SHORE LINE CHANGE ATLAS OF THE INDIAN COAST

(Volume-V)

Odisha and West Bengal

SPACE APPLICATIONS CENTRE, ISRO
Ahmedabad

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Abstract	This Atlas comprises of shoreline change maps prepared using satellite data of 2004-06 and 2014-16 time-frames on 1:25,000 scale for the entire country (Volume – V shows maps of Odisha and West Bengal). The maps show eroding, stable and accreting areas of the coast. Data used, methodology, results, area under erosion and accretion and status of coastal protection measures are briefly described. In Odisha, erosion occurred along 144 km of the coast while 99 km of the coast is under accretion, while stable coast is around 208 km. Around 831 ha of land have eroded in Odisha and 753 ha of area have accreted due to deposition of sediment. Around 34 km of the West Bengal coast is accreting, 56 km is eroding and the shoreline is stable along 67 km. Around 394 ha area of the land have eroded and about 141 ha of area have accreted in West Bengal.
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MESSAGE

The Coastal Zone represents a complex environmental entity, which is in constant interaction with the marine and terrestrial processes. The coastal zone has been receiving increased attention due to the immense anthropogenic pressure and inevitable development activities related to trade and transport. The coast is bestowed with rich bio-diversity and fragile ecosystems like mangroves and coral reefs that are highly sensitive to any climatic and environmental changes.

The coastal region, due to the influence of natural and anthropogenic forces and the sporadic events like cyclones undergo severe erosions leading to loss of human livelihood and crucial biodiversity besides critically damaging the coastal constructions and aesthetic quality that attracts huge economic benefits. Quantifying coastal change is essential for calculating trends in erosion, evaluating processes that shape coastal landscapes and predicting the response of coast to future storms and sea-level rise.The dynamic natures of the coast prompt for frequent monitoring and comprehending the coastal erosion activities. Space technology has been effectively deployed in identification and measurement of such activities.

Space Applications Centre (SAC) in collaboration with a large number of scientific organization & universities of the country has carried out various scientific investigation/inventory of the entire coastal zone of India using satellite data like impact of sea level rise on the Indian coastal environment, development of Coastal Zone Information System (CZIS), mapping and monitoring of coral reefs and mangroves, inventory of the coastal land use etc. One such significant work was preparation of Shoreline Change Atlas of India for the time frame 1989-91 and 2004-06.

The present Shoreline Change Atlas is an outcome of the shoreline change mapped for the entire Indian coast between the time frames of 2004-06 and 2014-16 carried out by Space Applications Centre, ISRO, Ahmedabad based on recommendation of Coastal Protection and Development Advisory Committee (CPDAC) at the request of Central Water Commission, Department of Water Resources, River Development & Ganga Rejuvenation, Ministry of Jal Shakti, Government of India.

I congratulate the team of scientists for carrying out such an important study for the entire Indian coast. This study assumes greater significance in the context of planning shoreline protection measures to be constructed by various maritime States and UTs. I am sure this atlas will be highly useful not only to the coastal zone managers and to the authorities involved but also to the scientific community working in the coastal environment and climate change studies.

(S.K. Haldar)
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FOREWORD

Coastal zone is one of the most fragile ecosystems having rich biodiversity and is characterised by constant interactions between various natural processes and human activities. Human interventions along the global coastal zones are profoundly increasing and may lead to disastrous consequences, if developmental activities are carried out with improper understanding of the coastal processes. In addition, the coastal ecosystems are also vulnerable to natural phenomena such as waves, tides, storm surges, erosion etc.

India has more than 7500 km. long coastline with diverse coastal ecosystem and hence, Coastal Zone in India, assumes its importance, more so because of high population pressure, development of various industries, spurt in recreational activities, exploitation of renewable and non-renewable natural resources, discharge of waste effluents and municipal sewage etc. The Indian shoreline is also dotted with vital coastal habitats like mangrove and coral reefs, ecological sensitive and biologically diverse regions and archaeologically and culturally important places. The natural and anthropogenic activities change the equilibrium of sediment transport along the coast and induce coastal erosion, thereby threating the valuable resources. In view of its dynamic nature, frequent monitoring of the coast is also required and that can be achieved only through satellite based methods.

In India, the use of satellite data for coastal zone studies have been initiated by Space Applications Centre (SAC), ISRO, Ahmedabad in collaboration with various scientific organisations and universities across the country. For the past 30 years, SAC has been engaged in conducting various national level programmes aimed at detailed scientific investigations and preparing inventory of the entire coastal zone of India. I am happy to know that geo-sciences team at SAC/ISRO has completed Indian coastal shoreline change analysis (for 2004-06 and 2014-16 time frames) using Resourcesat-1&2 LISS-IV data and publishing these maps in the form of an atlas in six (6) volumes.

I am sure, this 6-volume atlas will be useful to the scientific community and decision makers in investigating the coastal challenges as well as for taking appropriate actions to protect the Indian coast, which will go a long way in conserving the coastal environment of the country. I would like to place on record my deep appreciation for all those scientists and support staff, who have made contributions for the successful execution of this project.

16/08/2021

(एन एम देसाई) / (N M Desai)
निदेशक / Director

Place: Ahmedabad
Date: 16 August 2021

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PREFACE

Coastal regions of the world undergo a continuous process of erosion & accretion due to natural reasons and anthropogenic as well. The climatic change and consequently the rise in sea level is likely to be one of the major factors causing coastal erosion and accretion in the near future. The risks and hazards arising due to coastal erosion have raised a serious concern for the Indian coastal regions too, as a large population survives on the economy of its resources. Coastal erosion and accretion are reflected as the shift in the shoreline. Hence, a systematic and repetitive inventory and monitoring of shoreline change are the pre-requisite for a proper coastal management and forms the baseline data to carry out coastal protection measures by the maritime States and Union Territories besides its use by the scientific community.

Space Applications Centre (ISRO) had brought out Atlas of maps showing shoreline changes for the entire Indian coast between time frame 1989–1991 and 2004–2006 at 1:25,000 scale. The project was funded by Coastal Management Directorate, Central Water Commission, Ministry of Water Resources, New Delhi. Coastal Protection and Development Advisory Committee (apex body concerned with planning of coastal protection measures at the national level in India) requested Space Applications Centre to update the existing shoreline change maps using recent satellite data (2014-16 time frame) for assessing status of coastal erosion. The mapping has been completed at 1:25,000 scale using IRS LISS IV data and changes in shoreline have been brought out between 2004-06 and 2014-16 time frame.

The atlas also shows location and type of coastal protection measures taken up by maritime states and UTs based on the data provided. The atlas has been brought out in six volumes covering the entire Indian coastline. Six volumes contain 618 maps prepared covering 7549 km of the Indian coastline. The maps suggest that about 1144 km is under erosion, 1084 km is under accretion and 5321 km of the coastline has been observed showing no change.

I congratulate the entire team specially Mr. Ratheesh Ramakrishnan, Scientist SF and Mrs. Preeti Rajput, Scientist SD of Space Applications Centre, ISRO Ahmedabad.

(I M Bahuguna)

SUMMARY

Shoreline is a dynamic geomorphological entity that coincides with the physical interface of land and ocean. The shoreline responds to the coastal processes exerted by waves, tides, nearshore currents and the resultant sediment transport and the pressure exerted by anthropogenic influences. The equilibrium in the sediment supply gets disturbed due to either natural phenomena or human intervention causing shoreline changes. The shoreline changes are attributed as erosion (accretion), where the shoreline shift landwards (seawards). The change in shoreline positions are of essential importance to the coastal scientists, engineers and managements, where the shoreline change information is required in the design of any sustainable management plans.

Coastal erosion ails threat to the life and livelihood along the shoreline, destroying settlements and infrastructures like road and pose major hazard to the ecologically sensitive habitats like mangroves and turtle nesting grounds. Coastal erosion, as in other maritime countries, is a serious problem along the Indian coast. India forms a peninsula and has a long coast on its east and west regions with varied coastal processes dominating the coastal dynamics. The Indian coast is relentlessly modified by the mounting development activities along the coastal region, which under improper management at times leads to severe coastal erosion.

Inventory related to coastal erosion are a pre-requisite in understanding the coastal dynamics of the region. Planning measures for sustainable development along the coastal region require a systematic inventory of shoreline changes. In this view, Space Applications Centre in collaboration with Central Water Commission, mapped the shoreline changes for the time frame 1989-91 and 2004-06 on 1:25, 000 scale for the entire Indian coast based on multidate remote sensing data in GIS environment. The database were then used to generate A3 size Shoreline Change Atlas of all the maritime states of India. Central Water Commission requested to update the existing shoreline change maps (1989-91 & 2004-06 time-frame) using the satellite data of 2014-16 time-frame. The major objective was to prepare digital shoreline change atlas on 1:25, 000 scale in GIS environment using the shoreline delineated for the time-frame 2004-06 and 2014-16, depict and quantify shoreline changes as eroding/accreting/stable, show status of shoreline protection measures taken by respective states.

Assessment of shoreline change using satellite images have gained its applicability owing to the synoptic observations covering a large spatial scale and its availability in temporal domain. LISS-4 images of 2014-16 (on board Resourcesat-2) and 2004-06 (on board IRS P6) time-frames

have been used to delineate the shoreline for entire Indian coast. The high tide line (HTL) is considered as the shoreline and on-screen digitization of the HTL has been carried out based on the geomorphic indicators.

The shoreline change status along 7549 km of the Indian coast is assessed that excludes river/creek mouths. About 1144 km of the Indian coast is under erosion, while 1084 km of the coast is accreting and the coastline is observed to be stable along 5321 km. The Indian coastal region have in total lost around 3680 ha of land due to erosion whereas around 4042 ha of area have been gained due to accretion. West Bengal coast is having around 35 percentage of its coast under erosion, which is the largest among the Indian coastal state and percentage of shoreline under accretion is the largest for Andhra Pradesh state (26%). Percentage of stable coast is largest along the Gujarat coast (87%) followed by the Lakshadweep Islands (82%), while more than 57 percentage of the West Bengal coast is under either erosion or accretion. A long coastal stretch to the northern Andhra Pradesh coast is eroding whereas a long coastal stretch along the Saurashtra coast of Gujarat is stable in nature.

The major natural processes involved in the coastal erosion are the wave induced erosion and littoral drift. Alongshore shift of inlets are observed due to growth of spits and erosion at the other side and is dominant at Chilika inlet, Odisha and Mulki-Pavanje Estuary, Karnataka. The processes of longshore sediment transport occurring naturally along the coasts are highly altered by the constructions of breakwaters and have triggered coastal erosion due to obstruction of the littoral drift. Sand mining and land reclamation are the other anthropogenic activities altering the sediment dynamics and triggering coastal erosion. Andaman and Nicobar Island is observed to have critical shoreline changes, where the coast is regaining the equilibrium after the subsidence, uplift and erosion due to tsunami associated with the 2004 mega earthquake. The inventory along with current status of coastal protection measures taken up by concerned state departments has been used to prepare a Shoreline Change Atlas of the Indian Coast.

The baseline data are aimed towards initiating appropriate action by concerned Maritime states and UTs besides use by the scientific community as well decision makers of the country. The Atlas shall function as a reference material to obtain information on the status of shoreline changes during 2004-06 and 2014-16 time-frames along entire Indian coastline. Areas under coastal erosion and status of coastal protection measures taken up by respective maritime State and Union Territory are depicted and can be used for planning coastal protection measures.

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1. INTRODUCTION

The coastal zone is in constant interaction between various natural processes and human activities that leads to a modification of its geomorphology. Coastal zone in India assumes its importance due the presence of fragile ecosystems and its interaction with anthropogenic activities. The coast is also subjected to exploitation of natural resources and is used as a medium for discharge of waste effluent and municipal sewages. The coastal regions are also overburdened with mounting developmental activities, increasing load on harbours, spurt in recreational activities and above all petroleum exploration activities.

Shoreline is a dynamic geomorphological entity, which responds to the external forces exerted by waves, tides, nearshore currents and the resultant sediment transport. When the resultant sediment transport entering a particular area is greater than the sediment going out from the area, accretion or beach development takes place. On the other hand, when there is a deficit of the incoming sediment supply into a particular area with reference to the sediment going out of the same area, beach erosion takes place. The equilibrium in the sediment supply is fairly maintained by the coastal geomorphic environment. However, sometimes this equilibrium gets disturbed due to either natural phenomena or human intervention. Natural phenomenon like intense wave activities during monsoon, cyclones and changes in river mouth during flood conditions contributes towards disrupting the equilibrium, while construction of coastal structures like breakwaters, dam construction in the rivers are the human interventions

India has a long shoreline of about 7500 km including its island territories. The destruction and loss of land due to erosion is a severe problem, particularly for a country like India facing an increased population growth. Erosion of the coastal region poses a major threat not only to the human population, but also to the vital coastal ecosystem. The dynamic interaction between nearshore features and the hydrodynamics of the region, termed as coastal processes, determines the stability of the adjacent shoreline. Moreover, various developments along the coast enhance the changes in the shoreline. Indian coast forms a peninsula and has a long coast on its east and west regions with varied coastal processes dominating the coastal dynamics. These include tide-

dominated regions along the northern parts of the west coast, open coast with high wave energy along the southern parts of the west coast, strong longshore sediment transport along the southern parts of the east coast and the coast strongly influenced with river discharges along the northern parts of the east coast. The coastal geomorphology and the land-use pattern along the Indian coast also show a varied range, which includes coral reefs, mangrove belts, tidal mudflats, rocky coasts, wide sandy beaches and deltaic and bay environments.

The Indian coast is relentlessly modified by the mounting development activities along the coastal region, which under improper management at times leads to severe coastal erosion. Management plans with proper understanding of the coastal processes and coastal dynamics are needed to achieve sustainable development along the coastal region, where planning measures have to be taken up at the national level. Inventory related to coastal erosion are a pre-requisite in understanding the coastal dynamics of the region. Planning measures for sustainable development along the coastal region require a systematic inventory of shoreline changes occurring along the entire Indian coast on 1 : 25,000 scale. Space Applications Centre, along with Coastal Protection and Development Advisory Committee (CPDAC) (apex body concerned with planning of coastal protection measures at the national level in India) have brought out shoreline change atlas (SAC, 2014 and Rajawat et al, 2015). The atlas depicts the shoreline changes for the time-frame 1989-1991 (using SPOT-1/2 HRV1-MLA) and 2004–2006 (using IRS-P6 LISSIV), that was mapped on 1 : 25,000 scale for the entire Indian coast.

Coastal Management Directorate, Central Water Commission, Ministry of Water Resources, New Delhi have requested to update the existing shoreline change maps (1989-91 & 2004-06 time-frame) using recent satellite data (2014-16 time-frame) for assessing coastal\ erosion. CPDAC recommended the need for preparation of Shoreline Change Atlas of the Indian coast showing information related to coastal erosion derived from satellite data and protection measures undertaken by all maritime states of India. It is in this context, Space Applications Centre in collaboration with Central Water Commission, have mapped the shoreline for the time-frame 2014-16 on 1:25, 000 scale for the entire Indian coast based on LISS-IV images of 2014-16 in GIS environment. The information is

catalogued as per Survey of India topographical map indexing which is 1:25000 Scale.

The major objective is to prepare digital shoreline change atlas on 1:25, 000 scale in GIS environment using the shoreline delineated for the time-frame 2004-06 and 2014-16. The atlas shall depict and quantify shoreline changes as eroding/accreting/stable, show status of shoreline protection measures taken by respective states and generate A3 size state wise Coastal Atlas of all the maritime states of India.

The detailed objectives are:

i) To prepare shoreline database of 2014-16 time-frame for all the maritime states and UT.

ii) To quantify and classify the shoreline as shoreline under erosion, stable and accretion for entire Indian coast by integrating shoreline using database of 2004-06 and 2014-16 period.

iii) To integrate the information on coastal erosion and shoreline protection measures of all the maritime states and UT of India in GIS environment.

iv) To generate Six Volumes of A-3 size coloured Coastal Atlas of India (Volume I covering Gujarat, Daman & Diu, Volume II covering Maharashtra & Goa, Volume III covering Karnataka & Kerala, Volume IV covering Tamil Nadu, Pondicherry & Andhra Pradesh, Volume V covering Odisha & West Bengal and Volume VI covering Lakshadweep & Andaman & Nicobar).

2. DATA USED

High tidal line is demarcated using IRS-P6 LISSIV data of 2004-06 period and Resourcesat-2 LISS-IV data of 2014-16 time-frame procured from NRSC. The LISS-IV is a multispectral (three-VNIR-band) push-broom camera having a spatial resolution of 5.8m with a swath of 23.9km for IRS-P6 and 70km for Rescourcesat-2. Both the satellites orbits in a sun-synchronous orbit at an altitude of 817km with a 5-day revisit cycle.

Detailed list of the satellite data used is given in the Annexure-III. In few cases where suitable data were not available, the data of nearest time-frame was used. Shoreline changes are computed with respect to the spatial changes in the Highest High Tide Line. The status of coastal protection measures taken up by maritime states and UTs was provided through Central Water Commission (CWC), New Delhi. These were prepared in spatial format and were put in the GIS database.

DATABASE Standards

Satellite images of Resourcesat LISS-IV, having a spatial resolution of 5 m is used for both 2004-06 and 2014-16 time frame. Geometric projection for the images are set to UTM (Standard LANDSAT projection for Indian region). Image to image rectifications are carried out with an overlap error less than 1 pixel.

The vector layers are projected in polyconic projection system, with a planimetric accuracy of 6.25 m and weed tolerance of 3.125 m. Onscreen digitization are carried out in 1:12,500 scale. “State” and “year” attributes are created for the high tide line digitised using the satellite images.

3. METHODOLOGY

We have undertaken following steps to prepare shoreline change atlas:

i. LISS-IV images of 2014-16 (on board Resourcesat-2) and 2004-06 (on board IRS P6) time-frames have been used to delineate the shoreline for entire Indian coast. LANDSAT orthorectified products are used as base map. Image to image co-registration is carried out on LISS-IV images of both time-frames to bring the data set to same geo-reference with an error of +/- 1 pixel.

ii. High tide line (HTL) is considered as the shoreline. On-screen digitization of the HTL has been carried out based on the geomorphic indicators (NCSCM, 2015). Image interpretation keys based on Nayak et al (1991) is used to identify the geomorphic indicators to delineate the HTL.

iii. The HTL is prepared for all maritime states and Union territories of India on 1:25,000 scale. The 1°X1° grid consists of 8X8 rectangular grids or cells. Each rectangular grid or cell represents one Survey of India (SOI) topographic area on 1:25,000 scale.

iv. Limited field checks were carried out and based on field observations, corrections were incorporated while finalizing the map. Field photographs were also taken during the field visits.

v. Accuracy Assessment: Classification as well as planimetric accuracy of the maps was assessed while carrying out the fieldwork. Overall, the classification accuracy of these maps range from 90-95% at 90% confidence level. The Planimetric Accuracy of these maps is 6.25 m as per SOI standard.

vi. Spatial layer for habitation (as point feature) and, rail and road (as line features) are taken from CZIS database.

vii. Spatial analysis techniques are used to compute the spatial shift among the HTL of different time frame.

viii. Polygons for areas under erosion and accretion were created.

ix. Areas under erosion and accretion were measured for the main shoreline (excluding creeks, river mouths, estuaries). Shore length under erosion, accretion and stable categories were measured for the main shoreline (excluding creeks, river mouths, estuaries). Areas with no changes were consider as stable.

x. A table containing the length of eroding, accreting and stable coast along with the area of erosion and accretion for each SOI grid has been generated for the maritime state and U.T.

xi. Shoreline protection measures have been depicted as per the information provided by the maritime State/UT agencies through Central Water Commission.

xii. A standard map composition and layout were finalised and have been used for final map composition of each map.

xiii. Final maps depicting shoreline changes were utilized for preparing shoreline change Atlas of the Indian coast (Six Volumes). Volume I covers Gujarat, Daman & Diu, Volume II covers Maharashtra & Goa, Volume III covers Karnataka & Kerala, Volume IV covers Tamil Nadu, Puducherry & Andhra Pradesh, Volume V covers Odisha & West Bengal and Volume VI covers Lakshadweep & Andaman & Nicobar Islands.

4. RESULTS

The shoreline change maps of Odisha and West Bengal coasts at each SOI grid at 1:25000 scale are given in Section-II.

Odisha

The Odisha coast extends from 18° 56’ N to 21° 38’ N and 84° 41’ E to 87° 28’E along the eastern coast of India. The Odisha coast is mainly deltaic in nature, formed by the Mahanadi and the Brahmani- Baiterani rivers. The Chilka lagoon located on the southern parts of the Odisha coast is the largest natural water body in the country spread for around 830 sq km area. Sandy beaches are well marked along the shoreline from the Bahuda estuary near the Andhra Pradesh border to the Devi river mouth. The sandy beach of the southern coast of Odisha has its importance owing to the turtle nesting grounds. The delta region constitute major mangrove habitat at Bhitarkanika and Gahirmatha at the estuarine mouth of Brahmani-Baiterani confluence. Vast stretches of subtidal mudflats are observed from the Dhamra River to Chandipur along northern parts of the Odisha coast.

Shoreline change analysis is carried out along 451 km of the Odisha coast. The change analysis have avoided the coastal segments at major ports and harbours. Erosion have occurred along 144 km of the coast while 99 km of the coast is under accretion. Stable coast of Odisha is observed for around 208 km. Figure 1 shows the shoreline change status of Odisha coast. A large area of around 831 ha of land have eroded during the time frame of analysis and nearly about 753 ha of area have been accreted due to deposition of sediment. Details of erosion/accretion status at each SOI grid is given in Table 1.

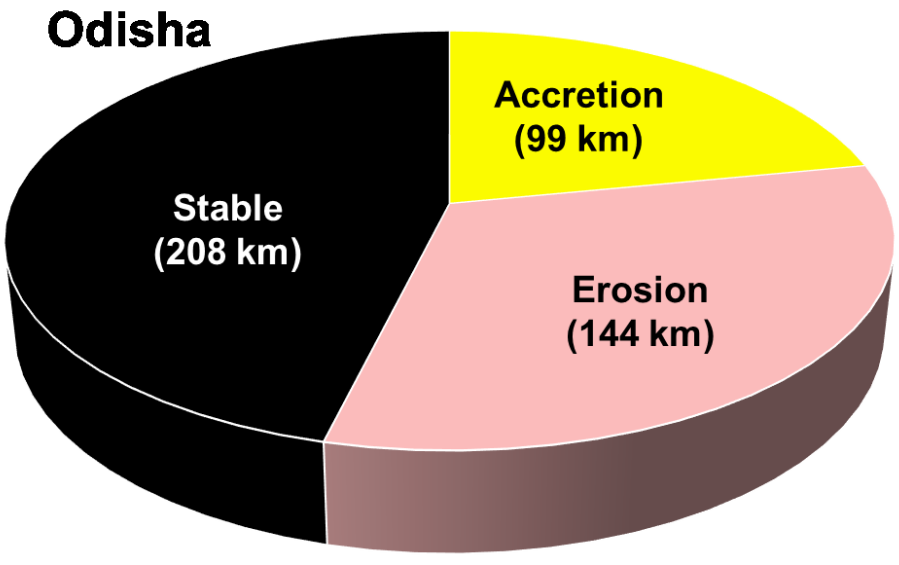

Figure 1: Shoreline change status of Odisha

The Odisha coast is classified into three sectors based on the coastal geomorphology and district boundary. The southern Odisha coast constitute of the districts Ganjam and Puri. The districts of Jagatsinghapur, Kendrapara and Bhadrak are the districts within the deltaic region. The northern part comprises of Baleshwar District.

The southern sector have eroding coastal length of about 57 km. The coast have accreted along 30 km while 112 km of the coastal length have remained stable. Plate 1 shows the shoreline change to the west and east coast of Gopalpur port (74A15SE). Significant change happened along the spit at the Chilika Lake mouth (74E10NW), where the southern spit have grown over 2.5 km northwards and huge erosion happened to the northern spit, that have eroded to around 4.5 km northwards. Plate 2 shows the shoreline changes along the Chilika spit. A long coastal stretch from the north of Gopalpur port (74A15SE) to Prayagi (74E03NE), from Konark (74I01SW) to Abadan (74I01NE) are under erosion. Coastal erosions are observed at Remayapetta (74A16NW), at Puri (74E13SW), to the north of Bhargavi River (74E13SE) and to the south of Devi River (74I05NW).

The delta region of Odisha have undergone severe erosion with around 70 km of the coast is under erosion. Around 33 km of the coast is accreting and 69 km of the coast is stable in nature. Severe erosion happened along a long coast of around 33 km to the north of Hansura River (73L14SW) to the mouth of Maipura River (73P02NW). Plate 3 shows the severe erosion along the coast at Uttampur (73L14SW). The spit between Sharabedi (73L08SE) and Jatadhartanda (73L12NW) and spit to the north of Mahanadi River (73L11SE and 73L15SW) are observed to be under sever erosion.

In the northern sector, accretion length exceeds both the erosion and stable length. Accretion happened along 35 km of the coast whereas erosion is along 17 km and stable coast is along 28 km. Plate 4 shows the accretion along the southern bank of Panchpara River (73O02SW). The coast to the north of Burhubalang River (73O03NW), and to the south of Subnarekha River (73O06SW) is under erosion.

