

CHAPTER - 1

BACKGROUND AND STUDY AREA

1.1 INTRODUCTION

The coastal area, or coastal zone is the area of interaction between the land and the sea. It is defined by Sorenson and McCreary as the interface or transition zone, specifically “that part of the land affected by its proximity to the sea and that part of the ocean affected by its proximity to the land, that is an area in which processes depending on the interaction between the land and sea are most intense.” However, the border between the land and sea is not fixed - it changes daily with the tides, with the moon stages, seasonally with astronomic forces, and sporadically with sea storms and great river floods.

The coastal zone may be drawn wide or narrow in order to meet program goals. For example, it could embrace a wide band of shore lands or a quite narrow strip. It can include coastal islands and the shallower near shore coastal waters, but it could in some cases extend to the outer edge of the continental shelf. But the coastal zone always includes the inter tidal and supra tidal zones of the water’s edge that include coastal floodplains, mangroves, marshes, and tidal flats, as well as beaches and dunes and fringing coral reefs. This is the place where agency authority changes abruptly, where storms hit, where waterfront development locates, where boats make their landfalls, and where some of the richest aquatic habitat is found. It is also the place where terrestrial-type planning and resource management programs are at their weakest. It is the core of the coastal zone (Clark, 1996).

Coastal zones are unique. Such things as daily tides, mangrove forests, coral reefs, tidal flats, sea beaches, storm waves, and barrier islands are found only at the coast. Because of these features and because coastal enterprise is also distinctive, most countries recognize the coastal zone as a distinct region with resources that require special attention. In all but the larger coastal settlements, the coastal location creates distinctively maritime cultures.

The transitional strip of land and sea that straddles the coastline contains some of the most productive and valuable habitats of the biosphere, including estuaries, lagoons, coastal wetlands, and fringing coral reefs. It is also a

place of natural dynamism where huge amounts of natural energy are released and a great abundance of life is nurtured. It is a place of high priority interest to people, to commerce, to the military, and to a variety of industries. Because it contains dense populations, the coast undergoes great environmental modification and deterioration through landfill, dredging, and pollution caused by urban, industrial, and agricultural development.

The land can strongly affect the sea. Impacts on coastal ecosystems from terrestrial activity include industrial and agricultural pollution; siltation from eroded uplands; filling to provide sites for industry, housing, recreation, airports, and farmland; dredging to create, deepen, and improve harbors; quarrying; and the excessive cutting of mangroves for fuel. The impacts affect community security (from sea storms), tourism revenues, biological diversity, and natural resources abundance.

The basic objective of 'Integrated Coastal Zone Management (ICZM)' is to ensure a level and type of development of coastal zone and its resource which is consistent with the continuing productivity and viability of the natural systems upon which the productivity of the area is based by taking all the influencing factors into account. In current terminology, coastal management is "integrated resource management" in a specific physical context, and it is also a form of what is called "environmental management".

In a world of rapid population growth and diminishing natural resources, each country must plan for economic growth in balance with resource conservation and environmental management if it is to make progress in health, food, housing, energy, and other critical national needs

In the coastal areas of the world, high population densities, linked with urban growth, expanding tourism, and industrialization, pose major threats to natural resources and biological diversity. The effects of uncontrolled development are destabilizing ecosystems, changing land use patterns, making communities vulnerable to sea storms. This situation is expected to worsen. The current coastal population is likely to more than double in a few decades while resources uses accelerate. Urbanization and tourism expansion will unavoidably lead to further pressure on water supplies and to irreversible changes in coastal environments. Growing amounts of gaseous, liquid, and solid waste also jeopardize the future of marine, coastal, and wetland ecosystems, as well as threaten species survival.

India has a long coastline of about 7500 km including of its island territories. Coastal zone in India assumes its importance because of high productivity of its ecosystems, concentration of population, exploitation of renewable and

non-renewable natural resources, discharge of waste effluent and municipal sewage, development of various industries and spurt in recreational activities. Thus, there is a need to protect the coastal environment while ensuring continuing production and development.

A principal concern of system management is to ensure a rational development of area and judicious use of its resources, which is consistent with the surrounding natural systems and environment. Thus, environmentally effective system management depends upon accurate and comprehensive scientific data on which policy decisions can be based. A basic problem confronting our country is limited availability of geographic data for coastal areas of the country. Moreover, all these data is in either spatial or non-spatial form and thus difficult to integrate conventionally. It is, therefore necessary to develop a computer based system composed of comprehensive and integrated set of data designed for decision making.

In order to manage and protect the coastal zone, which is an extremely complex, highly diverse, and complicated system, Space Applications Centre (SAC), Ahmedabad has taken up a Project "Coastal Zone Studies" to create a comprehensive digital thematic database and to develop a computerized Coastal Zone Information System (CZIS) for Integrated Coastal Zone Management of the entire country. The project is funded by Ministry of Environment and Forest (MoEF).

This report presents, in brief, the work done in the project, using an integrated approach of Remote Sensing and Geographical Information System (GIS). Remote sensing data from a variety of sensors have been proved to be extremely useful for number of applications. On the other hand, GIS has come up as a powerful tool not only for storing, organising and retrieving a large amount of spatial and non-spatial data but also, is capable of analyzing and transforming the spatial data into different projections and scales. Moreover, a number of models for various applications can be formulated around GIS using languages such as Arc Macro Language (AML). Thus remote sensing data when properly organised through or integrated with GIS, can be extremely useful for natural resources management, resource planning and decision making for administrator/ planners. In the present study, available landuse, wetland, shoreline and coral reef maps prepared by Space Applications Centre, Ahmedabad and user Agencies using remote sensing satellite data of IRS LISS-II, Landsat MSS/TM, SPOT of 1988-1994 to generate a baseline data which in turn can be used for preparing an 'Integrated Coastal Zone Management (ICZM)' plan for entire Indian coast. This baseline data in GIS environment can provide

- i) A set of benchmark or reference conditions in the coastal areas
- ii) Preservation, conservation and monitoring of vital/ critical habitats e.g. coral reefs, mangroves, etc.
- iii) Selection of appropriate sites for industries, landfall points, aquaculture and recreational activities using specific criteria.
- iv) To assess impact of conversion of wetlands, reclamation of land from sea, sand mining, dredging and recreational activities.
- v) Planning and implementation of coastal protection work (erosion, flood protection, cyclone, earth quakes, salt water intrusion, etc.) for protection of life and property.
- vi) To understand interactions between different developmental activities and modifications of coastal processes.
- vii) Impact of construction of dam, ports, jetties, etc. on shoreline equilibrium.
- viii) Sea-level rise and its possible effects.
- ix) Proper resource utilization (fisheries, minerals, etc.)
- x) Impact of pollution from a) industrial sources (industrial waste); b) domestic sources (household waste and solid waste); c) agricultural sources (pesticide and fertilizer runoff); and other sources (dredging activities) on habitats and marine living resources.

As an example, this data has been used in conjunction with satellite data (1996-2000) for change detection study and monitoring landuse pattern for some of the selected sites of Port Blair and Wandoor Marine Park (Gupta M.C et.al 2003). Island ecosystem management models were developed for zoning the coastal area into preservation, conservation, utilization and development zones to protect and conserve the units of vital / critical environmental concern e.g. coral reefs, mangroves etc. This zoning was based on environmentally sensitive criteria employing conditions of vital coastal habitats and their risk due to human interactions, polluted/impacted areas. Furthermore, another model was also developed to divide the coastal zone into CRZ-I, CRZ-II, CRZ-III and CRZ-IV for generating Coastal Regulation Zone (CRZ) maps for Gujarat using the criteria provided by the 1991 notification of Ministry of Environment and Forest (MOEF). Geographical Information System (GIS) was used to create a data base of spatial and non-spatial data and to implement the above cited models into GIS environment . The baseline landuse database was also used for selecting sites for aquaculture development in Gujarat Gupta M.C and Shailesh Nayak, 1998) and Kerala (Gupta M.C, 1999).

1.2 OBJECTIVE

The main objectives of Coastal Zone Information System (CZIS) are :

- i) To develop and organize a database comprising various themes at different scales using hardcopy thematic maps and or digital data prepared using satellite data mainly IRS data in conjunction with ground-based environmental data and Digital Image Analysis Techniques in Geographical Information System (GIS) environment.
- ii) To develop a 'Query Shell' / Customized Information System Package to retrieve and use the database in user friendly and efficient manner.

The outputs of such a system can be useful for assessing environmental impacts, preparing regional plans, development of coastal zone, development of tourism and in general creating a data base of collective layers for use by planners/ decision makers. Different thematic layers viz. landuse, wetland, shoreline and coral reef can be integrated along with other related numerical data to get an effective coastal zone management plan in the country.

1.3 STYDY AREA

The entire country's coastline, around 7500 km including that of its island territories. This consists of nine maritime states viz. Gujarat, Maharashtra, Goa, Karnataka, Kerala, Tamil Nadu, Andhra Pradesh, Orissa, West Bengal and two union territories of Andaman & Nicobar Group of Islands and Lakshadweep Islands.

CHAPTER - 2

METHODOLOGY

- i) Preparation of different thematic maps on different scales using remote sensing satellite data over a period of 1988 – 1994 to cover entire India's coastline. The maps were prepared using Visual Image Interpretation Techniques taking Survey of India (SOI) topographical maps as base maps. The ground truth information was used to improve upon the accuracy.
- ii) Collection of non-spatial (statistical) data such as population and name of settlements from different sources.
- iii) Creation and organisation of data base envisaging
 - a) Creation of reference frames (master files) for all nine maritime states (cited earlier) and Andaman & Nicobar and Lakshadweep separately.
 - b) Generation of different thematic layers using reference frames.
 - c) Linking non-spatial data to spatial data base.
- iv) Development of models
 - a) To identify environmentally sensitive zones (preservation, conservation, development and utilization) using criteria based on coastal habitats conditions and risks due to human interaction and
 - b) To classify the coastal zone into CRZ-I, CRZ-II, CRZ-III and CRZ-IV as per the criteria formed by Ministry of Environment & Forests notification 1991.
- v) Implementing the models into Geographical Information System (GIS) environment for developing customized software package. This was done for Gujarat, Andaman & Nicobar and Lakshadweep in collaboration with Forest & Environment Dept., Govt. of Gujarat, Gandhinagar, Central Agricultural Research Institute (CARI), Port Blair and DOS at Kavarati.
- vi) Development of a 'Query Shell' for creating data base and retrieving the data base information in a user friendly manner as well as generating different output maps.

CHAPTER - 3

DATA USED AND THEMATIC MAPS PREPARATION

The entire Indian coastal area including Union Territories was mapped by using different satellite data (IRS, SPOT, LANDSAT TM and MSS) over a period of 1988-1994. A list of data used for preparing different thematic maps on different scales along with satellites data used, sensors, Path, Row and date of data acquisition is given as Appendix I to Appendix -VI. Maps were prepared for following themes :

1. Landuse maps on 1:25,000 scale
2. Landuse maps on 1:50,000 scale
3. Wetland maps on 1:50,000 scale
4. Wetland maps on 1:250,000 scale
5. Shoreline maps on 1:50,000 scale
6. Shoreline maps on 1:250,000 scale
7. Coral reef maps on 1:50,000 scale.

A short summary of maps prepared using satellite data is given below:

3.1 Land Use Maps

Coastal land use is one of the most important component of coastal environment. Information on land use/ land cover in the form of maps and statistical data is very vital for planning, management, and utilization of land for various purposes such as agriculture, forestry, urban development, economic production, tourism, environmental studies and so on. Thus, it provides basic input for any coastal zone management. To provide benchmark or reference conditions for management, base line data is to be generated. The Landuse maps for Coastal Regulation Zone (CRZ) showing wetland features between HTL and LTL and land use features up to 500 m from HTL on 1:25,000 scale for the entire Indian coast have been prepared using satellite data of the year around 1991 (Year of MoEF notification for CRZ to protect and conserve the coastal environment). These maps were generated using visual interpretation techniques & employing False Colour Composites (FCCs) of LISS-II, Landsat TM and SPOT data by Space Applications Centre (SAC), Ahmedabad and different collaborating agencies of different maritime states. The main emphasis was on tidal wetlands, built-up area, mining areas, etc. About 1000 maps for the entire country's

coastline have been prepared. These maps have about 85 per cent classification accuracy at 90 per cent confidence level. The planimetric accuracy is about 60-75 m. CRZ maps provide baseline information for the planners and decision makers, and, are being used by the State Governments to prepare coastal zone management plan. Land use maps on 1:50,000 scales were also prepared for entire Indian coast. State-wise number of maps prepared are given below:

Table 1 : Number of maps prepared for Landuse on 25K and 50K

STATE	Landuse 1:25K	Period of Data Used	Landuse 1:50K	Period of Data Used
Gujarat	244	1988 - 1989	89	1988 - 1989
Maharashtra	81	1987 - 1994	35	1987 - 1994
Goa	21	1988 - 1993	5	1987 - 1994
Karnataka	33	1987 - 1991	17	1987 - 1991
Kerala	64	1988 - 1990	27	1988 - 1991
Tamil Nadu	33	1987 - 1991	17	1987 - 1991
Andhra Pradesh	117	1989 - 1993	43	1988 - 1989
Orissa	87	1988 - 1989	26	1988 - 1989
West Bengal	66	1988 - 1991	24	1988 - 1989
A & Nicobar	116	1987 - 1994	50	1987 - 1991

A standard classification scheme was designed to generate information on various environmental units on a regional or a national level on 1:25,000 scale (Table 2). Major land use categories delineated were agricultural land, forest (natural and man-made), coral reef, mangroves, mudflats, sandy areas, sandy beach, built-up land etc. . Linear features delineated were high water line, low water line, road, rail, administrative boundaries viz. district boundaries, state boundaries. Village locations (settlements) were also marked along with village/town/city names. A list of data used for preparing landuse maps on 1:25K & 1:50K scales along with satellites data used, sensors, Path, Row and date of data acquisition is given in Appendix I & II.

Table 2: Classification System of coastal landuse and wetland mapping

Code	Cover-ID	Level I	Level II	Level III
1	3	Wetland		
1.1	31		Mudflat /tidal flat	
1.1.1	311			Sub - tidal
1.1.2	312			Inter - tidal
1.1.3	313			High - tidal
1.1.4	314			High tidal with Salt - encrustation
1.13	315			Mud with Vegetation
1.9	32		Mangrove	
1.9.1	320			Very Dense
1.9.2	321			Dense
1.9.3	322			Sparse
1.9.4	323			Degraded
	33		Sand	
1.2	331		Beach/ Patch	
1.3	332		Spit	
1.4	333		Bar/barrier/ island	
1.5	334		Shoals	
1.6	335		Beach ridge	
	34		Rocks	
1.7	341		Rocky coast	
1.8	342		Rock exposure	
1.10	35		Salt-marsh/Marsh (Vegetation.)	
1.10.1	351			Dense
1.10.2	353			Moderately dense
1.10.3	352			Sparse
1.11	36		Algae	
1.11.1	361			Dense
1.11.2	363			Moderately dense
1.11.3	362			Sparse
1.12	37		Sea grass	

1.12.1	371			Dense
1.12.2	373			Moderately dense
1.12.3	372			Sparse
1.14	38		Sand vegetation with	
1.15	39		Scrub	
1.15.1	391			Dense
1.15.2	392			Sparse
1.15.3	393			Degraded
1.16	5		Coral reef	
1.16.1	51		Fringing	
1.16.2	52		Platform	
1.16.3	53		Patch	
1.16.4	54		Atoll	
1.16.5	541			Coral Lagoon
1.16.6	55		Coral pinnacle	
1.16.7	56		Coralline shelf	
1.16.8	57		Coral head	
2	2	Water bodies		
2.1	21		Estuary	
2.2	22		Creek	
2.3	23		Lagoon	
2.4	24		Bay	
2.5	25		Pond/lake	
2.6	26		Oxbow lake	
2.7	27		Meanders	
2.8	28		Cooling pond	
2.9	29		Water treatment plant	
2.10	251		River/stream	
	2511			River-sand
2.11	252		Canal	
2.12	253		Waterlogged	
2.13	254		Reservoir / tank	
3	7	Barren/ wasteland		
3.1	72		Mining areas / dumps	

3.2	73		Rock outcrops / gullied / eroded / barren land	
3.3	74		Brick kiln	
3.4	71		Sandy area	
4	6	Shore land		
4.1	61		Saline area	
4.2	62		Coastal dunes	
4.2.1	621			Dune with vegetation
4.2.2	622			Dune without vegetation
5	8	Built-up land		
5.1	81		Habitation	
5.1.1	811			Habitation With vegetation
5.2	82		Open/vacant land	
5.3	821			Industrial area
5.4	822			Waste dumping
5.5	83		Transportation	
5.5.1	831			Roads
5.5.2	832			Railways
5.5.3	833			Port/Harbour/jetty
5.5.4	834			Waterways
5.5.5	835			Airport
	84		Bridge	
6	1	Agricultural land		
7	10	Forest (Non-tidal)/ Plantation		
8	9	Other features		
8.1	91		Aquaculture ponds	
8.2	92		Salt pans	
8.3	94		Cliff	
8.4	93		Seawall/Embankment	

Note:

For Mangrove, criteria for density are as follows :

Very dense	> 70 %
Dense	= 40 – 70 %
Sparse	= 10 – 40 %
Degraded	< 10 %

For Salt Marsh/ Marsh vegetation / Algae / Sea grass :

Dense	= 80 – 100 %
Moderately dense	= 40 – 80 %
Sparse	= 10 – 40 %

Classification scheme for boundaries

Sr. No.	Cover-ID	Linear Features
1	31	High Water Line
2	32	Low Water Line
3	95	CRZ-Boundary
4	26	District Boundary
5	92	State Boundary
6	94	International Boundary
7	90	Taluka Boundary
8	91	Village Boundary
9	99	Rail
10	2	Road
11	22	Non-Metalled Road
12	21	River Stream
13	52	Canal
14	23	Sea-Wall
15	24	Embankment
16	41	Creek

3.2 Wetland Maps

Coastal habitats viz. wetland, mangroves, salt marshes, sea grasses are vital component of coastal environment. Wetlands are areas which are transitional between terrestrial and marine system where tidal water periodically inundates and water table is usually at or near surface or land is covered by water (Cowardin et al. 1979). These are being cleared for urban, industrial and recreational growth as well as for aquaculture development. Information of loss of tidal wetlands is important as they provide a vital link in the marine energy flow through transfer of solar energy into forms which are readily usable by a wide variety of estuarine organisms. Wetlands are responsible for maintaining reproductive fisheries not only by way of catch but as feeding, spawning and nursery grounds. Thus degradation of coastal habitats can have long term consequences for fish production. Apart from this they also serve as buffer for the mainland against ocean storms and protect the coast from erosion. The knowledge about areal extent, condition and destructive uses of wetlands is vital for coastal zone management programmes. Monitoring of changes in coastal wetlands can help in preservation, conservation of habitats, marine life, construction of ports and jetties and so on. Wetland maps are prepared on 1:50,000 and 1:250,000 scales for entire Indian coast using visual interpretation techniques & employing False Colour Composites (FCCs) of LISS-II, Landsat TM and SPOT data by Space Applications Centre (SAC), Ahmedabad and different collaborating agencies of different maritime states. State-wise number of maps prepared are given below:

Table 3 : Number of maps prepared for Wetland on 50K and 250K

STATE	Wetland 1: 50K	Period of Data Used	Wetland 1: 250K	Period of Data Used
Gujarat	64	1988 - 1989	4	1986
Maharashtra	29	1993	4	1986
Goa	6	1992 - 1993	--	--
Karnataka	12	1988 - 1991	2	1986
Kerala	28	1988 - 1993	8	1986
Tamil Nadu	38	1989 - 1990	9	1987 - 1991
Andhra Pradesh	38	1992 - 1993	10	1985 - 1987
Orissa	26	1993	5	1986
West Bengal	25	1988 - 1991	5	1985 - 1989
A & Nicobar	47	1987 - 1994	7	1986 - 1989
Lakshadweep	--	--	5	1986

Classification accuracy of these maps was about 85 per cent at 90% confidence level. The standard classification scheme for wetlands is given in Table 2. Major wetland categories delineated were coral reef, mangroves, mudflats, algae, sea grass, sandy beach, rocky coast etc. . Linear features delineated were high water line, low water line, road, rail, administrative boundaries viz. district boundaries, state boundaries. Village locations (settlements) were also marked along with village/town/city names. A list of data used for preparing wetland maps 1:50K and 1:250K scales along with satellites data used, sensors, Path, Row and date of data acquisition is given as Appendix III and IV.

3.3 Coral Reef Maps

A coral is a small animal of size of not more than a few millimeter. It is called 'polyp'. It has an uncomplicated body structure, catches its food by a set of arms (tentacles) and does not move except stretching its tentacles. However, two traits make it different from other animals. i) corals secrete a calcium carbonate skeleton outside their body, somewhat like a cup within which they live ii) they carry algal cells within their own cells. These algal cells recycle the waste products (ammonia, urea, phosphorous, carbon dioxide) generated by the corals and supply them back as useful carbohydrate and protein products to corals. A number of coral cups of a single species, form a coral colony and formation of a number of colonies (of assorted or mixed species) result into a reef. However, a reef develops under certain conditions such as a hard substratum on which the corals can settle, a water having temperature above 20 °C, good light penetration (the algal cells need light for photosynthesis) and uniform salinity. Due to these conditions, coral reefs are found only in tropical seas and along coastlines which are not subjected to heavy river discharge.

Coral reefs can be described, in reference to their locations and structure, as fringing, barrier, atoll, patch and a variety of other reefs. The fringing reef develops practically right on the shore (adjacent to the coast) with no large water body (lagoon) between the emerged shore and the submerged reef. A barrier reef is the one that has moved away from the shore and, in the process, has created a lagoon between the reef and the shore. An atoll reef is generally ring shaped, with a central lagoon and land mass(es) on the emerged portions of the reef and is located in the open ocean (as in Lakshadweep). Patchy reef is an agglomeration of a number of coral species near the shore that is yet to graduate to the state of a fringing reef. Platform reef are generally rounded or ovoid reefs. These are broad and flat and are large (over a mile or so long). The smaller ones are called coral pinnacles found in waters of moderate depth (20-40 m).

Coral reef is a unique creation. They sustain very high rates of biological productivity (i.e. the amount of organic carbon produced below sea surface in a day in a sq. meter). In open ocean, it is of the order of a few hundred mg of carbon, while in coral reefs, it is several thousands. This, naturally increases fish and mineral yield from reefs. Coral reefs are also sites of highest biodiversity in the marine environment with practically every known animal and floral group having at least one of their species living on a reef. They are also sites of great aesthetic value and are the destination for a large segment of tourism industry, be it for diving, spot-fishing or simple reef-walking.

In India, coral reefs are mostly found in the Gulf of Kachchh in Gujarat State, Gulf of Mannar in Tamil Nadu, in the Lakshadweep Islands and Andaman & Nicobar Group of Islands. There are mostly fringing reefs in the Gulf of Kachchh, Gulf of Mannar and A & Nicobar islands, with a few a few platform, patch and atoll reefs and coral pinnacles. Lakshadweep islands are mostly atolls with few coral heads, a platform reef and sandy cays. Coral reefs of Andaman & Nicobar islands are among the richest in the Indian Sub-continent, which not only protects the coastline against the sea erosion but also, harbor host of animal communities. As cited above, coral reefs are highly specific in their requirement of water quality, temperature, and salinity for their growth. These are being destroyed by siltation, mining and pollution. Sedimentation of reef reduces live coral and species diversity. The knowledge about extent and condition of coral reef will help to plan preventive and conservative measures to protect this fragile ecosystem. Indian Remote Sensing satellite data have been successfully used for preparing coral reef maps showing extent of coral reefs and their associated features. Coral reef maps of the Indian coastal areas cited above have been prepared by Space Applications Centre, Ahmedabad using FCCs of IRS LISS-II, LANDSAT TM (bands 2,3,4) and SPOT (bands 1,2,3) on 1:50,000 scale. These maps will be certainly useful to many users for the assessment of the ecological conditions and evolving methods for monitoring and zoning the area for management. The classification scheme used in preparing the maps is given as Table 4. State-wise number of maps prepared are given in Table 5.

