:** Dykes are constructed in the plain areas over rivers for creating Irrigation/water facilities. Such water storage areas develop into wetlands (Harike Barrage on Satluj – a Ramsar site, Okhla barrage on the Yamuna etc. – a bird sanctuary). Water appears in dark blue tone with a smooth texture. Aquatic vegetation appears in pink colour, which is scattered, or contiguous depending on the density. Reservoirs formed by barrages will be annotated as reservoir/barrage.

1202	**Tanks/Ponds:** A term used in Ceylon and the drier parts of Peninsular India for an artificial pond, pool or lake formed by building a mud wall across the valley of a small stream to retain the monsoon (Margarate *et al*, 1974). **Ponds** Generally, suggest a small, quiet body of standing water, usually shallow enough to permit the growth of rooted plants from one shore to another (Reid *et al*, 1976). Tanks appear in light blue colour showing bottom reflectance. In this category **Industrial ponds/mining pools mainly comprising Abandoned Quarries are also included (**Quarry is defined as "An open or surface working or excavation for the extraction of stone, ore, coal, gravel or minerals." In such pits water accumulate (McGraw Hill Encyclopaedia of Environmental Sciences, 1974), **Ash pond/Cooling pond** (The water body created for discharging effluents in industry, especially in thermal power plants (Encyclopaedic Directory of Environment, 1988) and **Cooling pond**: An artificial lake used for the natural cooling of condenser-cooling water serving a conventional power station (Encyclopaedic Directory of Environment, 1988). These ponds can be of any shape and size. Texture is rough and tonal appearance light (quarry) to blue shade (cooling pond).
1203	**Waterlogged :** Man-made activities like canals cause waterlogging in adjacent areas due to seepage especially when canals are unlined. Such areas can be identified on the images along canal network. Tonal appearance is in various hues of blue. Sometimes, such waterlogged areas dry up and leave white scars on the land. Texture is smooth.
1204	**Salt pans:** Inland salt pans in India occur in Rajasthan (Sambhar lake). These are shallow rectangular man-made depressions in which saline water is accumulated for drying in the sun for making salt.
2000	**Coastal Wetlands**
2100	**Natural**
2101	**Lagoons/Backwaters:** Such coastal bodies of water, partly separated from the sea by barrier beaches or bass of marine origin, are more properly termed lagoons. As a rule, lagoons are elongate and lie parallel to the shoreline. They are usually characteristic of, but not restricted to, shores of emergence. Lagoons are generally shallower and more saline than typical estuaries (Reid *et al*, 1976). **Backwater**: A creek, arm of the sea or series of connected lagoons, usually parallel to the coast, separated from the sea by a narrow strip of land but communicating with it through barred outlets (Margarate *et al*, 1974).
2102	**Creek:** A notable physiographic feature of salt marshes, especially low marshes. These creeks develop as do rivers "with minor irregularities sooner or later causing the water to be deflected into definite channels" (Mitsch and Gosselink, 1986). Creeks will be delineated, however, their area will not be estimated.
2103	**Sand/Beach:** Beach is an unvegetated part of the shoreline formed of loose material, usually sand that extends from the upper berm (a ridge or ridges on the backshore of the beach, formed by the deposit of material by wave action, that marks the upper limit of ordinary high tides and wave wash to low water mark(Clark,1977).Beach comprising rocky material is called rocky beach.
2104	**Intertidal mudflats**: Most unvegetated areas that are alternately exposed and inundated by the falling and rising of the tide. They may be mudflats or sand flats depending on the coarseness of the material of which they are made (Clark, 1977).
2105	**Salt Marsh**: Natural or semi-natural halophytic grassland and dwarf brushwood on the alluvial sediments bordering saline water bodies whose water level fluctuates either tidally or non- tidally (Mitsch and Gosselink, 1986). Salt marshes look in grey blue shade when wet.
2106	**Mangroves**: The mangrove swamp is an association of halophytic trees, shrubs, and other plants growing in brackish to saline tidal waters of tropical and sub-tropical coastlines (Mitsch and Gosselink, 1986). On the satellite images mangroves occur in red colour if in contiguous patch. When mangrove associations are scattered or are degraded then instead of red colour, brick red colour may be seen.
2107	**Coral reefs:** Consolidated living colonies of microscopic organisms found in warm tropical waters. The term coral reef, or organic reef is applied to the rock- like reefs built-up of living things, principally corals. They consist of accumulations of calcareous deposits of corals and corraline algae with the intervening space connected with sand, which consists largely of shells of foraminefera. Present reefs are living associations growing on this accumulation of past (Clark, 1977). Reefs appear in light blue shade.
2200	**Man-made**
2201	**Salt pans**: An undrained usually small and shallow rectangular, man-made depression or hollow in which saline water accumulates and evaporates leaving a salt deposit (Margarate *et al*, 1974). Salt pans are square or rectangular in shape. When water is there appearance is blue while salt is formed tone is white.
2202	**Aquaculture ponds**: Aquaculture is defined as "The breeding and rearing of fresh-water or marine fish in captivity. Fish farming or ranching". The water bodies used for the above are called aquaculture ponds (Encyclopaedic Directory of Environment, 1988). Aquaculture ponds are geometrical in shape usually square or rectangular. Tone is blue.