Table 1: Mapsheet-wise results of shoreline changes for 2004-06 and 2014-16 time-frame for Odisha coast

Serial No.	Mapsheet No.	Erosion Area (in ha)	Erosion Length (in km)	Accretion Area (in ha)	Accretion Length (in km)	Stable Length (in km)	Total Length (in km)
1	73O06SE	20.49	3.06	17.98	4.21	0.94	8.20
2	73O06SW	21.09	2.48	75.71	9.83	0.00	12.31
3	73O02SE	8.15	2.58	47.89	10.46	2.23	15.28
4	73O02SW	2.28	0.31	42.64	2.36	0.00	2.67
5	73O03NW	15.15	3.63	12.10	4.70	5.22	13.56
6	73K15NE	2.50	1.77	1.99	0.94	5.13	7.84
7	73K15SE	4.56	3.55	4.08	2.55	6.45	12.56
8	73K15SW	0.00	0.00	0.00	0.00	4.17	4.17
9	73K16NW	0.00	0.00	0.00	0.00	11.27	11.27
10	73K16SW	0.00	0.00	0.00	0.00	14.76	14.76
11	73L13NE	0.00	0.00	0.00	0.00	15.84	15.84
12	73L13NW	0.00	0.00	0.00	0.00	0.16	0.16
13	73L13SE	0.00	0.00	0.00	0.00	12.78	12.78
14	73P02NW	20.27	5.69	36.48	5.35	0.00	11.04
15	73L14NE	69.10	10.48	0.00	0.00	4.65	15.13
16	73L14SE	38.97	5.00	0.00	0.00	0.00	5.00
17	73L14SW	134.19	12.77	12.48	2.13	0.47	15.36
18	73L15NW	0.76	0.49	110.24	7.89	1.32	9.69
19	73L11NE	1.64	0.82	0.00	0.00	1.22	2.04
20	73L15SW	74.25	8.78	0.13	0.16	0.00	8.94
21	73L11SE	10.78	3.21	20.19	2.41	5.22	10.84
22	73L12NE	0.00	0.00	11.39	1.80	0.00	1.80
23	73L12NW	75.29	10.44	78.20	8.53	2.26	21.22
24	73L08NE	0.95	0.40	0.00	0.00	0.80	1.20
25	73L08SE	38.87	9.73	50.54	4.74	0.00	14.47
26	74I05NE	5.42	1.85	0.83	0.28	1.66	3.79
27	74I05NW	29.97	3.91	17.67	4.16	5.98	14.04
28	74I01NE	8.72	7.38	9.09	2.09	2.63	12.10
29	74E09SE	0.00	0.00	1.87	1.27	5.06	6.33
30	74E13SW	2.19	1.97	0.97	0.74	11.18	13.89
31	74I01SE	1.34	2.03	0.00	0.00	0.23	2.26
32	74E13SE	4.08	4.09	2.13	1.04	9.06	14.20
33	74I01SW	6.47	4.62	1.15	0.62	6.80	12.03
34	74E06NE	0.00	0.00	10.54	2.13	6.77	8.90
35	74E10NW	145.48	8.02	79.92	4.74	4.14	16.89
36	74E10NE	0.00	0.00	33.66	3.52	4.38	7.90
37	74E02SE	0.00	0.00	0.00	0.00	4.15	4.15
38	74E06SW	0.00	0.00	0.00	0.00	15.80	15.80
39	74E06SE	0.00	0.00	0.00	0.00	5.68	5.68
40	74E03NW	20.16	5.60	14.28	2.32	0.00	7.92
41	74E03NE	7.59	5.97	0.00	0.00	6.39	12.37
42	74A15SE	32.47	4.68	49.04	5.21	2.14	12.03
43	74E03SW	21.50	6.51	0.00	0.00	1.52	8.03
44	74A16NW	4.56	1.78	8.16	2.12	10.57	14.46
45	74A16NE	0.00	0.00	0.00	0.00	3.64	3.64
46	74A16SW	2.11	0.00	2.15	0.47	5.52	5.99
	Total	**831.4**	**143.6**	**753.5**	**98.8**	**208.2**	**450.5**

West Bengal

The West Bengal coast extends from 21° 36’ N to 21° 56’ N and 87° 27’ E to 89° 8’ E. The land–sea boundary of the Purba Medinipur district is wave dominated and is relatively less indented with characterized sand dunes, beaches, aquaculture/salt pans activities, longshore currents, minor river discharges, less turbid but high saline sea water influence and cuspate delta of the Subarnarekha. This part of the coast is largely inhabited and cultivated. The Sundarban area is fed with numerous rivers, which form network of creeks. These are affected by the daily tides. Many small sandy islands and mudflats mark the river channels and the coast and most of them are completely inundated during high tide. The mangroves in the West Bengal coast mainly colonies in the Sundarban area, which forms the largest single block of tidal halophytic mangroves of the world.

Shoreline change analysis is carried out along 157 km of the West Bengal coast. The change analysis have avoided the coastal segments at major ports and harbours. The West Bengal coast is eroding along 56 km and accretion is along 34 km, while the shoreline is stable along 67 km. Figure 2 shows the shoreline change status of West Bengal coast. An area of around 394 ha of the land have eroded and about 141 ha of area have been accreted due to deposition of sediment. Details of erosion/accretion status at each SOI grid is given in Table 2.

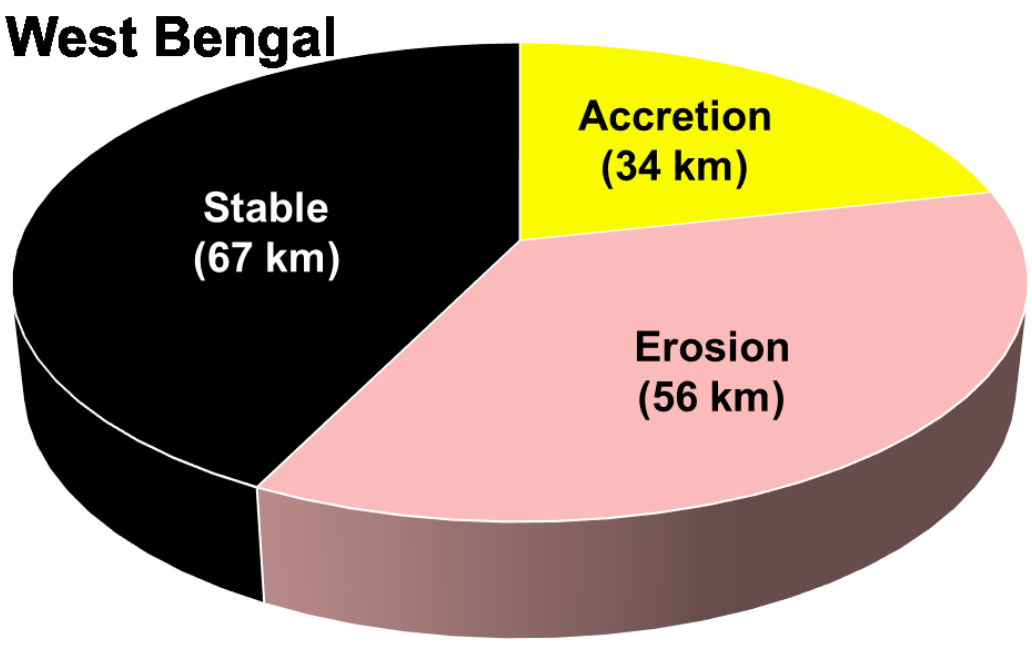

Figure 2: Shoreline change status of West Bengal

Shoreline change analysis of West Bengal is carried out by dividing the shoreline into two based on the coastal geomorphology and district administrative boundary; the western part comprising of the Purba Medinipur District and the eastern part comprising the South 24 Parganas District.

Coastal erosion happened along 26 km of the Purba Medinipur District. Accretion is along 20 km and 19 km of the coast is under stable condition. The coast at Jaldha (73O10NW) is under severe erosion as shown in Plate 5. Along this sector, the coast at Gadadhapur (73O06SE), the southern coast of Champa River mouth (73O10NW), a long stretch of coast at Dadanpatra (73O10NE), the coast near Masjidpur (73O13SW) and small coastal segments at Alichak, Pachuria and Sastimall (73O13SE) are under erosion.

The coastal erosion at South 24 Parganas District is along 31 km while accretion is along 14 km and 48 km of the coast is stable in nature. Severe erosion happened at Rasrur (79C02NW), that have made the shoreline to shift around 200 m towards land (Plate 6). Plate 7 shows the erosion of spit to the southern bank of the river Muri Ganga (79C02NE) and Plate 8 shows the erosion at Mahisani (79C02SE). A long stretch of coast from Bada Ganga (79C02NE) to Mahisani (79C02SE) is under erosion. The spit at Haripur (79C06SW) have undergone significant changes leading to series of eroding and accreting beaches. The coastal erosion at South 24 Parganas District are also observed along Mandirtala (79C01SW), Beguakhali (79C02NW), Lakshmipur (79C06SW) and near Sitarampur (79C06NE and 79C06SE).

Table 2: Mapsheet-wise results of shoreline changes for 2004-06 and 2014-16 time-frame for West Bengal coast

Serial No.	Mapsheet No.	Erosion Area (in ha)	Erosion Length (in km)	Accretion Area (in ha)	Accretion Length (in km)	Stable Length (in km)	Total Length (in km)
1	79C01NE	0.00	0.00	0.00	0.00	0.17	0.17
2	73O13SW	15.84	0.00	0.00	0.00	1.34	1.34
3	73O13SE	15.01	4.10	17.61	4.57	7.66	16.34
4	79C01SW	1.33	1.11	0.00	0.00	13.31	14.42
5	79C01SE	0.00	0.00	0.00	0.00	1.23	1.23
6	79C05SE	1.37	0.42	0.00	0.00	4.20	4.62
7	73O10NW	62.77	9.05	7.79	1.40	0.39	10.83
8	73O10NE	21.79	8.06	14.62	5.96	1.25	15.27
9	73O14NW	3.94	2.59	35.31	8.27	4.86	15.72
10	79C02NW	129.26	10.04	24.48	5.37	8.23	23.64
11	79C02NE	81.97	9.42	0.00	0.00	0.55	9.97
12	79C06NW	0.00	0.00	0.00	0.00	4.37	4.37
13	79C06NE	19.37	2.95	2.58	0.77	7.14	10.87
14	73O06SE	8.84	1.93	0.00	0.00	0.21	2.15
15	73O10SW	0.00	0.02	0.00	0.00	3.32	3.33
16	79C02SE	7.98	3.00	3.45	0.84	3.19	7.03
17	79C06SW	19.00	3.43	18.82	3.80	3.50	10.73
18	79C06SE	5.20	0.18	16.52	2.92	2.32	5.42
	Total	**393.7**	**56.3**	**141.2**	**33.9**	**67.2**	**157.4**

5. END USE

Coastal management plans require a proper understanding of the coastal processes and coastal dynamics to achieve a sustainable development along the coastal region. The inventory of shoreline change is the pre-requisite in understanding the dynamics of the coastal region. As the Indian coastal regions are modified by mounting development activities, an improper management at times shall lead to severe coastal erosion. Planning measures for sustainable development along the coastal region require a systematic inventory of shoreline changes occurring along the entire Indian coast on 1: 25,000 scale.

The Atlas can be used as a reference material for obtaining information on status of shoreline changes during 2004-06 and 2014-16 time-frames along entire Indian coastline. Areas under coastal erosion and status of coastal protection measures taken up by respective maritime State and Union Territory are depicted and can be used for planning coastal protection measures.

The Atlas is extremely useful to Coastal Management Directorate, Central Water Commission for providing guidance towards coastal protection works in maritime states of India.

All the State Public Works Departments, Ports and Harbour Authorities, Coastal Regulation Zone Authorities shall be able to have better management of the shorelines in respective states.

ACKNOWLEDGEMENTS

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We express special thanks to the Chairman and Members of Coastal Protection and Development Advisory Committee (CPDAC) for necessary support. We express deep gratefulness to the Director, Coastal Management Directorate, Central Water Commission, Ministry of Water Resources for his full support for this work and in organizing collection of coastal protection measures data from all the maritime States and U.T. of India.

We are highly grateful to the quality check team Shri T.V.R Murthy, Shri J.G Patel, Shri R.J Bhanderi, Shri B.P Rathore and Shri Manish Parmar for meticulously checking the shoreline change database and giving invaluable suggestion towards improving the same. We express our sincere gratitude to Ms. Savita Kumari and Ms. Anupama Sahoo for helping us in the map composition and database management.

Project team
Shoreline Change Atlas

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SHORELINE CHANGE MAPS

COMPLETE LEGEND TO SHORELINE CHANGE MAPS

EROSION

ACCRETION

HIGH-TIDE LINE 2014-16

HIGH-TIDE LINE 2004-06

STABLE

ROAD

RAILWAY

SEA WALL

GROYNES

BREAKWATER

JETTY

STATE BOUNDARY

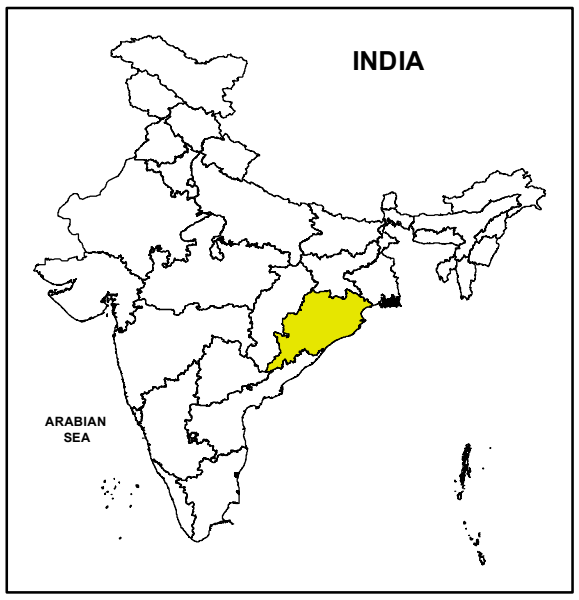
PORT/HARBOUR

HABITATION

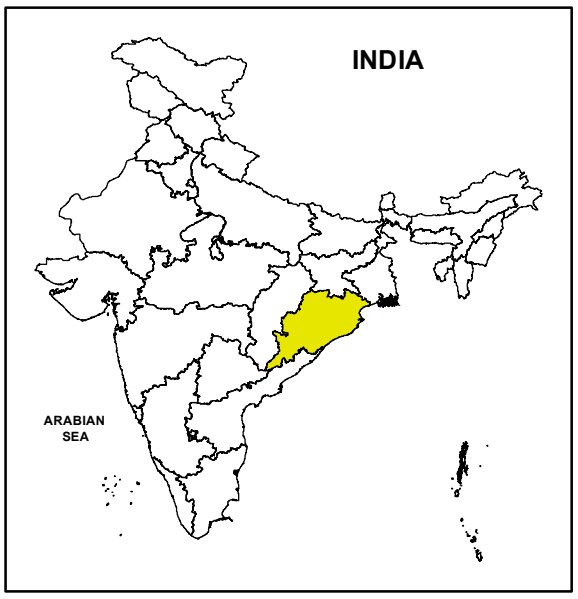
SHORELINE CHANGE MAPS

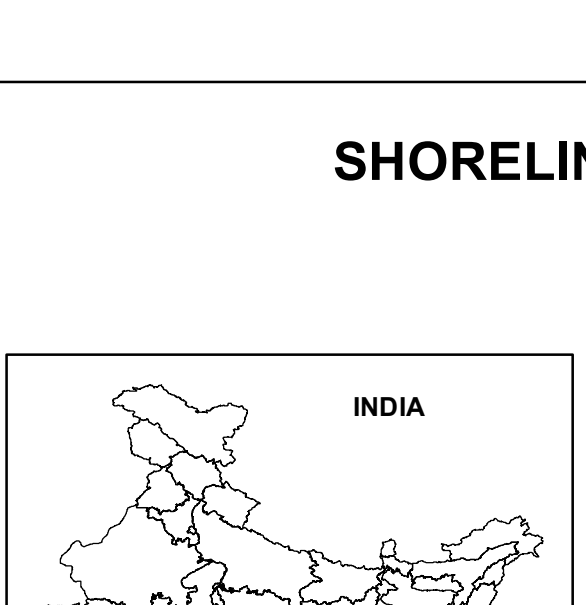
ODISHA

INDEX MAP OF ODISHA



SHORELINE CHANGES OF ODISHA





BALASORE

PURI

BERHAMPUR

BAY OF BENGAL

LEGEND

ACCRETION LENGTH
EROSION LENGTH
STABLE LENGTH
HIGH-TIDE LINE 2014-16

N

0 60 km

SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

GANJAM DISTRICT

ODISHA

SHEET NO. 74A16SW

Legend

- EROSION
- ACCRETION
- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- ROAD
- STATE BOUNDARY
- HABITATION

N
W E
S

0 2 km

INDEX TO SHEETS

74A12NE	74A16NW	74A16NE
74A12SE	74A16SW	SEA
74B09NE	SEA	SEA

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
SPACE APPLICATIONS CENTRE, ISRO, AHMEDABAD
AND CENTRAL WATER COMMISSION, NEW DELHI

SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

GANJAM DISTRICT

ODISHA

SHEET NO. 74A16NW

Chhelia

Markandi

Remayapetta

BAY OF BENGAL

Legend

- EROSION
- ACCRETION
- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- ROAD
- RAILWAY
- HABITATION

N
W E
S

0 2 km

INDEX TO SHEETS

74A11SE	74A15SW	74A15SE
74A12NE	74A16NW	74A16NE
74A12SE	74A16SW	SEA

INDIA

ODISHA

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
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SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

GANJAM DISTRICT

ODISHA

SHEET NO. 74A16NE

Baksipalli

BAY

OF

BENGAL

Legend

- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- ROAD
- HABITATION

N
W E
S

0 2 km

INDEX TO SHEETS

74A15SW	74A15SE	74E03SW
74A16NW	74A16NE	SEA
74A16SW	SEA	SEA

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

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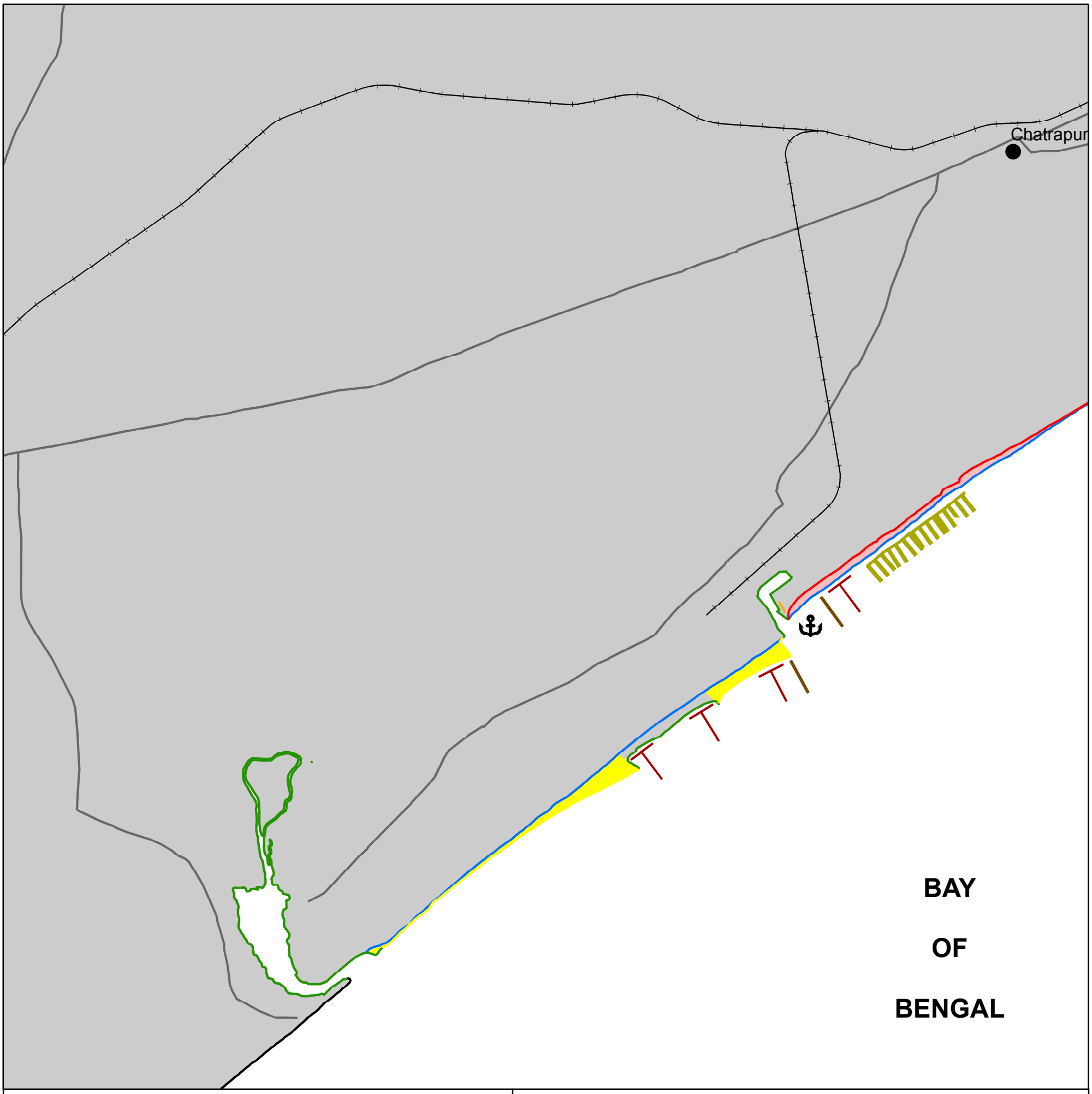
SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

GANJAM DISTRICT

ODISHA

SHEET NO. 74A15SE



Legend

- EROSION
- ACCRETION
- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- ROAD
- RAILWAY
- SEA WALL
- GROYNES
- BREAKWATER
- JETTY
- PORT/HARBOUR
- HABITATION

N
W E
S

0 2 km

INDEX TO SHEETS

74A15NW	74A15NE	74E03NW
74A15SW	74A15SE	74E03SW
74A16NW	74A16NE	SEA

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
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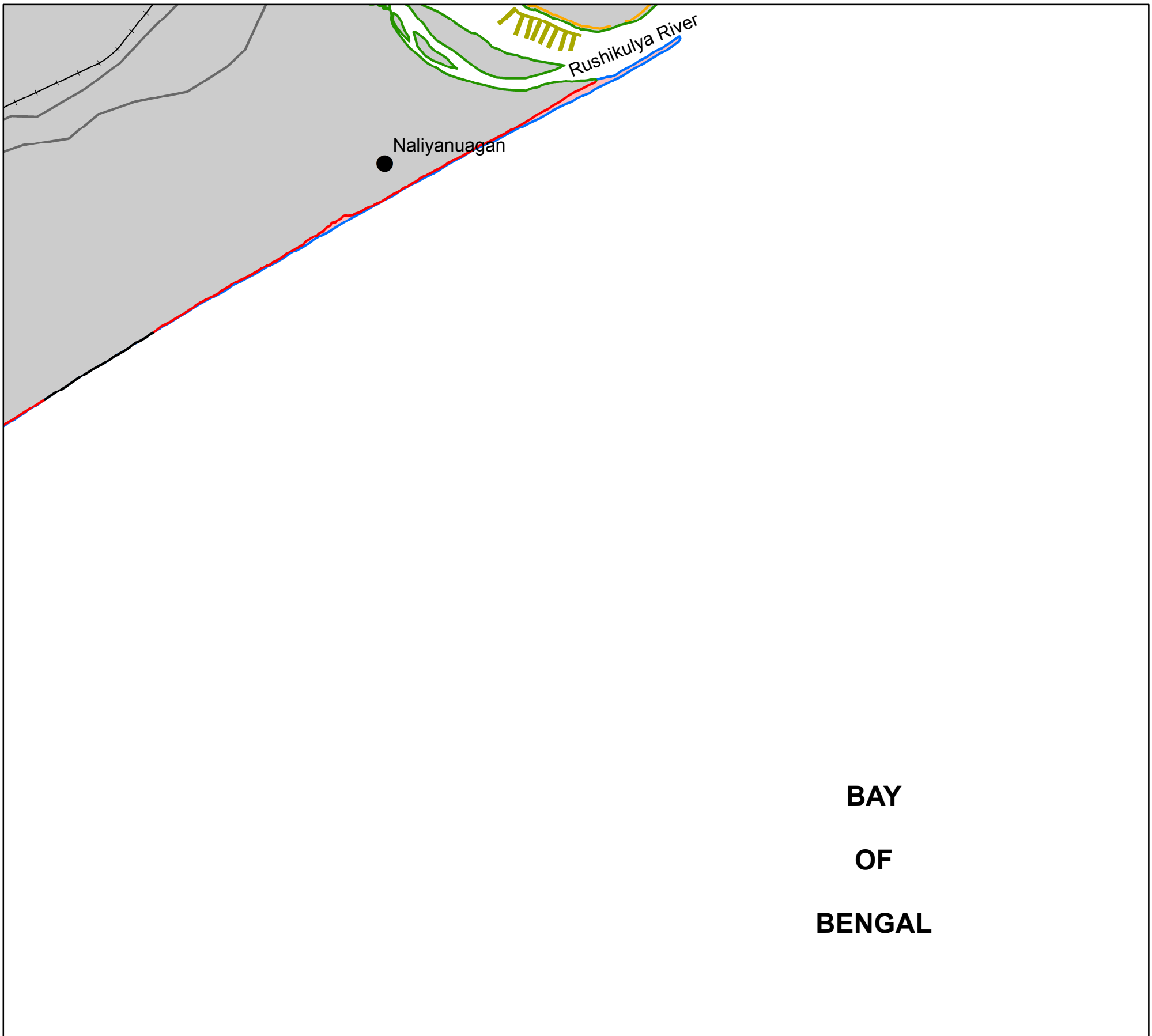
SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