Table 4. Coral Reefs Classification Scheme on 1:50,000 Scale

Level I	Level II
Coral reef	Reef flat (Fringing (A & N), Atoll (Lak))
	Live Coral Platform
	Reef Patch
	Coral Pinnacles
	Coraline Shelf
	Coral Head
Non-Vegetated	Sand over reef
	Mud over reef
	Sandy beach
Vegetated	Reef vegetation
	Beach vegetation
	Algae
	Sea grass
	Sea weeds
	Vegetation over sand
Water body	Lagoon
	Lagoon with sandy substrate (shallow)
	Lagoon with sandy substrate (deep)
	Lagoon (deep)
	Lagoon of uncertain depth substrate
Others	High water line
	Low water line / Reef Boundary
	Vegetation (coconut & Others)

Table 5. Number of maps prepared for coral reefs on 1:50,000 scale

STATE	Coral Reef Maps on 1: 50K	Period of Data Used
Gulf of Kachchh	6	1988 - 1989
Gulf of Mannar	7	1988 - 1989
A & Nicobar	50	1987 - 1991
Lakshadweep	15	1987-1990

3.4 Shoreline Maps

Shoreline maps is another important component of coastal environment. In India, many areas are eroded and threaten the life and property of the local population. One of the major requirement of coastal zone management is to understand the coastal processes of erosion, deposition, sediment transport, flooding and sea level changes. These processes continuously modify the shoreline. Thus maps delineating multi-date shorelines /shoreline change will be most useful to locate erosion prone areas, areas susceptible to flooding during monsoon and so on. This will help in number of applications such as construction of jetties/ ports, development near the shore etc. Shoreline change mapping has been carried out for the entire Indian coast using IRS and Landsat MSS/TM data on 1:50,000 and 1:250,000 scale. State-wise number of maps prepared are given below:

Table 6. Number of maps prepared for Shoreline on 50K and 250K

STATE	Shoreline 1: 50K	Period of Data Used	Shoreline 1: 250K	Period of Data Used
Gujarat	--	--	12	1975 - 1986
Maharashtra	29	1988 - 1993	5	1985 - 1989
Goa	6	1992 - 1993	--	--
Karnataka	10	1998	--	--
Kerala	26	1985 - 1993	8	1969 - 1987
Tamil Nadu	33	1989 - 1990	--	1987 - 1991
Andhra Pradesh	32	1985 - 1993	10	1973 - 1988
Orissa	25	1973 - 1993	7	1973 - 1987

Survey of India (SOI) topographical framework was used for organizing and creating the data base. Name of the villages and associated population were also stored in the database. A list of data used for preparing different shoreline maps on 1:50K and 1:250K scales along with satellites data used, sensors, Path, Row and date of data acquisition is given in Appendix IV and VI.

CHAPTER - 4

DATA BASE CREATION, DESIGN AND ORGANIZATION

Data base design and organization is one of the important task prior to creation of a data base. This is the key factor for a data base to be useful in an efficient management and planning. This includes various aspects such as basic framework of the spatial data sets, standard coordinate system, proper linkage of spatial and non-spatial data and standard registration procedure etc., along with its ultimate use. A well designed and organised data base can provide, not only an easy retrieval of all the existing data base information but also integrate various types of spatial and non-spatial information and their updation in an efficient manner.

4.1 Generation of Spatial Frameworks

In this study, basic frameworks (master frames) were prepared for all maritime states and Union Territories separately on 1:25,000 scale using developed Fortran Programs and ARC/INFO GIS.

Characteristics of Master Frames / Projection parameters :

Projection : Polyconic

Spheroid : Everest

Units : meter

Longitude of central meridian, latitude of projection's origin and longitude latitude ranges for different states are given below :

Table 7. Region of Longitude and Latitude for all maritime states for creating Reference (Master) Grid for different states

STATE	Longitude of Central Meridian	Latitude of Projection's Origin	Longitude Range	Latitude Range
Gujarat	71° 00' 00'	22 ° 30' 00'	68 ° - 74 °	20 ° - 25 °
Maharashtra	73° 00' 00'	18 ° 00' 00'	72 ° - 74 °	15 °30' – 20 ° 30'
Goa	74° 00' 00'	15 ° 15' 00'	73 ° 30' –	14 ° 30 - 16 °

			74 ° 30'	
Karnataka	75° 00' 00'	13 ° 30' 00'	74 ° - 76 °	12 ° - 15 °
Kerala	76° 00' 00'	10 ° 30' 00'	74 ° 30'- 77 ° 30'	8 ° - 13 °
Tamil Nadu	78° 45' 00'	11 ° 00' 00'	77 °- 80 °30'	8 ° - 14 °
Andhra Pradesh	82° 15' 00'	16 ° 15' 00'	79 ° 30'-85 °	13 °-19 ° 30'
Orissa	86° 00' 00'	22 ° 30' 00'	84 ° - 88 °	19 ° - 22 °
West Bengal	88° 30' 00'	22 ° 30' 00'	87 ° - 90 °	21 ° - 24 °
Andaman	93° 30' 00'	12 ° 00' 00'	92 ° - 95 °	10 ° - 14 °
Nicobar	93° 00' 00'	8 ° 00' 00'	92 ° - 94 °	6 °30' -9 °30'
Lakshadweep	73° 00' 00'	11 ° 00' 00'	71 ° - 75 °	8 ° - 14 °

One degree consists of 8X8 rectangular grids or cells. Each rectangular grid or cell represents one SOI topographic area on 1:25,000 scale. As an example, the master cover on 1:25,000 scale for Andaman and Nicobar with coral reef data are shown in Island Ecosystem for Andaman & Nicobar Report (Gupta. M. C. et. al., 2003).

4.2 Generation of Thematic Layers (Coverages)

To create data base, SOI standard was used and four corners of the grid were taken as the TICs or registration points to digitize maps for creating thematic layers taking master grids as the references. Shades/ symbols and unique IDs for polygons and line features were standardized. Attributes were assigned to spatial data sets and linked with shades/ symbols using Look-Up tables in ARC/INFO GIS. Different thematic maps prepared for entire Indian coast using visual image interpretation techniques were used to create different thematic layers. Different data sets of the present study with feature type, scale and data used are listed below :

Table 8. List of Primary Data Sets /Thematic Coverages

Sr. No	Layers	Scale	Feature Type	Data Used
1	Land use	25,000	Poly	Remote Sensing (RS) Data
2	Land use	50,000	Poly	RS data
3	Wetland	50,000	Poly	RS data
4	Wetland	250,000	Poly	RS data
5	Shoreline	50,000	Line	RS data
6	Shoreline	250,000	Line	RS data
7	Coral Reef	50,000	Poly	RS data

8	Rail	25,000	Line	RS data
9	Road	25,000	Line	RS data
10	HWL	25,000	Line	RS data
11	LWL	25,000	Line	RS data
12	State Boundary	25,000	Line	RS data
13	District Boundary	25,000	Line	RS data
14	Creek	25,000	Line	RS data
15	Habitation	25,000	Point	Revenue Maps

Data base design and specifications were standardized as per NRIS Nodes (2000). Data base can be updated to include multi-temporal data and other thematic data such as turbidity maps, primary productivity maps, SST maps, administrative maps showing taluka/village boundaries, etc. These maps are to be digitized using reference coverages (master grids) to get automatically registered with the above data base. This is necessary to integrate all the information for effective management.

4.3 Linkage of Non-Spatial Data with Spatial Data

Non-spatial data viz. village names, village-wise population etc. are linked with the spatial data. Non-spatial data may be used for preparing vulnerability maps for habitats and coastal zone management maps using different models (Andaman Report, Gupta M.C et.al, 2003). The other statistical data such as rainfall, temperature, humidity, wild food, medicinal plants, timber yielding plants, live stock and wind speed etc. can also be incorporated in GIS as an ASCII data table.

CHAPTER - 5

DEVELOPMENT OF A CUSTOMIZED QUERY SHELL

A Query Shell (Customized Package) "CZIS-INDIA" for entire Indian coast including union territories is designed and developed around ARC/INFO GIS to facilitate preparation of an effective coastal zone management plan. The Query Shell is aimed at to provide systematic retrieval as well as integration of wide range of data, both spatial and non-spatial for decision making as well as for automatic generation of map outputs.

The GIS facilities of MACRO language such as Arc Macro language (AML) in Arc/INFO GIS, are used for the realization of customized query shell as per the user's needs. The query shell is menu-based, easy to use as per the user profile. User friendly 'Software Modules' are developed to facilitate automatic retrieval of general information, theme wise information, zone-wise information, map compositions and generation of output maps on 1:250,000, 1: 50,000 as well as on 1:25,000 scales.

CAPABILITIES OF QUERY SHELL

The query shell 'CZIS-INDIA" can be invoked in arc of ARC/INFO GIS by a simple command :

Arc : &r czis-india

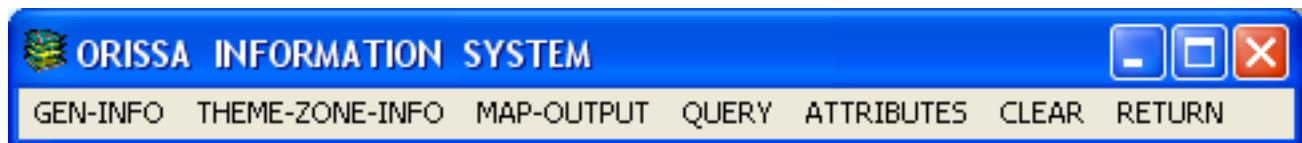
It display the front menu (Fig. 1) to interact with the coastal zone information system (CZIS) of different states and union territories, as per user's selection by clicking the mouse. The user can access all the states / Union Territories CZIS one by one, optionally, by selecting Yes or No. The package has two broad facilities as required for developing any Information System. These are described below :

5.1 DATA BASE CREATION

This facilitates the creation of data base for all maritime states and union territories using the master grids and associated information. The maps on 1:50,000 scale or 1:25,000 scale can be digitized by giving SOI toposheet number as an input. The Query Shell then provides the four corner TICs to be used for digitization. It also calculates the latitudes and longitudes of four TICs and display them on the screen. This will help to check that a proper map is taken for digitization by verifying its geographic co-ordinates. Once the correct map is taken and fixed on the digitizer, it either update the existing coverage to include different maps covering the study area or create new coverage. It enters in ARCEDIT environment of GIS and prompts for corner TICs to be entered on the digitizer one by one. The digitization of different arcs and or labels can now be done by a user.

5.2 INFORMATION RETRIEVAL

This part of 'Query Shell' provides retrieval of all the data Base Information, derived information and automatic generation of maps as per user's requirement. After selecting the desired state/ union territory, it displays the following menu bar (e.g. for Orissa) to interact and access the total information of the respective state/ union territory.



Information Retrieval has following three main capabilities :

5.2.1 Query System (General Info)

It provides retrieval of all the information existing in the data base prepared for the entire country such as land use information on 1:25,000/1:50,000 scales including transport network, habitation, HTL, LTL & CRZ boundaries, wetland information on 1:50,000/250,000 scale, shoreline information on 1:50,000/250,000 scale and coral reef information on 1:50,000 scale. Information of non-spatial data can be provided either in the tabular form or is linked with spatial data such as population and names of villages.

5.2.2 Thematic Information

A user can extract information for specific land use categories viz. agriculture, natural forest, man-made forest, dense mangroves, sparse mangrove, coral reefs etc. in any order, or similarly for wetlands categories and coral reefs categories on different scales for entire states/ union territories or SOI as per toposheetsCC. The area of different categories is calculated automatically and is displayed along with legend. The user can optionally generate map composition to obtain the hard copy maps.

5.2.3 Output Map Generation

Automatic Generation of different maps using either SOI toposheet numbers as input or a desired area of interest (A.O.I) to cover the desired area or complete island(s) in case of Lakshadweep, that has more than one SOI toposheets. This is provided for all seven themes mentioned earlier.

These Sub-shells are described in Sections A, B and C respectively. The complete Flow Chart of CZIS is given as Appendix - VII.

The procedure for creating data base for using the 'Query Shell' is given as Appendix - VIII. The database design specifications are standardized (Gupta et. al., 2000) as per NRIS project.

A. QUERY SYSTEM

Query System can be used to retrieve all the information created in the data base in a user friendly manner. This is the first menu of CZIS named as "General Info". This has the following Sub-menus

General Info

- **Land use on 25,000 scale**
- **Land use on 50,000 scale**
- **Wetland on 50,000 scale**

- **Wetland on 250,000 scale**
- **Coral Reef on 50,000 scale**
- **Coral Reef on 250,000 scale**
- **Shoreline on 50,000 scale**
- **Shoreline on 250,000 scale**
- **Existing Map Compositions (.COM)**

The first sub-menu provide land use information on 1:25,000 scale. By clicking this sub-menu, the land use data of the entire state or union territory is displayed on the terminal. Optionally, the other information viz. legend, linear features namely rail, road, high water line, low water line, settlements, SOI map numbers can also be superimposed. The scale of the display is calculated automatically and is shown at the bottom. The information of other themes cited in the above sub-menu i.e. land use on 1:50, 000 scale, wetland and coral reefs on 1:50,000 and 1:250,000 can be obtained in the similar fashion by clicking the desired theme. The sub-menu of shoreline on 1:50,000 and 1:250,000 scales provide shorelines of different years with different line patterns. The information about different polygons of land use, wetlands, coral reefs (in sq. meters) and the linear features such as transport, boundaries (in metres) can be obtained interactively using 'Query' menu of CZIS.

The desired area can be selected and enlarged using either cursor or by providing longitudes and latitudes of two opposite corners. Different themes of the selected area (A.O.I) can be integrated and a map composition can be created optionally (This is shown for Orissa State in section 6.8). The total area of states / union territories or the desired enlarged area can be displayed on the screen again and again. The scale and full legend is displayed automatically after enlargement.

'Existing Map Compositions' sub-menu allows to select any map composition (.com) existing in the data base from a popup menu and display it with a desired page size. Non-spatial information existing in the tabular form can be obtained on the screen by clicking the desired title menu if any in the General Info menus. The non-spatial socio-economic data such as village names, population etc. linked with spatial data can be obtained interactively using 'Query Menu'.

Figure 2 shows the Flow Chart of Information Retrieval using Gen. Info of Main Menu .

B. Thematic Information

Query System can provide thematic information for selected categories by a user on a popup menu. Any theme viz. landuse, wetlands and coral reefs on different scales can be taken up by clicking its corresponding item in the sub-menu under 'Theme Info' as given below :

Theme Info

This sub-shell provides land use, wetlands and coral reefs information and has the following sub-menus

- ❖ **Land use entire state / Union Territory (scale-1: 25k)**
- ❖ **Land use Toposheet-wise (1: 25k scale)**
- ❖ **Land use entire state / Union Territory (scale-1: 50k)**
- ❖ **Land use Toposheet-wise (1: 50k scale)**
- ❖ **Wetlands entire state / Union Territory (scale-1: 50k)**
- ❖ **Wetlands Toposheet-wise (1: 50k scale)**
- ❖ **Wetlands entire state / Union Territory (scale-1: 250k)**
- ❖ **Wetlands Toposheet-wise (1: 250k scale)**
- ❖ **Coral Reefs entire area / Union Territory (scale-1: 50k)**
- ❖ **Coral Reefs Toposheet-wise (1: 50k scale)**
- ❖ **Coral Reefs entire area / Union Territory (scale-1: 250k)**
- ❖ **Coral Reefs Toposheet-wise (1: 250k scale)**

All the above sub-menus have the following facilities

- i) Any number of land use/wetlands/coral reef categories can be selected on the popup menu in any order one by one.
- ii) The thematic map will be displayed on the screen using the selected shades with legend.
- iii) The area of each category will be calculated automatically in sq.kms.
- iv) The scale will be generated.
- v) The map composition can be created optionally to get the print or hard copy.

Thus, this sub-shell facilitates to get area of any category for the entire state or union territory such as mangroves, coral reefs, forest etc. automatically from the database. Optionally, any number of categories can be selected and the map composition with selected shades (Legend) can be generated. Similarly, any SOI map area from a thematic coverage can be clipped from the corresponding database and its selected categories with area and legend can be mapped in a user friendly manner.

C. OUTPUT MAP GENERATION

As an Output Map Generation System, CZIS can be used for generating land use, wetlands, coral reefs and shoreline changes maps of any user selected area or as per SOI toposheets on different scales. Thus, it is one of the most important shell to produce map compositions and hard copy thematic maps. This sub-shell has the following menu :

Map Outputs

- **LANDUSE-MAPAS PER SOI TOPOSHEET ON 25000-Scale**
- **LANDUSE-MAP-OF-ANY-SPECIFIC-AREA-FROM-25 K Scale**
- **LANDUSE-MAP AS PER SOI TOPOSHEET ON 50K Scale**
- **LANDUSE-MAP-OF-ANY-SPECIFIC-AREA- FROM-50 K Scale**
- **WETLAND-MAP AS PER SOI TOPOSHEET ON 50K-Scale**
- **WETLAND-MAP-OF-ANY-SPECIFIC-AREA- FROM-50 K Scale**
- **WETLAND-MAP AS PER SOI TOPOSHEET ON 250K-Scale**
- **WETLAND-MAP-OF-ANY-SPECIFIC-AREA- FROM-250 K Scale**
- **SHORELINE-MAP AS PER SOI TOPOSHEET ON 50K-Scale**
- **SHORELINE-MAP-OF-ANY-SPECIFIC-AREA- FROM- 50 K Scale**
- **SHORELINE-MAP AS PER SOI TOPOSHEET ON 250 K-Scale**
- **SHORELINE250K-MAP-ANY-SPECIFIC-AREA- FROM-250 K Scale**

Map generation as per SOI toposheet numbers requires toposheet Number as the only input. While map generation for any specific area prompts for selecting the rectangular box using two opposite corner points. The later facilitates to cover the user selected area or island (for Lakshadweep/ A & Nicobar) for map generation. The selected area is displayed on the screen to verify it and can be changed if required. Zooming option is provided to enlarge any area for accurate selection of the area of

interest (A.O.I). The standard map format and the illustrations are given in the next chapter. This sub-shell has three distinct capabilities as follows :

1. Map Specific Legend Generation :

Thematic coverage for the entire state / Union Territory may consist large number of categories on different scales. However, an individual SOI map or specific area map may consist of only a few of these categories/features. Thus it is necessary to generate the legend of only those categories which exist on the individual map to avoid confusion. This menu has an in built facility to generate only these categories/ features existing on the individual maps.

2. Map Index Generation :

This menu has also the capability to generate the map index that is the SOI map numbers of the output map and its surrounding maps automatically. For the maps of any specific area, it lists all the SOI maps covering the area automatically.

3. Map Scale Generation :

For any map output, the map scale is generated automatically.

For all the maps, a standard output map format is taken up. However, it can be modified if required. A simple Flow Chart for Output Map Generation is shown in Figures 3.

CHAPTER - 6

RESULTS AND DISCUSSION

Coastal area / zone of a country assumes great importance because of high productivity of its ecosystems, concentration of population, exploitation of renewable and non-renewable natural resources, discharge of waste effluent and municipal sewage, development of various industries and spurt in recreational activities. India has a long coastline of about 7500 km distributed among nine coastal states and its islands territories of Andaman & Nicobar and Lakshadweep . It's coast is divided into two parts, West coast and East coast. The West coast is fronted by the Arabian sea and the east coast is fronted by the Bay of Bengal. It has richly diverse coastal ecosystems like coral reefs and mangroves which contribute to its high productivity along with wide expanse of mudflats, lagoons, estuaries, beaches, dunes etc. However, exploitation of its natural coastal resources has been increased due to pressure of population along with an increase in the load on harbors due to expanding import-export trades, developments of various chemical, petrochemical fertilizer and allied industries and above all petroleum exploration. Thus, there is a need to protect the coastal environment using scientific methods, ensuring continuing production and development. This requires an "Integrated Coastal Zone Management System".

Coastal Zone Information System (CZIS) has been developed at SAC for Integrated Coastal Zone Management (ICZM) of entire country i.e. all maritime states including Union Territories as this can integrate all relevant thematic layers viz. landuse, coral reef, shorelines, habitation etc. due to their inherent property of being automatically registered. The front menu of CZIS is shown in Fig. 3. For invoking CZIS of any of the state / union territory, the user has to click in the respective state on the entire country's map. This will take the user in the corresponding CZIS with State Shell directly in the ARC PLOT to display all the database information in a user friendly manner. State wise descriptions are given below :

6.1 GUJARAT COAST

Gujarat is a major maritime State of India . It has about 1600 km long Coastline. The Gujarat coast is classified into five regions based on geomorphic characteristics viz. the Rann of Kachchh, the Gulf of Kachchh, the Saurashtra coast, the Gulf of Khambhat and the South Gujarat coast. Two Gulfs viz. the Gulf of Kachchh and the Gulf of Khambhat , dominate the coastal

zone. Dense mangroves and coral reef occur in the Gulf of Kachchh. Coral reefs are mainly fringing type with many platform and patch reefs. The Saurashtra coast is less indented and made up of rocky coast, beach, cliffs, bays, spits etc. The Gulf of Khambhat coast is marked by estuaries, creeks, extensive mudflats and absence of sandy beaches. The South Gujarat coast is rocky in nature having lagoonal mudflats. In all, the Gujarat coast supports a variety of habitats such as mangroves, coral reefs, sea grass beds, algae/sea weeds, estuaries, beaches etc. There are number of activities going on and coming up all along the coast such as salt industries, cement industries, oil & natural gas exploration, brackish water aquaculture, load on harbors due to expanding import-export trade and so on, besides the pressure of growing population. This puts a tremendous pressure on the coastal zone and hence necessitates a proper scientific method for developmental planning to sustain the environment. Initially, A Coastal Zone Information System (CZIS), Gujarat (Gupta M.C et.al, 2000) was developed in 2000 in collaboration with Department of Forests & Environment, Government of Gujarat, Gandhinagar. This was having 244 land use maps prepared for CRZ using IRS LISS-II and SPOT data of 1988-1989, along with administrative boundaries, transport, high water line, low water line etc., on 1:25,000 scale to cover the entire coast. A standard quality database was generated using SOI standards for creating spatial frame, taking 7 ' 30 " x 7' 30" Grid Size in Polyconic projection. The registration accuracies and tolerances etc. were set as per NRDB standards. Coastal Regulation Zone (CRZ) maps were prepared using a model to delineate CRZ-I, CRZ-II, CRZ-III and CRZ-IV areas as per MoEF notification of 1991 to protect and conserve the coastal environment. The results and illustrations are shown in the report "Coastal Zone Information – Gujarat" published by SAC, Remote Sensing & Communication Centre (at Present BISAG), Gandhinagar and Department of Forest & Environment in Dec. 2000.

In the present Project, CZIS-India, funded by MoEF, the following thematic layers are created / added for entire Gujarat State using the above standard spatial frame :

- i) Landuse on 1:25,000 Scale
- ii) Landuse on 1:50,000 Scale
- iii) Wetland on 1:50,000 Scale
- iv) Wetland on 1:250,000 Scale
- v) Coral Reef on 1:50,000 Scale &
- vi) Shoreline on 1:250,000 Scale

These layers are created from hardcopy maps prepared using IRS LISS-II, Landsat TM and SPOT data over a period of 1987-1991 by Space Application Centre (SAC), Ahmedabad and Gujarat Ecological Education & Research

Foundation (GEER), Gandhinagar. A list of available data used for preparing maps along with satellites used, sensors, Path, Row and date of data acquisition is given in Appendix – I, II, III, IV and VI respectively.

The results are shown in Plates 1 To 8. Plate 1 shows the Coastal Landuse map for the entire Gujarat State from database of 1:25,000 scale prepared using SPOT and LISS-II satellite data. Plate 2 shows the Thematic map for toposheet No. 46D15 of Valsad District. This delineate thematic categories viz. agriculture, forest, barren land, mangroves, plantation, river and habitation as selected by user using popup menu. The precise area is calculated automatically.

Plate 3 and 4 shows the Coastal Landuse maps of S.O.I toposheet 41F03 and an Area of Interest (A.O.I) as selected by user respectively, using landuse database on 1:50,000 scale.