Annexure – II
Details of District information followed in the atlas

State : Tamilnadu

District Boundary Map



List of Districts

District code	District name
01	Thiruvallur
02	Chennai
03	Kancheepuram
04	Vellore
05	Dharampuri
06	Thiruvannamalai
07	Viluppuram
08	Salem
09	Namakkal
10	Erode
11	The Nilgiris

District code	District name
12	Coimbatore
13	Dindigul
14	Karur
15	Tiruchirappalli
16	Perambalur
17	Ariyalur
18	Cuddalore
19	Nagapattinam
20	Thiruvarur
21	Thanjavur
22	Pudukkottai

District code	District name
23	Sivaganga
24	Madurai
25	Theni
26	Virudhunagar
27	Ramanathapuram
28	Thoothukkudi
29	Tirunelveli
30	Kanniyakumari

Legend

State Boundary

District Boundary

Source : Survey of India (Surveyed in 2004 and published in 2005)

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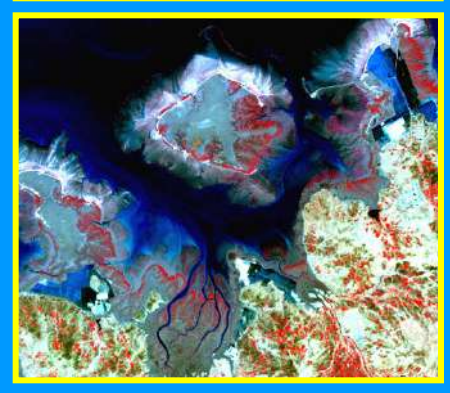
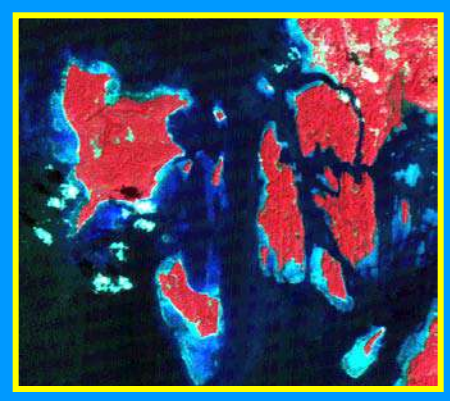
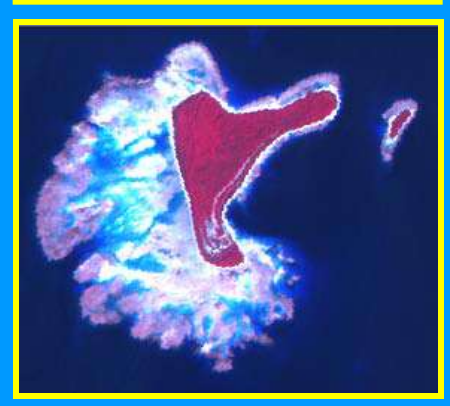
SAC is a host institution for the training programmes related to Satellite Communication, Satellite Meteorology and global change under the Centre for Space Science & Technology Education in Asia and the Pacific (CSSTEAP) affiliated to the United Nations (UN).

http://www.isro.org







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