GANJAM DISTRICT

ODISHA

SHEET NO. 74E03SW



Legend

- EROSION
- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- ROAD
- RAILWAY
- SEA WALL
- GROYNES
- HABITATION

N
W E
S

0 2 km

INDEX TO SHEETS

74A15NE	74E03NW	74E03NE
74A15SE	74E03SW	SEA
74A16NE	SEA	SEA

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

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SHORELINE CHANGE MAP

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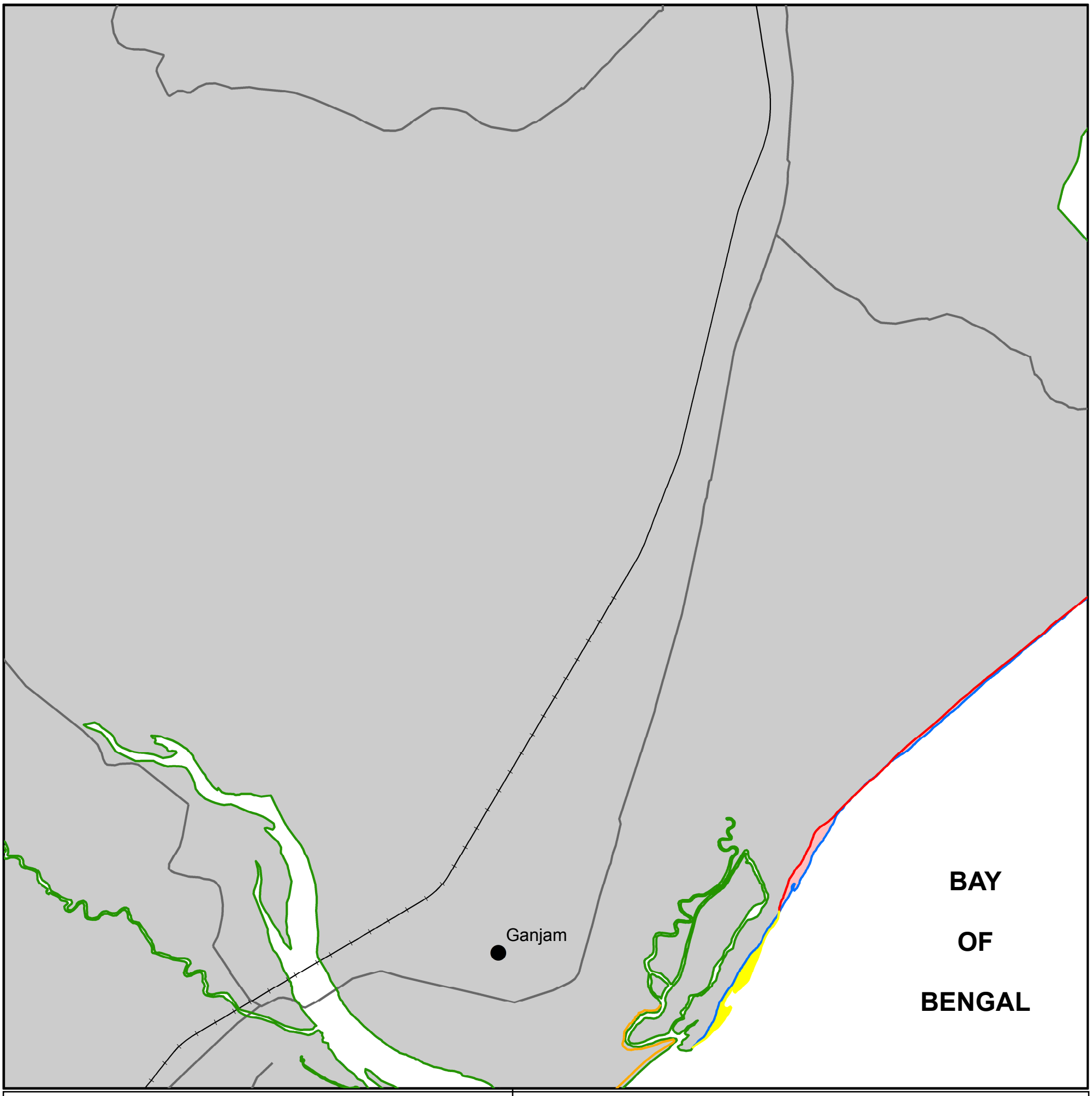
GANJAM DISTRICT

ODISHA

SHEET NO. 74E03NW



Legend

- EROSION
- ACCRETION
- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- ROAD
- RAILWAY
- SEA WALL
- HABITATION

N
W E
S

0 2 km

INDEX TO SHEETS

74A14SE	74E02SW	74E02SE
74A15NE	74E03NW	SEA
74A15SE	SEA	SEA

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

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SHORELINE CHANGE MAP

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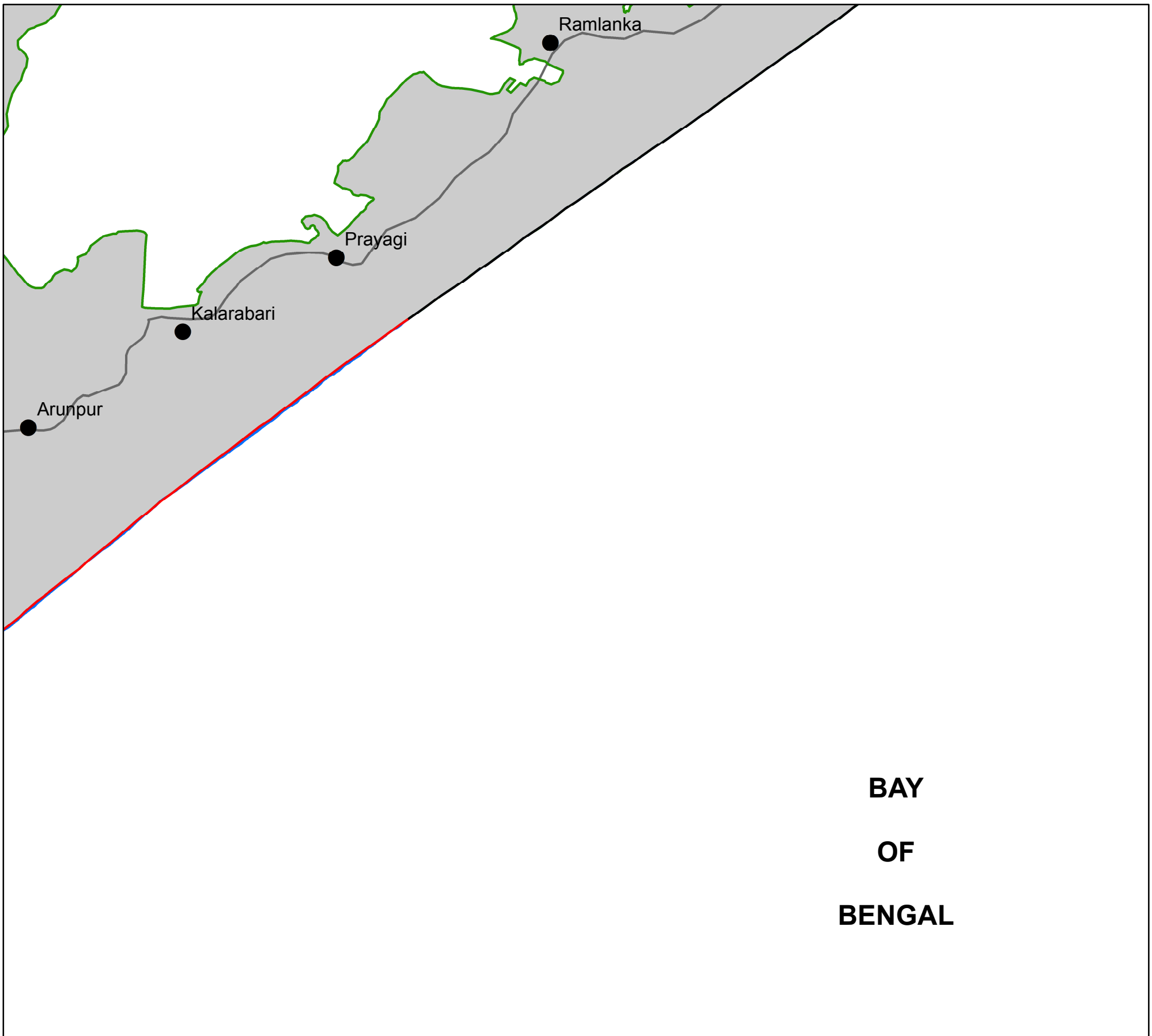
PURI/GANJAM DISTRICTS

ODISHA

SHEET NO. 74E03NE



Legend

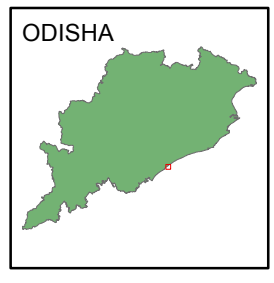
- EROSION
- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- ROAD
- HABITATION

N
W E
S

0 2 km

INDEX TO SHEETS

74E02SW	74E02SE	74E06SW
74E03NW	74E03NE	SEA
74E03SW	SEA	SEA



DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

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SHORELINE CHANGE MAP

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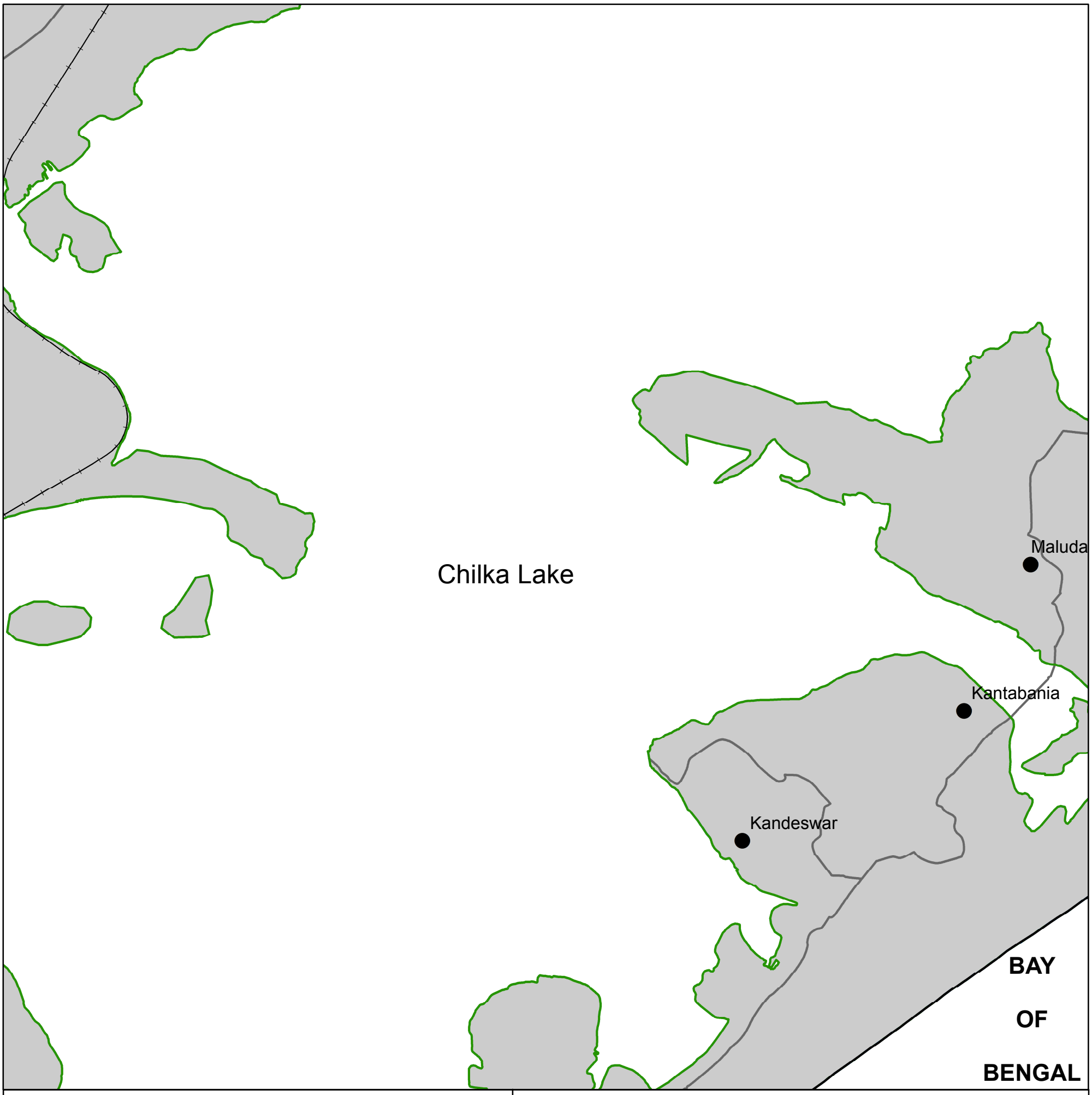
PURI/GANJAM DISTRICTS

ODISHA

SHEET NO. 74E02SE



Legend

- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- ROAD
- RAILWAY
- HABITATION

N
W E
S

0 2 km

INDEX TO SHEETS

74E02NW	74E02NE	74E06NW
74E02SW	74E02SE	74E06SW
74E03NW	74E03NE	SEA

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
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AND CENTRAL WATER COMMISSION, NEW DELHI

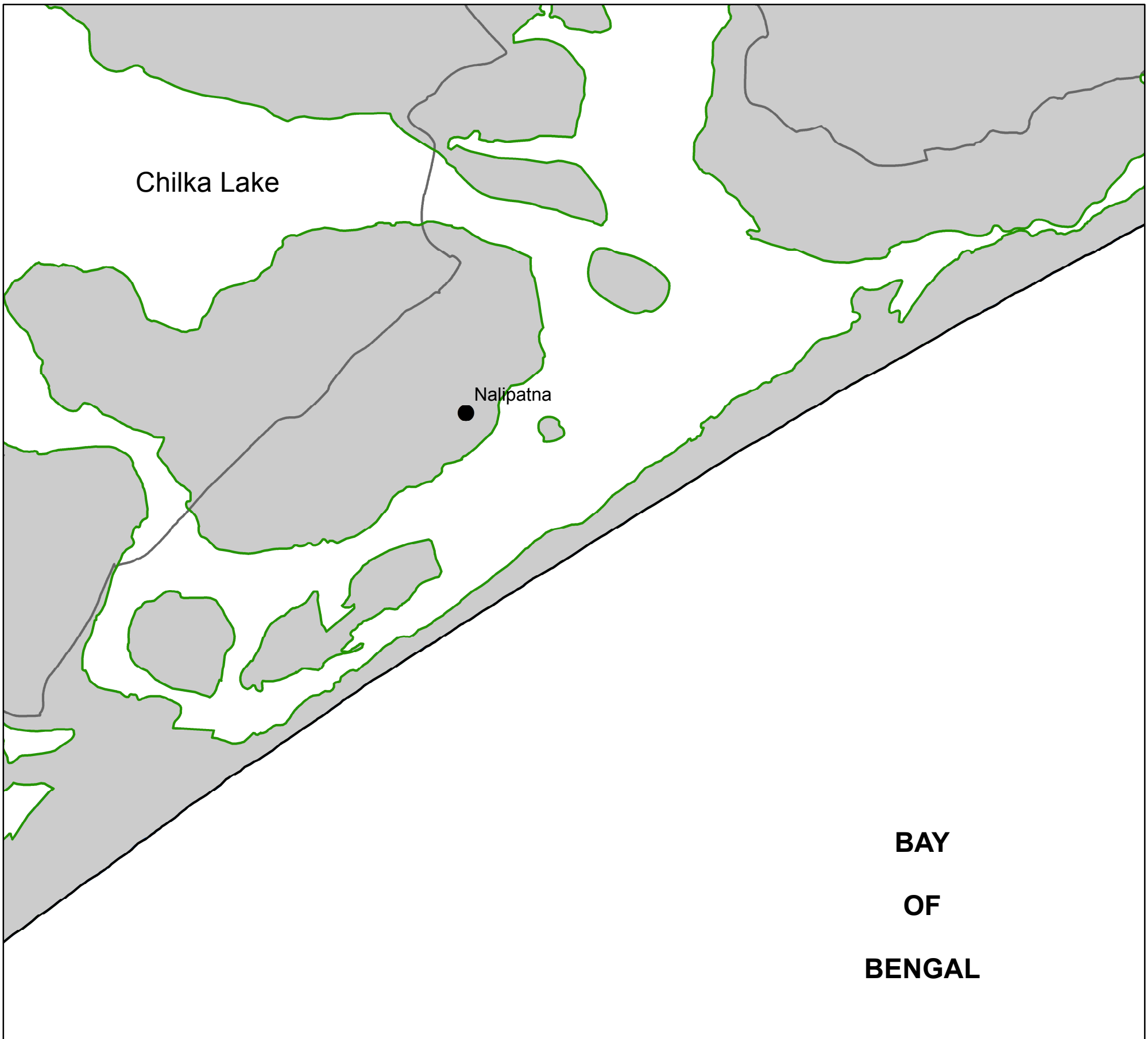
SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

PURI DISTRICT

ODISHA

SHEET NO. 74E06SW



Legend

- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- ROAD
- HABITATION

N
W E
S

0 2 km

INDEX TO SHEETS

74E02NE	74E06NW	74E06NE
74E02SE	74E06SW	74E06SE
74E03NE	SEA	SEA

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
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AND CENTRAL WATER COMMISSION, NEW DELHI

SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

PURI DISTRICT

ODISHA

SHEET NO. 74E06SE

Chilka Lake

BAY

OF

BENGAL

Legend

- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE

N
W E
S

0 2 km

INDEX TO SHEETS

74E06NW	74E06NE	74E10NW
74E06SW	74E06SE	SEA
SEA	SEA	SEA

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
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AND CENTRAL WATER COMMISSION, NEW DELHI

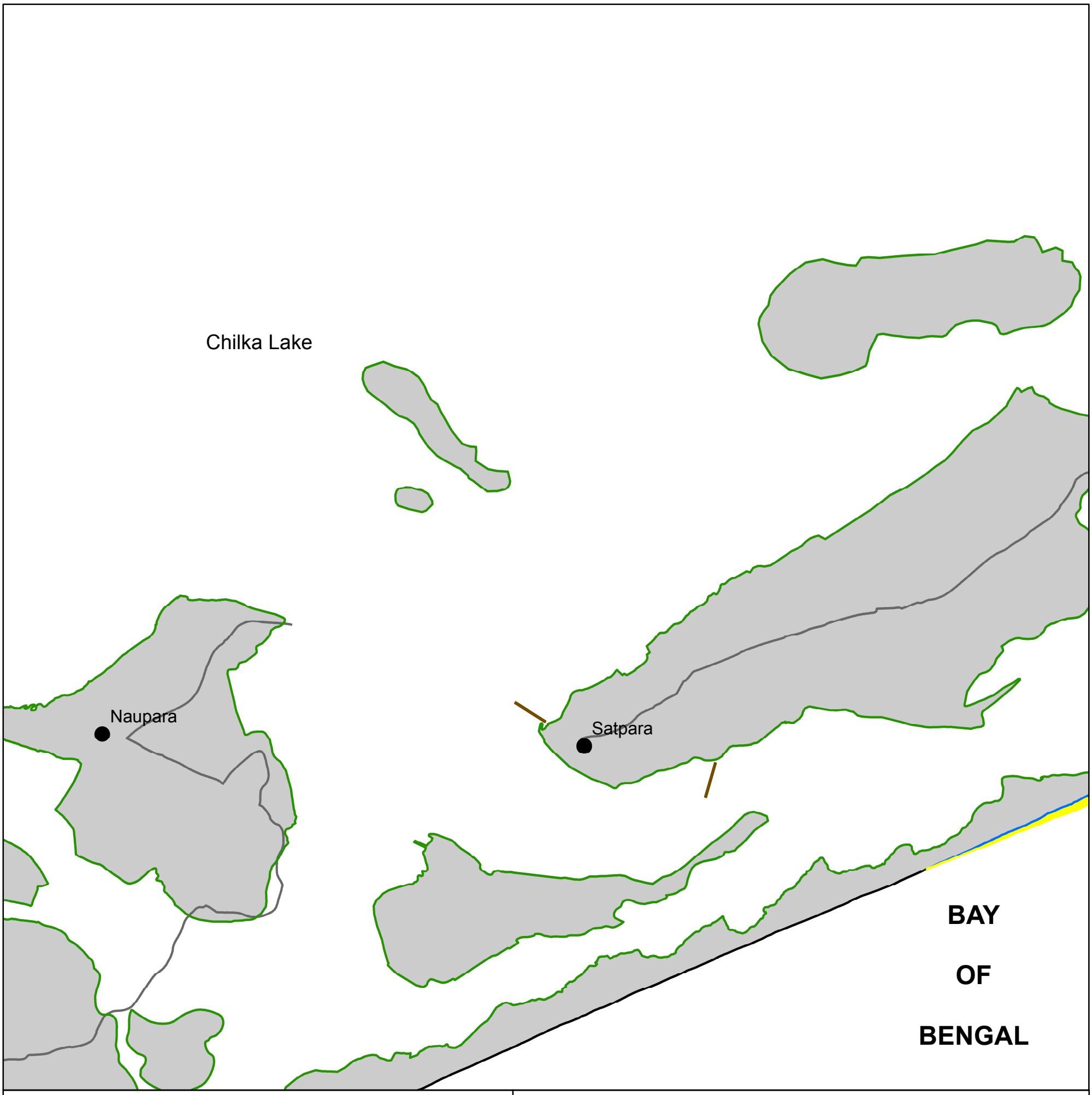
SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

PURI DISTRICT

ODISHA

SHEET NO. 74E06NE



Legend

- ACCRETION
- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- ROAD
- JETTY
- HABITATION

N
W E
S

0 2 km

INDEX TO SHEETS

74E05SW	74E05SE	74E09SW
74E06NW	74E06NE	74E10NW
74E06SW	74E06SE	SEA

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
SPACE APPLICATIONS CENTRE, ISRO, AHMEDABAD
AND CENTRAL WATER COMMISSION, NEW DELHI

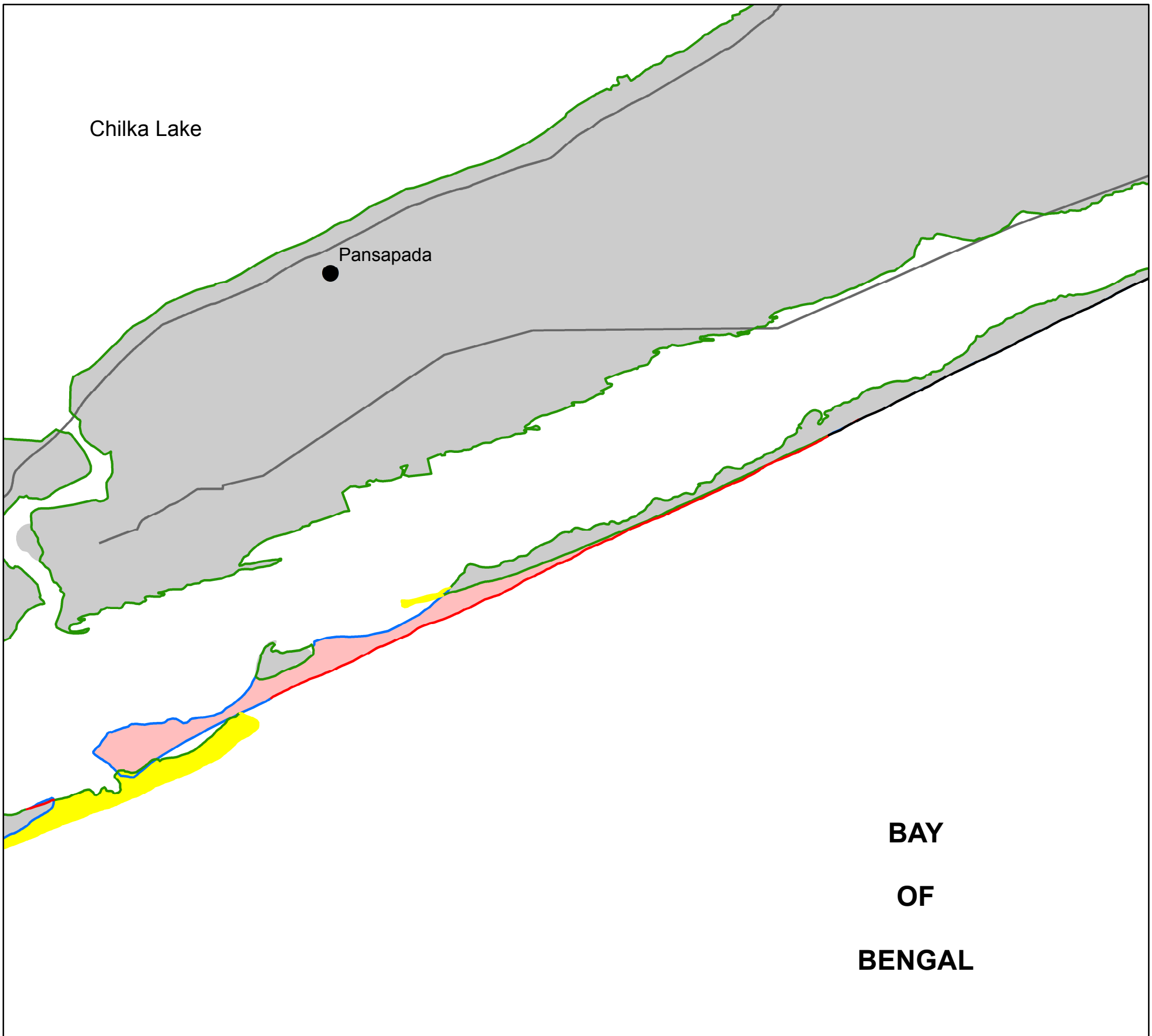
SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