Plate 5 shows the Coastal Wetland maps of an Area of Interest (A.O.I) as selected by user using wetland database on 1:50,000 scale. Plate 6 shows the coastal wetland map of S.O.I toposheet 46C using wetland database on 1:250,000 scale

Plate 7 shows the Coral Reef map of S.O.I toposheet 41F11 using coral reef database on 1:50,000 scale.

Plate 8 shows the Shoreline map of S.O.I toposheet 41F11 using shoreline database on 1:50,000 scale.

6.2 MAHARASHTRA COAST

The Maharashtra coast is characterized by pocket beaches flanked by rocky cliffs of Deccan basalt, many estuaries and patches of mangroves. Large area have been reclaimed from mudflats for agriculture, industrial, residential and aquaculture use mainly in Bombay and Thane region. The agricultural activity dominates in the coastal zone of Maharashtra that mainly consists of coconut, mango and jack-fruits. There are many small islands mainly in estuaries (muddy) and off the coast (rocky).

In the present Study, the following thematic layers are created for entire Maharashtra State using the standard spatial frame :

- i) Landuse on 1:25,000 Scale
- ii) Landuse on 1:50,000 Scale

- iii) Wetland on 1:50,000 Scale
- iv) Wetland on 1:250,000 Scale
- v) Shoreline on 1:50,000 Scale &
- vi) Shoreline on 1:250,000 Scale

These layers are created from hardcopy maps prepared using IRS LISS-II, Landsat TM and SPOT data over a period of 1987-1991 by Space Application Centre (SAC), Ahmedabad in collaboration with Centre of Studies in Resources Engineering (CSRE), IIT, Bombay, Maharashtra Remote Sensing Applications Centre, Nagpur, National Institute of Oceanography (NIO), Goa and Maharashtra State Forest Department, Thane. A list of available data used for preparing maps along with satellites used, sensors, Path, Row and date of data acquisition is given in Appendix – I, II, III, IV, V and VI respectively.

The results are shown in Plates 9 to 16. Plate 9 shows the Thematic map for toposheet No. 47A15SW using landuse database on 1:25,000 scale. This delineate thematic categories viz. agriculture, natural forest, mangrove dense, mangrove sparse, sand, aqua-pond, salt pan and habitation etc. as selected by user using popup menu. The precise area is calculated automatically.

Plate 10 and 11 show the Coastal Landuse maps of S.O.I toposheet 47A15SE and an Area of Interest (A.O.I) as selected by the user respectively, using landuse database on 1:25,000 scale. Plate. 12 shows the landuse map of user selected A.O.I using landuse database on 1:50,000 scale.

Plate 13 shows the Coastal Wetland maps of an Area of Interest (A.O.I) as selected by the user using wetland database on 1:50,000 scale while Plate 14 shows the coastal wetland map of user selected A.O.I using wetland database on 1:250,000 scale

Plate 15 and Plate 16 shows the Shoreline map of S.O.I toposheet 47A15 and user selected A.O.I using shoreline database on 1:50,000 scale and 1:250,000 scale respectively.

6.3 GOA COAST

The Goa coast is about 120 km long. It has long, linear and wide beaches and rocky cliffs. It is indented by estuaries and narrow creeks. Mangroves occur in the sheltered areas of the inter tidal zone of the estuaries. The coastal strip represents a gently rolling type of topography.

In the present Study, the following thematic layers are created for entire Goa State using the standard spatial frame :

- i) Landuse on 1:25,000 Scale
- ii) Landuse on 1:50,000 Scale
- iii) Wetland on 1:50,000 Scale
- iv) Shoreline on 1:250,000 Scale

These layers are created from hardcopy maps prepared using IRS LISS-II, Landsat TM and SPOT data over a period of 1987-1991 by Space Application Centre (SAC), in collaboration with Centre of Studies in Resources Engineering (CSRE), IIT, Bombay and Maharashtra Remote Sensing Applications Centre, Nagpur. A list of available data used for preparing maps along with satellites used, sensors, Path, Row and date of data acquisition is given in Appendix – I, II, III and VI respectively.

The results are shown in Plates 17 to 23. Plate 17 shows the Thematic map for entire Goa State using landuse database on 1:25,000 scale. This delineate thematic categories viz. agriculture, natural forest, man made forest, mangrove dense, mangrove sparse, sand, pond, salt pan and habitation etc. as selected by user using popup menu. The precise area is calculated automatically.

Plate 18 shows the Coastal Landuse map of S.O.I toposheet 48E14SW using landuse database on 1:25,000 scale. Plates 19 and 20 show the Coastal Landuse maps of S.O.I toposheet 48E14 and an Area of Interest (A.O.I) as selected by the user respectively, using landuse database on 1:50,000 scale.

Plate 21 shows the Coastal Wetland map of S.O.I toposheet 48E14 using wetland database on 1:50,000 scale.

Plates 22 & 23 show the Shoreline maps of S.O.I toposheet 48E14 and an Area of Interest (A.O.I) as selected by the user, using shoreline database on 1:50,000 and 1:250,000 scales respectively.

6.4 KARNATAKA COAST

The Karnataka coast is about 300 km long. The coastal zone is narrow and straight except around estuaries. It has long, narrow and straight beaches as well as small crescent shaped pocket beaches intercepted by rocky headlands, spectacular spits, estuaries, shallow lagoons, mudflats and few patches of mangroves. The northern coast is rocky while the southern coast has long linear beaches. Mangroves (*Rhizophora* and *Avicennia*) are found in tidal waters, near estuaries and along the confluence of estuaries in coastal areas. Rocky coast is present in the Uttara Kannada district. The major part of the Coastal Regulation Zone area comes under agricultural land which mainly includes paddy and vegetables.

In the present Study, the following thematic layers are created for entire Karnataka State using the standard spatial frame :

- i) Landuse on 1:25,000 Scale
- ii) Landuse on 1:50,000 Scale
- iii) Wetland on 1:50,000 Scale
- iv) Wetland on 1:250,000 Scale
- v) Shoreline on 1:250,000 Scale
- vi)

These layers are created from hardcopy maps prepared using IRS LISS-II, Landsat TM and SPOT data over a period of 1987-1991 by Space Application Centre (SAC), Ahmedabad and Karnataka State Remote Sensing Technology Utilization Centre, Bangalore. A list of available data used for preparing maps along with satellites used, sensors, Path, Row and date of data acquisition is given in Appendix –I, II, III, IV and VI respectively.

The results are shown in Plates 24 to 30. Plate 24 shows Thematic map for of entire Karnataka state using landuse database on 1:25,000 scale. This delineate thematic categories viz. agriculture, natural forest, man made forest, mangrove, sand, aqua-pond, salt pan and habitation etc. as selected by user using popup menu. The precise area is calculated automatically.

Plate 25 and 26 show the Coastal Landuse maps of S.O.I toposheet 48J01SE and an Area of Interest (A.O.I) as selected by the user respectively, using landuse database on 1:25,000 scale. Plate. 27 shows the landuse map of user selected A.O.I using landuse database on 1:50,000 scale.

Plate 28 shows the Coastal Wetland maps of S.O.I toposheet 48J06 using wetland database on 1:50,000 scale while Plate 29 shows the coastal wetland map of S.O.I toposheet 48J using wetland database on 1:250,000 scale

Plate 30 shows the Shoreline map of S.O.I toposheet 48J06 using shoreline database on 1:50,000 scale.

6.5 KERALA COAST

The Kerala coast is about 590 km long. It is famous for its beautiful beaches, estuaries and lagoon. The coastline is more or less linear, at places it is offsetted by the presence of promontories. The coastal zone has high population density that makes an adverse impact on the areal distribution of different wetlands. This also creates problems such as erosion, sand mining and effluent disposal. The mangrove vegetation has become sparse. Land reclamation has taken up for urbanization and agriculture.

In the present Study, the following thematic layers are created for the entire Kerala State using the standard spatial frame :

- i) Landuse on 1:25,000 Scale
- ii) Landuse on 1:50,000 Scale
- iii) Wetland on 1:50,000 Scale
- iv) Wetland on 1:250,000 Scale
- v) Shoreline on 1:50,000 Scale &
- vi) Shoreline on 1:250,000 Scale

These layers are created created from hardcopy maps prepared using IRS LISS-II, Landsat TM and SPOT data over a period of 1987-1991 by Space Application Centre (SAC), Ahmedabad and Centre for Earth Science Studies, (CESS), Trivendrum. A list of available data used for preparing maps along with satellites used, sensors, Path, Row and date of data acquisition is given in Appendix – I to VI respectively.

The results are shown in Plates 31 to 36. Plates 31 and 32 show the Coastal Landuse maps of S.O.I toposheet 58B04NE and an Area of Interest (A.O.I) as selected by the user respectively, using landuse database on 1:25,000 scale. Plates. 33 and 34 show the landuse map of S.O.I toposheet 58C05 and an Area of Interest (A.O.I) as selected by the user using landuse database on 1:50,000 scale.

Plates 35 and 36 shows the Shoreline maps of user selected A.O.I using shoreline database on 1:50,000 scale and 1:250,000 scale respectively.

6.6 TAMIL NADU COAST

The coastline of Tamil Nadu is about 900 km long. Increase in population exert pressure on the coastal zone by way of commercial and industrial exploitation. The pressure on urban areas have increased a lateral migration of population, concentrating more towards coastal zone. Pulicat is the large lagoon which support variety of plants and animals. Fringing reef and patch reefs are present near Rameswaram (Palk bay) and in the Gulf of Mannar. Well developed mangroves forest occur at Pichavaram. Mudflats are present along lagoons and used at some places for salt harvesting.

In the present study, the following thematic layers are created for the entire Tamil Nadu State using the standard spatial frame :

- i) Landuse on 1:25,000 Scale
- ii) Landuse on 1:50,000 Scale
- iii) Wetland on 1:50,000 Scale
- iv) Wetland on 1:250,000 Scale
- v) Coral Reef on 1:50,000 Scale &
- vi) Shoreline on 1:50,000 Scale

These layers are created from hardcopy maps prepared using IRS LISS-II, Landsat TM and SPOT data over a period of 1987-1991 by Space Application Centre (SAC), Ahmedabad and Institute of Remote Sensing, Anna University, Madras. A list of available data used for preparing maps along with satellites used, sensors, Path, Row and date of data acquisition is given in Appendix – II, III, IV and VI respectively.

The results are shown in Plates 37 to 44. Plates 37 and 38 show the Coastal Landuse maps of S.O.I toposheet 58N14SW and an Area of Interest (A.O.I) as selected by the user respectively, using landuse database on 1:25,000 scale. Plate 39 shows the landuse map of user selected A.O.I using landuse database on 1:50,000 scale.

Plates 40 and 41 show the Coastal Wetland maps of an Area of Interest (A.O.I) as selected by the user using wetland database on 1:50,000 scale and 1:250,000 scales respectively.

Plate 42 shows the Coral Reef map of S.O.I toposheet 58O03 using coral reef database on 1:50,000 scale.

Plate 43 and Plate 44 show the Shoreline map of S.O.I toposheet 58L02 and user selected A.O.I respectively using shoreline database on 1:50,000 scale.

6.7 ANDHRA PRADESH COAST

The Andhra Pradesh coast is about 1035 km long. It extends from Srikakulam district in the north to Nellore district in the south. It is marked by spits, wide beaches, mangroves and tidal flats. The coastal zone is potentially a rich terrain in agriculture, fisheries, commerce and communication. There are a number of intermediate and small ports including a natural harbour at Vishakhapatnam. The prominent rivers viz. the Krishna and the Godavari form large deltaic regions. Both these deltas have large mangrove forests. The Andhra coast is of deltaic nature with agricultural land present all along the coast. The coast has been divided into three following regions based on relief, nature of the material and the types of the vegetation

- i) Rocky Coast – north of the Godavari delta (North Coastal Andhra Pradeshh)
- ii) Sandy Coast – South of the Krishna delta upto Pulicat lake (South Andhra Pradesh)
- iii) Wooded (vegetated coast) – deltas of Godavari and Krishna and interdelta (delta fronts, mangroves).

In the present study, the following thematic layers are created for the entire Andhra Pradesh State using the standard spatial frame :

- i) Landuse on 1:50,000 Scale
- ii) Landuse on 1:50,000 Scale
- iii) Wetland on 1:50,000 Scale
- iv) Wetland on 1:250,000 Scale
- v) Shoreline on 1:50,000 Scale &
- vi) Shoreline on 1:250,000 Scale

These layers are created created from hardcopy maps prepared using IRS LISS-II, Landsat TM and SPOT data over a period of 1987-1991 by Space Application Centre (SAC), Ahmedabad, Andhra Pradesh State Remote Sensing Applications Centre (APSRAC), Hyderabad and Geography Department, Andhra University, Visakhapatnam. A list of available data used for preparing maps along with satellites used, sensors, Path, Row and date of data acquisition is given in Appendix – II, III, IV and VI respectively.

The results are shown in Plates 45 to 50. Plates 45 and 46 show the Coastal Landuse maps of S.O.I toposheet 65H07NE and an Area of Interest (A.O.I) as selected by the user respectively, using landuse database on 1:25,000 scale.

Plate. 47 shows the landuse map of user selected A.O.I using landuse database on 1:50,000 scale.

Plate 48 shows the Coastal Wetland maps of an Area of Interest (A.O.I) as selected by the user using wetland database on 1:50,000 scale while Plate 49 shows the coastal wetland map of S.O.I toposheet 66A using wetland database on 1:250,000 scale

Plate 50 shows the Shoreline map of S.O.I toposheet 66A using shoreline database on 1:250,000.

6.8 ORISSA COAST

The coastal track of Orissa extends over 480 km. It is mainly depositional in nature, formed by the Mahanadi and the Brahmani-Baitarani deltas. The coast houses some of the excellent mangroves. The coast is endowed with six major estuaries, rich mangrove forests, Asia's largest brackish water lagoon (Chilka lake), extensive mudflats, sandy beaches etc. The Chilka lake supports many commercial and recreational activities. The tidal mark as per the SOI (Survey of India) goes to a maximum of 53 km in the distributaries for olive ridley sea turtle. Two rare species of hoarse-shoe crabs also occur in abundance in the northern Orissa coast. The area between Chilka mouth to Paradeep is characterized by Casurina plantations and agricultural area. The picturesque sandy beach of Puri is a tourist attraction. The Chilka lake has a long (~ 65 km) spit. The lake is bordered by agricultural fields, swams and rocky area. The lake houses a bird sanctuary named 'Nalabana'. The Chilka mouth is a spawning and nursery ground for many fish and prawn species.

In the present study, the following thematic layers are created for the entire Orissa coast using the standard spatial frame :

- i) Landuse on 1:25,000 Scale
- ii) Landuse on 1:50,000 Scale
- iii) Wetland on 1:50,000 Scale
- iv) Shoreline on 1:50,000 Scale &
- v) Shoreline on 1:250,000 Scale

These layers are created created from hardcopy maps prepared using IRS LISS-II, Landsat TM and SPOT data over a period of 1987-1991 by Space Application Centre (SAC), Ahmedabad and Orissa Remote Sensing Applications Centre (ORSAC), Bhuvvaneshwar. A list of available data used for preparing maps along with satellites used, sensors, Path, Row and date of data acquisition is given in Appendix – II, III, IV and VI respectively.

The results are shown in Plates 51 to 60. Plate 51 shows the 'Query Shell' by displaying landuse of entire Orissa state along with the selection on an A.O.I as selected by a user on 1:25,000 scale. The Integrated map of different themes viz. landuse, SOI master grid, roads, rails, high water line, low water line, administrative boundaries for A.O.I can be created by adding these themes optionally as per users choice on a popup menu. This is shown as Plate 52. Thus Query Shell (Gen. Info) Sub-Menu has the capability of i) enlarging any area using lat. Long. or a box interactively ii) integrating desired themes and iii) optionally generating a map composition at different stages.

Plate 53 shows Thematic map for entire Orissa state using landuse database on 1:25,000 scale. This delineates thematic categories viz. agriculture, natural forest, man made forest, mangrove dense, sand, aqua-pond, salt pan and habitation etc. as selected by user using popup menu. The precise area is calculated automatically.

Plate 54 and 55 show the Coastal Landuse maps of S.O.I toposheet 73L11SE and an Area of Interest (A.O.I) as selected by the user respectively, using landuse database on 1:25,000 scale. Plate. 56 shows the landuse map of user selected A.O.I using landuse database on 1:50,000 scale.

Plate 57 shows the Coastal Wetland maps of an Area of Interest (A.O.I) as selected by the user using wetland database on 1:50,000 scale while Plate 58 shows the coastal wetland map of S.O.I toposheet 73L using wetland database on 1:250,000 scale

Plate 59 shows the Shoreline map of S.O.I toposheet 73L11 using shoreline database on 1:50,000 scale. Plate 60 shows the shoreline map an Area of Interest (A.O.I) as selected by the user using shoreline database 1:250,000 scale.

6.9 WEST BENGAL COAST

The West Bengal coast is famous for its mangroves. The mangroves mainly exist in the Sunderbans area which is largest single block of halophytic mangroves of the world. These are in the form of dense forest along the east and the south east part of the coast. Mudflats are found all along the coast of West Bengal. In the western part of the coast, the mudflats are slightly sandy and cover large areas. In the central part of the coast, the mudflats is mainly composed of dark coloured clay and is wide extensive. Aquaculture ponds are found near Digha, Junput, Manasdwip, Pathankhali etc. The salt pans are found in the western parts of the coast near Phulbari, Kalindi, north of Dadanpatra etc.

Beaches are present in the western parts of the coast. Agricultural area are distributed all along the coast. The main crop is paddy. Plantations are mainly present along south east coast . They are mainly Casurina over dunes. The Hooghly and its distributaries form the most conspicuous drainage system and forms an estuarine delta.

In the present Study, the following thematic layers are created for entire West Bengal State using the standard spatial frame :

- i) Landuse on 1:25,000 Scale
- ii) Landuse on 1:50,000 Scale
- iii) Wetland on 1:50,000 Scale
- iv) Shoreline on 1:50,000 Scale

These layers are created created from hardcopy maps prepared using IRS LISS-II, Landsat TM and SPOT data over a period of 1987-1991 by Space Application Centre (SAC), Ahmedabad and Institute of Ecological Studies and Wetland Management (IESWM), Kolkatta. A list of available data used for preparing maps along with satellites used, sensors, Path, Row and date of data acquisition is given in Appendix – II, III, IV and VI respectively.

The results are shown in Plates 61 to 66. Plate 61 shows the Thematic map for entire West Bengal state using landuse database on 1:25,000 scale. This delineate thematic categories viz. agriculture, man made forest, mangrove dense, mangrove sparse, estuary, creek, aqua-pond, salt pan and mudflat etc. as selected by user using popup menu. The precise area is calculated automatically.

Plate 62 show the Coastal Landuse maps of S.O.I toposheet 79C05SW using landuse database on 1:25,000 scale. Plate. 63 and 64 show the landuse map

of S.O.I toposheet 79C01 and a user selected A.O.I respectively, using landuse database on 1:50,000 scale.

Plate 65 shows the Coastal Wetland maps of S.O.I toposheet 79C05 using wetland database on 1:50,000 scale.

Plate 66 shows the Shoreline map of a user selected A.O.I using shoreline database on 1:50,000 scale and 1:250,000 scale.

6.10 NDAMAN & NICOBAR ISLANDS

The Andaman and Nicobar Islands is a group of islands (approximately 572) in the Bay of Bengal which include islets, rock outcrops and coral reefs. These islands are endowed with a great deal of natural beauty. Their flora and fauna are of a special type, having very high degree of bio-diversity and endemism. The coral reefs of these islands are among the richest in the Indian Sub-continent, which not only protects the coastline against the sea erosion but also harbour host of animal communities. However, there have been significant changes in the islands during the last few decades. The natural resources of the islands have been increasingly exploited. Increased forest extraction, development of tourism, setting up of colonies for settlers are some of the activities which have lead to a great deal of apprehensions that these unique and fragile island ecosystems would be irreversibly degraded.

The ecosystem of Andaman and Nicobar comprise two main components, a) the natural ecosystem and b) the man-made ecosystem. Natural ecosystem of islands can further be classified into – the Forest Ecosystem, the Marine Ecosystem and the interface between the two and the Mangrove Ecosystem. The topographical features, the climatic regime and the soil characteristics are the foundation on which these inter-connected systems are built (Saldanha, 1989). The man-made ecosystems are forestry and industry, agriculture, fisheries, tourism, transport and communications which have close links with natural ecosystems. The people, whether as householders or as service agencies, control and at the same time depend on these man-made ecosystems.

Coral reefs of the Andaman & Nicobar islands are of fringing type, often separated from the shore by lagoons. They exhibit narrow linear and fringing type of reefs. At certain places, coral pinnacles have been identified. Small patches of sand are present on the reef flats. There are many small tidal estuaries and lagoons which support a dense and diverse mangrove flora. Mudflats appear as small patches along the mangroves or sometimes in the mangrove areas. Dense evergreen forest cover the hinterland area.

In Andaman and Nicobar Islands, there have been an increased number of developmental activities in the recent decades which have simultaneously given rise to a growing concern over their adverse environmental impacts. Due to overuse and abuse, both biological diversity and biomass of the forest and marine ecosystems are undergoing rapid decline and changes. The tribal population living in the island hideouts is also reportedly decreasing. Thus there is need to have a proper Coastal Zone Information System to protect the natural ecosystem/ environment, to understand complex linkages between man-made and natural ecosystems of these islands for sustainable development.

In the present study, the following thematic layers are created / added for entire Andaman & Nicobar area using the standard spatial frame :

- i) Landuse on 1:50,000 Scale
- ii) Landuse on 1:50,000 Scale
- iii) Wetland on 1:50,000 Scale
- iv) Wetland on 1:250,000 Scale
- v) Coral Reef on 1:50,000 Scale

These layers are created for entire Andaman & Nicobar created from hardcopy maps prepared using IRS LISS-II, Landsat TM and SPOT data over a period of 1987-1991 by Space Application Centre (SAC), Ahmedabad, Institute of Ocean Management (IOM), Anna University, Madras and National Institute of Oceanography (NIO), Goa. A list of available data used for preparing maps along with satellites used, sensors, Path, Row and date of data acquisition is given in Appendix – II, III, IV and VI respectively.

Database of Landuse on 1:25,000 and 1:50,000 Scale and Coral Reef on 1:50,000 Scale was already created along with development of CZIS. The report Island Ecosystem for Andaman & Nicobar (Gupta M.C et.al 2003). was published. The database of landuse on 1:25,000 scale was used in conjunction with satellite data (1996-2000) for change detection study and monitoring landuse pattern for some of the selected sites of Port Blair and Wandoor Marine Park. Island ecosystem management models were developed for zoning the coastal area into preservation, conservation, utilization and development zones to protect and conserve the units of vital / critical environmental concern e.g. coral reefs, mangroves etc as cited earlier. Furthermore, another model was also developed to divide the coastal zone into CRZ-I, CRZ-II, CRZ-III and CRZ-IV for generating Coastal Regulation Zone (CRZ) maps for Andaman & Nicobar using the criteria provided by the 1991 notification of Ministry of Environment and Forest (MOEF).

The results for wetland mapping of Andaman & Nicobar on 1:50,000 and 1:250,000 are shown in Plate 67 To 70. Plate 67 shows the Coastal Wetland map of S.O.I toposheet 87A10, using wetland database on 1:50,000 scale and Plate 68 shows an Area of Interest (A.O.I) as selected by user using wetland database on 1:250,000 scale for Andaman Islands.

Plate 69 shows the Coastal Wetland map of an Area of Interest (A.O.I) as selected by user using wetland database on 1:50,000 scale while Plate 70 shows an Area of Interest (A.O.I) using wetland database on 1:250,000 scale for Nicobar Islands.