PURI DISTRICT

ODISHA

SHEET NO. 74E10NW



Legend

- EROSION
- ACCRETION
- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- ROAD
- HABITATION

N
W E
S

0 2 km

INDEX TO SHEETS

74E05SE	74E09SW	74E09SE
74E06NE	74E10NW	74E10NE
74E06SE	SEA	SEA

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
SPACE APPLICATIONS CENTRE, ISRO, AHMEDABAD
AND CENTRAL WATER COMMISSION, NEW DELHI

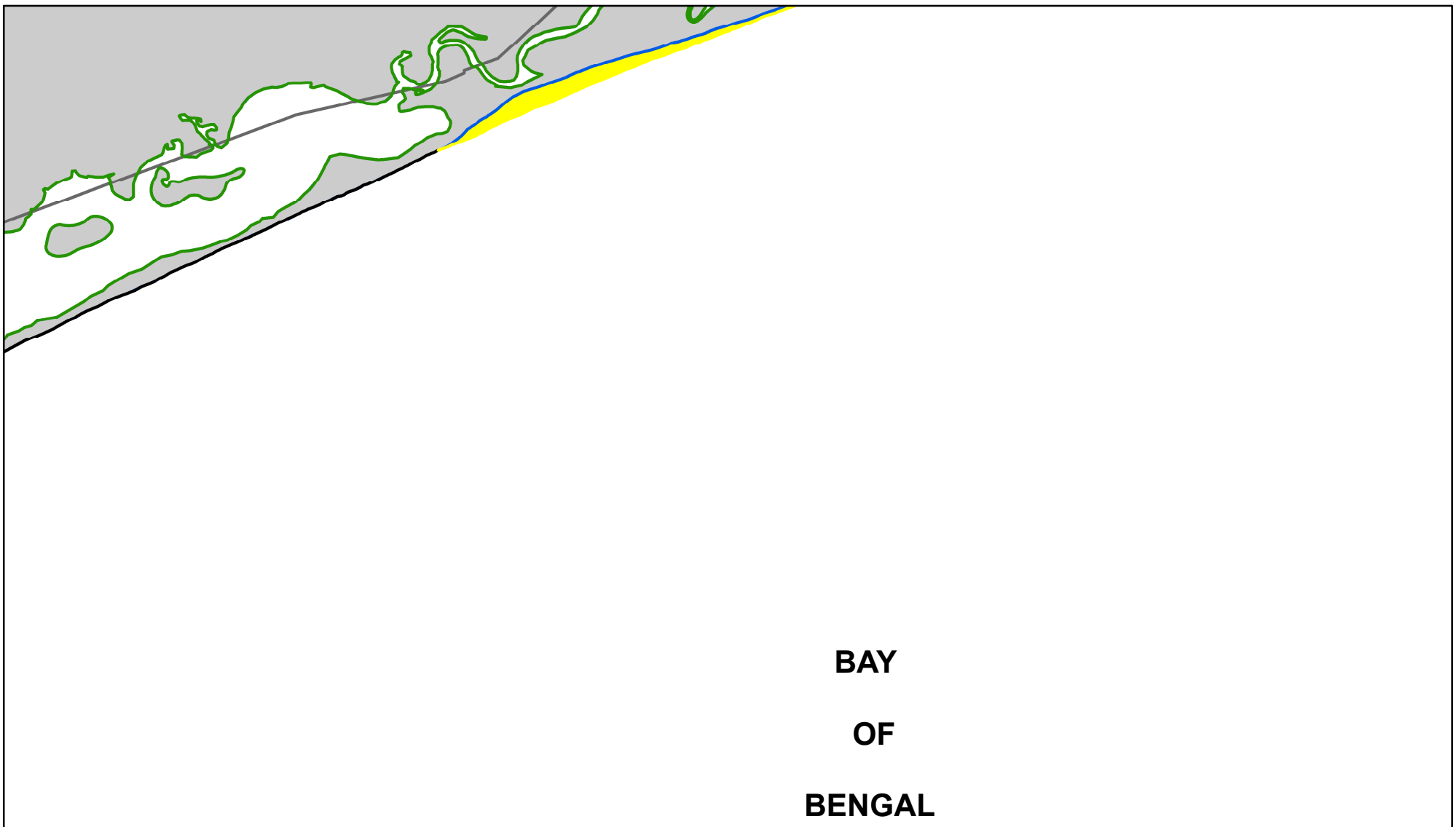
SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

PURI DISTRICT

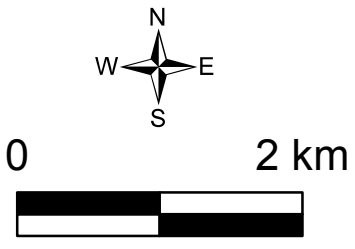
ODISHA

SHEET NO. 74E10NE



Legend

- ACCRETION
- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- ROAD



INDEX TO SHEETS

74E09SW	74E09SE	74E13SW
74E10NW	74E10NE	74E14NW
74E10SW	74E10SE	74E14SW

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

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AND CENTRAL WATER COMMISSION, NEW DELHI

SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

PURI DISTRICT

ODISHA

SHEET NO. 74E09SE

Brahmagirl

Halia

Rendhagarh

BAY
OF
BENGAL

Legend

- ACCRETION
- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- ROAD
- HABITATION

N
W E
S

0 2 km

INDEX TO SHEETS

74E09NW	74E09NE	74E13NW
74E09SW	74E09SE	74E13SW
74E10NW	74E10NE	74E14NW

INDIA

ODISHA

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
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AND CENTRAL WATER COMMISSION, NEW DELHI

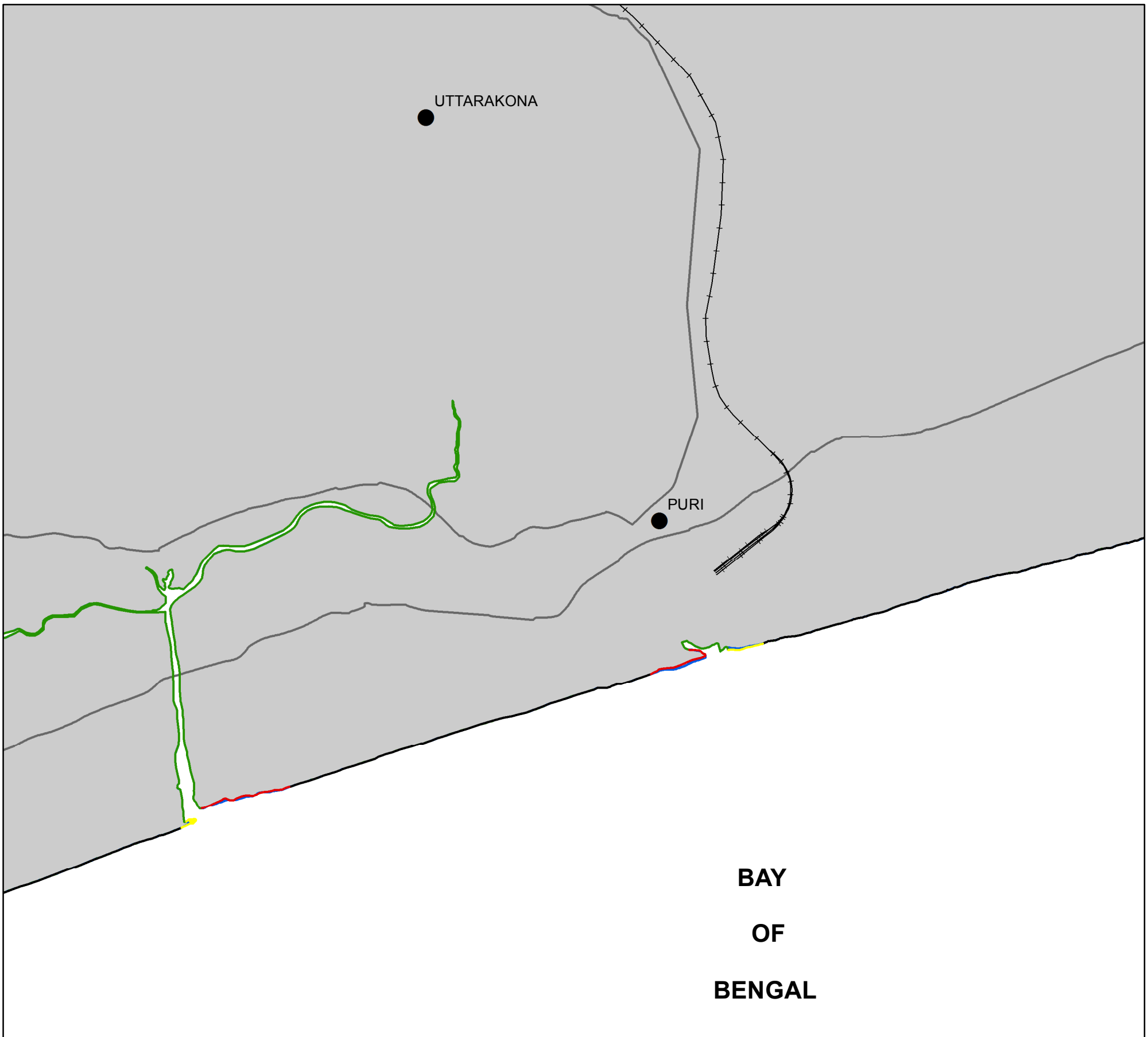
SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

PURI DISTRICT

ODISHA

SHEET NO. 74E13SW



Legend

- EROSION
- ACCRETION
- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- ROAD
- RAILWAY
- HABITATION

N
W E
S

0 2 km

INDEX TO SHEETS

74E09NE	74E13NW	74E13NE
74E09SE	74E13SW	74E13SE
74E10NE	74E14NW	74E14NE

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
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AND CENTRAL WATER COMMISSION, NEW DELHI

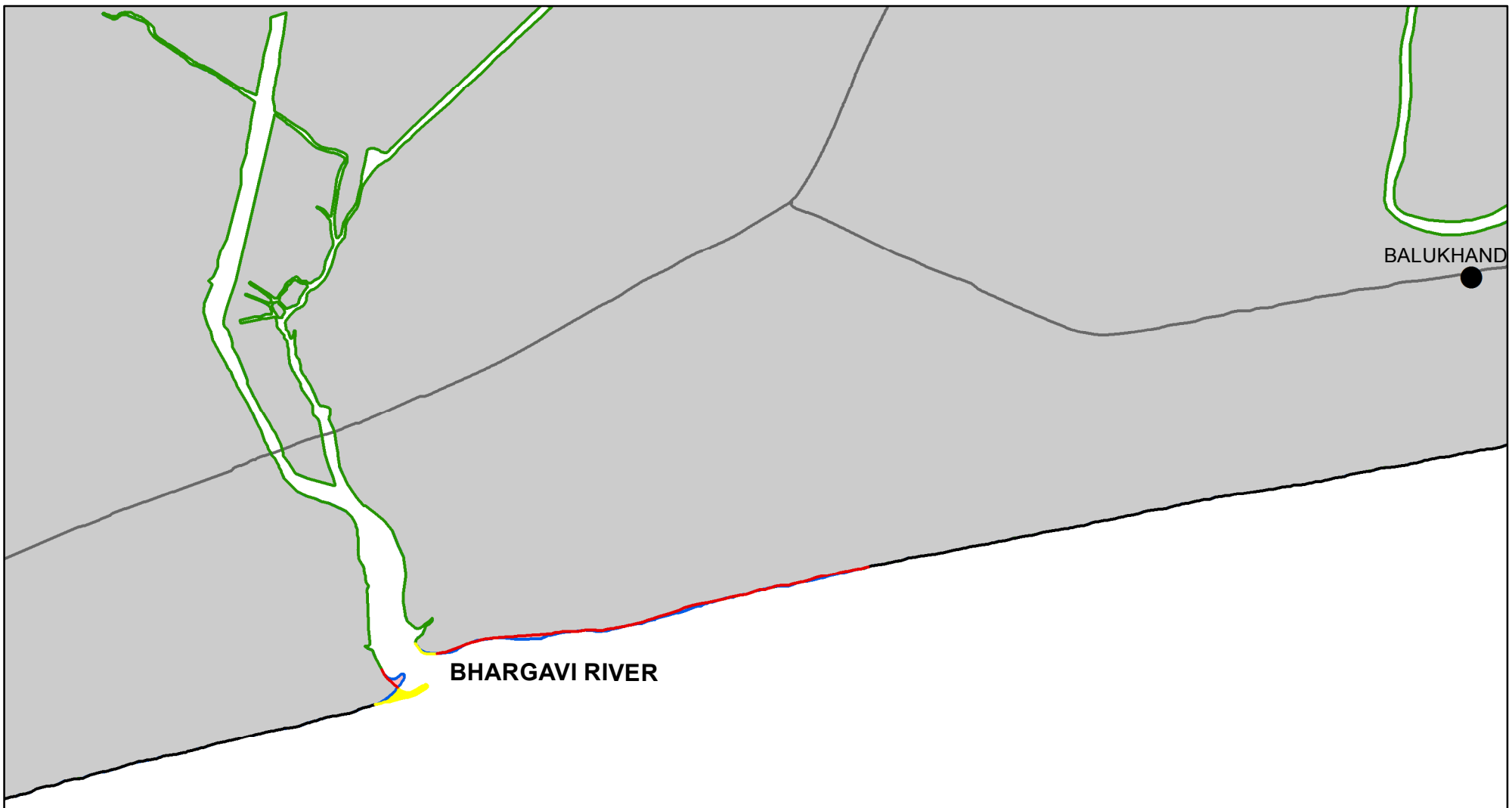
SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

PURI DISTRICT

ODISHA

SHEET NO. 74E13SE



Legend

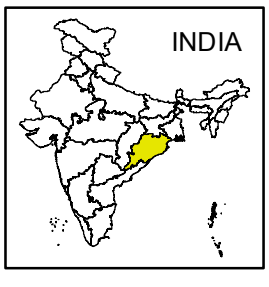
- EROSION
- ACCRETION
- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- ROAD
- HABITATION

N
W E
S

0 2 km

INDEX TO SHEETS

74E13NW	74E13NE	74I01NW
74E13SW	74E13SE	74I01SW
74E14NW	74E14NE	74I02NW



DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
SPACE APPLICATIONS CENTRE, ISRO, AHMEDABAD
AND CENTRAL WATER COMMISSION, NEW DELHI

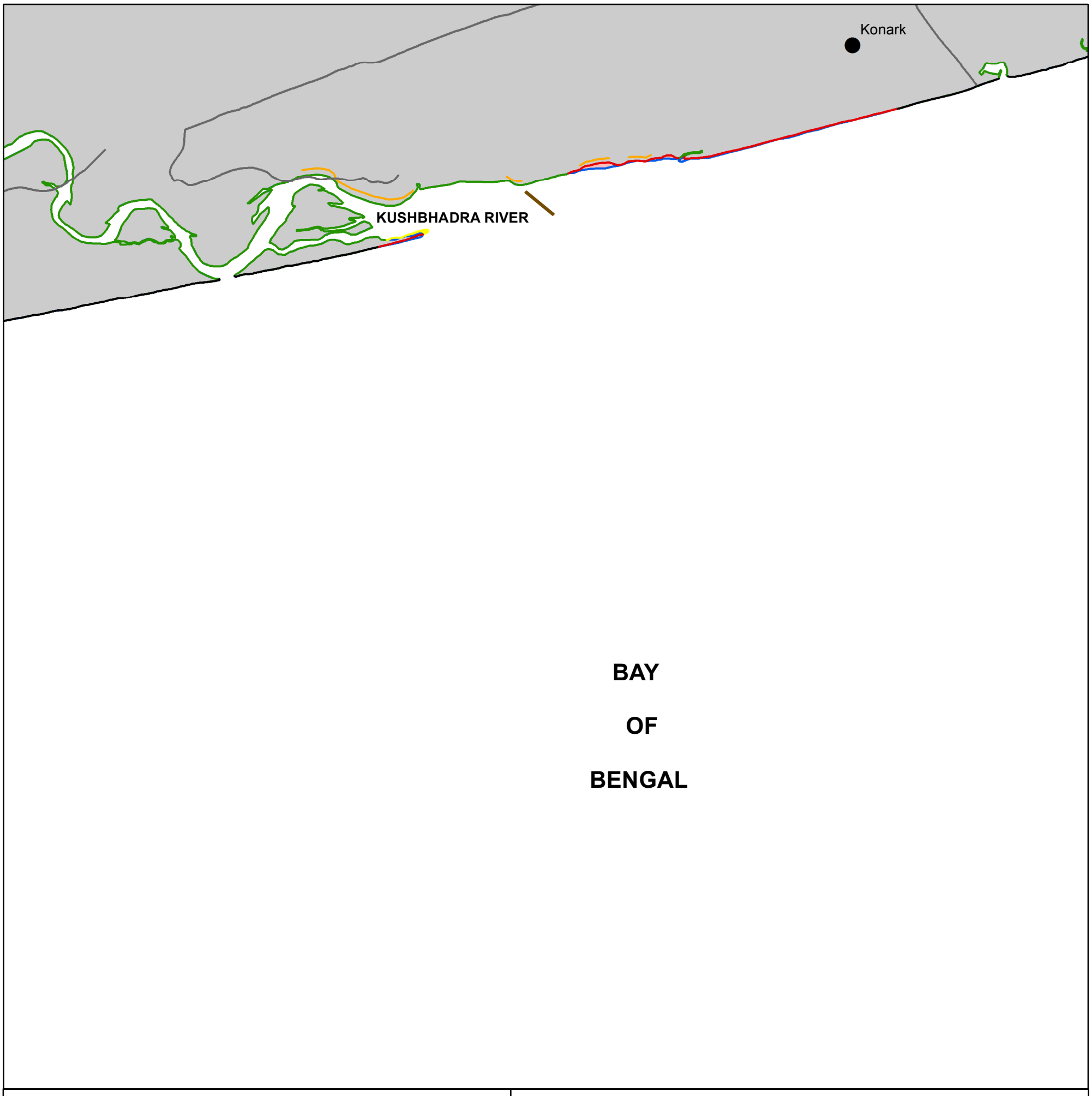
SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

PURI DISTRICT

ODISHA

SHEET NO. 74I01SW



Legend

- EROSION
- ACCRETION
- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- ROAD
- SEA WALL
- JETTY

N
W E
S

0 2 km

INDEX TO SHEETS

74E13NE	74I01NW	74I01NE
74E13SE	74I01SW	74I01SE
74E14NE	74I02NW	74I02NE

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
SPACE APPLICATIONS CENTRE, ISRO, AHMEDABAD
AND CENTRAL WATER COMMISSION, NEW DELHI

SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

PURI DISTRICT

ODISHA

SHEET NO. 74I01SE

BAY

OF

BENGAL

Legend

EROSION

HIGH-TIDE LINE 2014-16

HIGH-TIDE LINE 2004-06

STABLE

N

W E

S

0 2 km

INDEX TO SHEETS

74I01NW	74I01NE	74I05NW
74I01SW	74I01SE	74I05SW
74I02NW	74I02NE	74I06NW

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

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AND CENTRAL WATER COMMISSION, NEW DELHI

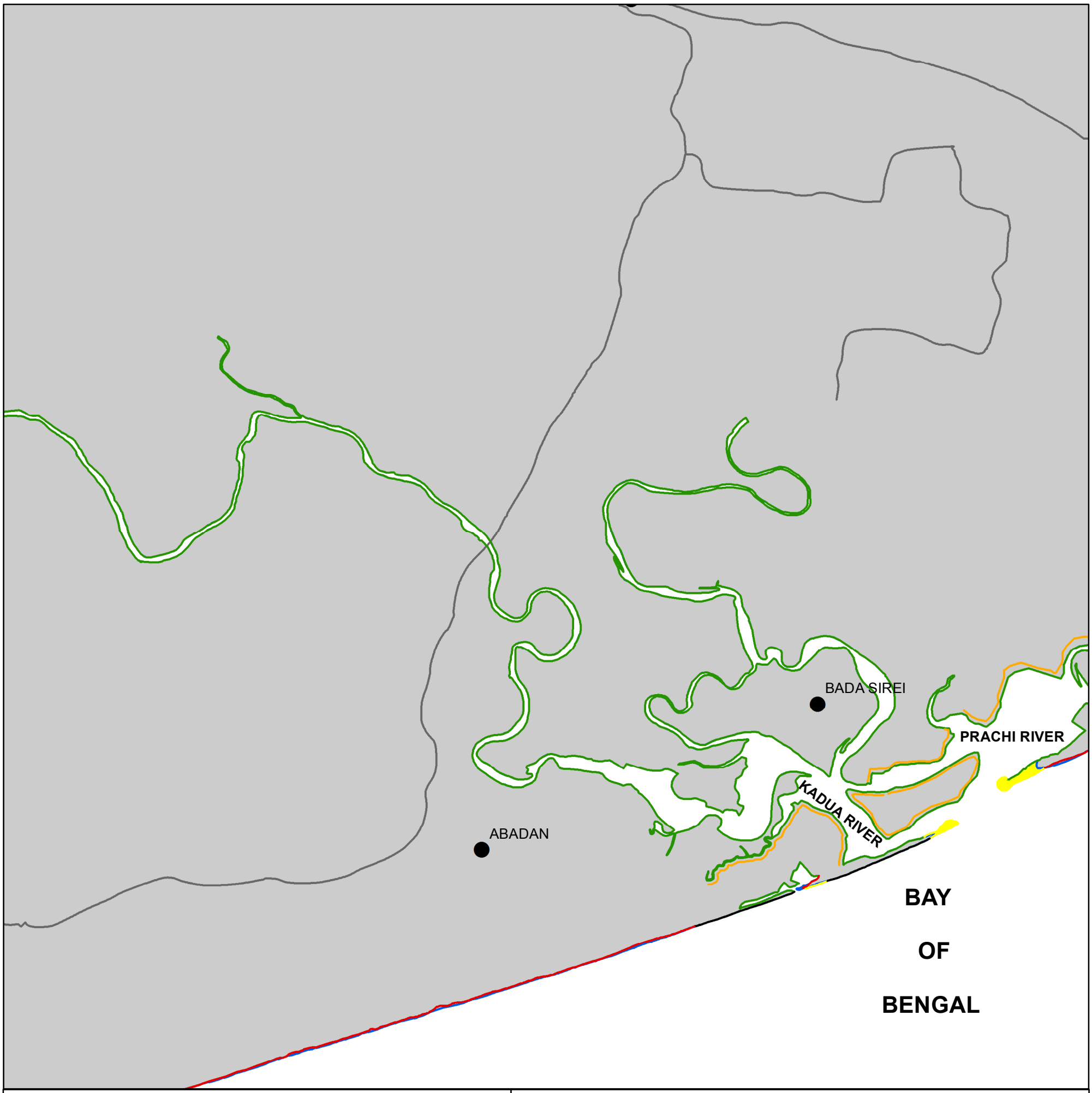
SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

PURI DISTRICT

ODISHA

SHEET NO. 74I01NE



Legend

- EROSION
- ACCRETION
- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- ROAD
- SEA WALL
- HABITATION

N
W E
S

0 2 km

INDEX TO SHEETS

73L04SW	73L04SE	73L08SW
74I01NW	74I01NE	74I05NW
74I01SW	74I01SE	74I05SW

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
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AND CENTRAL WATER COMMISSION, NEW DELHI