6.11 LAKSHADWEEP ISLANDS

The Lakshadweep, the Union Territory of India, in the Arabian sea have in all 36 islands. Of these, the ten islands are inhabited viz. Agatti, Amini, Andrott, Bitra, Chetlat, Kadmatta, Kalpeni, Kavaratti, Kilton and Minicoy. It consists 3 coral reefs, 12 atolls and 6 submerged sand banks. The total geographical land area is about 32 sq. km with around 26 sq. km as usable land area (Saldhan C. J. 1989). Kavaratti is the headquarter of the Administration since 1964. The Lakshadweep islands are made up of coral boulders weather into fine white sand. They are flat and only a few meters above the high tide mark. The islands have lagoons (about 4000 sq. km area) and atoll reefs. Exotic life underwater is abundant and includes butterfly fishes, surgeon fishes, Powder blue surgeon fishes, the parrot fishes, damsel fishes, puffer fishes, cucumbers, shelled animals (mollusks) and hermit crabs (India-2001, encyclopedia). A variety of crabs, lobsters and shrimps inhabit the crevices of corals. The beauty of the so called coral islands and their biological diversity needs to be preserved. Developmental activities like tourism, construction of houses to meet pressure of increasing population etc. may lead to irreversible degradation of these unique and fragile islands. To preserve these islands, there is a need to have an Information System which can help in providing necessary and timely information for their monitoring and effective management.

Coral reefs of the Lakshadweep islands are mainly atoll except one platform reef of Androth. The reefs are crescentic with a steeper shore on the east and a lagoon in the west. The corals are rich in diversity. The presence of rising reef patches in the lagoonal floor, live coral platform, coral heads etc. are the indicators of the continuing coral reef growth in the region. The lagoons vary considerably in size, bottom topography and geomorphology. The lagoons are devoid of any suspended sediments. Sea grass is present adjoining the shore facing the lagoon. Algae are present in small and scattered patches on the

inner reef margins of few atolls. Sandy beaches exist only on windward sides of Lakshadweep atolls while northern, southern tips and the leeward beaches are called storm beaches as they are made up of coral debris. Vegetation on the beach may be seasonal grasses or perrineals. Coconut plantations are present on the sand immediately adjacent to the beaches. These plantations cover the entire islands.

In the present study, the following thematic layers are created / added using the standard spatial frame :

- i) Wetland on 1:250,000 Scale
- ii) Coral Reef on 1:50,000 Scale

These layers are created for entire Lakshadweep area from hardcopy maps prepared using IRS LISS-II, Landsat TM and SPOT data over a period of 1987-1991 by Space Application Centre (SAC), Ahmedabad. A list of available data used for preparing wetland maps along with satellites used, sensors, Path, Row and date of data acquisition is given in Appendix IV.

Database of Coral Reef on 1:50,000 Scale was already created along with development of CZIS. The report NRIS (National (Natural) Resources Information System) for Lakshadweep Islands (Gupta M.C et.al 2006). was published. This database was used in conjunction with satellite data of Year 2000 for change detection study and monitoring coral reef for Kavarati Island. Island ecosystem management models were also developed for Lakshadweep, zoning the coral reefs into preservation, conservation, utilization and development zones.

The results of wetland mapping on 1:25,000 are shown in Plate 71 and 72. Plate 71 shows the Coastal Wetland map of S.O.I toposheet 49A while Plate 72 shows an Area of Interest (A.O.I) as selected by the user.

CHAPTER - 7

CONCLUSIONS

Coastal Zone Information System for entire India (ZIS-India) is developed to include and update all the coastal information viz. landuse, wetland, shoreline, coral reef etc. for all maritime states including Union Territories in ARC/INFO environment. Due to its automatic registration nature for different thematic layers along with associated information, it is very powerful to integrate all the spatial and non-spatial information for Integrated Coastal Zone Management. The system is capable

- a) To retrieve all the information of data base of all Indian maritime states in a user friendly manner,
- b) To generate category wise land use, wetland, shoreline and coral reef maps / information for an area of entire state or Union Territory or a SOI toposheet on 1:25,000, 1:50,000 and 1:250,000 scale and
- c) To create final map outputs by providing only SOI toposheet number (obtained from General Info) or the Area of Interest (AOI) interactively, as an input.

The criteria provided by MoEF (CRZ notification 1991) can be used for generating CRZ information (Gupta M.C, et. al. 200, 2003, 2006) which in turn can provide zoning of coastal area into different zones (CRZ-I, II, III and IV). This information can be used for taking decision to allow permitted activities and / or to impose certain restrictions on setting up and expansions of industries, operations and processes into the coastal zone.

Environmental Appraisal Model and Habitat at Risk Model can be used to generate Integrated Coastal Zone Management Maps delineating preservation, conservation, development and utilization zones for coastal habitats using multi-temporal database (Gupta M.C, et. al. 2003). These maps provide the area where coastal habitats have been degraded so in turn will help in finding out the causes of degradation and then in taking up the remedial measures for proper development of the area.

Thus CZIS-India can provide an effective Coastal Zone Management Planning System for sustainable development in the coastal areas due to its wide information retrieval capability along with generation of varied information and automatic map generation. This will not only guide for development of

various activities such as development of industries, tourism, setting up of harbors or jetties all along the coast but also in proper utilization of coastal resources to avoid any adverse effect or damage to the coastal eco-system. Being developed around ARC/INFO, it has the capability of timely updating the data as well as creating multi-temporal and multi-thematic data so as to monitor various activities in the coastal areas e.g. status of critical habitats (such as mangroves, corals etc.), wetlands, national parks, sanctuaries, progress of developmental projects, identifying and checking violations etc.

FUTURE SCOPE :

At present, the database has layers of land use, wetland, shorelines and coral reefs. It can be updated to include more and more layers viz. forest density, watershed, soils, geomorphology, water quality, drainage etc. using master frame so as to register them automatically with the existing layers. This will help to get management plan for forest, water facilities and so on. Moreover, although the present data is used for coastal zone and habitats management, it can also be used for other applications such as erosion, deposition etc. requiring land use, wetland, shoreline and coral reef information and other non-spatial information such as plant species, village-wise population, rainfall, humidity, temperature etc.

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APPENDIX – I

SATELLITE DATA USED FOR PREPARING LANDUSE MAPS ON 1:25,000 SCALE FOR DIFFERENT MARITIME STATES

1. Maharashtra

S.No	Map Number	Satellite	Sensor	Path	Row	Date
1	46D/12SE & NE	SPOT-1	HRV1-MLA	202	310	11-03-1989
2	47A/16NW	SPOT-2	HRV1-MLA	203	312	23-11-1990
3	47B/13SE & SW	SPOT-2	HRV1-MLA	203, 204	312, 313	23-11-1990, 13-11-1990
4	47B/14NE	SPOT-2	HRV1-MLA	204	313	13-11-1990
5	47B/14NW	SPOT-2	HRV1-MLA	204	313	13-11-1990
6	47B/14SE	SPOT-2	HRV1-MLA	204	313	13-11-1990
7	47B/15NE	SPOT-2	HRV1-MLA	204	313	13-11-1990
8	47B/15SE	SPOT-2	HRV1-MLA	203, 203	313, 314	13-11-1990, 23-11-1990
9	47B/16NE	SPOT-2	HRV1-MLA	203	314	23-11-1990
10	47B/16SE	SPOT-2	HRV1-MLA	203	314	23-11-1990
11	47E/03SE	SPOT-2	HRV1-MLA	203	311	23-11-1990
12	47E/03SW	SPOT-2	HRV1-MLA	203	311	23-11-1990
13	47E/04NW	SPOT-2	HRV1-MLA	204	312	13-11-1990
14	47E/04SW	SPOT-2	HRV1-MLA	203	312	23-11-1990
15	48E/09NW	SPOT-1	HRV1-MLA	206	318	14-05-1988
16	48E/10NE	SPOT-1	HRV1-MLA	206	319	22-11-1990
17	47F/01NW	SPOT-2	HRV1-MLA	203	312	23-11-1990
18	47F/01SE	SPOT-2	HRV1-MLA	203	312	23-11-1990
19	47F/01SW	SPOT-2	HRV1-MLA	203	312	23-11-1990
20	47F/02NW	SPOT-2	HRV1-MLA	204	314	13-11-1990
21	47F/02SE	SPOT-2	HRV1-MLA	203	313	13-11-1990
22	47F/02SW	SPOT-2	HRV1-MLA	203	314	13-11-1990
23	47F/03NW	SPOT-2	HRV1-MLA	204	313	13-11-1990
24	47F/03SW	SPOT-2	HRV1-MLA	204	313	13-11-1990
25	47F/04NW	SPOT-2	HRV1-MLA	203, 204	314, 314	23-11-1990, 12-11-1990
26	47F/04SE	SPOT-2	HRV1-MLA	204	314	12-11-1990
27	47F/04SW	SPOT-2	HRV1-MLA	203	314	23-11-1990
28	47F/08NW	SPOT-2	HRV1-MLA	204	314	12-11-1990
29	47F/08SE	SPOT-2	HRV1-MLA	204	68	12-11-1990
30	47F/08SW	SPOT-2	HRV1-MLA	204	314	12-11-1990
31	47G/01NE	SPOT-2	HRV1-MLA	204	314	12-11-1990
32	47G/01NW	SPOT-2	HRV1-MLA	204	314	12-11-1990
33	47G/01SE	SPOT-2	HRV1-MLA	204	314	12-11-1990
34	47G/01SW	SPOT-2	HRV1-MLA	204, 204	314, 315	12-11-1990, 12-11-1990
35	47G/02NE & NW	SPOT-2	HRV1-MLA	204	315	12-11-1990
36	47G/02SE	SPOT-2	HRV1-MLA	204	315	12-11-1990
37	47G/03NE	SPOT-2	HRV1-MLA	204	315	12-11-1990

38	47G/03SE	SPOT-2	HRV1-MLA	204	315	12-11-1990
39	47G/04NE	SPOT-1	HRV1-MLA	205	316	22-11-1988
40	47G/06NE	SPOT-1	HRV1-MLA	205	315	14-05-1988
41	47G/06NW	SPOT-1	HRV1-MLA	205	315	14-05-1988
42	47G/06SE	SPOT-2	HRV1-MLA	205	315	14-05-1988
43	47G/06SW	SPOT-2	HRV1-MLA	204	315	12-11-1990
44	47G/07SE	SPOT-1	HRV1-MLA	205	316	22-11-1988
45	47G/07SW	SPOT-2	HRV1-MLA	204	315	12-11-1990
46	47G/08NE	SPOT-1	HRV1-MLA	205	316	22-11-1988
47	47G/08NW	SPOT1	HRV1-MLA	205	316	22-11-1988
48	47G/08SE	SPOT-1	HRV1-MLA	205	316	22-11-1988
49	47G/08SW	SPOT-1	HRV1-MLA	205	316	22-11-1988
50	47G/10SW	SPOT-1	HRV1-MLA	205	315	14-05-1988
51	47G/12NW	SPOT-2	HRV1-MLA	206	318	22-10-1990
52	47H/05NE	SPOT-1	HRV1-MLA	205	316	22-11-1988
53	47H/05NW	SPOT-1	HRV1-MLA	205	316	22-11-1988
54	47H/05SW	SPOT-1	HRV1-MLA	205	316	22-11-1988
55	47H/06NE	SPOT-1	HRV1-MLA	205	317	22-11-1988
56	47H/06NW	SPOT-1	HRV1-MLA	205	317	22-11-1988
57	47H/06SE	SPOT-1	HRV1-MLA	205, 206	317, 317	22-11-1988
58	47H/06SW	SPOT-1	HRV1-MLA	205	317	22-11-1988
59	47H/07NE	SPOT-1	HRV1-MLA	205, 206	317, 317	22-11-1988
60	47H/07NW	SPOT-1	HRV1-MLA	205	317	22-11-1988
61	47H/07SE & SW	SPOT-1	HRV1-MLA	205, 206	317	22-11-1989
62	47H/08NE	SPOT-1	HRV1-MLA	205, 206	318, 318	14-05-1988, 14-05-1988
63	47H/08SE	SPOT-1	HRV1-MLA	206	318	14-05-1988
64	47H/11NW	SPOT-1	HRV1-MLA	206	317	22-11-1988
65	47H/12NW	SPOT-1	HRV1-MLA	206	318	14-05-1988
66	47H/12SE	SPOT-1	HRV1-MLA	206	318	14-05-1988
67	47H/12SW	SPOT-1	HRV1-MLA	206	318	14-05-1988
68	48E/05NE	SPOT-1	HRV1-MLA	206	318	14-05-1988
69	48E/09SE	SPOT-1	HRV1-MLA	206	318	14-05-1988
70	48E/09SW	SPOT-1	HRV1-MLA	206	318	14-05-1988
71	48E/13SW	SPOT-1	HRV1-MLA	206	318	14-05-1988

2. Goa

S.No	Map Number	Satellite	Sensor	Path	Row	Date
1	48E/10NE	SPOT-1	HRV1-MLA	206	319	22-11-1988
2	48E/10SE	SPOT-1	HRV1-MLA	206	319	22-11-1988
3	48E/13SW	SPOT-1	HRV1-MLA	206	318	14-05-1988
4	48E/14NE	SPOT-1	HRV1-MLA	207	319	25-11-1990
5	48E/14NW	SPOT-1	HRV1-MLA	206	319	22-11-1988
6	48E/14SE	SPOT-1	HRV1-MLA	207	319	25-11-1990
7	48E/14SW	SPOT-1	HRV1-MLA	206,	319,	22-11-1988,

				207	319	25-11-1990
8	48E/15NE	SPOT-1	HRV1-MLA	207	319	25-11-1990
9	48E/15NW	SPOT-1	HRV1-MLA	207	319	25-11-1990
10	48E/15SE	SPOT-1	HRV1-MLA	207	319	25-11-1990
11	48E/15SW	SPOT-1	HRV1-MLA	207	319	25-11-1990
12	48E/16NE	SPOT-1	HRV1-MLA	207	320	17-03-1989
13	48E/16SE	SPOT-1	HRV1-MLA	207	320	17-03-1989
14	48I/02SW	IRS-1B	LISS-II	29	57	05-03-1993
15	48I/03NW	SPOT-1	HRV1-MLA	207	319	25-11-1990
16	48I/03SE	IRS-1B	LISS-II	29	57	05-03-1993
17	48I/03SW	SPOT-1	HRV1-MLA	207	320	25-11-1990
18	48I/04NE	IRS-1B	LISS-II	29	57	05-03-1993
19	48I/04NW	SPOT-1	HRV1-MLA	207	320	17-03-1989
20	48I/04SW	SPOT-1	HRV1-MLA	207	320	17-03-1989
21	48J/01NW	SPOT-1	HRV1-MLA	207	320	17-03-1989

3. Karnataka

S.No	Map Number	Satellite	Sensor	Path	Row	Date
1	48J/01NE	SPOT	HRV1-MLA	D-208	320	17-03-1989
2	48J/01NW	SPOT	HRV1-MLA	D-208	320	17-03-1989
3	48J/01SE	SPOT	HRV1-MLA	D-208	320	17-03-1989
4	48J/01SW	SPOT	HRV1-MLA	D-208,D208	320,321	17-03-1989
5	48J/02NE	SPOT	HRV1-MLA	D-208	320	17-03-1989
6	48J/06NW	SPOT	HRV1-MLA	D-208	320	17-03-1989
7	48J/07NE & 48J/07NW	SPOT	HRV1-MLA	D-208	320	17-03-1989
8	48J/07SE	SPOT	HRV1-MLA	D-208	320	17-03-1989
9	48J/08NE	SPOT	HRV1-MLA	D-208	320	17-03-1989
10	48J/08SE	SPOT	HRV1-MLA	D-208	320	17-03-1989
11	48J/12NE	SPOT	HRV1-MLA	D-208	320	17-03-1989
12	48J/12NW	SPOT	HRV1-MLA	D-208	320	17-03-1989
13	48J/12SW	SPOT	HRV1-MLA	D-208	320	17-03-1989
14	48K/09NW	SPOT	HRV1-MLA	D-208	320	17-03-1989
15	48K/09SE	SPOT	HRV1-MLA	D-208	320	17-03-1989
16	48K/09SW	SPOT	HRV1-MLA	D-208	320	17-03-1989
17	48K/10NE	SPOT	HRV1-MLA	D-208	320	17-03-1989
18	48K/10SE	SPOT	HRV1-MLA	D-208	320	17-03-1989
19	48K/11NE	SPOT	HRV1-MLA	D-208	320	17-03-1989
20	48K/11SE	SPOT	HRV1-MLA	D-208	320	17-03-1989
21	48K/12NE	SPOT	HRV1-MLA	D-208	320	17-03-1989
22	48K/16NW	SPOT	HRV1-MLA	D-208	320	17-03-1989
23	48K/16SW	SPOT	HRV1-MLA	D-208	320	17-03-1989
24	48L/13NW	SPOT	HRV1-MLA	D-208	320	17-03-1989
25	48L/13SE	SPOT	HRV1-MLA	D-208	320	17-03-1989
26	48L/13SW	SPOT	HRV1-MLA	D-208	320	17-03-1989

4. Kerala

S.No	Map Number	Satellite	Sensor	Path	Row	Date
1	48L/13SW	SPOT	HRV1-MLA	210	325	17-03-1989
2	48L/14NE7NW	SPOT	HRV1-MLA	210	325	17-03-1989
3	48L/14SE	SPOT	HRV1-MLA	210	325	17-03-1989
4	48L/15NE	SPOT	HRV1-MLA	211	325	08-03-1988
5	48P/03NW	SPOT	HRV1-MLA	211	325	08-03-1988
6	48P/03SE	SPOT	HRV1-MLA	211	325	08-03-1988
7	48P/03SW	SPOT	HRV1-MLA	211	325	08-03-1988
8	48P/04NE	SPOT	HRV1-MLA	211	326	07-03-1989
9	48P/04NW	SPOT	HRV1-MLA	211	326	07-03-1989
10	48P/04SE	SPOT	HRV1-MLA	211	326	07-03-1989
11	48P/08SE	SPOT	HRV1-MLA	211	326	07-03-1989
12	48P/08SW	SPOT	HRV1-MLA	211	326	07-03-1989
13	49M/05NE	SPOT	HRV1-MLA	211	326	07-03-1989
14	49M/05NW	SPOT	HRV1-MLA	211	326	07-03-1989
15	49M/05SE	SPOT	HRV1-MLA	211	326, 327	17-03-1989, 09-02-1989
16	49M/05SW	SPOT	HRV1-MLA	212	326	09-02-1989
17	49M/09SW	SPOT	HRV1-MLA	212	327	17-03-1989
18	49M/10NW&49M/06NE	SPOT	HRV1-MLA	212	327	17-03-1989
19	49M/10SE	SPOT	HRV1-MLA	212	327	17-03-1989
20	49M/10SW	SPOT	HRV1-MLA	212	327	17-03-1989
21	49M/11NE	SPOT	HRV1-MLA	213, 212	327	04-02-1989, 17-03-1989
22	49M/11NW	SPOT	HRV1-MLA	212	327	17-03-1989
23	49M/11SE	SPOT	HRV1-MLA	213	327	04-02-1989
24	49M/15NW	SPOT	HRV1-MLA	213, 212	327	04-02-1989, 17-03-1989
25	49M/15SW	SPOT	HRV1-MLA	213, 213	328, 327	04-02-1989, 04-02-1989
26	49M/16NE	SPOT	HRV1-MLA	24	328	04-02-1989
27	49M/16NW	SPOT	HRV1-MLA	213	328	04-02-1989
28	49M/16SE	SPOT	HRV1-MLA	214	328	04-02-1989
29	49M/16SW	SPOT	HRV1-MLA	213	328	04-02-1989
30	49N/13NE&NW	SPOT	HRV1-MLA	214	328	04-02-1989
31	49N/13SE	SPOT	HRV1-MLA	213, 213	329, 328	04-02-1989, 04-02-1989
32	49N/14NE	SPOT	HRV1-MLA	213	329	04-02-1989
33	58B/02SW	SPOT	HRV1-MLA	214	329	04-02-1989
34	58B/03NE	SPOT	HRV1-MLA	214	329	04-02-1989
35	58B/03NW	SPOT	HRV1-MLA	214	329	04-02-1989
36	58B/03SE	SPOT	HRV1-MLA	214, ,214	330, 329	04-02-1989, 04-02-1989
37	58B/03SW	SPOT	HRV1-MLA	214	329	04-02-1989
38	58B/04NE	SPOT	HRV1-MLA	214	330	04-02-1989
39	58B/04SE	SPOT	HRV1-MLA	214	330	04-02-1989
40	58B/07SW	SPOT	HRV1-MLA	214	330	04-02-1989
41	58B/08NW	SPOT	HRV1-MLA	214	330	04-02-1989
42	58B/08SW	SPOT	HRV1-MLA	214	330	04-02-1989
43	58C/05NW&58C/01NE	SPOT	HRV1-MLA	214	330	04-02-1989

44	58C/05SE	SPOT	HRV1-MLA	215	331	23-11-1989
45	58C/05SW	SPOT	HRV1-MLA	215	331	23-11-1989
46	58C/06NE	SPOT	HRV1-MLA	215	331	23-11-1989
47	58C/06NW	SPOT	HRV1-MLA	215	331	23-11-1989
48	58C/06SW	SPOT	HRV1-MLA	215	331	23-11-1989
49	58C/07NW	SPOT	HRV1-MLA	215	331	23-11-1989
50	58C/07SW&SE	SPOT	HRV1-MLA	215, 215	332, 331	07-11-1989, 23-11-1989
51	58C/08NE	SPOT	HRV1-MLA	215	332	07-11-1989
52	58C/08SE	SPOT	HRV1-MLA	215	332	07-11-1989
53	58C/12SE	SPOT	HRV1-MLA	215	332	07-11-1989
54	58C/12SW	SPOT	HRV1-MLA	215	332	07-11-1989
55	58D/09NE	SPOT	HRV1-MLA	215	332	07-11-1989
56	58D/09NW	SPOT	HRV1-MLA	215	332	07-11-1989
57	58D/09SE	SPOT	HRV1-MLA	216, 215	333, 332	09-12-1990, 07-11-1989
58	58D/09SW	SPOT	HRV1-MLA	215	332	07-11-1989
59	58D/10NE	SPOT	HRV1-MLA	216	333	09-12-1990
60	58D/14NW	SPOT	HRV1-MLA	216	333	09-12-1990
61	58D/14SE	SPOT	HRV1-MLA	216	333	09-12-1990
62	58D/14SW	SPOT	HRV1-MLA	216	333	09-12-1990
63	58D/15NE	SPOT	HRV1-MLA	216	333	09-12-1990
64	58H/03SW&58D/05SE	SPOT	HRV1-MLA	216	333	09-12-1990

5. Andhra Pradesh

S.No	Map Number	Satellite	Sensor	Date
1	57N/16NE	SPOT-1	HRV1-MLA	20-05-1990
2	57N/16SE	SPOT-1	HRV1-MLA	20-05-1990
3	65H/11NE	SPOT-1	HRV1-MLA	23-12-1992
4	65H/11NE	SPOT-1	HRV1-MLA	03-03-1989
5	65H/11SE	SPOT-1	HRV1-MLA	03-03-1989
6	65H/14SE	SPOT-1	HRV1-MLA	03-03-1989
7	65H/14SW	SPOT-1	HRV1-MLA	03-03-1989
8	65K/08NE	SPOT-1	HRV1-MLA	10-02-1989
9	65K/08EW	SPOT-1	HRV1-MLA	10-02-1989
10	65K/12NW	SPOT-1	HRV1-MLA	10-02-1989
11	65L/01NE	SPOT-1	HRV1-MLA	03-04-1989
12	65L/01SE	SPOT-1	HRV1-MLA	03-04-1989
13	65L/02NE	SPOT-1	HRV1-MLA	03-03-1989
14	65L/02NW	SPOT-1	HRV1-MLA	03-03-1989
15	65L/02SE	SPOT-1	HRV1-MLA	10-03-1989
16	65L/03NW	SPOT-1	HRV1-MLA	10-03-1989
17	65L/05SW	SPOT-1	HRV1-MLA	10-03-1989
18	65D/16NE	SPOT-1	HRV1-MLA	10-05-1989
19	65D/16SW	SPOT-1	HRV1-MLA	10-05-1989
20	65H/10SW	SPOT-1	HRV1-MLA	10-02-1989
21	65H/11NW	SPOT-1	HRV1-MLA	23-12-1992
22	65H/11SE	SPOT-1	HRV1-MLA	23-12-1992
23	65H/11SW	SPOT-1. IRS	HRV1-MLA, LISS-II	03-03-1989,23-12-1992
24	65H/14NE	SPOT-1	HRV1-MLA	03-03-1989

25	65H/14NW	SPOT-1	HRV1-MLA	10-02-1989
26	65H/14SW	SPOT-1	HRV1-MLA	03-03-1989
27	65H/15NE	SPOT-1	HRV1-MLA	03-03-1989
28	65H/15NW	SPOT-1	HRV1-MLA	23-12-1992
29	65H/03SE	SPOT-1	HRV1-MLA	10-05-1989
30	65H/04NE	SPOT-1	HRV1-MLA	10-05-1989
31	65H/04NW	SPOT-1	HRV1-MLA	10-05-1989
32	65H/04SE	SPOT-1	HRV1-MLA	10-05-1989
33	65H/04SW	SPOT-1	HRV1-MLA	10-05-1989
34	65H/06SE	SPOT-1	HRV1-MLA	03-02-1989
35	65H/06SW	SPOT-1, IRS	HRV1-MLA, LISS-II	03-03-1989,03-02-1989
36	65H/07NE	SPOT-1, IRS	HRV1-MLA, LISS-II	03-03-1989,23-12-1992
37	65H/07NW	SPOT-1	HRV1-MLA	03-03-1989
38	65H/07SE	SPOT-1, IRS	HRV1-MLA, LISS-II	03-03-1989,23-12-1992
39	65H/07SW	SPOT-1	HRV1-MLA	03-03-1989
40	65K/11SE	SPOT-1	HRV1-MLA	15-05-1989
41	65K/11SW	SPOT-1	HRV1-MLA	15-05-198
42	65K/15NE	SPOT-2, IRS	HRV1-MLA, LISS-II	15-05-1989,26-02-1993
43	65K/15NW,SW	SPOT-1, IRS	HRV1-MLA, LISS-II	15-05-1989,26-02-1993
44	65K/08/NW	SPOT-1	HRV1-MLA	10-02-1989
45	65K/08SE	SPOT-1	HRV1-MLA	10-02-1989
46	65L/02SW	SPOT-1	HRV1-MLA	10-03-1989
47	65K/03NE	SPOT-1	HRV1-MLA	10-03-1989
48	65L/05NW	SPOT-1	HRV1-MLA	10-02-1989
49	65L/06NW	SPOT-1	HRV1-MLA	10-02-1989
50	65L/06SW	SPOT-1	HRV1-MLA	10-02-1989
51	65N/12SE	SPOT-1	HRV1-MLA	16-05-1989
52	65N/12SW	SPOT-1	HRV1-MLA	16-05-1989
53	65N/16NE	SPOT-1	HRV1-MLA	23-11-1989
54	65N/16NW	SPOT-1	HRV1-MLA	23-11-1989
55	65O/02NE	SPOT-1	HRV1-MLA	15-05-1989
56	65O/02SE	SPOT-1	HRV1-MLA	15-05-1989
57	65O/02SW&65O/03NW	SPOT-1	HRV1-MLA	15-05-1989
58	65O/05NE	SPOT-1, IRS	HRV1-MLA, LISS-II	15-05-1989,1903-1993
59	65O/05SE	SPOT-1	HRV1-MLA	15-05-1989
60	65O/05SW	SPOT-1	HRV1-MLA	15-05-1989
61	65O/06NW	SPOT-1	HRV1-MLA	15-05-1989
62	65O/09NW	SPOT-1	HRV1-MLA	15-05-1989
63	66A/13NE	SPOT-1	HRV1-MLA	10-05-1989
64	66A/13NW	SPOT-1	HRV1-MLA	10-05-1989
65	66A/13SE	SPOT-1	HRV1-MLA	10-05-1989
66	66A/13SW	SPOT-1	HRV1-MLA	10-05-1989
67	66A/14NE	SPOT-1	HRV1-MLA	10-05-1989
68	66A/14NW	SPOT-1	HRV1-MLA	10-05-1989
69	66A/02NE	SPOT-1	HRV1-MLA	29-04-1989
70	66A/02SE	SPOT-1	HRV1-MLA	29-04-1989
71	66A/02SW	SPOT-1	HRV1-MLA	29-04-1989
72	66A/03NE,SE	SPOT-1	HRV1-MLA	29-04-1989
73	66A/03NW	SPOT-1	HRV1-MLA	29-04-1989
74	66A/03SW	SPOT-1	HRV1-MLA	29-04-1989

75	66A/04NW	SPOT-1	HRV1-MLA	29-04-1989
76	66A/04SW	SPOT-1	HRV1-MLA	29-04-1989
77	66A/05SE	SPOT-1	HRV1-MLA	29-04-1989
78	66A/05SW	SPOT-1	HRV1-MLA	29-04-1989
79	66A/06NW	SPOT-1	HRV1-MLA	29-04-1989
80	66A/09NE	SPOT-1	HRV1-MLA	10-05-1989
81	66A/09NW	SPOT-1	HRV1-MLA	29-04-1989
82	66A/09SW	SPOT-1	HRV1-MLA	29-04-1989
83	66B/04SW	SPOT-1	HRV1-MLA	20-05-1990
84	66B/01NW	SPOT-1	HRV1-MLA	29-04-1989
85	66B/01SW	SPOT-1	HRV1-MLA	29-04-1989
86	66B/02NE	SPOT-1	HRV1-MLA	20-05-1989
87	66B/02SE	SPOT-1	HRV1-MLA	20-05-1989
88	66B/02NW	SPOT-1	HRV1-MLA	20-05-1989
89	66B/02SW	SPOT-1	HRV1-MLA	20-05-1989
90	66B/03NE	SPOT-1	HRV1-MLA	20-05-1989
91	66B/03SE	SPOT-1	HRV1-MLA	20-05-1990
92	66B/03SW	SPOT-1	HRV1-MLA	20-05-1990
93	66B/04SE	SPOT-1	HRV1-MLA	20-05-1990
94	66B/04NE	SPOT-1	HRV1-MLA	20-05-1990
95	66B/04NW	SPOT-1	HRV1-MLA	20-05-1990
96	66C/01NW	SPOT-1	HRV1-MLA	20-05-1990
97	66C/01NE	SPOT-1	HRV1-MLA	29-04-1989
98	66C/01SE&66C/05SW	SPOT-1	HRV1-MLA	19-04-1990
99	66C/01SW	SPOT-1	HRV1-MLA	19-04-1990
100	66C/02NE	SPOT-1	HRV1-MLA	19-04-1990
101	66C/02NW	SPOT-1	HRV1-MLA	19-04-1990
102	66C/02SE	SPOT-1	HRV1-MLA	19-04-1990
103	66C/02SW&66C/03NW	SPOT-1	HRV1-MLA	19-04-1990
104	66C/06SW	SPOT-1	HRV1-MLA	19-04-1990
105	66E/01NE	SPOT-1	HRV1-MLA	10-05-1989
106	66E/01NW	SPOT-1	HRV1-MLA	10-05-1989
107	66E/01SW&66E/02NW	SPOT-1	HRV1-MLA	10-05-1989
108	74A/12SE	SPOT-1	HRV1-MLA	13-10-1989
109	74B/03NE	SPOT-1	HRV1-MLA	23-11-1989
110	74B/03SE	SPOT-1	HRV1-MLA	23-11-1989
111	74B/03SW&74B/04NW	SPOT-1	HRV1-MLA	23-10-1989
112	74B/06NE&74B/10NW	SPOT-1	HRV1-MLA	13-10-1989
113	74B/06SE	SPOT-1	HRV1-MLA	13-10-1989
114	74B/06SW	SPOT-1	HRV1-MLA	13-10-1989
115	74B/07NW	SPOT-1	HRV1-MLA	23-11-1989
116	74B/09NE&NW	SPOT-1	HRV1-MLA	13-10-1989
117	74B/09SW	SPOT-1	HRV1-MLA	13-10-1989

6. Orissa

S.No	Map Number	Satellite	Sensor	Path	Row	Date
1	73K/12SE	SPOT	HRV1-MLA	230	308	04-03-1989
2	73K/12SW	SPOT	HRV1-MLA	230	308	04-03-1989
3	73K/14SE	SPOT	HRV1-MLA	230	307	04-03-1989
4	73K/15NE	SPOT	HRV1-MLA	230	307	04-03-1989
5	73K/15SE	SPOT	HRV1-MLA	230	307	04-03-1989
6	73K/15SW	SPOT	HRV1-MLA	230	317	04-03-1989
7	73K/16NW	SPOT	HRV1-MLA	230	308	04-03-1989
8	73K/16SE	SPOT	HRV1-MLA	230	308	04-03-1989
9	73K/16SW	SPOT	HRV1-MLA	230	308	04-03-1989
10	73L/04NE	IRS-1A	LISS-II	20	54	07-04-1989
11	73L/04SE	IRS-1A	LISS-II	20	54	07-04-1989
12	73L/06SE	SPOT	HRV1-MLA	230	309	04-03-1989
13	73L/07NE	SPOT	HRV1-MLA	230	309	04-03-1989
14	73L/07SE	SPOT	HRV1-MLA	230	309	04-03-1989
15	73L/08NE	SPOT	HRV1-MLA	230	310	04-03-1989
16	73L/08NW	SPOT	HRV1-MLA	230	310	04-03-1989
17	73L/08SE	SPOT	HRV1-MLA	230	310	04-03-1989
18	73L/08SW	SPOT	HRV1-MLA	230	310	04-03-1989
19	73L/09NE	SPOT	HRV1-MLA	230	308	04-03-1989
20	73L/09NW	SPOT	HRV1-MLA	230	308	04-03-1989
21	73L/09SE	SPOT	HRV1-MLA	230	308	04-03-1989
22	73L/09SW	SPOT	HRV1-MLA	230	308	04-03-1989
23	73L/10NE	SPOT	HRV1-MLA	230	309	04-03-1989
24	73L/10NW	SPOT	HRV1-MLA	230	309	04-03-1989
25	73L/10SE	SPOT	HRV1-MLA	230	309	04-03-1989
26	73L/10SW	SPOT	HRV1-MLA	231	309	04-03-1989
27	73L/11NE	SPOT	HRV1-MLA	231	309	09-12-1989
28	73L/11NW	SPOT	HRV1-MLA	230	309	09-12-1989
29	73L/11SE	SPOT	HRV1-MLA	231	310	04-03-1989
30	73L/11SW	SPOT	HRV1-MLA	231	310	04-03-1989
31	73L/12NE	SPOT	HRV1-MLA	230	310	04-03-1989
32	73L/12NW	SPOT	HRV1-MLA	230	310	04-03-1989
33	73L/13NE	SPOT	HRV1-MLA	231	308	09-12-1989
34	73L/13NW	SPOT	HRV1-MLA	230	308	04-03-1989
35	73L/13SE	SPOT	HRV1-MLA	231	308	09-12-1989
36	73L/13SW	SPOT	HRV1-MLA	230	308	04-03-1989
37	73L/14NE	SPOT	HRV1-MLA	231	309	04-03-1989
38	73L/14NW	SPOT	HRV1-MLA	231	309	09-12-1989
39	73L/14SE	SPOT	HRV1-MLA	231	309	09-12-1989
40	73L/14SW	SPOT	HRV1-MLA	231	309	09-12-1989
41	73L/15NW	SPOT	HRV1-MLA	231	309	04-03-1989
42	73L/15SW	SPOT	HRV1-MLA	231	309	04-03-1989
43	73O/02NE	SPOT	HRV1-MLA	231	307	09-12-1989
44	73O/02NW	SPOT	HRV1-MLA	231	307	09-12-1989
45	73O/02SE	SPOT	HRV1-MLA	231	307	09-12-1989
46	73O/02SW	SPOT	HRV1-MLA	231	307	09-12-1989
47	73O/03NW	SPOT	HRV1-MLA	229	310	09-12-1989

48	73O/06NE	SPOT	HRV1-MLA	231	307	09-12-1989
49	73O/06NW	SPOT	HRV1-MLA	231	307	09-12-1989
50	73O/06SE	SPOT	HRV1-MLA	231	307	09-12-1989
51	73O/06SW	SPOT	HRV1-MLA	231	307	09-12-1989
52	73P/01SW	SPOT	HRV1-MLA	231	308	04-03-1989
53	73P/02NW	SPOT	HRV1-MLA	231	308	04-03-1989
54	74A/12NE	SPOT	HRV1-MLA	207	312	05-12-1988
55	74A/12SE	SPOT	HRV1-MLA	227	312	05-12-1988
56	74A/15SE	SPOT	HRV1-MLA	228	311	05-12-1988
57	74A/16NE	SPOT	HRV1-MLA	228	312	05-12-1988
58	74A/16NW	SPOT	HRV1-MLA	227	312	05-12-1988
59	74A/16SW	SPOT	HRV1-MLA	227	312	05-12-1988
60	74E/01SE	SPOT	HRV1-MLA	228	310	10-05-1989
61	74E/02NE	SPOT	HRV1-MLA	228	311	10-05-1989
62	74E/02SE	SPOT	HRV1-MLA	228	311	10-05-1989
63	74E/02SW	SPOT	HRV1-MLA	228	311	10-05-1989
64	74E/03NE	SPOT	HRV1-MLA	20	54	07-04-1989
65	74E/03NW	IRS-1A	LISS-II	20	54	07-04-1989
66	74E/03SW	SPOT	HRV1-MLA	20	54	07-04-1989
67	74E/05NE	SPOT	HRV1-MLA	228	310	10-05-1989
68	74E/05SE	SPOT	HRV1-MLA	228	310	10-05-1989
69	74E/05SW	SPOT	HRV1-MLA	228	310	10-05-1989
70	74E/06NE	SPOT	HRV1-MLA	228	311	10-05-1989
71	74E/06NW	SPOT	HRV1-MLA	228	311	10-05-1989
72	74E/06SE	SPOT	HRV1-MLA	228	311	10-05-1989
73	74E/06SW	IRS-1A	LISS-II	20	54	07-04-1989
74	74E/09NW	SPOT	HRV1-MLA	229	310	06-05-1988
75	74E/09SE	SPOT	HRV1-MLA	229	311	06-05-1988
76	74E/09SW	SPOT	HRV1-MLA	229	310	06-05-1988
77	74E/10NE	SPOT	HRV1-MLA	229	311	06-05-1988
78	74E/10NW	SPOT	HRV1-MLA	229	311	06-05-1988
79	74E/13NE	SPOT	HRV1-MLA	229	310	06-05-1988
80	74E/13SE	SPOT	HRV1-MLA	229	310	06-05-1988
81	74E/13SW	SPOT	HRV1-MLA	229	310	06-05-1988
82	74I/01NE	IRS-1A	LISS-II	19	54	06-04-1989
83	74I/01NW	SPOT	HRV1-MLA	229	310	06-05-1988
84	74I/01SE	IRS-1A	LISS-II	19	54	06-04-1989
85	74I/01SW	SPOT	HRV1-MLA	229	310	06-05-1988
86	74I/05NE	SPOT	HRV1-MLA	230	310	04-05-1989
87	74I/05NW	SPOT	HRV1-MLA	230	310	04-03-1989

7. Tamil Nadu

S.No	Map Number	Satellite	Sensor	Path	Row	Date
1	57P/15SE	SPOT	HRV1-MLA	221	326	May-89
2	57P/16NE	SPOT	HRV1-MLA	221	326	Apr-89
3	57P/16NW	SPOT	HRV1-MLA	221	326	May-89
4	57P/16SE	SPOT	HRV1-MLA	221	326	Apr-89
5	57P/16SW	SPOT	HRV1-MLA	221	326	May-89
6	58H/03SE	IRS-1A	LISS-II	25	63	Apr-90
7	58H/03SW	IRS-1A	LISS-II	25	63	Mar-89
8	58H/04NE	IRS-1A	LISS-II	25	63	Mar-89
9	58H/08NW	IRS-1A	LISS-II	24	63	Feb-89
10	58H/08SE	IRS-1A	LISS-II	24	63	Feb-89
11	58H/08SW	IRS-1A	LISS-II	24	63	Feb-89
12	58H/12NE	SPOT	HRV1-MLA	218	334	May-88
13	58H/12NW	SPOT	HRV1-MLA	218	334	May-88
14	58H/12SW	IRS-1A	LISS-II	24	63	Feb-89
15	58H/15SE	IRS-1A	LISS-II	24	63	Feb-89
16	58H/15SW	SPOT	HRV1-MLA	218	333	May-88
17	58H/16NW	SPOT	HRV1-MLA	218	334	May-88
18	58K/08NE	SPOT	HRV1-MLA	219	332	Feb-89
19	58K/08SE	SPOT	HRV1-MLA	219	332	Feb-89
20	58K/08SW	SPOT	HRV1-MLA	219	332	Feb-89
21	58K/12NE	SPOT	HRV1-MLA	219	332	Feb-89
22	58K/12NW	SPOT	HRV1-MLA	219	332	Feb-89
23	58K/12SW	SPOT	HRV1-MLA	219	332	Feb-89
24	58K/14NE	SPOT	HRV1-MLA	220	331	Apr-89
25	58K/14SE	SPOT	HRV1-MLA	220	331	Apr-89
26	58K/15NE	SPOT	HRV1-MLA	220	331	Apr-89
27	58K/15SE	SPOT	HRV1-MLA	220	331	Apr-89
28	58K/15SW	SPOT	HRV1-MLA	220	331	Apr-89
29	58K/16NE	SPOT	HRV1-MLA	219	332	Feb-89
30	58K/16NW	SPOT	HRV1-MLA	219	332	Feb-89
31	58L/01NE & 58L/05NE	IRS-1A	LISS-II	24	62	Feb-89
32	58L/01SW	IRS-1A	LISS-II	24	62	Feb-89
33	58L/02NE	IRS-1A	LISS-II	24	63	Feb-89
34	58L/02NW	IRS-1A	LISS-II	24	62	Feb-89
35	58L/02SE	IRS-1A	LISS-II	24	63	Sep-93
36	58L/02SW	IRS-1A	LISS-II	24	63	Sep-93
37	58L/03NE	IRS-1A	LISS-II	24	63	Sep-93
38	58L/03NW	IRS-1A	LISS-II	24	63	Sep-93
39	58L/03SW	IRS-1A	LISS-II	24	63	Sep-93
40	58M/10NE & 58M/14NE	SPOT	HRV1-MLA	221	327	May-89
41	58M/10SE & 58M/14SE	SPOT	HRV1-MLA	221	327	May-89
42	58M/13NW	SPOT	HRV1-MLA	221	326	May-89
43	58M/13SW	SPOT	HRV1-MLA	221	326	May-89
44	58M/15NW	SPOT	HRV1-MLA	221	327	May-89
45	58M/15SW	SPOT	HRV1-MLA	221	327	May-89
46	58M/16NW	SPOT	HRV1-MLA	221	328	May-89
47	58M/16SW	SPOT	HRV1-MLA	221	328	May-89

48	58N/04NE	SPOT	HRV1-MLA	220	330	Apr-89
49	58N/04SE	SPOT	HRV1-MLA			Apr-89
50	58N/07NE	SPOT	HRV1-MLA	220	329	May-89
51	58N/07SE	SPOT	HRV1-MLA	220	329	Apr-89
52	58N/07SW	SPOT	HRV1-MLA	220	329	Apr-89
53	58N/08NE	SPOT	HRV1-MLA	220	330	Apr-89
54	58N/08SE	SPOT	HRV1-MLA			Apr-89
55	58N/11NE	SPOT	HRV1-MLA	221	329	Mar-89
56	58N/11NW	SPOT	HRV1-MLA	221	329	Mar-89
57	58N/11SE	SPOT	HRV1-MLA	221	329	Mar-89
58	58N/11SW	SPOT	HRV1-MLA	221	329	Mar-89
59	58N/13NW	SPOT	HRV1-MLA	221	328	May-89
60	58N/13SW	SPOT	HRV1-MLA	221	328	May-89
61	58N/14NW	SPOT	HRV1-MLA	221	329	Mar-89
62	58N/14SW	SPOT	HRV1-MLA	221	329	Mar-89
63	58N/15NW	SPOT	HRV1-MLA	221	329	Mar-89
64	58N/15SE	SPOT	HRV1-MLA	221	329	Mar-89
65	58N/15SW	SPOT	HRV1-MLA	221	329	Mar-89
66	58O/01NE & 58O/02NE	SPOT	HRV1-MLA	220	330	Apr-89
67	58O/01NW & 58O/02NW	SPOT	HRV1-MLA	220	330	Apr-89
68	58O/01SW & 58O/02SW	SPOT	HRV1-MLA	220	330	Apr-89
69	58O/03NW & 58O/04NW	SPOT	HRV1-MLA	220	331	Apr-89
70	58O/03SE & 58O/04SE	SPOT	HRV1-MLA	220	331	Apr-89
71	58O/03SW & 58O/04SW	SPOT	HRV1-MLA	220	331	Apr-89
72	58O/07NW & 58O/08NW	IRS-1A	LISS-II	23	62	Jan-90
73	58O/07SE & 58O/08SE	IRS-1A	LISS-II	23	62	Jan-90
74	58O/07SW & 58O/08SW	IRS-1A	LISS-II	23	62	Apr-89
75	66C/03NE	SPOT	HRV1-MLA	221	323	Apr-89
76	66C/03NW	SPOT	HRV1-MLA	221	323	Apr-89
77	66C/07NW	SPOT	HRV1-MLA	221	323	Apr-89
78	66C/07SW	SPOT	HRV1-MLA	221	323	Apr-89
79	66C/08NW	SPOT	HRV1-MLA	221	324	Apr-89
80	66C/08SW	SPOT	HRV1-MLA	221	324	Apr-89
81	66D/01NE & 66D/05NE	SPOT	HRV1-MLA	221	324	Apr-89
82	66D/01SE & 66D/05SE	SPOT	HRV1-MLA	221	325	May-89
83	66D/02NE	SPOT	HRV1-MLA	221	325	May-89
84	66D/02SE	SPOT	HRV1-MLA	221	325	May-89
85	66D03NE & 66D/04NE	SPOT	HRV1-MLA	221	325	May-89
86	66D03NW & 66D/04NW	SPOT	HRV1-MLA	221	325	May-89
87	66D03SW & 66D/04SW	SPOT	HRV1-MLA	221	325	May-89