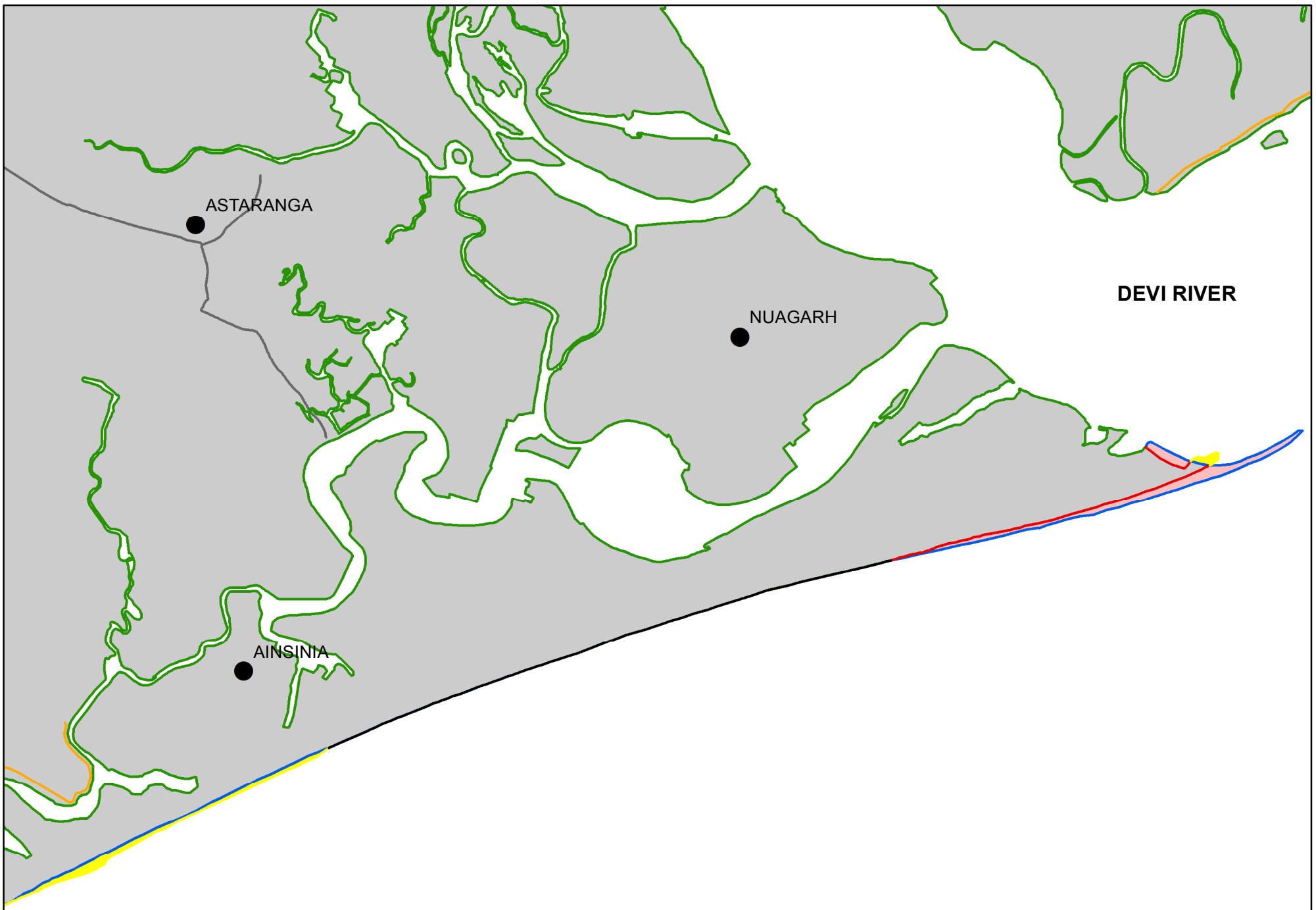
SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

PURI/CUTTACK DISTRICT

ODISHA

SHEET NO. 74I05NW



Legend

- EROSION
- ACCRETION
- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- ROAD
- SEA WALL
- HABITATION

N
W E
S

0 2 km

INDEX TO SHEETS

73L04SE	73L08SW	73L08SE
74I01NE	74I05NW	74I05NE
74I01SE	74I05SW	74I05SE

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
SPACE APPLICATIONS CENTRE, ISRO, AHMEDABAD
AND CENTRAL WATER COMMISSION, NEW DELHI

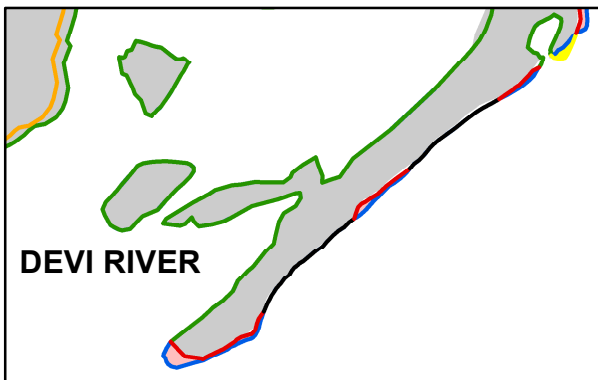
SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

PURI/CUTTACK DISTRICT

ODISHA

SHEET NO. 74I05NE



BAY

OF

BENGAL

Legend

- EROSION
- ACCRETION
- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- SEA WALL

N
W E
S

0 2 km

INDEX TO SHEETS

73L08SW	73L08SE	73L12SW
74I05NW	74I05NE	74I09NW
74I05SW	74I05SE	74I09SW

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
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AND CENTRAL WATER COMMISSION, NEW DELHI

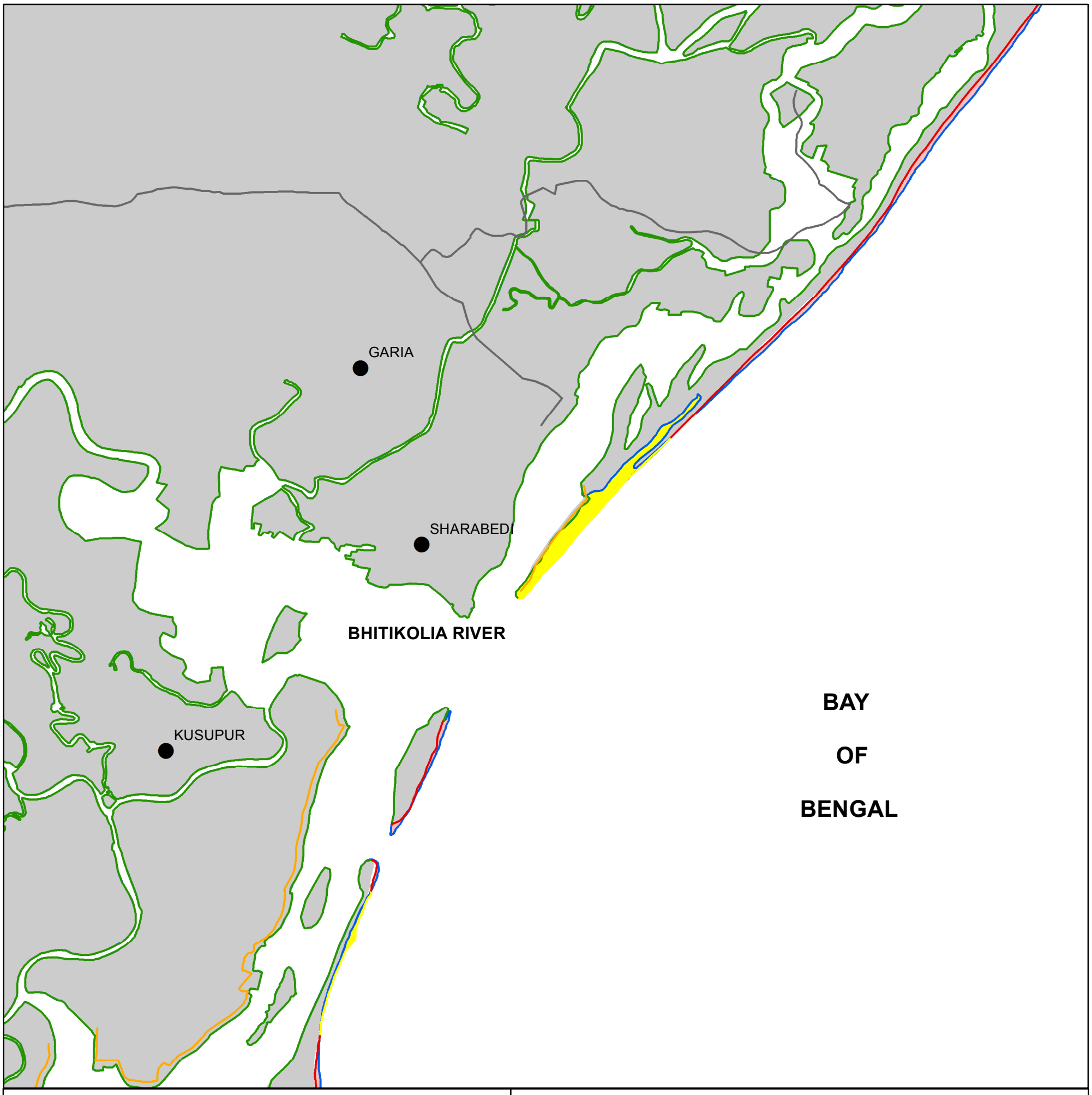
SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

CUTTACK DISTRICT

ODISHA

SHEET NO. 73L08SE



Legend

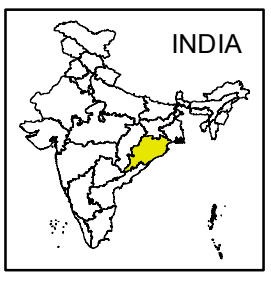
- EROSION
- ACCRETION
- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- ROAD
- SEA WALL
- HABITATION

N
W E
S

0 2 km

INDEX TO SHEETS

73L08NW	73L08NE	73L12NW
73L08SW	73L08SE	73L12SW
74I05NW	74I05NE	74I09NW



DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
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AND CENTRAL WATER COMMISSION, NEW DELHI

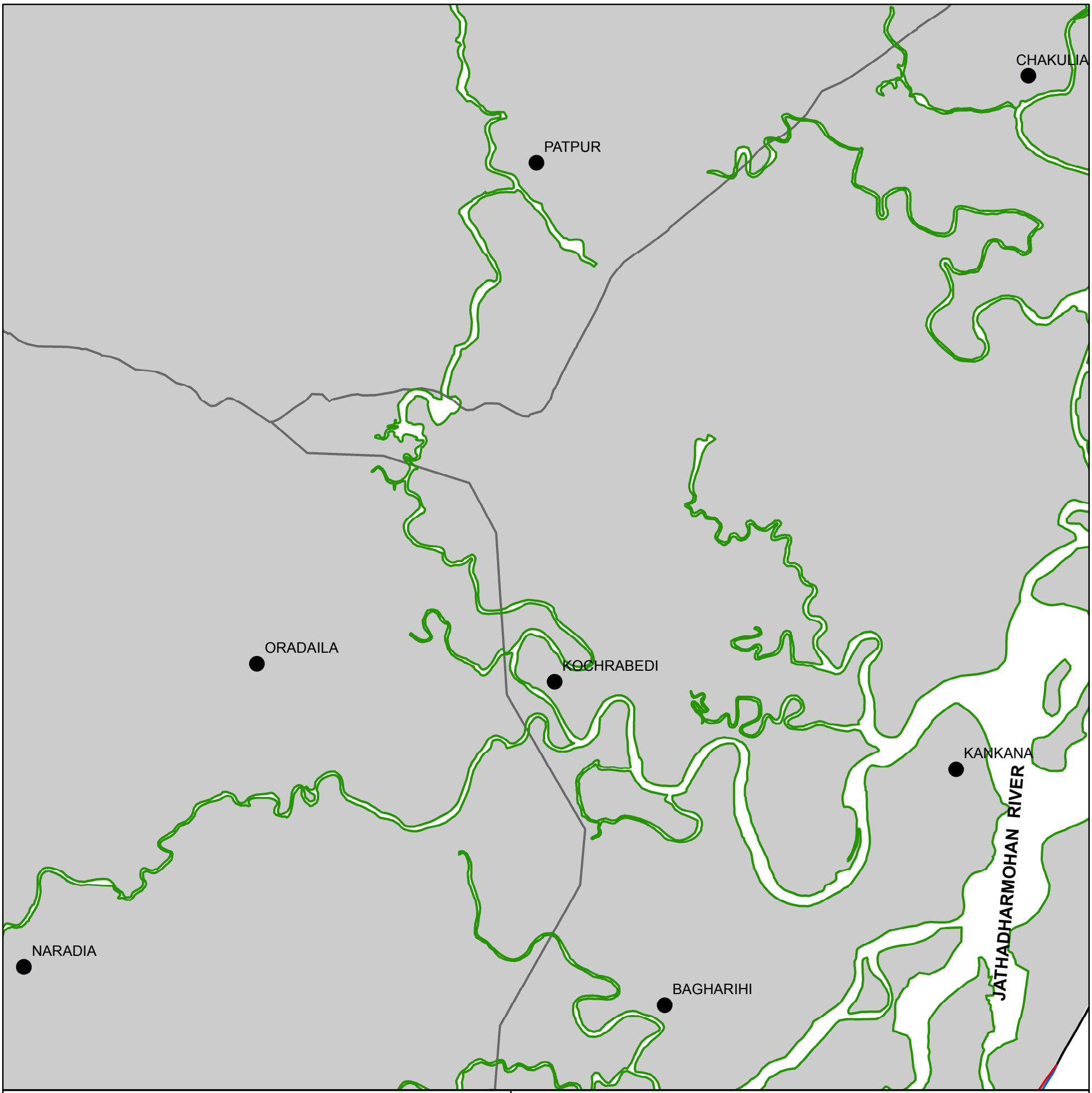
SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

CUTTACK DISTRICT

ODISHA

SHEET NO. 73L08NE



Legend

- EROSION
- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- ROAD
- HABITATION

N
W E
S

0 2 km

INDEX TO SHEETS

73L07SW	73L07SE	73L11SW
73L08NW	73L08NE	73L12NW
73L08SW	73L08SE	73L12SW

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

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AND CENTRAL WATER COMMISSION, NEW DELHI

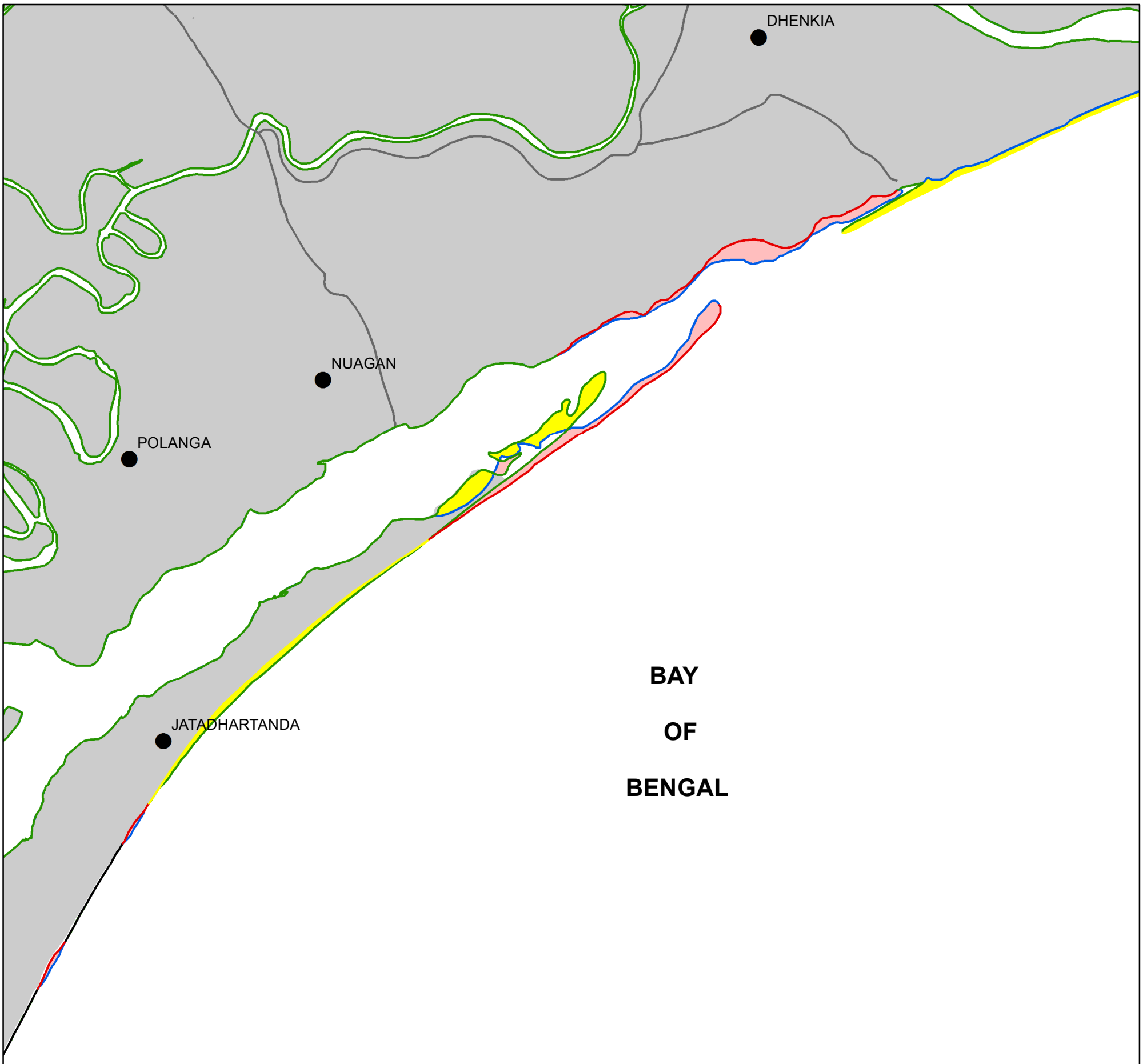
SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

CUTTACK DISTRICT

ODISHA

SHEET NO. 73L12NW



Legend

- EROSION
- ACCRETION
- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- ROAD
- HABITATION

N
W E
S

0 2 km

INDEX TO SHEETS

73L07SE	73L11SW	73L11SE
73L08NE	73L12NW	73L12NE
73L08SE	73L12SW	73L12SE

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
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AND CENTRAL WATER COMMISSION, NEW DELHI

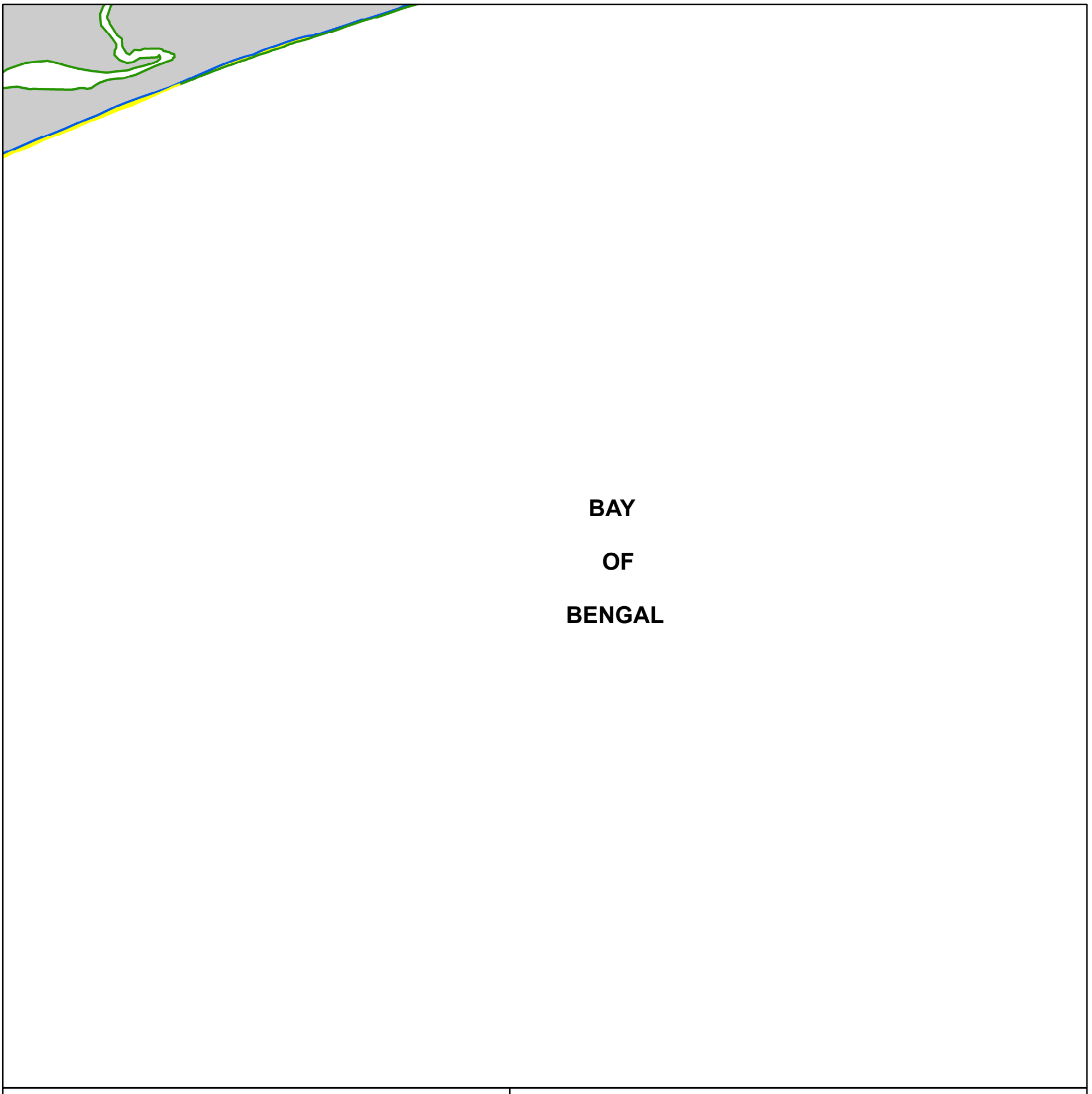
SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

CUTTACK DISTRICT

ODISHA

SHEET NO. 73L12NE



Legend

ACCRETION

HIGH-TIDE LINE 2014-16

HIGH-TIDE LINE 2004-06

N
W E
S

0 2 km

INDEX TO SHEETS

73L11SW	73L11SE	73L15SW
73L12NW	73L12NE	73L16NW
73L12SW	73L12SE	73L16SW

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
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AND CENTRAL WATER COMMISSION, NEW DELHI

SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

CUTTACK DISTRICT

ODISHA

SHEET NO. 73L11SE

BAHUKUD

AGNASHI

MAHANADI RIVER

PARADIP

BAY

OF

BENGAL

Legend

- EROSION
- ACCRETION
- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- ROAD
- RAILWAY
- SEA WALL
- BREAKWATER
- JETTY
- PORT/HARBOUR
- HABITATION

N

W E

S

0 2 km

INDEX TO SHEETS

73L11NW	73L11NE	73L15NW
73L11SW	73L11SE	73L15SW
73L12NW	73L12NE	SEA

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
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AND CENTRAL WATER COMMISSION, NEW DELHI

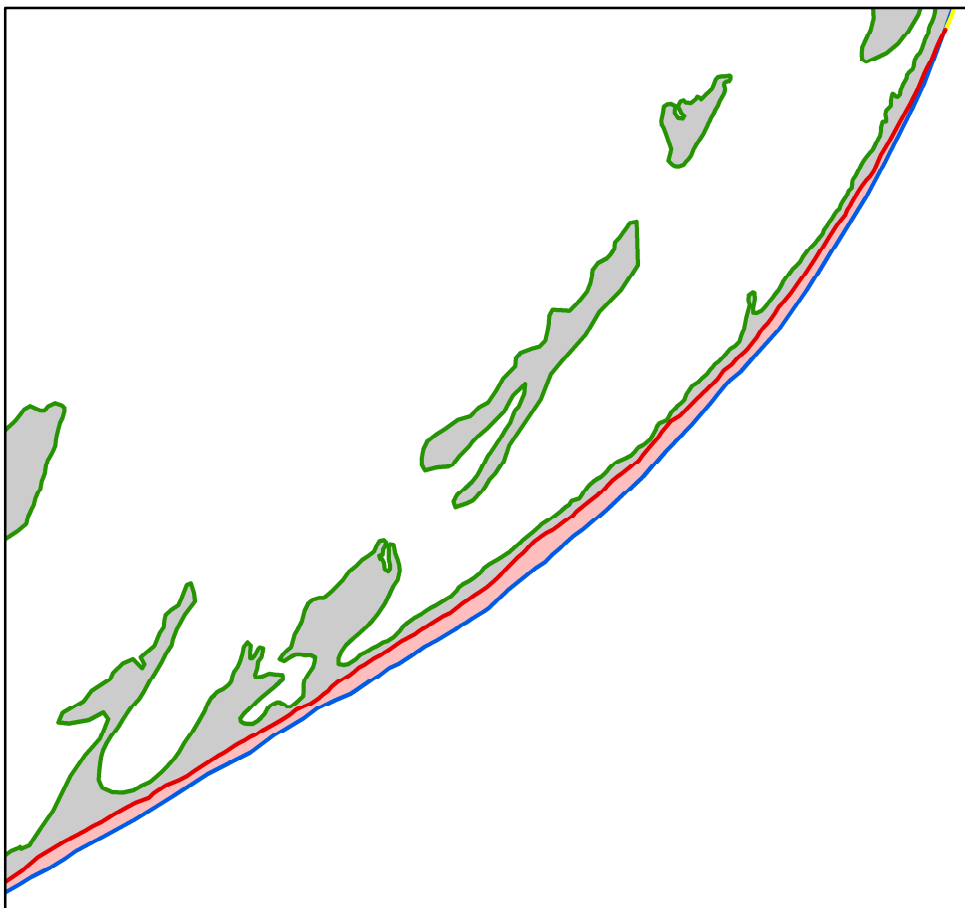
SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

CUTTACK DISTRICT

ODISHA

SHEET NO. 73L15SW



BAY

OF

BENGAL

Legend

EROSION

ACCRETION

HIGH-TIDE LINE 2014-16

HIGH-TIDE LINE 2004-06

N

W E

S

0 2 km

INDEX TO SHEETS

73L11NE	73L15NW	73L15NE
73L11SE	73L15SW	73L15SE
73L12NE	73L16NW	73L16NE

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
SPACE APPLICATIONS CENTRE, ISRO, AHMEDABAD
AND CENTRAL WATER COMMISSION, NEW DELHI

SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

CUTTACK DISTRICT

ODISHA

SHEET NO. 73L15NW

BAY

OF

BENGAL

Legend

- EROSION
- ACCRETION
- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE

N
W E
S

0 2 km

INDEX TO SHEETS

73L10SE	73L14SW	73L14SE
73L11NE	73L15NW	73L15NE
73L11SE	73L15SW	73L15SE

INDIA

ODISHA

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
SPACE APPLICATIONS CENTRE, ISRO, AHMEDABAD
AND CENTRAL WATER COMMISSION, NEW DELHI

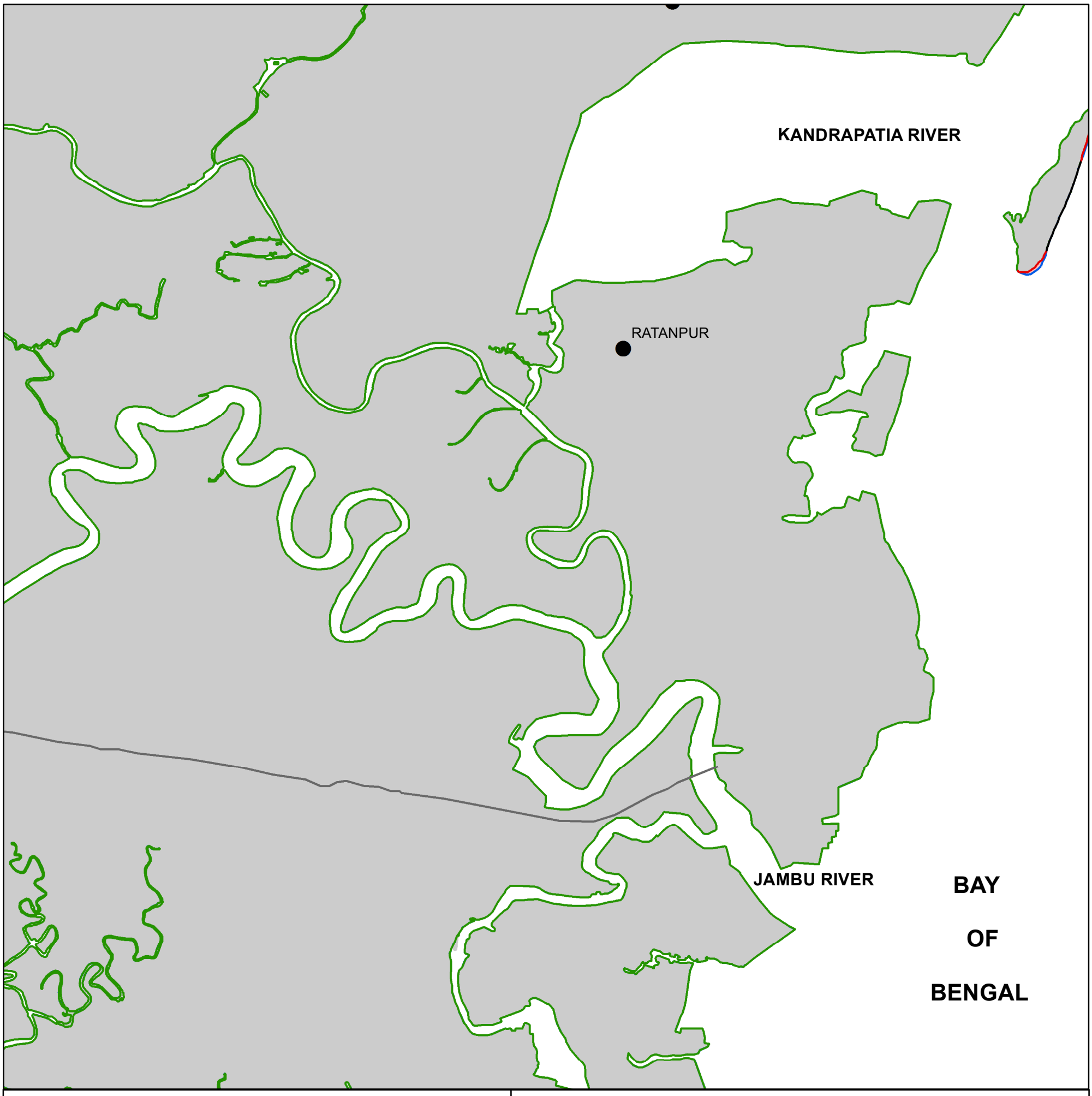
SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

CUTTACK DISTRICT

ODISHA

SHEET NO. 73L11NE



Legend

- EROSION
- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- ROAD
- HABITATION

N
W E
S

0 2 km

INDEX TO SHEETS

73L10SW	73L10SE	73L14SW
73L11NW	73L11NE	73L15NW
73L11SW	73L11SE	73L15SW

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
SPACE APPLICATIONS CENTRE, ISRO, AHMEDABAD
AND CENTRAL WATER COMMISSION, NEW DELHI

SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

CUTTACK DISTRICT

ODISHA

SHEET NO. 73L14SW

HANSURA RIVER

BAY

OF

BENGAL

Legend

- EROSION
- ACCRETION
- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- ROAD
- SEA WALL
- HABITATION

N

W E

S

0 2 km

INDEX TO SHEETS

73L10NE	73L14NW	73L14NE
73L10SE	73L14SW	73L14SE
73L11NE	73L15NW	73L15NE

INDIA

ODISHA

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
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AND CENTRAL WATER COMMISSION, NEW DELHI

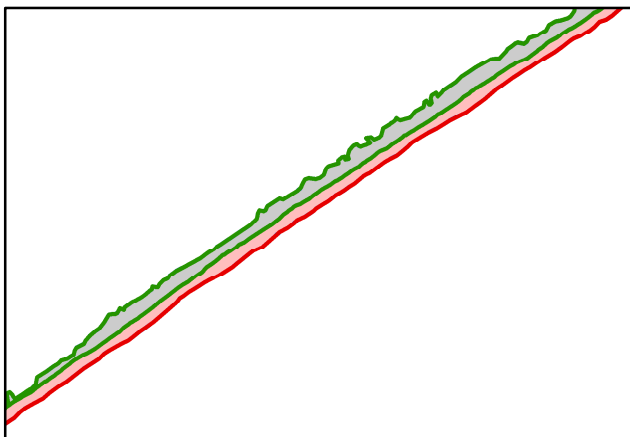
SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

CUTTACK DISTRICT

ODISHA

SHEET NO. 73L14SE



BAY

OF

BENGAL

Legend

EROSION

HIGH-TIDE LINE 2014-16

HIGH-TIDE LINE 2004-06

N

W E

S

0 2 km

INDEX TO SHEETS

73L14NW	73L14NE	73P02NW
73L14SW	73L14SE	73P02SW
73L15NW	73L15NE	73P03NW

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
SPACE APPLICATIONS CENTRE, ISRO, AHMEDABAD
AND CENTRAL WATER COMMISSION, NEW DELHI

SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

CUTTACK DISTRICT

ODISHA

SHEET NO. 73L14NE

MAIPURA RIVER

BAY

OF

BENGAL

Legend

- EROSION
- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- ROAD
- HABITATION

N

W E

S

0 2 km

INDEX TO SHEETS

73L13SW	73L13SE	73P01SW
73L14NW	73L14NE	73P02NW
73L14SW	73L14SE	73P02SW

INDIA

ODISHA

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
SPACE APPLICATIONS CENTRE, ISRO, AHMEDABAD
AND CENTRAL WATER COMMISSION, NEW DELHI

SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

CUTTACK DISTRICT

ODISHA

SHEET NO. 73P02NW

BAY

OF

BENGAL

Legend

EROSION

ACCRETION

HIGH-TIDE LINE 2014-16

HIGH-TIDE LINE 2004-06

N

W E

S

0 2 km

INDEX TO SHEETS

73L13SE	73P01SW	73P01SE
73L14NE	73P02NW	73P02NE
73L14SE	73P02SW	73P02SE

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
SPACE APPLICATIONS CENTRE, ISRO, AHMEDABAD
AND CENTRAL WATER COMMISSION, NEW DELHI

SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

BALESHWAR/CUTTACK DISTRICTS **ODISHA** SHEET NO. 73L13SE

KAITHKOLA

DHAMRA

BAY OF BENGAL

DHAMRA RIVER

Legend

- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- ROAD
- RAILWAY
- JETTY
- PORT/HARBOUR
- HABITATION

N W E S

0 2 km

INDEX TO SHEETS

73L13NW	73L13NE	SEA
73L13SW	73L13SE	73P01SW
73L14NW	73L14NE	73P02NW

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
SPACE APPLICATIONS CENTRE, ISRO, AHMEDABAD
AND CENTRAL WATER COMMISSION, NEW DELHI

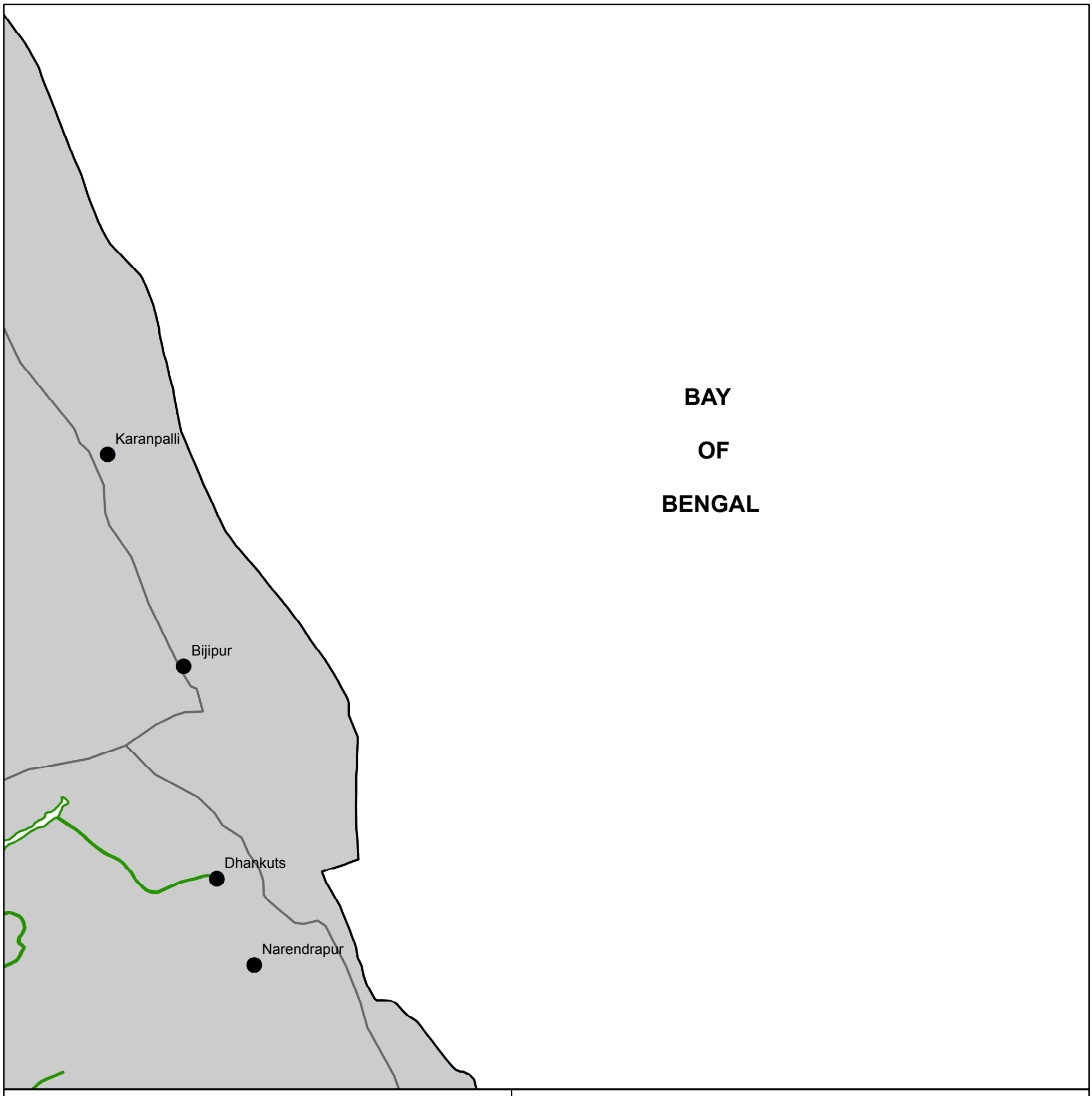
SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

CUTTACK DISTRICT

ODISHA

SHEET NO. 73L13NE



Legend

- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- ROAD
- HABITATION

N
W E
S

0 2 km

INDEX TO SHEETS

73K16SW	73K16SE	73O04SW
73L13NW	73L13NE	SEA
73L13SW	73L13SE	73P01SW

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
SPACE APPLICATIONS CENTRE, ISRO, AHMEDABAD
AND CENTRAL WATER COMMISSION, NEW DELHI

014-16

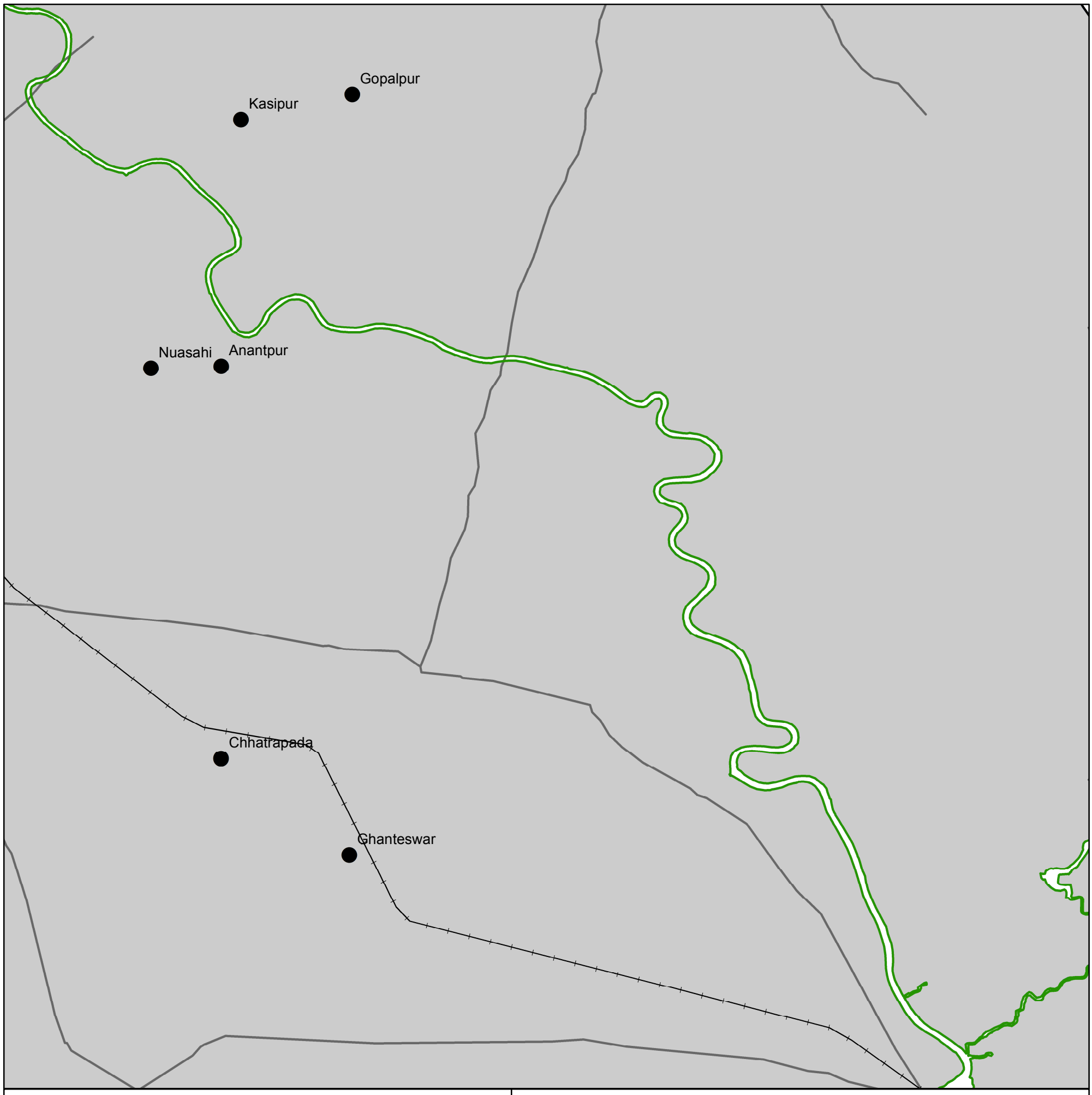
SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

BALESWAR DISTRICT

ODISHA

SHEET NO. 73L13NW



Legend

- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- ROAD
- RAILWAY
- HABITATION

N
W E
S

0 2 km

INDEX TO SHEETS

73K12SE	73K16SW	73K16SE
73L09NE	73L13NW	73L13NE
73L09SE	73L13SW	73L13SE

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
SPACE APPLICATIONS CENTRE, ISRO, AHMEDABAD
AND CENTRAL WATER COMMISSION, NEW DELHI

SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

BALESWAR DISTRICT

ODISHA

SHEET NO. 73K16SW

Legend

- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- ROAD
- HABITATION

N
W E
S

0 2 km

INDEX TO SHEETS

73K12NE	73K16NW	73K16NE
73K12SE	73K16SW	73K16SE
73L09NE	73L13NW	73L13NE

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
SPACE APPLICATIONS CENTRE, ISRO, AHMEDABAD
AND CENTRAL WATER COMMISSION, NEW DELHI

SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

BALESWAR DISTRICT

ODISHA

SHEET NO. 73K16NW

Legend

- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- ROAD
- HABITATION

N
W E
S

0 2 km

INDEX TO SHEETS

73K11SE	73K15SW	73K15SE
73K12NE	73K16NW	73K16NE
73K12SE	73K16SW	73K16SE

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
SPACE APPLICATIONS CENTRE, ISRO, AHMEDABAD
AND CENTRAL WATER COMMISSION, NEW DELHI

SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

BALESWAR DISTRICT

ODISHA

SHEET NO. 73K15SW

BAHANAGA

GOPALPUR

RUPKHAND

BAY OF BENGAL

Legend

- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- ROAD
- RAILWAY
- HABITATION

N W E S

0 2 km

INDEX TO SHEETS

73K11NE	73K15NW	73K15NE
73K11SE	73K15SW	73K15SE
73K12NE	73K16NW	73K16NE

INDIA

ODISHA

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
SPACE APPLICATIONS CENTRE, ISRO, AHMEDABAD
AND CENTRAL WATER COMMISSION, NEW DELHI

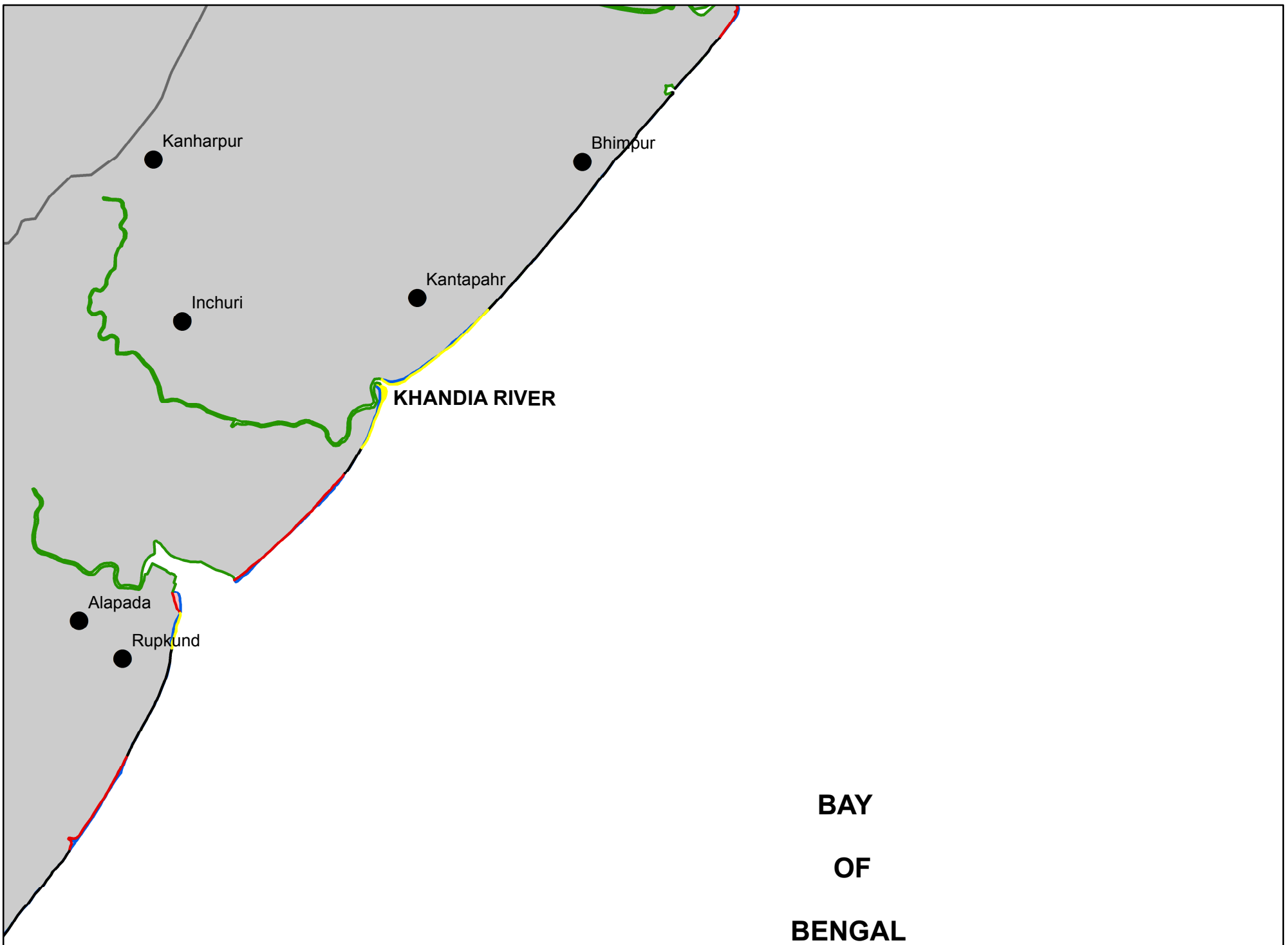
SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

BALESWAR DISTRICT

ODISHA

SHEET NO. 73K15SE



Legend

- EROSION
- ACCRETION
- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- ROAD
- HABITATION

N
W E
S

0 2 km

INDEX TO SHEETS

73K15NW	73K15NE	73O03NW
73K15SW	73K15SE	73O03SW
73K16NW	73K16NE	73O04NW

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
SPACE APPLICATIONS CENTRE, ISRO, AHMEDABAD
AND CENTRAL WATER COMMISSION, NEW DELHI

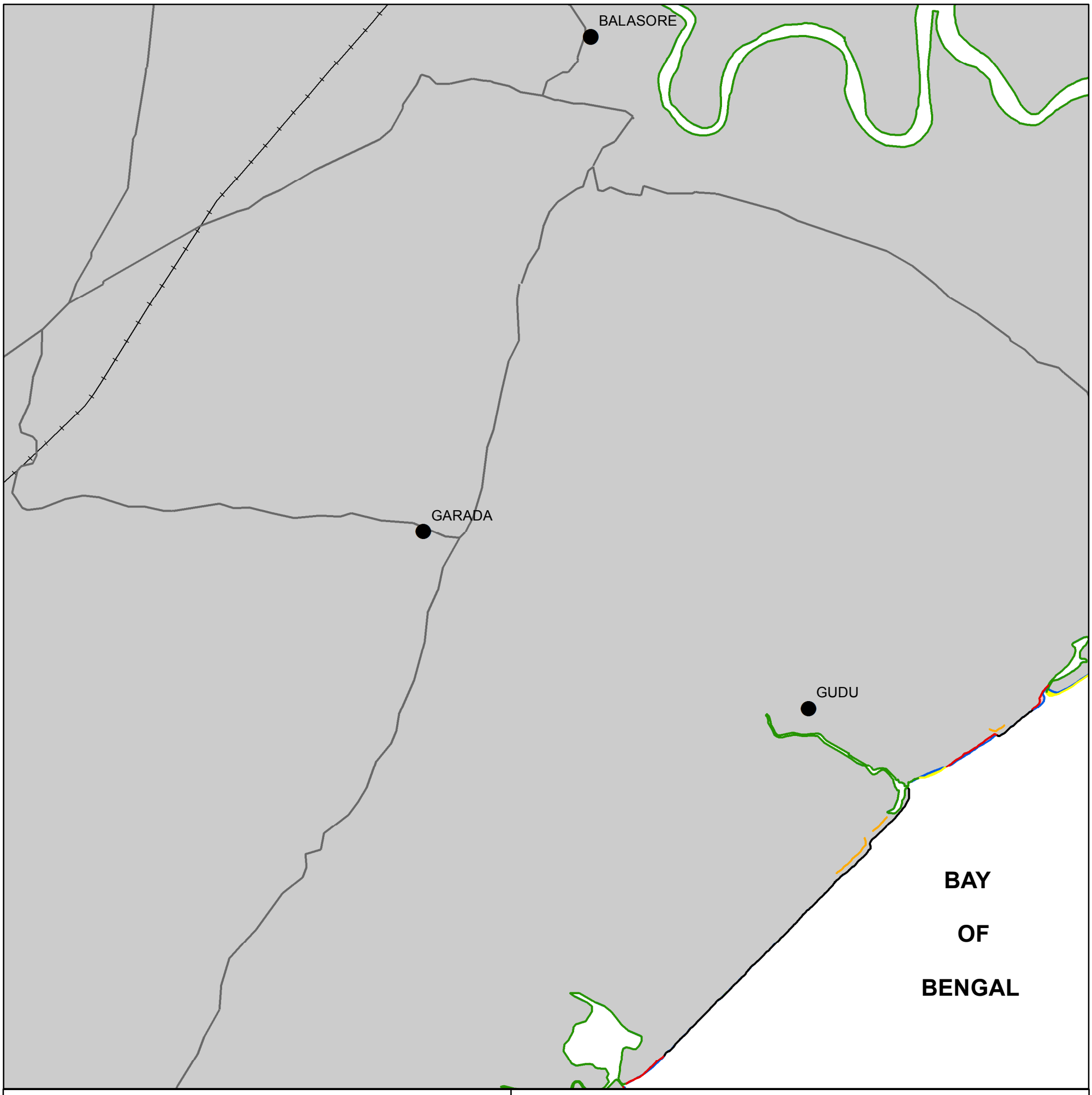
SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