8. West Bengal

S.No	Map Number	Satellite	Sensor	Path	Row	Date
1	73O/10 NW	SPOT-1	HRV1-MLA	232	307	18/1/88
2	73O/14 NW	SPOT-1	HRV1-MLA	232	307	18/1/88
3	73O/10 SW	SPOT-1	HRV1-MLA	232	307	18/1/88
4	73O/06 NE	SPOT-1	HRV1-MLA	232	307	10/1/1988
5	73N/15 NE	SPOT-1	HRV1-MLA	232	307	18/1/88
6	79B/05 NW	IRS-1B	LISS-II	18	52A1	4/11/1992
7	73N/15 SW	SPOT-1	HRV1-MLA	232	305	18/1/88
8	79A/11 NW	IRS-1B	LISS-II	18	52A1	4/11/1992
9	73N/15 NW	SPOT-1	HRV1-MLA	232	305	18/1/88
10	73N/15 NW	SPOT-1	HRV1-MLA	232, 233	305, 306	18/1/88, 27/1/88
11	79A/07 NW	IRS-1B	LISS-II	18	51A2	4/11/1992
12	73N/14 SW	SPOT-1	HRV1-MLA	232	305	18/1/88
13	73N/14 SE	SPOT-1	HRV1-MLA	232	305	18/1/88
14	73N/11 SE	SPOT-1	HRV1-MLA	232,232	305,306	18/1/88
15	73N/12 NE	SPOT-1	HRV1-MLA	232	306	18/1/88
16	73N/12 SE	SPOT-1	HRV1-MLA	232	306	18/1/88
17	79A/08 SE	IRS-1B	LISS-II	18	52A1	4/11/1992
18	79A/07 SE	IRS-1B	LISS-II	18	52A2	4/11/1992
19	73N/16 NE	SPOT-1	HRV1-MLA	233	306	27/1/89
20	79A/08 NW	IRS-1B	LISS-II	18	51A2	7/11/1992
21	79A/08 NE	IRS-1B	LISS-II	18	52A1	4/11/1992
22	79A/12 SW	IRS-1B	LISS-II	18	52A1	4/11/1992
23	79A/16 SE	IRS-1B	LISS-II	18	52B1	7/4/1993
24	79A/16 NW	IRS-1B	LISS-II	18	51B2	7/4/1993
25	79A/16 SW	IRS-1B	LISS-II	18	52B1	7/4/1993
26	79A/12 NW	IRS-1B	LISS-II	18	52A1	4/11/1992
27	73O/06 SE	SPOT-1	HRV1-MLA	232	307	18/1/88
28	73O/09 SW	SPOT-1	HRV1-MLA	232,232	306,307	18/1/88
29	73O/09 SE	SPOT-1	HRV1-MLA	232,232	306,307	18/1/88
30	73O/13 SW	SPOT-1	HRV1-MLA	232	306	18/1/88
31	73O/13 SE	SPOT-1	HRV1-MLA	232	306	18/1/88
32	73O/10 NE	SPOT-1	HRV1-MLA	232	307	18/1/88
33	79A/12 NE	IRS-1B	LISS-II	18	51A2	4/11/1992
34	79B/13 NW	IRS-1B	LISS-II	18,18	52B1, 52B1	7/4/93, 24/10/92
35	79C/01 SE	SPOT-1	HRV1-MLA	233	306	27/1/89
36	79C/06 NE	SPOT-1	HRV1-MLA	234	307	27/1/89
37	79C/06 NW	SPOT-1	HRV1-MLA	233	306	27/1/89
38	79C/06 SW	SPOT-1	HRV1-MLA	233	307	27/1/89
39	79C/06 SE	SPOT-1	HRV1-MLA	234	307	27/1/89
40	79C/05 NE	SPOT-1	HRV1-MLA	233	306	27/1/89
41	79C/05 SE	SPOT-1	HRV1-MLA	233	306	27/1/89
42	79C/05 NW	SPOT-1	HRV1-MLA	233	306	27/1/89
43	79C/05 SW	SPOT-1	HRV1-MLA	233	306	27/1/89
44	79B/05 NE	IRS-1B	LISS-II	18	52A1	4/11/1992
45	79B/07 NE	SPOT-1	HRV1-MLA	233	305	1/2/1989
46	79B/02 SE	SPOT-1	HRV1-MLA	233	305	1/2/1989

47	79B/05 SE	IRS-1B	LISS-II	18	52A1	4/11/1992
48	79B/07 NW	SPOT-1	HRV1-MLA	233	305	1/2/1989
49	79C/01 NE	SPOT-1	HRV1-MLA	233	306	27/1/89
50	79B/14 NE	SPOT-1	HRV1-MLA	234	305	27/1/89
51	79B/13 SW	IRS-1B	LISS-II	18/18	52B1, 52B1	7/4/93, 24/10/92
52	79B/04 SW	SPOT-1	HRV1-MLA	233	306	27/1/89
53	79B/04 SE	SPOT-1	HRV1-MLA	233	306	27/1/89
54	79C/10 NE	SPOT-1	HRV1-MLA	234	307	27/1/89
55	79C/09 SE	SPOT-1	HRV1-MLA	234	306	27/1/89
56	79C/09 SW	SPOT-1	HRV1-MLA	234	307	27/1/89
57	79C/09NE	SPOT-1	HRV1-MLA	234	306	27/1/89
58	79C/09 NW	SPOT-1	HRV1-MLA	234	306	27/1/89
59	79F/03 SW	SPOT-1	HRV1-MLA	234,235	305, 306	27/1/89, 25/3/89
60	73N/16 SE	SPOT-1	HRV1-MLA	233	306	27/1/89
61	79B/04 NE	SPOT-1	HRV1-MLA	233	306	27/1/89
62	79B/04 NW	SPOT-1	HRV1-MLA	233	306	27/1/89
63	79C/13 SW	SPOT-1	HRV1-MLA	234	306	27/1/89
64	79C/13 NE	SPOT-1	HRV1-MLA	234	306	27/1/89
65	79C/13 NW	SPOT-1	HRV1-MLA	234	306	27/1/89
66	79C/13 SE	SPOT-1	HRV1-MLA	234,235	306, 307	27/1/89, 25/3/89
67	79C/14 SE	SPOT-1	HRV1-MLA	234	307	27/1/89
68	79C/14 NE	SPOT-1	HRV1-MLA	234,235	307, 307	27/1/89, 25/3/89
69	79C/14 SW	SPOT-1	HRV1-MLA	234	307	27/1/89
70	79C/14 NW	SPOT-1	HRV1-MLA	234,235	307, 307	27/1/89, 25/3/89
71	79G/01 NW	SPOT-1	HRV1-MLA	235	306	25/3/89
72	79G/01 SW	SPOT-1	HRV1-MLA	235,235	306,307	25/3/89
73	79C/10 SE	SPOT-1	HRV1-MLA	234	307	27/1/89
74	79C/10 SW	SPOT-1	HRV1-MLA	234	307	27/1/89
75	79C/10 NW	SPOT-1	HRV1-MLA	234	307	27/1/89
76	79A/07 NE	IRS-1B	LISS-II	18	51A2	4/11/1992
77	73N/16 SW	SPOT-1	HRV1-MLA	232,233	306, 306	18/1/88, 27/1/89
78	79A/07 SW	IRS-1B	LISS-II	18	51A2	4/11/1992
79	73O/09 NE	SPOT-1	HRV1-MLA	232	306	18/1/88
80	79C/01 NW	SPOT-1	HRV1-MLA	233	306	27/1/89
81	79B/13 NE	IRS-1B	LISS-II	18,52	52B1, 52B1	7/4/93, 24/10/92
82	79B/06 SW	IRS-1B	LISS-II	18,18	52A1,52A2	14/11/92
83	79B/07 SW	SPOT-1	HRV1-MLA	233	305	1/2/1989
84	79B/05 SW	IRS-1B	LISS-II	18	52A1	4/11/1992
85	79B/03 NW	SPOT-1	HRV1-MLA	232	305	18/1/88
86	79B/06 NW	IRS-1B	LISS-II	18	52A1	4/11/1992
87	79B/03 SW	SPOT-1	HRV1-MLA	232	305	18/1/88
88	79B/03 NE	SPOT-1	HRV1-MLA	233	305	1/2/1989
89	79B/03 SE	SPOT-1	HRV1-MLA	233	305	1/2/1989
90	79B/10 NW	SPOT-1	HRV1-MLA	233,234	305,305	27/8/88
91	79C/02 SE	SPOT-1	HRV1-MLA	233	307	27/1/89

92	79C/02 SW	SPOT-1	HRV1-MLA	233	307	27/1/89
93	79C/02 NE	SPOT-1	HRV1-MLA	233	307	27/1/89
94	79C/02 NW	SPOT-1	HRV1-MLA	233	307	27/1/89
95	79C/01 SW	SPOT-1	HRV1-MLA	233	306	27/1/89
96	73/N14 NW	SPOT-1	HRV1-MLA	232	305	18/1/88
97	73O/09 NW	SPOT-1	HRV1-MLA	232	306	18/1/88
98	79B/12 SE	SPOT-1	HRV1-MLA	234	306	27/1/89
99	79B/10 SE	SPOT-1	HRV1-MLA	234	305	27/1/89
100	79F/04 NW	SPOT-1	HRV1-MLA	235	306	25/3/89
101	79B/15 SW	SPOT-1	HRV1-MLA	234	305	27/1/89
102	79B/15 NE	SPOT-1	HRV1-MLA	234	305	27/1/89
103	79B/16 NE	SPOT-1	HRV1-MLA	234	306	27/1/89
104	79B/16 NW	SPOT-1	HRV1-MLA	234	306	27/1/89
105	79B/16 SE	SPOT-1	HRV1-MLA	234	306	27/1/89
106	79B/15 NW	SPOT-1	HRV1-MLA	234	305	27/1/89
107	79B/11 NE	SPOT-1	HRV1-MLA	234	305	27/1/89
108	79B/12 SW	SPOT-1	HRV1-MLA	234	306	27/1/89
109	79B/11 SW	SPOT-1	HRV1-MLA	234,234	305,306	27/1/89
110	79G/02 NW	SPOT-1	HRV1-MLA	235	307	25/3/89
111	79B/12 NE	SPOT-1	HRV1-MLA	234	306	27/1/89
112	79B/11 NW	SPOT-1	HRV1-MLA	234,233	305,305	27/1/89
113	79B/15 SE	SPOT-1	HRV1-MLA	234	305	27/1/89
114	79B/12 NW	SPOT-1	HRV1-MLA	234	306	27/1/89
115	79G/02 SW	SPOT-1	HRV1-MLA	235	307	25/3/89
116	79B/08 SW	SPOT-1	HRV1-MLA	233	306	27/1/89
117	73O/13 NW	SPOT-1	HRV1-MLA	232	306	18/1/88
118	79B/14 SW	SPOT-1	HRV1-MLA	234	305	27/1/89
119	79B/08 NE	SPOT-1	HRV1-MLA	233, 234	305, 306	27/1/89, 1/2/89
120	79B/08 SE	SPOT-1	HRV1-MLA	233,234	306,306	27/1/89
121	79B/16 SW	SPOT-1	HRV1-MLA	234	306	27/1/89
122	79B/11 SE	SPOT-1	HRV1-MLA	234,234	305,306	27/1/89
123	79B/14 SE	SPOT-1	HRV1-MLA	234	305	27/1/89
124	73O/13 NE	SPOT-1	HRV1-MLA	232	306	18/1/88
125	79F/04 SW	SPOT-1	HRV1-MLA	235	306	25/3/89
126	79B/07 SE	SPOT-1	HRV1-MLA	233	305	1/2/1989
127	79B/14 NW	SPOT-1	HRV1-MLA	234	305	27/1/89
128	79B/10 NE	SPOT-1	HRV1-MLA	234	305	27/1/89
129	79B/08 NW	SPOT-1	HRV1-MLA	233	306	27/1/89
130	79B/10 SW	SPOT-1	HRV1-MLA	234	306	27/1/89

APPENDIX – II

SATELLITE DATA USED FOR PREPARING LANDUSE MAPS ON 1:50,000 SCALE FOR DIFFERENT MARITIME STATES

1. Gujarat

S.No	Map Number	Satellite	Sensor	Path	Row	Date
1	46C/13	IRS-1B	LISS-II	31	52	1/12/1991
2	46B/08	IRS	LISS-II	32	52	31/10/1990
3	46C/01	IRS	LISS-II	32	52	21/10/1990
4	46C/03	IRS	LISS-II	32	53	15/3/1990
5	46B/11	IRS-1B	LISS-II	31	52	1/12/1991
6	41G/15	SPOT, IRS	HRV1-MLA, LISS-II	195, 33	307, 53	23/11/1989, 25/5/1988
7	46C/12	SPOT, IRS	HRV1-MLA, LISS-II	202, 31	308, 53	1/4/1989, 20/10/1990
8	46C/10	IRS	LISS-II	31	53	20/10/1990
9	46C/14	IRS-1B	LISS-II	31	53	1/12/1991
10	46D/15	IRS-1B	LISS-II	31	54	1/12/1991
11	46D/14	IRS	LISS-II	31	53	23/2/1991
12	46D/16	IRS-1B	LISS-II	31	54	1/12/1991
13	46C/06	IRS	LISS-II	32	53	15/3/1990
14	46B/12	IRS-1B	LISS-II	31	52	1/12/1991
15	46B/07	IRS	LISS-II	32	52	21/10/1990
16	46B/03	IRS	LISS-II	32	52	21/10/1990
17	46C/05	IRS	LISS-II	32	52	21/10/1990
18	46C/15	IRS	LISS-II	31	53	21/10/90
19	46C/04	IRS	LISS-II	32	53	15/3/1990
20	46B/16	IRS	LISS-II	31	52	1/12/1991
21	46C/11	IRS	LISS-II	31	53	21/10/1990
22	46B/04	IRS	LISS-II	32	52	21/10/1990
23	46C/16	IRS	LISS-II	31	53	21/10/1990
24	46C/02	IRS	LISS-II	32	53	15/3/1990
25	46C/09	IRS-1B	LISS-II	31,31	52,53	1/12/1991
26	41I/03	IRS-1A	LISS-II	34	51	27/10/1988
27	41M/07	IRS	LISS-II	33	51	29/3/1989
28	41M/02	IRS	LISS-II	33	51	4/10/1988
29	41K/04	IRS	LISS-II	33	53	12/5/1989
30	41A/16	SPOT, IRS-1A	HRV1-MLA, LISS-II	193, 35	304, 51	28/2/1989, 1/3/1990
31	41B/15	IRS	LISS-II	34	52	17/3/1990
32	41F/09	IRS	LISS-II	34	52	6/12/1990
33	41J/09	IRS-1A	LISS-II	33	52	6/3/1990
34	41A/05	IRS	LISS-II	35	51	2/10/1990
35	41F/01	SPOT	HRV1-MLA	193	304	28/2/1989
36	41A/07	IRS	LISS-II	35	51	18/3/1990
37	41F/05	IRS	LISS-II	34	52	6/12/1990
38	41G/10	SPOT	HRV1-MLA	195	307	23/1/1989
39	41G/01	IRS	LISS-II	34	52	27/10/1988

40	41P/09	IRS	LISS-II	32, 32	53, 53	15/3/1990, 25/10/1988
41	41M/09	IRS	LISS-II	33	51	22/10/1990
42	41L/05	IRS	LISS-II	33, 33	53, 53	16/3/1990, 12/5/1989
43	41L/12	SPOT	HRV1-MLA	148	309	6/11/1988
44	41P/05	IRS	LISS-II	32	53	15/3/1990
45	41L/09	IRS	LISS-II	33	53	16/3/1990
46	41M/08	IRS	LISS-II	33	52	16/3/1990
47	41O/12	IRS	LISS-II	32	53	15/3/1990
48	41L/13	IRS	LISS-II	33	53	16/3/1990
49	41A/01	SPOT, IRS	HRV1-MLA, LISS-II	191, 35	302, 51	17/5/1989, 18/3/1990
50	41A/06	SPOT, IRS	HRV1-MLA, LISS-II	192, 35	303, 51	28/2/1989, 2/10/1990
51	41G/09	SPOT	HRV1-MLA,	195	307	23/1/1989
52	41J/01	IRS	LISS-II	34	52	17/3/1990
53	41A/09	IRS-1A	LISS-II	35	51	18/3/1990
54	41A/13	IRS-1A	LISS-II	35	51	27/3/1991
55	41A/10	SPOT, IRS	HRV1-MLA, LISS-II	192, 35	303, 51	28/2/1989, 18/3/1990
56	41M/03	IRS	LISS-II	33	51	4/10/1988
57	41M/06	IRS	LISS-II	33	51	29/3/1989
58	41I/10	IRS	LISS-II	33	51	16/3/1990
59	41I/15	IRS	LISS-II	33	51	22/10/1990
60	41O/16	IRS	LISS-II	32	53	15/3/1990
61	41M/11	IRS	LISS-II	33	51	29/3/1989
62	41I/14	IRS	LISS-II	33	51	22/10/1990
63	41I/05	IRS-1A	LISS-II	34	51	8/4/1990
64	41F/04	IRS	LISS-II	34	52	17/3/1990
65	41I/01	IRS	LISS-II	34	51	26/3/1991
66	41J/06	IRS-1A	LISS-II	34	25	6/12/1990
67	41I/04	IRS	LISS-II	34	52	17/3/1990
68	41I/09	IRS-1A	LISS-II	33	51	16/3/1990
69	41I/13	IRS	LISS-II	33	51	22/10/1990
70	41J/02	IRS-1A	LISS-II	34	52	6/12/1990
71	41G/05	IRS	LISS-II	34	52	27/10/1988
72	41I/16	IRS-1A	LISS-II	33	52	12/5/1989
73	41I/06	IRS-1A	LISS-II	34	51	27/10/1988
74	41I/02	IRS-1A	LISS-II	34	51	27/10/1988
75	41M/10	IRS	LISS-II	33	51	29/3/1989
76	41F/13	IRS	LISS-II	34	52	17/3/1990
77	41M/04	IRS	LISS-II	33	52	16/3/1990
78	41I/08	IRS	LISS-II	34,33	52,52	17/3/1990,16/3/1990
79	41M/05	IRS	LISS-II	33	51	29/3/1989
80	41F/03	IRS	LISS-II	34	52	17/3/1990
81	41M/01	IRS	LISS-II	33	51	4/10/1988
82	41A/11	SPOT,IRS	HRV1-MLA, LISS-II	192,35	303,51	28/2/1989,18/3/1990
83	41P/01	IRS	LISS-II	32	53	15/3/1990
84	41A/02	IRS	LISS-II	35	51	18/3/1990

2. Maharashtra

S.No	Map Number	Satellite	Sensor	Date
1	46D/12	IRS	LISS-II	10-05-1989 & 11-11-1990
2	47A/09	IRS	LISS-II	10-05-1989 & 11-11-1990
3	47A/10	IRS	LISS-II	10-05-1989 & 11-11-1990
4	47A/13	IRS	LISS-II	11-11-1990
5	47A/14	IRS	LISS-II	10-05-1989 & 11-11-1990
6	47A/15 & 47A/11	IRS	LISS-II	10-05-1989, 19-10-1990 & 11-11-1990
7	47A/16	IRS	LISS-II	09-04-1988, 19-10-1990 & 11-11-1990
8	47B/13	IRS	LISS-II	19-10-1990 & 11-11-1990
9	47B/14	IRS	LISS-II	08-04-1988 & 19-10-1990
10	47B/15	IRS	LISS-II	08-04-1988 & 19-10-1990
11	47B/16	IRS	LISS-II	08-04-1988 & 19-10-1990
12	47E/03	IRS	LISS-II	04-04-1990 & 19-10-1990
13	47E/04	IRS	LISS-II	11-10-1990
14	47F/01	IRS	LISS-II	21-04-1988, 19-10-1990
15	47F/02	IRS	LISS-II	08-04-1988 & 19-10-1990
16	47F/03	IRS	LISS-II	08-04-1988 & 19-10-1990
17	47F/04	IRS	LISS-II	08-04-1988 & 19-10-1990
18	47G/01	IRS	LISS-II	19-10-1990
19	47G/02	IRS	LISS-II	28-12-1988, 10-02-1989 & 10-10-1990
20	47G/03	IRS	LISS-II	08-04-1988, 28-12-1988 & 19-10-1990
21	47G/06	IRS	LISS-II	08-04-1988 & 19-10-1990
22	47G/07	IRS	LISS-II	08-04-1988 & 19-10-1990
23	47G/08 & 47G/04	IRS	LISS-II	08-04-1988, 28-12-1988 & 10-02-1989
24	47H/05	IRS	LISS-II	08-04-1988 & 19-10-1990
25	47H/06	IRS	LISS-II	08-04-1988, 10-02-1989 & 19-10-1990
26	47H/07	IRS	LISS-II	08-04-1988, 10-02-1989, 03-03-1989 & 01-12-1990
27	47H/08	IRS	LISS-II	03-03-1989 & 01-12-1990
28	48E/09 & 48E/05	IRS	LISS-II	03-03-1989 & 01-12-1990
29	48E/10	IRS	LISS-II	03-03-1989

3. Goa

S.No	Map Number	Satellite	Sensor	Date
1	48E/10	IRS	LISS-II	03-03-1989 & 25-03-1989
2	48E/14	IRS	LISS-II	03-03-1989 & 01-12-1990
3	48E/15	IRS	LISS-II	03-03-1989 & 19-12-1990
4	48E/16	IRS	LISS-II	22-10-1988, 03-03-1989 & 01-12-1990
5	48I/03	IRS	LISS-II	03-03-1989

4. Karnataka

S.No	Map Number	Satellite	Sensor	Date
1	48J/01	IRS	LISS-II	04-12-1988, 03-02-1991
2	48J/02	IRS	LISS-II	04-12-1988, 03-02-1991
3	48J/07	IRS	LISS-II	04-12-1988, 03-02-1991
4	48J/08	IRS	LISS-II	04-12-1988, 03-02-1991
5	48J/12	IRS	LISS-II	04-12-1988, 03-02-1991
6	48K/09	IRS	LISS-II	04-12-1988, 03-02-1991
7	48K/10	IRS	LISS-II	04-12-1988, 03-02-1991
8	48K/11	IRS	LISS-II	04-12-1988, 03-02-1991
9	48K/12	IRS	LISS-II	04-12-1988, 03-02-1991
10	48K/16	IRS	LISS-II	04-12-1988, 03-02-1991
11	48L/13	IRS	LISS-II	04-12-1988, 03-02-1991

5. Kerala

S.No	Map Number	Satellite	Sensor	Date
1	48L/14	IRS-1A	LISS-II	3/2/1991
2	48P/03 & 48L/15	IRS-1A	LISS-II	3/2/1991
3	48P/04	IRS-1A	LISS-II	3/2/1991
4	48P/08	IRS-1A	LISS-II	3/2/1991
5	48P/08	IRS-1A	LISS-II	3/2/1991
6	49M/05	IRS-1A	LISS-II	3/2/1991
7	49M/09	IRS-1A	LISS-II	3/2/1991
8	49M/10	IRS-1A	LISS-II	3/3/1991
9	49M/11	IRS-1A	LISS-II	3/2/1991
10	49M/15	IRS-1A	LISS-II	11/1/1991
11	49M/16	IRS-1A	LISS-II	11/1/1991
12	58B/02	IRS-1A	LISS-II	11/1/1991
13	58B/03	IRS-1A	LISS-II	11/1/1991
14	58B/04	IRS-1A	LISS-II	11/1/1991
15	58B/08	IRS-1A	LISS-II	11/1/1991
16	58C/05 & C/01	IRS-1A	LISS-II	24/1/1991
17	58C/06	IRS-1A	LISS-II	24/1/1990
18	58C/07	IRS-1A	LISS-II	24/1/1990
19	58C/08	IRS-1A	LISS-II	23/1/1990
20	58C/12	IRS-1A	LISS-II	23/1/1990
21	58D/09	IRS-1A	LISS-II	23/1/1990
22	58D/10	IRS-1A	LISS-II	23/1/1990
23	58D/14	IRS-1A	LISS-II	23/1/1990
24	58D/15	IRS-1A	LISS-II	23/1/1990
25	58H/03	IRS-1A	LISS-II	23/1/1990
26	49N/13	IRS-1A	LISS-II	11/1/1991
27	49M/6 & M/10	IRS-1A	LISS-II	3/2/1991
28	49N/14	IRS-1A	LISS-II	11/1/1990

6. Tamil Nadu

S.No	Map Number	Satellite	Sensor	Path	Row	Date
1	57P/15	IRS-1A	LISS-II	23	60	Jan-90
2	57P/16	IRS-1A	LISS-II	23	60	Jan-90
3	58H/03	IRS-1A	LISS-II	25	63	Apr-90
4	58H/04	IRS-1A	LISS-II	25	63	Apr-90
5	58H/08	IRS-1A	LISS-II	25	63	Apr-90
6	58H/15	IRS-1A	LISS-II	24	63	Feb-89
7	58H/16	IRS-1A	LISS-II	24	63	Mar-90
8	58K/08	IRS-1A	LISS-II	24	62	Mar-90
9	58K/12	IRS-1A	LISS-II	24	62	Mar-90
10	58K/14	IRS-1A	LISS-II	23	62	Jan-90
11	58K/15	IRS-1A	LISS-II	23	62	Jan-90
12	58K/16	IRS-1A	LISS-II	23	62	Jan-90
13	58L/01 & 58L/05	IRS-1A	LISS-II	24	62	Mar-90
14	58L/02	IRS-1A	LISS-II	24	63	Mar-90
15	58L/03	IRS-1A	LISS-II	24	63	Mar-90
16	58M/10 & M/14	IRS-1A	LISS-II	23	60	Jan-90
17	58M/13	IRS-1A	LISS-II	23	60	Jan-90
18	58M/15	IRS-1A	LISS-II	23	60	Jan-90
19	58M/16	IRS-1A	LISS-II	23	61	Jan-90
20	58N/04 & 58N/08	IRS-1A	LISS-II	23	61	Jan-90
21	58N/07	IRS-1A	LISS-II	23	61	Jan-90
22	58N/11	IRS-1A	LISS-II	23	61	Jan-90
23	58N/13	IRS-1A	LISS-II	23	61	Jan-90
24	58N/14	IRS-1A	LISS-II	23	61	Jan-90
25	58N/15	IRS-1A	LISS-II	23	61	Jan-90
26	58O/01 & 58O/02	IRS-1A	LISS-II	23	62	Jan-90
27	58O/03 & 58O/04	IRS-1A	LISS-II	23	62	Jan-90
28	58O/07 & 58O/08	IRS-1A	LISS-II	23	62	Jan-90
29	66C/03	IRS-1A	LISS-II	23	59	Jan-90
30	66C/07	IRS-1A	LISS-II	23	59	Jan-90
31	66C/08	IRS-1A	LISS-II	23	59	Jan-90
32	66D/01 & D/05	IRS-1A	LISS-II	23	59	Jan-90
33	66D/02	IRS-1A	LISS-II	23	59	Jan-90
34	66D/03 & D/04	IRS-1A	LISS-II	23	59	Jan-90
35	58M/11	IRS-1A	LISS-II	23	60	Dec-90
36	58H/12	IRS-1A	LISS-II	24	63	Mar-90
37	58M/12	IRS-1A	LISS-II	23	61	Dec-90
38	58N/10	IRS-1A	LISS-II	23	61	Jan-90

7. Andhra Pradesh

S.No	Map Number	Satellite	Sensor	Date
1	65H/03	IRS	LISS-II	10-04-1989
2	65H/04	IRS	LISS-II	19-03-1989
3	65H/07	IRS	LISS-II	24-05-1989
4	65H/11	IRS	LISS-II	15-10-1988
5	65H/15	IRS	LISS-II	15-10-1988
6	65K/08 & 65K/12	IRS	LISS-II	15-10-1988
7	65K/11	IRS	LISS-II	15-10-1988
8	65K/14	IRS	LISS-II	09-04-1989
9	65K/15	IRS	LISS-II	15-10-1988
10	65L/01	IRS	LISS-II	09-04-1989
11	65L/02	IRS	LISS-II	09-04-1989
12	65L/03	IRS	LISS-II	15-10-1988
13	65L/05	IRS	LISS-II	15-10-1988
14	65L/06	IRS	LISS-II	15-10-1988
15	65N/12	IRS	LISS-II	06-12-1989
16	65N/15	IRS	LISS-II	06-12-1989
17	65N/16	IRS	LISS-II	06-12-1989
18	65O/02 & 65O/03	IRS	LISS-II	15-10-1988
19	65O/05	IRS	LISS-II	06-12-1989
20	65O/06	IRS	LISS-II	06-12-1989
21	65O/09	IRS	LISS-II	09-04-1989
22	66A/02	IRS	LISS-II	29-11-1988 & 10-04-1989
23	66A/03	IRS	LISS-II	10-04-1989
24	66A/04	IRS	LISS-II	10-04-1989
25	66A/05	IRS	LISS-II	16-10-1988
26	66A/06	IRS	LISS-II	10-04-1989
27	66A/09	IRS	LISS-II	29-11-1988
28	66A/13 & 66A/14	IRS	LISS-II	28-06-1988 & 10-04-1989
29	66B/01	IRS	LISS-II	10-04-1989
30	66B/02	IRS	LISS-II	16-10-1988
31	66B/03	IRS	LISS-II	16-10-1988
32	66B/04	IRS	LISS-II	16-10-1988
33	66C/01	IRS	LISS-II	19-03-1989
34	66C/02 & 66C/06	IRS	LISS-II	16-10-1988,19-03-1989
35	66C/03	IRS	LISS-II	19-03-1989
36	66E/01	IRS	LISS-II	10-04-1989
37	74A/12	IRS	LISS-II	06-12-1989
38	74A/16	IRS	LISS-II	06-12-1989
39	74B/02	IRS	LISS-II	06-12-1989
40	74B/03 & 74B/04 & 74B/07	IRS	LISS-II	06-12-1989
41	74B/05	IRS	LISS-II	06-12-1989
42	74B/06	IRS	LISS-II	06-12-1990
43	74B/09 & 74B/10	IRS	LISS-II	06-12-1989

8. Orissa

S.No	Map Number	Satellite	Sensor	Date
1	73K/15	IRS	LISS-II	25-11-1988 & 06-04-1989
2	73K/16	IRS	LISS-II	06-04-1989
3	73L/08	IRS	LISS-II	25-11-1988 & 06-04-1989
4	73L/10	IRS	LISS-II	06-04-1989
5	73L/11	IRS	LISS-II	25-11-1988 & 06-04-1989
6	73L/12	IRS	LISS-II	25-11-1988 & 06-04-1989
7	73L/13	IRS	LISS-II	25-11-1988
8	73L/14	IRS	LISS-II	25-11-1988 & 06-04-1989
9	73L/15	IRS	LISS-II	25-11-1988 & 06-04-1989
10	73O/02	IRS	LISS-II	25-11-1988
11	73O/03	IRS	LISS-II	25-11-1988
12	73O/06	IRS	LISS-II	02-06-1988 & 06-04-1989
13	73P/01 & 73P/02	IRS	LISS-II	02-06-1988
14	74A/12	IRS	LISS-II	06-04-1989
15	74A/15	IRS	LISS-II	13-10-1988
16	74A/16	IRS	LISS-II	25-11-1988 & 06-04-1989
17	74E/01	IRS	LISS-II	25-11-1988 & 06-04-1989
18	74E/02	IRS	LISS-II	13-10-1988 & 06-04-1989
19	74E/03	IRS	LISS-II	10-10-1988 & 17-04-1989
20	74E/05	IRS	LISS-II	13-10-1988 & 06-04-1989
21	74E/06	IRS	LISS-II	13-10-1988 & 06-04-1989
22	74E/09	IRS	LISS-II	13-10-1988
23	74E/10	IRS	LISS-II	13-10-1988
24	74E/13	IRS	LISS-II	13-10-1988 & 06-04-1989
25	74I/01	IRS	LISS-II	25-11-1988
26	74I/05	IRS	LISS-II	25-11-1988

9. West Bengal

S.No	Map Number	Satellite	Sensor	Date
1	73N/16	IRS	LISS-II	05-04-1989
2	73O/06	IRS	LISS-II	06-04-1989
3	73O/10	IRS	LISS-II	25-11-1988 & 29-01-1989
4	73O/13	IRS	LISS-II	29-01-1989
5	73O/14	IRS	LISS-II	29-01-1989
6	79B/04	IRS	LISS-II	05-04-1989
7	79B/10	IRS	LISS-II	05-04-1989
8	79B/11	IRS	LISS-II	05-04-1989
9	79B/12	IRS	LISS-II	24-04-1988
10	79B/14	IRS	LISS-II	05-04-1989
11	79B/15	IRS	LISS-II	05-04-1989
12	79B/16	IRS	LISS-II	24-11-1988
13	79C/01	IRS	LISS-II	29-01-1989 & 24-11-1988
14	79C/02	IRS	LISS-II	05-04-1989
15	79C/05	IRS	LISS-II	29-01-1989
16	79C/06	IRS	LISS-II	29-01-1989
17	79C/09	IRS	LISS-II	29-01-1989
18	79C/10	IRS	LISS-II	29-01-1989
19	79C/13	IRS	LISS-II	23-11-1988
20	79C/14	IRS	LISS-II	23-11-1988
21	79F/03	IRS	LISS-II	13-03-1989
22	79F/04	IRS	LISS-II	13-03-1989
23	79G/01	IRS	LISS-II	23-11-1988
24	79G/02	IRS	LISS-II	23-11-1988

APPENDIX – III

SATELLITE DATA USED FOR PREPARING WETLAND MAPS ON 1:50,000 SCALE FOR DIFFERENT MARITIME STATES

1. Gujarat

S. No	Map Number	Satellite	Sensor	Path	Row	Date
1	41A/09	IRS	LISS-II-A2	35	51	27-03-91
2	41A/10	IRS	LISS-II-A3	35	51	18-03-90
3	41A/11	IRS	LISS-II	35	51	28-02-89
4	41A/13	IRS	LISS-II-A2	35	51	21-11-1992
5	41B/15	IRS	LISS-II-B2	35	52	21-11-1992
6	41F/01	IRS	LISS-II-B1	35	52	21-11-1992
8	41F/03	IRS	LISS-II-A2	34	52	17-03-1990
9	41F/04	IRS	LISS-II-A2	34	52	20-11-1992
10	41F/04 & 41B/16	IRS, SPOT	LISS-II, HRV1-MLA	34, 306	52, 309	04-05-1988, 22-10-1988 & 21-12-1988
11	41F/05	IRS	LISS-II-A1	34	52	20-11-1992
12	41F/06	IRS	LISS-II-A2	34	52	06-12-90
13	41F/06 & 41F/07	IRS, LANDSAT	LISS-II, TM	34, 151	52, 044	06-12-1990, 27-10-1988 & 05-10-1989
14	41F/07	IRS-1A	LISS-II-A2	34	52	17-03-1990
16	41F/11	IRS	LISS-II-B2	34	52	17-11-1990
17	41F/13	IRS	LISS-II-A1, LISS-II-B1	34	52	20-11-1992
18	41F/14	IRS, SPOT	LISS-II, HRV1-MLA	34, 195	52, 305	27-10-1988, 23-01-1989
19	41F/15	IRS, SPOT	LISS-II-A2, HRV1-MLA	34, 195	52, 305	05-10-1988, 04-05-1988 & 23-01-1989
20	41G/01	IRS	LISS-II-A2	34	52	09-11-1992
21	41G/05	IRS	LISS-II-A2	34	52	20-11-1992
22	41I/01	IRS	LISS-II-B1	34	51	09-11-1992
23	41I/02	IRS	LISS-II-A2, LISS-II-B2	34, 34	51, 51	20-11-1992
24	41I/03	IRS	LISS-II-A2, LISS-II-B2	34, 34	51, 51	20-11-1992, 20-11-1992
25	41I/04	IRS	LISS-II-B1	34	52	20-11-1992
26	41I/05	IRS	LISS-II-B2	34	51	20-11-1992
27	41I/06	IRS	LISS-II-B2	34	51	20-11-1992
28	41I/08	IRS	LISS-II-B1	34	52	20-11-1992
29	41I/09	IRS	LISS-II-B2	34	51	20-11-1992
30	41I/10	IRS	LISS-II-B2	34	51	20-11-1992
31	41I/12	IRS	LISS-II-A1	33	52	19-11-1992
32	41I/14	IRS	LISS-II-A2	33	51	19-11-1992
33	41I/15	IRS	LISS-II-A2	33	51	19-11-1992
34	41I/16	IRS	LISS-II-A1	33	52	19-11-1992
35	41J/01	IRS	LISS-II-B2	34	52	20-11-1992
36	41J/02	IRS	LISS-II-A2	34	52	31-05-1991
37	41J/05	IRS	LISS-II-B1	34	52	20-11-1992
38	41J/06	IRS	LISS-II-B1	34	52	20-11-1992

39	41J/09	IRS	LISS-II-B1	34	52	19-11-1992
40	41J/13	IRS	LISS-II-A2	33	51	19-11-1992
41	41K/04	IRS	LISS-II-B1	33	53	02-01-1993
42	41L/05	IRS	LISS-II-B2, LISS-II-A2	33, 33	53, 53	07-04-1990 & 11-11-1991
43	41L/09	IRS	LISS-II-B2	33	53	02-01-1993
44	41L/13	IRS	LISS-II-B2	33	53	02-01-1993
45	41M/01	IRS	LISS-II-A1	33	51	19-11-1992
46	41M/02	IRS	LISS-II-A2, LISS-II-B2	33, 33	53, 53	19-11-1992
47	41M/03	IRS	LISS-II-A2, LISS-II-B2	33, 33	53, 53	19-11-1992
48	41M/04	IRS	LISS-II-A1, LISS-II-B2	33, 33	52, 52	19-11-1992
49	41M/06	IRS	LISS-II-B2	33	51	19-11-1992
50	41M/07	IRS	LISS-II-B2	33	51	19-11-1992
51	41M/08	IRS	LISS-II-B2	33	51	19-11-1992
52	41M/10	IRS	LISS-II-B2	33	51	19-11-1992
53	41M/11	IRS	LISS-II-B2	33	52	19-11-1992
54	41M/12	IRS	LISS-II-B1	33	52	02-01-1992
55	41O/12	IRS	LISS-II-A2	32	33	18-11-1992
56	41O/16	IRS	LISS-II-B2	32	53	18-11-1992
57	41P/01	IRS	LISS-II-A2	32	53	01-01-1993
58	41P/05	IRS	LISS-II-A2	33	52	18-11-1992
59	41P/09	IRS	LISS-II-A2	32	53	18-11-1992
60	41I/05	IRS	LISS-II-B2	34	51	20-11-1992

2. Maharashtra

S. No	Map Number	Satellite	Sensor	Path	Row	Date
1	46D/12	IRS	LISS-II	31	54	13-02-1993
2	47A/10	IRS	LISS-II	31	54	13-02-1993
3	47A/11 & 47A/15	IRS	LISS-II	30,31	55,54	07-03-1993
4	47A/13	IRS	LISS-II	31	54	13-02-1993
5	47A/14	IRS	LISS-II	31	54	13-02-1993
6	47A/16	IRS	LISS-II	31	54	07-03-1993
7	47A/09	IRS	LISS-II	31	54	13-02-1993
8	47B/13	IRS	LISS-II	31	55	07-03-1993
9	47B/14	IRS	LISS-II	30,31	55,55	06-03-1993
10	47B/15	IRS	LISS-II	30	55	06-03-1993
11	47B/16	IRS	LISS-II	30	55	06-03-1993
12	47E/03	IRS	LISS-II	30	55	06-03-1993
13	47E/04	IRS	LISS-II	30	55	06-03-1993
14	47F/01	IRS	LISS-II	30	55	06-03-1993
15	47F/02	IRS	LISS-II	30	55	06-03-1993
16	47F/03	IRS	LISS-II	30	55	06-03-1993
17	47F/04	IRS	LISS-II	30	55	06-03-1993
18	47G/01	IRS	LISS-II	30,30	55,56	06-03-1993
19	47G/02	IRS	LISS-II	30	56	06-03-1993
20	47G/03	IRS	LISS-II	30	56	06-03-1993
21	47G/04 & 47G/08	IRS	LISS-II	30	56	06-03-1993

3. Goa

S. No	Map Number	Satellite	Sensor	Path	Row	Date
1	48E/10	IRS-1B	LISS-II	29	57	07-12-1992
2	48E/14	IRS-1B	LISS-II	29	57	07-12-1993
3	48E/15	IRS-1B	LISS-II	29	57	07-12-1992
4	48E/16	IRS-1B	LISS-II	29	57	07-12-1992
5	48I/04	IRS-1B	LISS-II	29	58	05-03-1993
6	48J/01	IRS-1B	LISS-II	29	58	05-03-1993

4. Karnataka

S. No	Map Number	Satellite	Sensor	Path	Row	Date
1	48J/01	IRS	LISS-II	29	58	22-12-1988, 03-02-1991
2	48J/02	IRS	LISS-II	29	58	22-12-1988, 03-02-1991
3	48J/06	IRS	LISS-II	29	58	22-12-1988, 03-02-1991
4	48J/07	IRS	LISS-II	28	58	22-12-1988, 03-02-1991
5	48J/08	IRS	LISS-II	28	58	21-11-1988, 03-02-1991
6	48J/12	IRS	LISS-II	28	58	22-12-1988, 03-02-1991
7	48K/09	IRS	LISS-II	28, 28	59, 58	04-12-1988, 03-02-1991 & 21-10-1988
8	48K/10	IRS	LISS-II	28	59	04-12-1988, 03-02-1991
9	48K/11	IRS	LISS-II	28	59	04-12-1988, 03-02-1991
10	48K/12	IRS	LISS-II	28	59	04-12-1988, 03-02-1991
11	48K/16	IRS	LISS-II	28	59	04-12-1988, 03-02-1991
12	48L/13	IRS	LISS-II	28	59	04-12-1988, 03-02-1991

5. Tamilnadu

S. No	Map Number	Satellite	Sensor	Path	Row	Date
1	57P/15	IRS-1A	LISS-II-A1	23	60	JAN-1990
2	57P/16	IRS-1A	LISS-II-A1	23	60	JAN-1990
3	58H/03	IRS-1A	LISS-II-B1	25	63	APRIL-1990
4	58H/04	IRS-1A	LISS-II-B1	25	63	APRIL-1990
5	58H/08	IRS-1A	LISS-II-B1	25	63	APRIL-1990
6	58H/12	IRS-1A	LISS-II-A1	24	63	MARCH-1990
7	58H/15	IRS-1A	LISS-II-A1	24	63	FEB-1989
8	58H/16	IRS-1A	LISS-II-A1	24	63	MARCH-1990
9	58K/08	IRS-1A	LISS-II-B2	24	62	MARCH-1990
10	58K/12	IRS-1A	LISS-II-B2	24	62	MARCH-1990
11	58K/14	IRS-1A	LISS-II-A1	23	62	JAN-1990
12	58K/15	IRS-1A	LISS-II-A2	23	62	JAN-1990
13	58K/16	IRS-1A	LISS-II-A2	23	62	JAN-1990
14	58L/01 & 05	IRS-1A	LISS-II-B2	24	62	MARCH-1990
15	58L/02	IRS-1A	LISS-II-B1	24	63	MARCH-1990
16	58L/03	IRS-1A	LISS-II-B1	24	63	MARCH-1990
17	58M/10 & 14	IRS-1A	LISS-II-A2	23	60	JAN-1990
18	58M/11	IRS-1A	LISS-II-A2	23	60	DEC-1990
19	58M/12	IRS-1A	LISS-II-A1	23	61	DEC-1990

20	58M/13	IRS-1A	LISS-II-A2	23	60	JAN-1990
21	58M/15	IRS-1A	LISS-II-A2	23	60	JAN-1990
22	58M/16	IRS-1A	LISS-II-A1	23	61	JAN-1990
23	58N/04 & 08	IRS-1A	LISS-II-A2	23	61	JAN-1990
24	58N/07	IRS-1A	LISS-II-A2	23	61	JAN-1990
25	58N/10	IRS-1A	LISS-II-B1	23	61	JAN-1990
26	58N/11	IRS-1A	LISS-II-A1	23	61	JAN-1990
27	58N/13	IRS-1A	LISS-II-B1	23	61	JAN-1990
28	58N/14	IRS-1A	LISS-II-B2	23	61	JAN-1990
29	58N/15	IRS-1A	LISS-II-B2	23	61	JAN-1990
30	58O/01 & 02	IRS-1A	LISS-II-A1	23	62	JAN-1990
31	58O/03 & 04	IRS-1A	LISS-II-A1 & A2	23	62	JAN-1990
32	58O/07 & 08	IRS-1A	LISS-II-A2 & B2	23	62	JAN-1990
33	66C/03	IRS-1A	LISS-II-A1	23	59	JAN-1990
34	66C/07	IRS-1A	LISS-II-A1	23	59	JAN-1990
35	66C/08	IRS-1A	LISS-II-B2	23	59	JAN-1990
36	66D/01 & 05	IRS-1A	LISS-II-B2	23	59	JAN-1990
37	66D/02	IRS-1A	LISS-II-B2	23	59	JAN-1990
38	66D/03 & 04	IRS-1A	LISS-II-B1	23	59	JAN-1990

6. Orissa

S. No	Map Number	Satellite	Sensor	Path	Row	Date
1	73K/15	IRS-1B	LISS-II	19	53	23-02-1993
2	73K/16	IRS-1B	LISS-II	19	53	23-02-1993
3	73L/08	IRS-1B	LISS-II	19	53	23-02-1993
4	73L/10	IRS-1B	LISS-II	19	53	23-02-1993
5	73L/12	IRS-1B	LISS-II	19	54	17-03-1993
6	73L/13	IRS-1B	LISS-II	19	53	23-02-1993
7	73L/14	IRS-1B	LISS-II	19	53	23-02-1993
8	73L/15	IRS-1B	LISS-II	19	54	17-03-1993
9	73L/11	IRS-1B	LISS-II	19	54	17-03-1993
10	73O/02	IRS-1B	LISS-II	19	53	23-02-1993
11	73O/03	IRS-1B	LISS-II	19	53	23-02-1993
12	73O/06	IRS-1B	LISS-II	19	53	23-02-1993
13	73P/01 & 02	IRS-1B	LISS-II	19	53	23-02-1993
14	74I/05	IRS-1B	LISS-II	19	54	23-02-1993
15	74A/12	IRS-1B	LISS-II	21	55	19-03-1993
16	74A/15	IRS-1B	LISS-II	20	54	24-02-1993
17	74A/16	IRS-1B	LISS-II	20	55	24-02-1993
18	74E/01	IRS-1B	LISS-II	20	54	24-02-1993
19	74E/02	IRS-1B	LISS-II	20	54	24-02-1993
20	74E/03	IRS-1B	LISS-II	20	54	24-02-1993
21	74E/05	IRS-1B	LISS-II	20	54	24-02-1993
22	74E/06	IRS-1B	LISS-II	20	54	24-02-1993
23	74E/09	IRS-1B	LISS-II	20	54	24-02-1993
24	74E/10	IRS-1B	LISS-II	20	54	14-05-1992
25	74E/13	IRS-1B	LISS-II	20	54	24-02-1993
26	74I/01	IRS-1B	LISS-II	19	54	24-02-1993

7. Andaman & Nicobar

S. No	Map Number	Satellite	Sensor	Path	Row	Date
1	86C/12	IRS-1B	LISS-II	12	59	08-02-1992
2	86C/14	IRS-1B	LISS-II	12	59	03-01-1993
3	86C/15	IRS-1B	LISS-II	12	59	03-01-1993
4	86C/16	IRS-1B	LISS-II	12	56	03-01-1993
5	86D/09	IRS-1B	LISS-II	12	59	03-01-1993
6	86D/10	IRS-1B	LISS-II	12	60	03-01-1993
7	86D/11	IRS-1B	LISS-II	12	60	03-01-1993
8	86D/12	IRS-1B	LISS-II	12	60	03-01-1993
9	86D/13 & 86H/01	IRS-1B	LISS-II	12	59	03-01-1993
10	86D/14	IRS-1B	LISS-II	12	60	03-01-1993
11	86D/15	IRS-1B	LISS-II	12	60	03-01-1993
12	86D/16	IRS-1B	LISS-II	12	60	03-01-1993
13	86G/02	IRS-1B	LISS-II	12	59	03-01-1993
14	86G/03	IRS-1B	LISS-II	12	57	03-01-1993
15	86G/04	IRS-1B	LISS-II	12	57	03-01-1993
16	86H/03	IRS-1B	LISS-II	12	60	03-01-1993
17	86H/04	IRS-1B	LISS-II	12	60	03-01-1994
18	86K/07 & 86K/03	IRS-1B	LISS-II	11	59	09-03-1993
19	87A/02	IRS-1B	LISS-II	13	60	24-03-1992
20	87A/06	IRS-1B	LISS-II	12	60	23-03-1992
21	87A/09	IRS-1B	LISS-II	12	60	03-01-1993
22	87A/10	IRS-1B	LISS-II	12	60	03-01-1993
23	87A/11	IRS-1B	LISS-II	12	60	12-03-1992
24	87A/12	LANDSAT-5	MSS	134	52	27-02-1987
25	87A/13	IRS-1B	LISS-II	12	60	03-01-1993
26	87A/14	IRS-1B	LISS-II	12	60	03-01-1993
27	87B/01	IRS-1B	LISS-II	12	61	23-03-1992
28	87B/05	IRS-1B	LISS-II	12	61	23-03-1992
29	87B/06	LANDSAT-5	TM	134	53	31-03-1993
30	87B/09	IRS-1B	LISS-II	12	61	23-03-1992
31	87B/10	IRS-1B	LISS-II	12	61	23-03-1992
32	87C/16, 12 & 15	IRS-1B, LANDSAT-5	LISS-II, TM	12, 133	62,54	21-12-1993 & 15-02-1991
33	87E/01	IRS-1B	LISS-II	12	60	03-01-1993
34	87H/03	IRS-1B	LISS-II	11	63	15-02-1993
35	87H/04	IRS-1B	LISS-II	11	63	15-02-1993
36	87H/08	IRS-1B	LISS-II	11	63	15-02-1993
37	87H/10	IRS-1B	LISS-II	11	63	15-02-1993
38	87H/11	IRS-1B	LISS-II	11	63	15-02-1993
39	87H/12	IRS-1B	LISS-II	11	63	15-02-1993
40	88E/05	IRS-1B	LISS-II	11	63	15-02-1993
41	88E/09	IRS-1B	LISS-II	11	63	15-02-1993
42	88E/10	LANDSAT-5	TM	133	55	02-03-1992
43	88E/11	LANDSAT-5	TM	133	55	05-03-1992
44	88E/12	LANDSAT-5	TM	133	55	05-03-1992
45	88E/15	LANDSAT-5	TM	132	55	05-04-1994
46	88E/16	LANDSAT-5	TM	132	55	05-04-1994