BALESWAR DISTRICT

ODISHA

SHEET NO. 73K15NE



Legend

- EROSION
- ACCRETION
- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- ROAD
- RAILWAY
- SEA WALL

N
W E
S

0 2 km

INDEX TO SHEETS

73K14SW	73K14SE	73O02SW
73K15NW	73K15NE	73O03NW
73K15SW	73K15SE	73O03SW

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
SPACE APPLICATIONS CENTRE, ISRO, AHMEDABAD
AND CENTRAL WATER COMMISSION, NEW DELHI

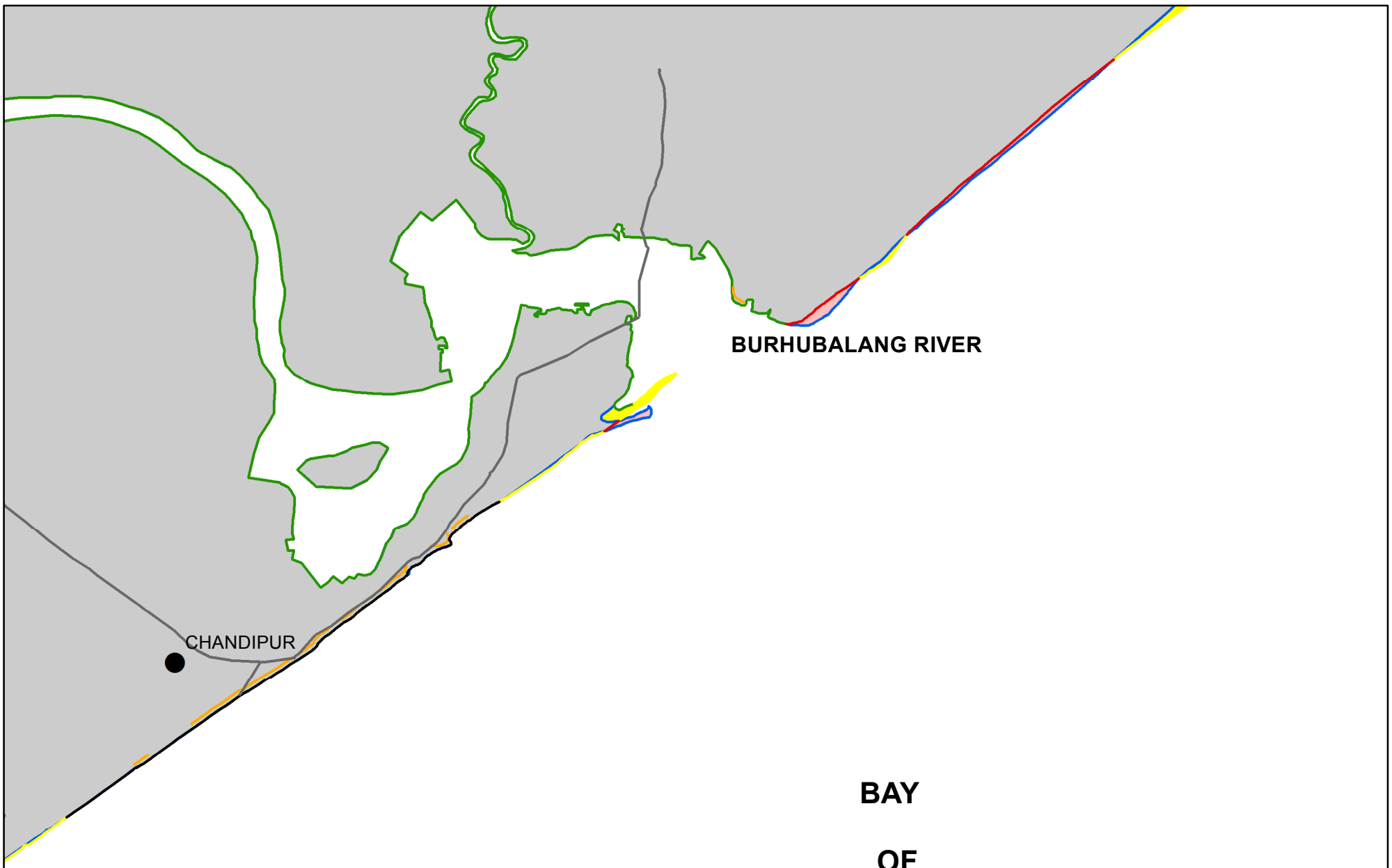
SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

BALESWAR DISTRICT

ODISHA

SHEET NO. 73O03NW



Legend

- EROSION
- ACCRETION
- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- ROAD
- SEA WALL

N
W E
S

0 2 km

INDEX TO SHEETS

73K14SE	73O02SW	73O02SE
73K15NE	73O03NW	73O03NE
73K15SE	73O03SW	73O03SE

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
SPACE APPLICATIONS CENTRE, ISRO, AHMEDABAD
AND CENTRAL WATER COMMISSION, NEW DELHI

SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

BALESWAR DISTRICT

ODISHA

SHEET NO. 73O02SW

NILIDA

PANCHPARA RIVER

BAGADA

Legend

- EROSION
- ACCRETION
- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- ROAD
- RAILWAY
- HABITATION

N
W E
S

0 2 km

INDEX TO SHEETS

73K14NE	73O02NW	73O02NE
73K14SE	73O02SW	73O02SE
73K15NE	73O03NW	73O03NE

INDIA

ODISHA

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
SPACE APPLICATIONS CENTRE, ISRO, AHMEDABAD
AND CENTRAL WATER COMMISSION, NEW DELHI

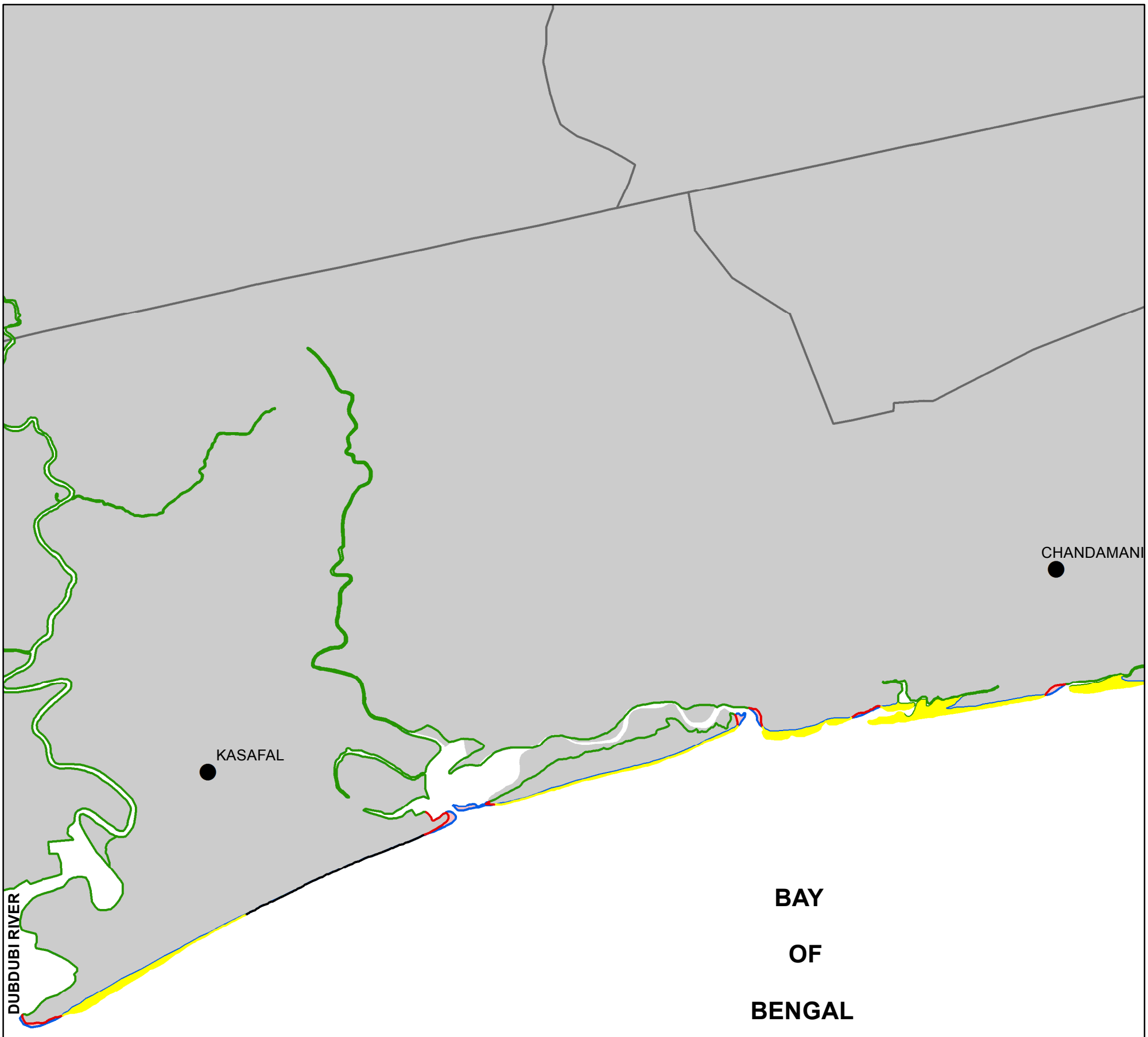
SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

BALESWAR DISTRICT

ODISHA

SHEET NO. 73O02SE



Legend

- EROSION
- ACCRETION
- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- ROAD
- HABITATION

N
W E
S

0 2 km

INDEX TO SHEETS

73O02NW	73O02NE	73O06NW
73O02SW	73O02SE	73O06SW
73O03NW	73O03NE	73O07NW

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
SPACE APPLICATIONS CENTRE, ISRO, AHMEDABAD
AND CENTRAL WATER COMMISSION, NEW DELHI

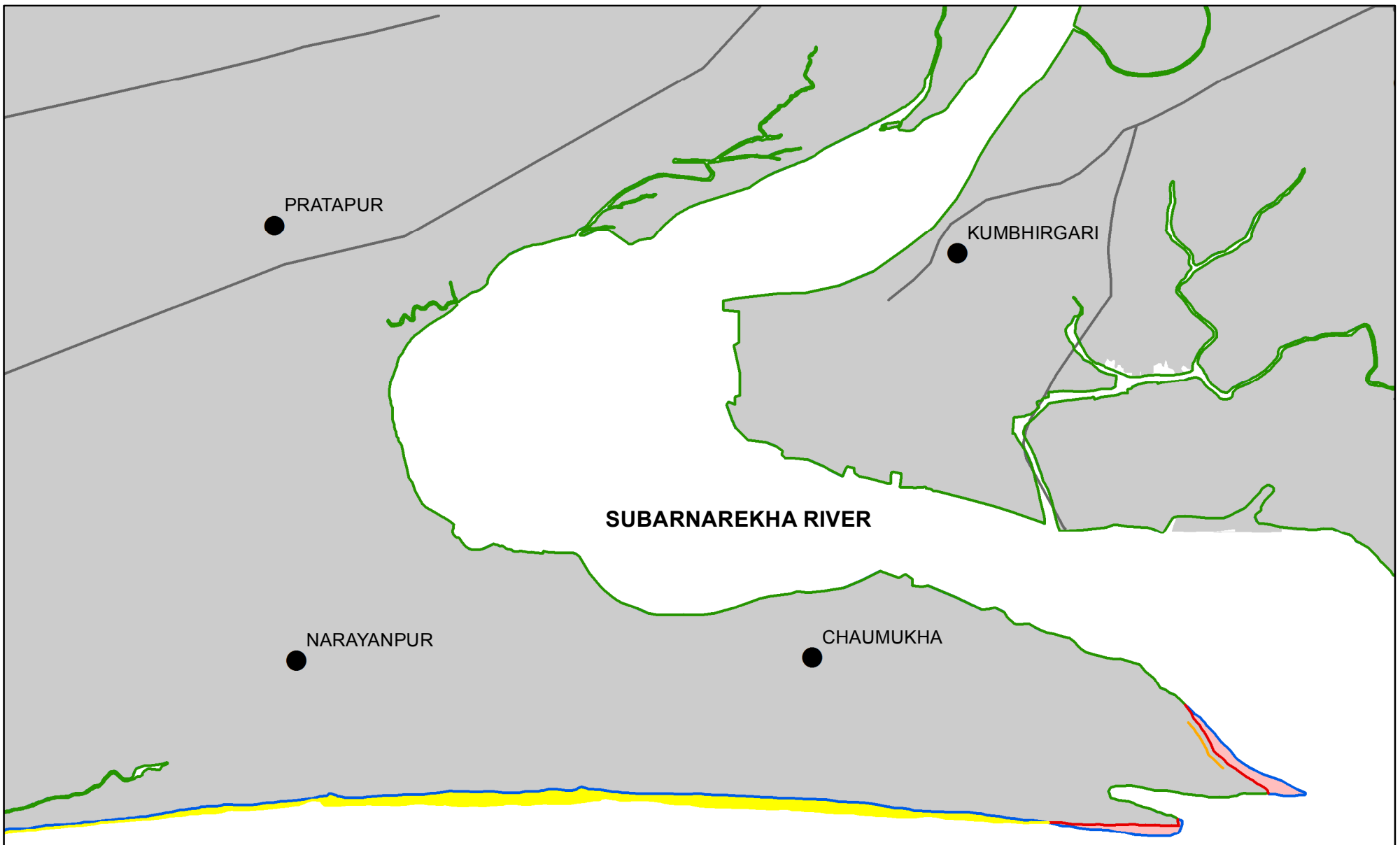
SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

BALESWAR DISTRICT

ODISHA

SHEET NO. 73O06SW



Legend

- EROSION
- ACCRETION
- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- ROAD
- SEA WALL
- HABITATION

N
W E
S

0 2 km

INDEX TO SHEETS

73O02NE	73O06NW	73O06NE
73O02SE	73O06SW	73O06SE
73O03NE	73O07NW	73O07NE

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
SPACE APPLICATIONS CENTRE, ISRO, AHMEDABAD
AND CENTRAL WATER COMMISSION, NEW DELHI

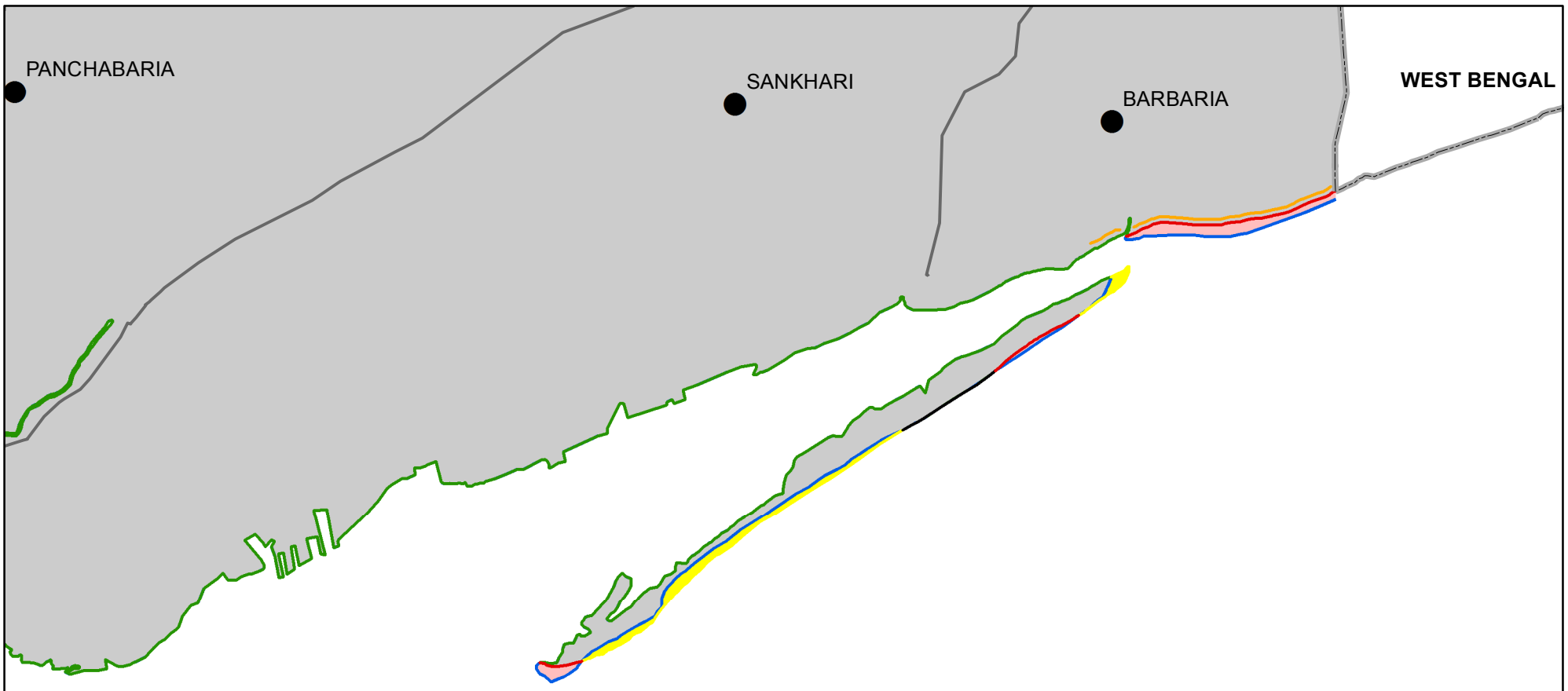
SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

BALESWAR DISTRICT

ODISHA

SHEET NO. 73O06SE



BAY

OF

BENGAL

Legend

- EROSION
- ACCRETION
- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- ROAD
- SEA WALL
- STATE BOUNDARY
- HABITATION

N
W E
S

0 2 km

INDEX TO SHEETS

73O06NW	73O06NE	73O10NW
73O06SW	73O06SE	73O10SW
73O07NW	73O07NE	73O11NW

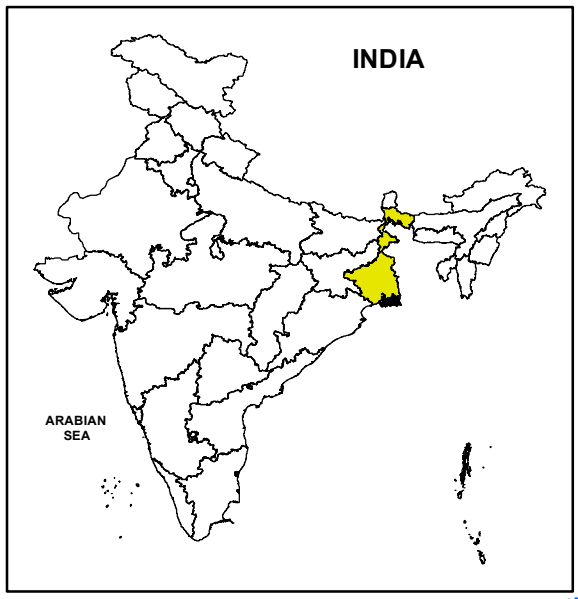
DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
SPACE APPLICATIONS CENTRE, ISRO, AHMEDABAD
AND CENTRAL WATER COMMISSION, NEW DELHI

SHORELINE CHANGE MAPS

WEST BENGAL

INDEX MAP OF WEST BENGAL



CANNING

HALDIA

DIGA

79C01NE
79C05SE
79C01SW
79C01SE
73O13SW
73O13SE
79C06NE
79C06NW
79C02NW
79C02NE
73O14NW
73O10NW
73O10NE
79C06SE
79C06SW
79C02SE
73O06SE
73O10SW

BAY

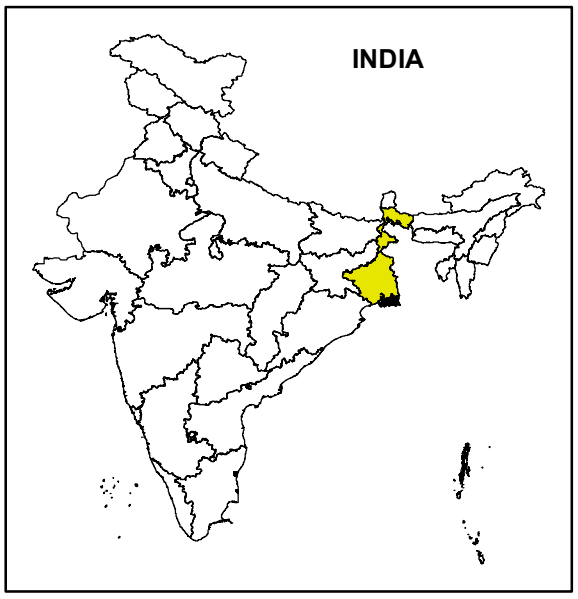
OF

BENGAL

N

0 40 km

SHORELINE CHANGES OF WEST BENGAL



CANNING

HALDIA

DIGA

BAY

OF

BENGAL

LEGEND

- ACCRETION LENGTH
- EROSION LENGTH
- STABLE LENGTH
- HIGH-TIDE LINE 2014-16

N

0 40 km

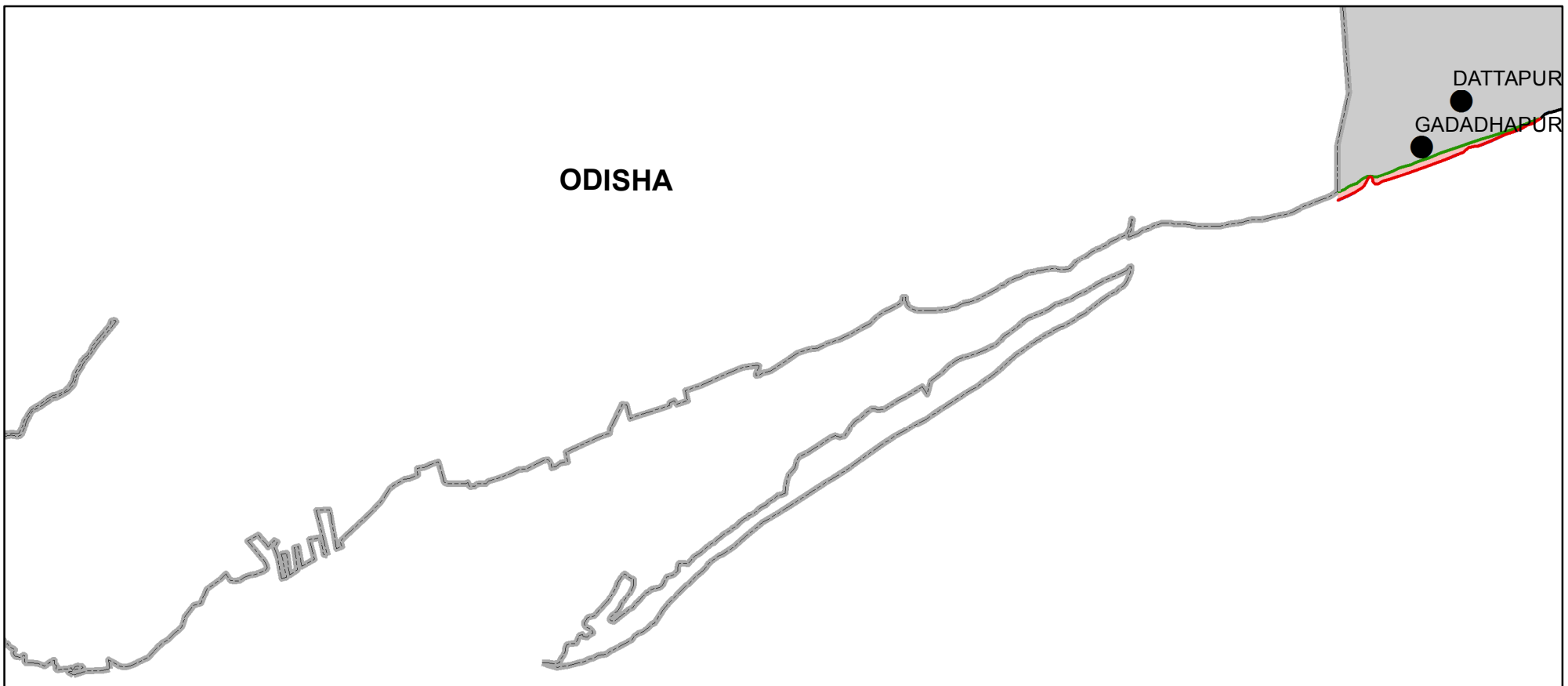
SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