47	88F/13 & 09	LANDSAT-5	TM	132, 133	55	05-04-1994 & 05-03-1992
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APPENDIX – IV

SATELLITE DATA USED FOR PREPARING WETLAND MAPS ON 1:250,000 SCALE FOR DIFFERENT MARITIME STATES

1. Gujarat

S. No.	Map Number	Satellite	Sensor	Path	Row	Date
1	41F & B	LANDSAT 4/5	TM	151	44	1986
2	41G	LANDSAT 4/5	TM	151, 150	44	1986
3	41M	LANDSAT 4/5	TM	149, 150	44	1986
4	46B	LANDSAT 4/5	TM	149, 148	44, 45	1986

2. Maharashtra

S. No	Map Number	Satellite	Sensor	Path	Row	Date
1	46D	LANDSAT 4/5	TM	148	46	1986
2	47A & E	LANDSAT 4/5	TM	148	57	1986
3	47F & B	LANDSAT 4/5	TM	147	47	1986
4	47G	LANDSAT 4/5	TM	147	48	1986

3. Kerala

S. No	Map Number	Satellite	Sensor	Path	Row	Date
1	48L	LANDSAT - 5	TM	145	51	1987,1988
2	48P	LANDSAT - 5	TM	145	52	1987,1988
3	49M	LANDSAT - 5	TM	145	52	1987,1988
4	49N	LANDSAT - 5	TM	145, 144	52, 53	1987,1988
5	58B	LANDSAT - 5	TM	144	53	1987,1988
6	58C	LANDSAT - 5	TM	144, 144	53, 54	1987,1988
7	58D	LANDSAT - 5	TM	144	54	1987,1988
8	58H	LANDSAT - 5	TM	143	54	1987,1988

4. Tamil Nadu

S. No	Map Number	Satellite	Sensor	Path	Row	Date
1	57P	LANDSAT-4/5	TM	142	52	1986
2	58H	LANDSAT-4/5	TM	143	54	1986
3	58K	LANDSAT-4/5	TM	142	54	1986
4	58L	LANDSAT-4/5	TM	143	54	1986
5	58M	LANDSAT-4/5	TM	143	52	1986
6	58N	LANDSAT-4/5	TM	142	53	1986
7	58O	LANDSAT-4/5	TM	142	54	1986
8	66C	LANDSAT-4/5	TM	142	51	1986
9	66D	LANDSAT-4/5	TM	142	51, 52	1986

5. Andhra Pradesh

S. No	Map Number	Satellite	Sensor	Path	Row	Date
1	65H	LANDSAT-5	TM	142	49	1985
2	65K	LANDSAT-5	TM	141	48	1986
3	65L	LANDSAT-5	TM	141	48,49	1986
4	65N	LANDSAT-5	TM	140	47	1986
5	65O	LANDSAT-5	TM	140	47	1986
6	66A & E	LANDSAT-5	TM	142	49-50	1985
7	66B	LANDSAT-5	TM	142	50	1989
8	66C	LANDSAT-5	TM	142	51	1987
9	74A	LANDSAT-5	TM	140	47	1986
10	74B	LANDSAT-5	TM	140	47	1986

6. Orissa

S. No	Map Number	Satellite	Sensor	Path	Row	Date
1	73L	LANDSAT-5	TM	139	46	1986
2	73O	LANDSAT-5	TM	139	45	1986
3	74A	LANDSAT-5	TM	140	47	1986
4	74E	LANDSAT-5	TM	139, 140, 140	44, 46, 47	1986
5	74I	LANDSAT-5	TM	139	46	1986

7. Andaman & Nicobar

S. No	Map Number	Satellite	Sensor	Path	Row	Date
1	86D	LANDSAT 4/5	TM	134	56	1986,1987 & 19889
2	86H	LANDSAT 4/5	TM	134	52	1986,1987 & 19889
3	87A & E	LANDSAT 4/5	TM	134	52	1986,1987 & 1989
4	87B	LANDSAT 4/5	TM	133	53	1986,1987 & 1989
5	87C & D	LANDSAT 4/5	TM	133	54	1986,1987 & 1989
6	87H	LANDSAT 4/5	TM	133	54, 55	1986,1987 & 1989
7	88E & F	LANDSAT 4/5	TM	132	55	1986,1987 & 1989

8. Lakshadweep

S. No	Map Number	Satellite	Sensor	Path	Row	Date
1	44M	LANDSAT 4/5	TM	147	52	1986
2	49A & E	LANDSAT 4/5	TM	147	52	1986
3	49B	LANDSAT 4/5	TM	147	53	1986
4	49F	LANDSAT 4/5	TM	157, 157	52, 53	1986
5	49H	LANDSAT 4/5	TM	146	54	1986

APPENDIX – V

SATELLITE DATA USED FOR PREPARING SHORELINE MAPS ON 1:50,000 SCALE FOR DIFFERENT MARITIME STATES

1. Maharashtra

S. No	Map Number	Satellite	Sensor	Path	Row	Date
1	46D/12	IRS	LISS-II	31	54	13-02-1993
2	47A/09	IRS	LISS-II	31	54	13-02-1993
3	47A/10	IRS	LISS-II	31	54	13-02-1993
4	47A/11 & 47A/15	IRS	LISS-II	31	54	07-03-1993
5	47A/13	IRS	LISS-II	31	54	13-02-1993
6	47A/14	IRS	LISS-II	31	54	06-03-1993
7	47A/16	IRS	LISS-II	31	54	07-03-1993
8	47B/13	IRS	LISS-II	31	55	07-03-1993
9	47B/14	IRS	LISS-II	30	55	06-03-1993
10	47B/15	IRS	LISS-II	30	55	06-03-1993
11	47B/16	IRS	LISS-II	30	55	06-03-1993
12	47E/03	IRS	LISS-II	30	54	06-03-1993
13	47E/04	IRS	LISS-II	30	55	06-03-1993
14	47F/01	IRS	LISS-II	30	55	06-03-1993
15	47F/02	IRS	LISS-II	30	55	06-03-1993
16	47F/03	IRS	LISS-II	30	55	06-03-1993
17	47F/04	IRS	LISS-II	30	55	06-03-1993
18	47G/01	IRS	LISS-II	30	55	06-03-1993
19	47G/02	IRS	LISS-II	30	56	06-03-1993
20	47G/03	IRS	LISS-II	30	56	06-03-1993
21	47G/06	IRS	LISS-II	30	56	06-03-1993
22	47G/07	IRS	LISS-II	30	56	06-03-1993
23	47G/08 & 04	IRS	LISS-II	30	56	06-03-1993
24	47H/05	IRS	LISS-II	30	56	06-03-1993
25	47H/06	IRS	LISS-II	30	56	06-03-1993
26	47H/07	IRS	LISS-II	30	57	06-03-1993
27	47H/08	IRS	LISS-II	30	55	06-03-1993
28	48E/05 & 09	IRS	LISS-II	31	54	13-02-1993
29	48E/10	IRS	LISS-II	29	57	07-03-1993

2. Goa

S. No	Map Number	Satellite	Sensor	Path	Row	Date
1	48E/10	IRS-1B	LISS-II	29	57	07-12-1992
2	48E/14	IRS-1B	LISS-II	29	57	07-12-1992
3	48E/15	IRS-1B	LISS-II	29	57	07-12-1992
4	48E/16	IRS-1B	LISS-II	29	57	07-12-1992
5	48I/04	IRS-1B	LISS-II	29	57	07-12-1992
6	48J/01	IRS-1B	LISS-II	29	58	05-03-1993

3. Karnataka

S. No	Map Number	Satellite	Sensor	Date
1	48J/02	IRS	LISS-II	OCT-1988
2	48J/06	IRS	LISS-II	OCT-1988
3	48J/07	IRS	LISS-II	OCT-1988
4	48J/08	IRS	LISS-II	OCT-1988
5	48J/12	IRS	LISS-II	OCT-1988
6	48K/09	IRS	LISS-II	OCT-1988
7	48K/11	IRS	LISS-II	OCT-1988
8	48K/12	IRS	LISS-II	OCT-1988
9	48K/16	IRS	LISS-II	OCT-1988
10	48L/13	IRS	LISS-II	OCT-1988

4. Andhra Pradesh

S. No.	Map Number	Satellite	Sensor	Date
1	65D/16	SPOT, IRS-1A	HRV2-MLA, LISS-II	1989, 1992
2	65H/07	SPOT, IRS-1A	HRV2-MLA, LISS-II	1989, 1992
3	65H/14	SPOT, IRS-1A	HRV2-MLA, LISS-II	1989, 1992
4	65H/15	SPOT, IRS-1A	HRV2-MLA, LISS-II	1989, 1992
5	65K/08 & 65K/12	SPOT, IRS-1A	HRV2-MLA, LISS-II	1989, 1993
6	65K/11	SPOT, IRS-1A	HRV2-MLA, LISS-II	15-02-1989 & 09-12-1985
7	65K/15	SPOT, IRS-1A	HRV2-MLA, LISS-II	15-02-1989 & 07-12-1985
8	65L/02	SPOT, IRS-1A	HRV2-MLA, LISS-II	1993, 1985
9	65L/03	SPOT, IRS-1A	HRV2-MLA, LISS-II	1985, 1993
10	65L/06	SPOT, IRS-1A	HRV2-MLA, LISS-II	1989, 1993
11	65N/12	SPOT, IRS-1A	HRV2-MLA, LISS-II	19-01-1990 & 19-03-1993
12	65N/16	SPOT, IRS-1A	HRV2-MLA, LISS-II	23-11-1989 & 19-03-1993
13	65O/02 & 65O/03	SPOT, IRS-1A	HRV2-MLA, LISS-II	24-12-1990 & 07-12-1985
14	65O/05 & 65O/09	SPOT, IRS-1A	HRV2-MLA, LISS-II	24-12-1990 & 04-12-1985
15	65O/06	SPOT, IRS-1A	HRV2-MLA, LISS-II	24-12-1990 & 07-12-1990
16	66A/02	SPOT, IRS-1A	HRV2-MLA, LISS-II	22-03-1993 & 22-03-1993
17	66A/04	SPOT, IRS-1B	HRV2-MLA, LISS-II	08-04-1984 & 22-03-1993
18	66A/05	SPOT, IRS-1B	HRV2-MLA, LISS-II	29-04-1989 & 06-01-1992
19	66A/06	SPOT, IRS-1A	HRV2-MLA, LISS-II	29-04-1989 & 06-01-1992
20	66A/09	SPOT, IRS-1A	HRV2-MLA, LISS-II	1989 & 1992
21	66B/01	SPOT-MLA, IRS-1B	HRV2-MLA, LISS-II	1989 & 13-03-1992
22	66B/02	SPOT-MLA, IRS-1A	HRV2-MLA, LISS-II	1989 & 01-03-1992
23	66B/03	SPOT-MLA, IRS-1B	HRV2-MLA, LISS-II	1989 & 12-03-1992
24	66B/04	SPOT-MLA, IRS-1B	HRV2-MLA, LISS-II	1989 & 12-03-1992
25	66C/01 & 66C/05	SPOT-MLA, IRS-1B	HRV2-MLA, LISS-II	1989 & 12-03-1992
26	66C/02 & 66C/06	SPOT-MLA, IRS-1A	HRV2-MLA, LISS-II	1989 & 18-03-1992
27	66E/01 & 66E/02	SPOT-MLA, IRS-1A	HRV2-MLA, LISS-II	1989 & 1992
28	74A/12 & 74A/16	SPOT, IRS-1A	HRV2-MLA, LISS-II	05-12-1988 & 19-03-1993

29	74B/03 & 04 & 07	SPOT, IRS-1A	HRV2-MLA, LISS-II	23-11-1989 & 19-03-1993
30	74B/06 & 74B/10	SPOT, IRS-1A	HRV2-MLA, LISS-II	05-12-1988 & 19-03-1993
31	74B/09	SPOT, IRS-1A	HRV2-MLA, LISS-II	05-12-1988 & 19-03-1993
32	66A/13 & 66A/14	SPOT, IRS-1A	HRV2-MLA, LISS-II	1989 & 1992

5. Orissa

S. No	Map Number	Satellite	Sensor	Date
1	73K/15	LANDSAT, IRS-1B	MSS, TM LISS-II	29.3.75, 9.12.85, 23.2.93
2	73K/16	LANDSAT, IRS-1B	MSS, TM LISS-II	29.3.75, 9.12.85, 23.2.93
3	73L/08	LANDSAT, IRS-1B	MSS, TM LISS-II	18.1.73, 9.12.85, 23.2.93
4	73L/11	LANDSAT, IRS-1B	MSS, TM LISS-II	29.3.75, 9.12.85, 17.3.93
5	73L/12	LANDSAT, IRS-1B	MSS, TM LISS-II	18.1.73, 9.12.85, 17.3.93
6	73L/13	LANDSAT, IRS-1B	MSS, TM LISS-II	29.3.75, 9.12.85, 23.2.93
7	73L/14	LANDSAT, IRS-1B	MSS, TM LISS-II	29.3.75, 9.12.85, 23.2.93
8	73L/15	LANDSAT, IRS-1B	MSS, TM LISS-II	29.3.75, 9.12.85, 17.3.93
9	73O/02	LANDSAT, IRS-1B	MSS, TM LISS-II	29.3.75, 5.11.86, 23.2.93
10	73O/03	LANDSAT, IRS-1B	MSS, TM LISS-II	29.3.75, 5.11.86, 23.2.93
11	73O/06	LANDSAT, IRS-1B	MSS, TM LISS-II	29.3.75, 5.11.86, 23.2.93
12	73P/01 & 02	LANDSAT, IRS-1B	MSS, TM LISS-II	29.3.75, 9.12.85, 23.2.93
13	74A/12	LANDSAT, IRS-1B	MSS, TM LISS-II	18.2.73, 19.3.85, 19.3.93
14	74A/15	LANDSAT, IRS-1B	MSS, TM LISS-II	18.2.73, 19.3.85, 24.2.93
15	74A/16	LANDSAT, IRS-1B	MSS, TM LISS-II	18.2.73, 19.4.85, 24.2.93
16	74E/01	LANDSAT, IRS-1B	MSS, TM LISS-II	18.2.73, 18.2.86, 24.2.93
17	74E/02	LANDSAT, IRS-1B	MSS, TM LISS-II	18.1.73, 18.2.86, 24.2.93
18	74E/03	LANDSAT, IRS-1B	MSS, TM LISS-II	18.1.73, 9.3.86, 24.2.93
19	74E/05	LANDSAT, IRS-1B	MSS, TM LISS-II	18.1.73, 18.2.86, 24.2.93
20	74E/09	LANDSAT, IRS-1B	MSS, TM LISS-II	18.2.73, 18.2.86, 24.2.93
21	74E/06	LANDSAT, IRS-1B	MSS, TM LISS-II	18.1.73, 18.2.86, 24.2.93
22	74E/10	LANDSAT, IRS-1B	MSS, TM LISS-II	18.1.73, 18.2.86, 14.5.92
23	74E/13	LANDSAT, IRS-1B	MSS, TM LISS-II	18.2.73, 18.2.85, 24.2.93
24	74I/01	LANDSAT, IRS-1B	MSS, TM LISS-II	18.1.73, 9.12.85, 23.2.93
25	74I/05	LANDSAT, IRS-1B	MSS, TM LISS-II	18.1.73, 9.12.85, 23.2.93

6. Tamilnadu

S. No	Map Number	Satellite	Sensor	Path	Row	Date
1	57P/16	IRS-1A	LISS-II	23	60	JAN-1990
2	58H/03	IRS-1A	LISS-II	25	63	APRIL-1990
3	58H/04	IRS-1A	LISS-II	25	63	APRIL-1990
4	58H/08	IRS-1A	LISS-II	24	63	MARCH-1989
5	58H/12	IRS-1A	LISS-II	24	63	MARCH-1990
6	58H/15	IRS-1A	LISS-II	24	63	FEB-1989
7	58H/16	IRS-1A	LISS-II	24	63	MARCH-1990
8	58K/08	IRS-1A	LISS-II	24	62	MARCH-1990
9	58K/12	IRS-1A	LISS-II	24	62	MARCH-1990
10	58K/14	IRS-1A	LISS-II	23	62	JAN-1990
11	58K/15	IRS-1A	LISS-II	23	62	JAN-1990
12	58K/16	IRS-1A	LISS-II	23	62	JAN-1990

13	58L/01 & 05	IRS-1A	LISS-II	24	62	MARCH-1990
14	58L/02	IRS-1A	LISS-II	24	63	MARCH-1990
15	58L/03	IRS-1A	LISS-II	24	63	MARCH-1990
16	58M/10 & 14	IRS-1A	LISS-II	23	60	JAN-1990
17	58M/13	IRS-1A	LISS-II	23	60	JAN-1990
18	58M/15	IRS-1A	LISS-II	23	60	JAN-1990
19	58M/16	IRS-1A	LISS-II	23	61	JAN-1990
20	58N/04 & 08	IRS-1A	LISS-II	23	61	JAN-1990
21	58N/07	IRS-1A	LISS-II	23	61	JAN-1990
22	58N/11	IRS-1A	LISS-II	23	61	JAN-1990
23	58N/13	IRS-1A	LISS-II	23	61	JAN-1990
24	58N/14	IRS-1A	LISS-II	23	61	JAN-1990
25	58N/15	IRS-1A	LISS-II	23	61	JAN-1990
26	58O/01 & 02	IRS-1A	LISS-II	23	62	JAN-1990
27	58O/03 & 04	IRS-1A	LISS-II	23	62	JAN-1990
28	58O/07 & 08	IRS-1A	LISS-II	23	62	JAN-1990
29	66C/07	IRS-1A	LISS-II	23	59	JAN-1990
30	66C/08	IRS-1A	LISS-II	23	59	JAN-1990
31	66D/01 & 05	IRS-1A	LISS-II	23	59	JAN-1990
32	66D/02	IRS-1A	LISS-II	23	59	JAN-1990
33	66D/03 & 04	IRS-1A	LISS-II	23	59	JAN-1990

APPENDIX – VI

SATELLITE DATA USED FOR PREPARING SHORELINE MAPS ON 1:250,000 SCALE FOR DIFFERENT MARITIME STATES

1. Gujarat

S. No	Map Number	Satellite	Sensor	Path	Row	Date
						HWL/LWL, Shoreline/LWL
1	41A	LANDSAT-4/5	TM	151	44	24.10.1988, 15.2.1975
2	41F & B	LANDSAT-4/5	TM	151	44	28.3.1986, 15.2.1975
3	41G	LANDSAT-4/5	TM	151, 150	45	28.3.1986, 5.3.1975
4	41I	LANDSAT-4/5	TM	150	44	6.12.1985, 15.2.1975
5	41J	LANDSAT-4/5	TM	150	44	28.3.1986, 5.3.1975
6	41K	LANDSAT-4/5	TM	150	44	28.3.1986, 15.2.1975
7	41L	LANDSAT-4/5	TM	150, 149	46	17.2.1986, 4.3.1975
8	41O	LANDSAT-4/5	TM	149	44	17.2.1986, 4.3.1975
9	41P	LANDSAT-4/5	TM	149	46	17.2.1986, 4.3.1975
10	46B	LANDSAT-4/5	TM	148, 149	44, 45	30.3.1986, 3.3.1975
11	46C	LANDSAT-4/5	TM	148	45	30.3.1986, 3.3.1975
12	46D	LANDSAT-4/5	TM	146	46	30.3.1986, 21.3.1975

2. Maharashtra

S. No	Map Number	Satellite	Sensor	Path	Row	Date
1	47A	LANDSAT-5	TM	147	046-047	9.4.1988
2	47F & B	LANDSAT-5	TM	147,148	047	9.1.1986
3	47G	LANDSAT-5	TM	147	048	15.11.1985
4	47H	LANDSAT-5	TM	147	049	3.3.1989
5	48E	LANDSAT-5	TM	146	050	1.1.1986

3. Kerala

S. No	Map Number	Satellite	Sensor	Path	Row	Date
1	48L	LANDSAT-5	TM	145	051	1986, 1973
2	48P	LANDSAT-5	TM	145	052	1986
3	49M	LANDSAT-5	TM	145	052	1986, 1973
4	49N	LANDSAT-5	TM	145,144	052, 053	1986, 1973
5	58B	LANDSAT-5	TM	144	053	1987, 1973
6	58C	LANDSAT-5	TM	144,144	053, 054	1987, 1973
7	58D	LANDSAT-5	TM	144	054	1987, 1973
8	58H	LANDSAT-5	TM	143	054	1987, 1973

4. Andhra Pradesh

S. No	Map Number	Satellite	Sensor	Path	Row	Date	Date
						HW, LWL, HWL	Shorelines
1	65H	LANDSAT-4/5	TM	141&142	049	28.6.88, 28.6.88, --	2.12.1985, 20.1.1973
2	65K	LANDSAT-4/6	TM	141	048	12.12.84, 12.12.84, 1973	
3	65L	LANDSAT-4/7	TM	141	048 & 049	15.10.88, 15.10.88, --	7.12.1985, 20.1.1973
4	65N	LANDSAT-4/8	TM	140	047	10.3.85, 10.3.85, 1973	
5	65O	LANDSAT-4/9	TM	140	048	12.12.84, 12,12,84, 1966	
6	66A & E	LANDSAT-4/10	TM	142	049	28.6.88, 28.6.88, --	17.3.1985, 26.2.1973
7	66B	LANDSAT-4/11	TM	142	050	28.6.88, 28.6.88, --	26.2.1973
8	66C	LANDSAT-4/12	TM	142	051	25.6.88, 25.6.88, --	26.2.1973
9	74A	LANDSAT-4/13	TM	140	047	15.6.84, 15.6.84, 1975	

5. Orissa

S. No	Map Number	Satellite	Sensor	Path	Row	Date
1	73K	LANDSAT-5	TM	139	045, 046	March 1975 & March 1986
2	73L	LANDSAT-5	TM	139	046	March 1975 & March 1986
3	73O	LANDSAT-5	TM	139	045	March 1973 & March 1985
4	73P	LANDSAT-5	TM	139	046	March 1975 & March 1986
5	74A	LANDSAT-5	TM	140	047	March 1973 & March 1987
6	74E	LANDSAT-5	TM	139, 140	046, 047	Jan. 1975 & March 1987
7	74I	LANDSAT-5	TM	139	046	Jan 1973 & March 1987

APPENDIX - VIII

Procedure to create a Database for using the Query Shell

- Create a master grid coverage in polyconic projection with SOI toposheet map numbers as an item (field) covering the total area of interest. The grid points are to be used as TIC points for digitization, registration etc.
- Create thematic coverages viz.. land use, soil, watershed, transport, boundary , (state, district, taluka etc.) etc. taking master grid coverage as the reference.
- Standardize all the polygons and linear features IDs for different thematic categories. These IDs should be unique for each category.
- Define shade / color code scheme for different thematic categories.
- Generate Look-Up tables using shade/ color code scheme for different coverages.
- Add items (fields) in all the coverages for their corresponding categories.
- Design standard format for output map generation.