PURBA MEDINIPUR DISTRICT

WEST BENGAL

SHEET NO. 73O06SE



Legend

- EROSION
- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- STATE BOUNDARY
- HABITATION

N
W E
S

0 2 km

INDEX TO SHEETS

73O06NW	73O06NE	73O10NW
73O06SW	73O06SE	73O10SW
SEA	SEA	SEA

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
SPACE APPLICATIONS CENTRE, ISRO, AHMEDABAD
AND CENTRAL WATER COMMISSION, NEW DELHI

SHORELINE CHANGE MAP

PURBA MEDINIPUR DISTRICT

WEST BENGAL

FOR OFFICIAL USE ONLY

SHEET NO. 73O10SW

DIGHA

BAY

OF

BENGAL

Legend

- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- SEA WALL
- HABITATION

N

W E

S

0 2 km

INDEX TO SHEETS

73O06NE	73O10NW	73O10NE
73O06SE	73O10SW	SEA
SEA	SEA	SEA

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
SPACE APPLICATIONS CENTRE, ISRO, AHMEDABAD
AND CENTRAL WATER COMMISSION, NEW DELHI

SHORELINE CHANGE MAP

PURBA MEDINIPUR DISTRICT

WEST BENGAL

FOR OFFICIAL USE ONLY

SHEET NO. 73O10NW

BAMUNIA

NASIRPUR

BADALPUR

RAMNAGAR

CHAMPA RIVER

JALDHA

MIRZAPUR

BAHARAMPUR

BAY OF BENGAL

Legend

- EROSION
- ACCRETION
- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- ROAD
- RAILWAY
- SEA WALL
- BREAKWATER
- JETTY
- HABITATION

N

W E

S

0 2 km

INDEX TO SHEETS

73O05SE	73O09SW	73O09SE
73O06NE	73O10NW	73O10NE
73O06SE	73O10SW	SEA

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
SPACE APPLICATIONS CENTRE, ISRO, AHMEDABAD
AND CENTRAL WATER COMMISSION, NEW DELHI

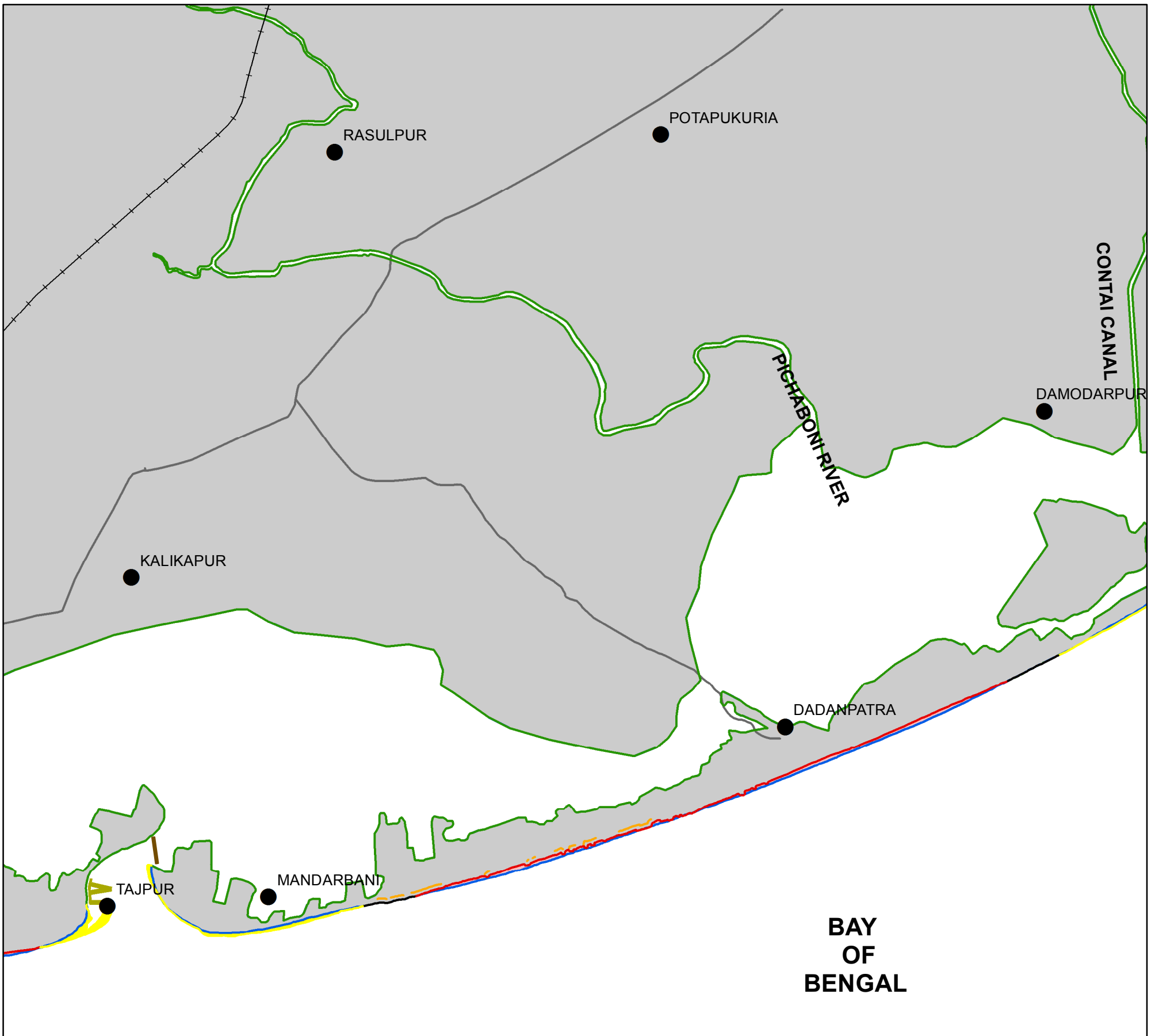
SHORELINE CHANGE MAP

PURBA MEDINIPUR DISTRICT

WEST BENGAL

FOR OFFICIAL USE ONLY

SHEET NO. 73O10NE



Legend

- EROSION
- ACCRETION
- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- ROAD
- RAILWAY
- SEA WALL
- GROYNES
- JETTY
- HABITATION

N
W E
S

0 2 km

INDEX TO SHEETS

73O09SW	73O09SE	73O13SW
73O10NW	73O10NE	73O14NW
73O10SW	SEA	SEA

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
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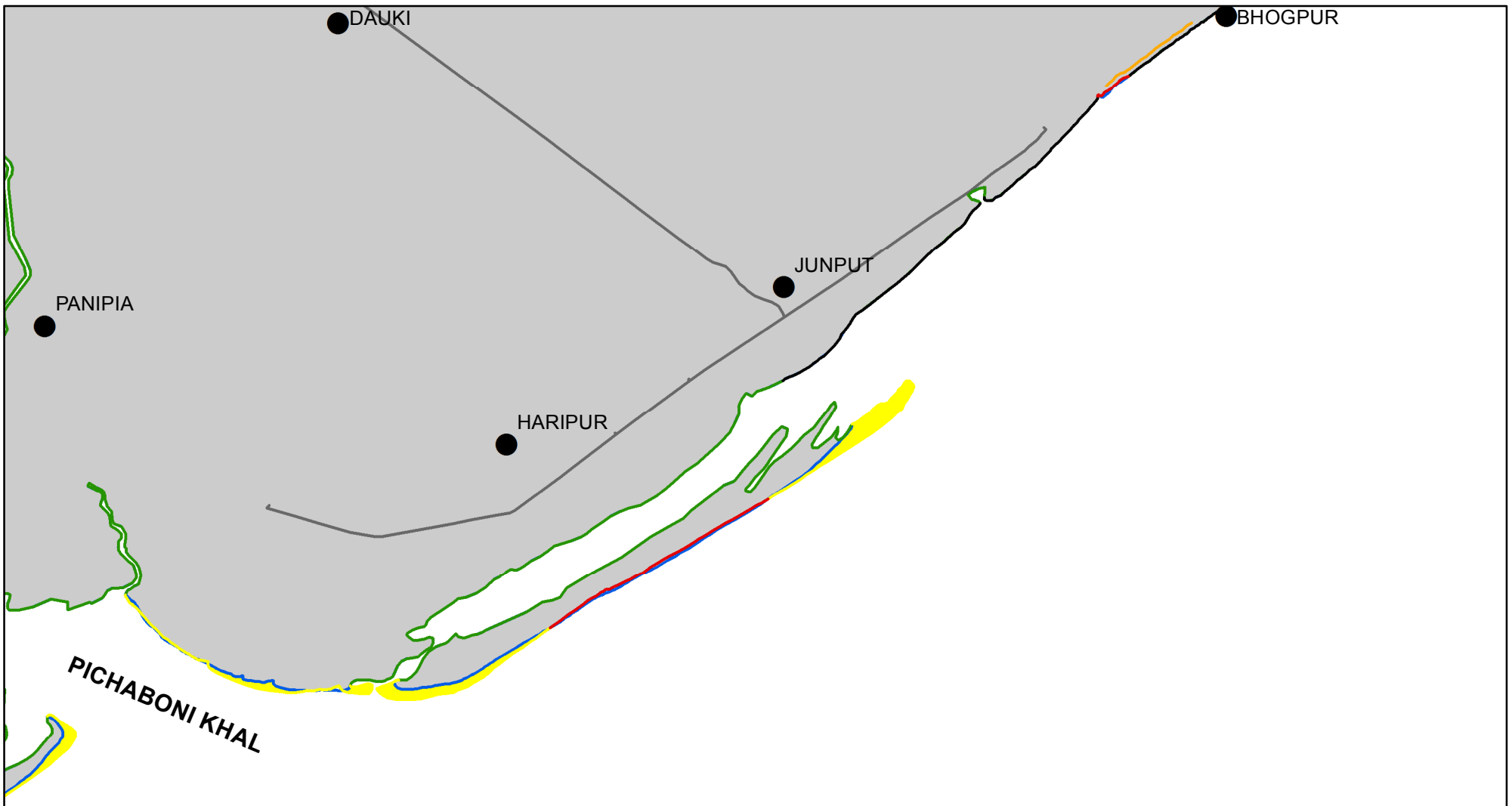
SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

PURBA MEDINIPUR DISTRICT

WEST BENGAL

SHEET NO. 73O14NW



BAY

OF

BENGAL

Legend

- EROSION
- ACCRETION
- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- ROAD
- SEA WALL
- HABITATION

N
W E
S

0 2 km

INDEX TO SHEETS

73O09SE	73O13SW	73O13SE
73O10NE	73O14NW	SEA
SEA	SEA	SEA

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
SPACE APPLICATIONS CENTRE, ISRO, AHMEDABAD
AND CENTRAL WATER COMMISSION, NEW DELHI

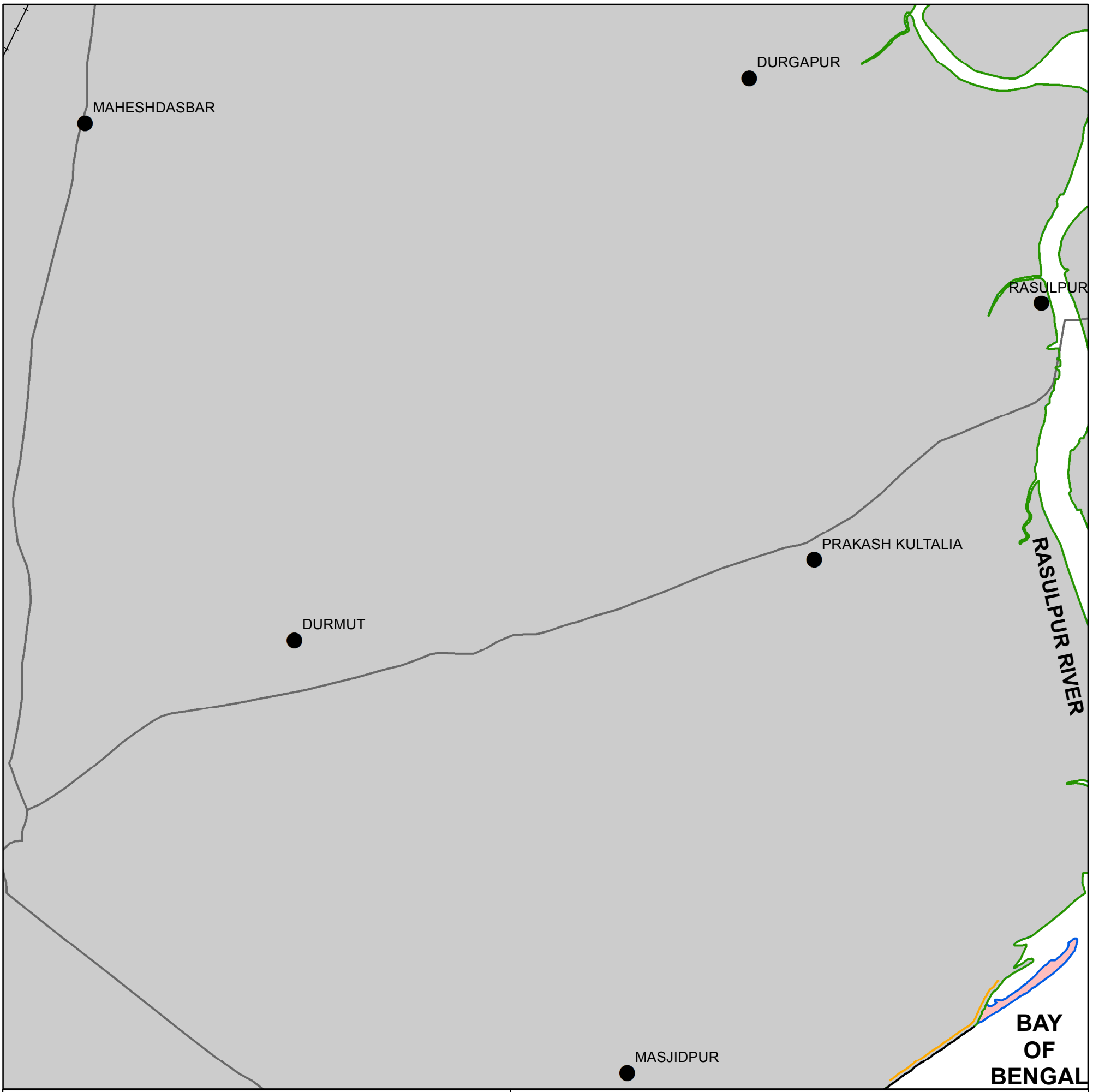
SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

PURBA MEDINIPUR DISTRICT

WEST BENGAL

SHEET NO. 73O13SW



Legend

- EROSION
- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- ROAD
- RAILWAY
- SEA WALL
- HABITATION

N
W E
S

0 2 km

INDEX TO SHEETS

73O09NE	73O13NW	73O13NE
73O09SE	73O13SW	73O13SE
73O10NE	73O14NW	SEA

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
SPACE APPLICATIONS CENTRE, ISRO, AHMEDABAD
AND CENTRAL WATER COMMISSION, NEW DELHI

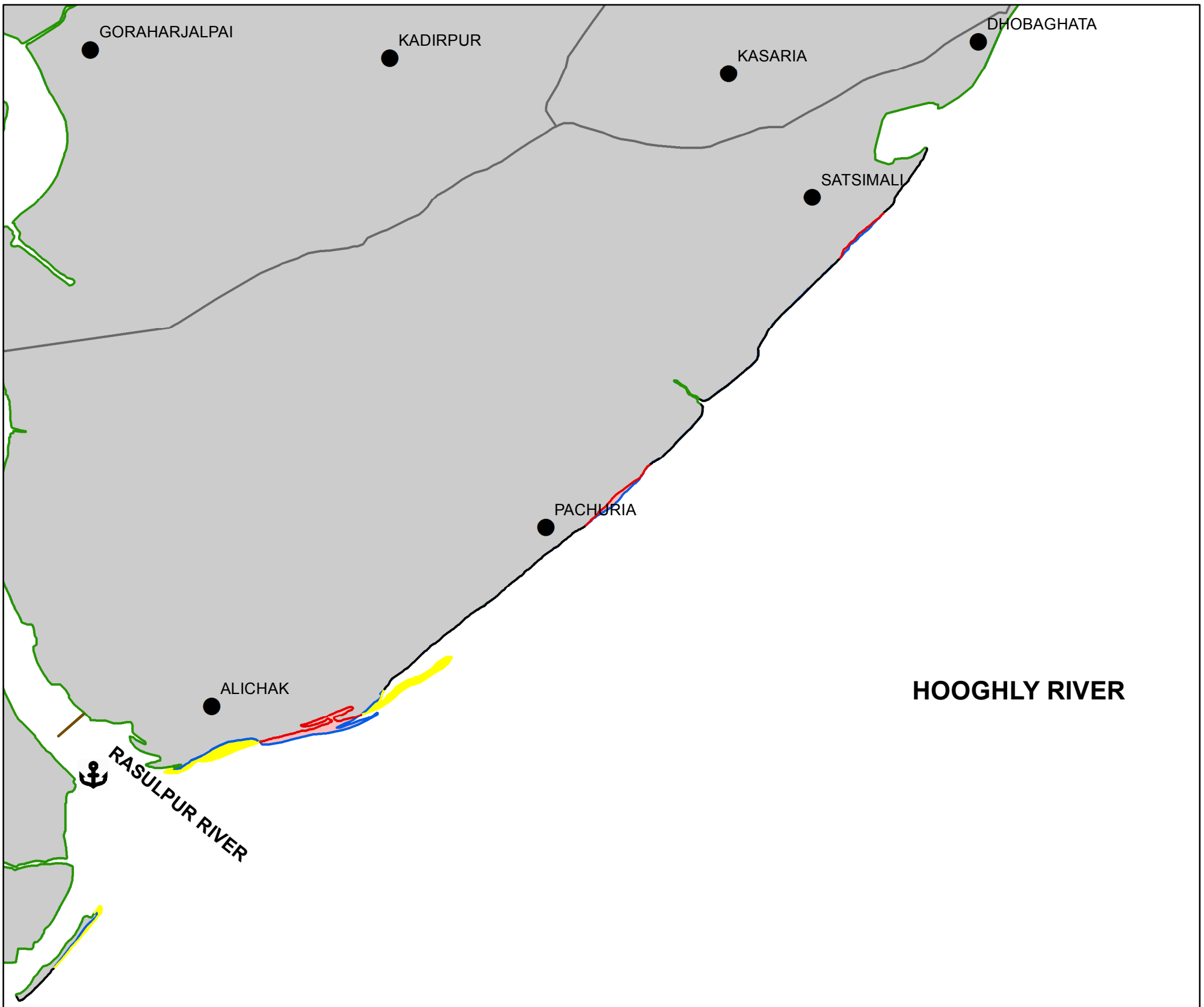
SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

PURBA MEDINIPUR DISTRICT

WEST BENGAL

SHEET NO. 73O13SE



Legend

- EROSION
- ACCRETION
- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- ROAD
- JETTY
- PORT/HARBOUR
- HABITATION

N
W E
S

0 2 km

INDEX TO SHEETS

73O13NW	73O13NE	79C01NW
73O13SW	73O13SE	79C01SW
73O14NW	SEA	79C02NW

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
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AND CENTRAL WATER COMMISSION, NEW DELHI

SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

SOUTH 24 PARGANAS DISTRICT **WEST BENGAL** SHEET NO. 79C01NE

UTTAR CHANDANNAGAR
RAMTANUNAGAR
MADHUSUDANPUR
SURJYANAGAR
HOOGHLY RIVER
LAKSHMIPASHA
SITARAMPUR
SIBKALINAGAR
KASINAGAR
KHASIMARA
GHORAMARA ISLAND
KALINAGAR
MANDIRTALA
TILAKMANDAL CHAK
GANGADHARPUR

Legend

- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- ROAD
- RAILWAY
- GROYNES
- BREAKWATER
- JETTY
- HABITATION

N
W E
S

0 2 km

INDEX TO SHEETS

79B04SW	79B04SE	79B08SW
79C01NW		79C05NW
79C01SW	79C01SE	79C05SW

INDIA

WEST BENGAL

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
SPACE APPLICATIONS CENTRE, ISRO, AHMEDABAD
AND CENTRAL WATER COMMISSION, NEW DELHI

SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

SOUTH 24 PARGANAS DISTRICT **WEST BENGAL** SHEET NO. 79C01SE

PHULBARI
SIBPUR
KACHUBARIA
CHARERGHERI
BUDHAKHALI
SAGAR ISLAND
MURIGANGA RIVER
NARYANPUR
DUARAGRA GANG
KAILAPARA
NAMKHANA

Legend

- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- ROAD
- RAILWAY
- JETTY
- HABITATION

N
W E
S

0 2 km

INDEX TO SHEETS

79C01NW	79C01NE	79C05NW
79C01SW	79C01SE	79C05SW
79C02NW	79C02NE	79C06NW

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

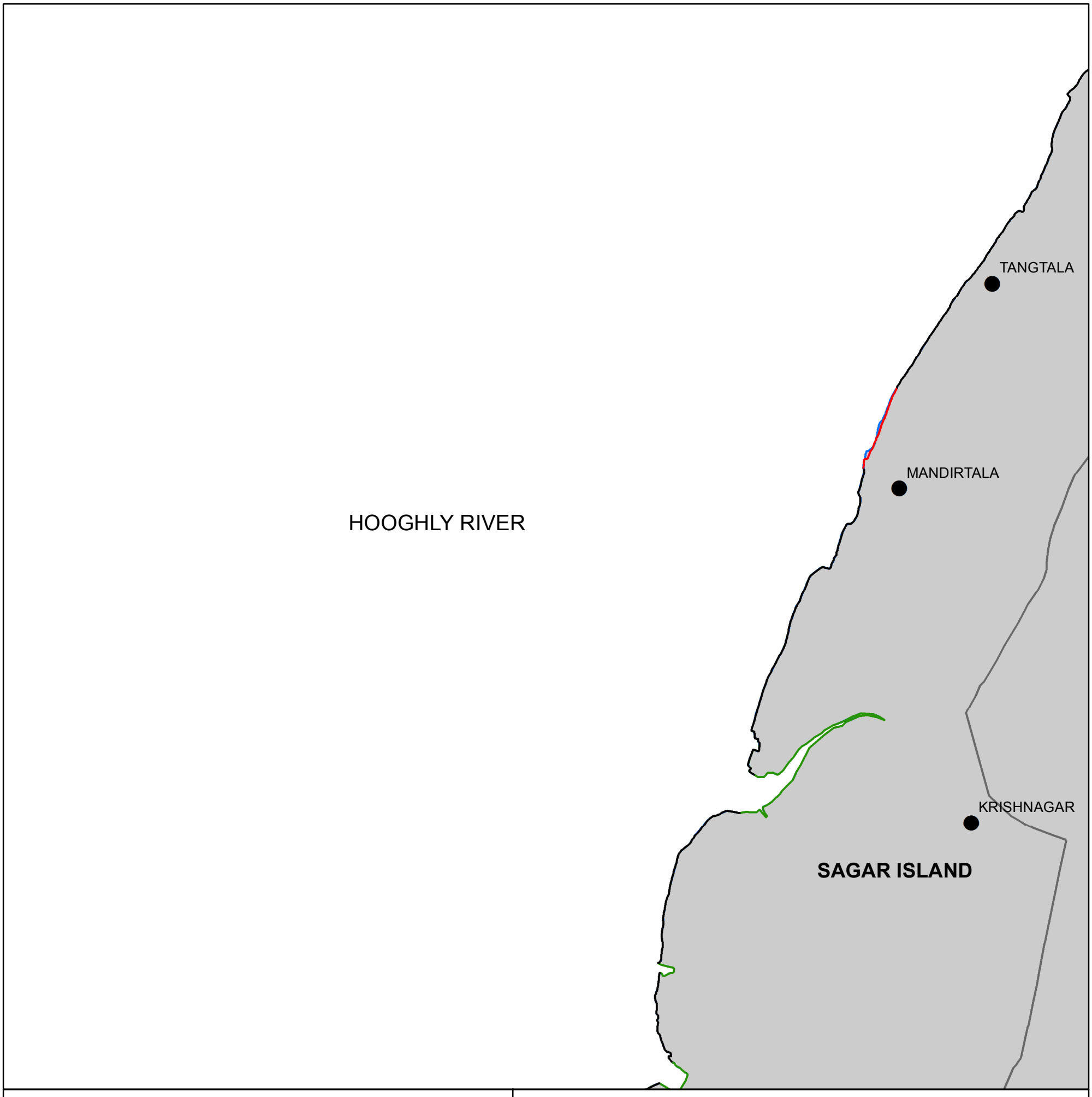
PREPARED BY:
SPACE APPLICATIONS CENTRE, ISRO, AHMEDABAD
AND CENTRAL WATER COMMISSION, NEW DELHI

SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

SOUTH 24 PARGANAS DISTRICTS **WEST BENGAL**

SHEET NO. 79C01SW



Legend

- EROSION
- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- ROAD
- HABITATION

N
W E
S

0 2 km

INDEX TO SHEETS

73O13NE	79C01NW	79C01NE
73O13SE	79C01SW	79C01SE
SEA	79C02NW	79C02NE

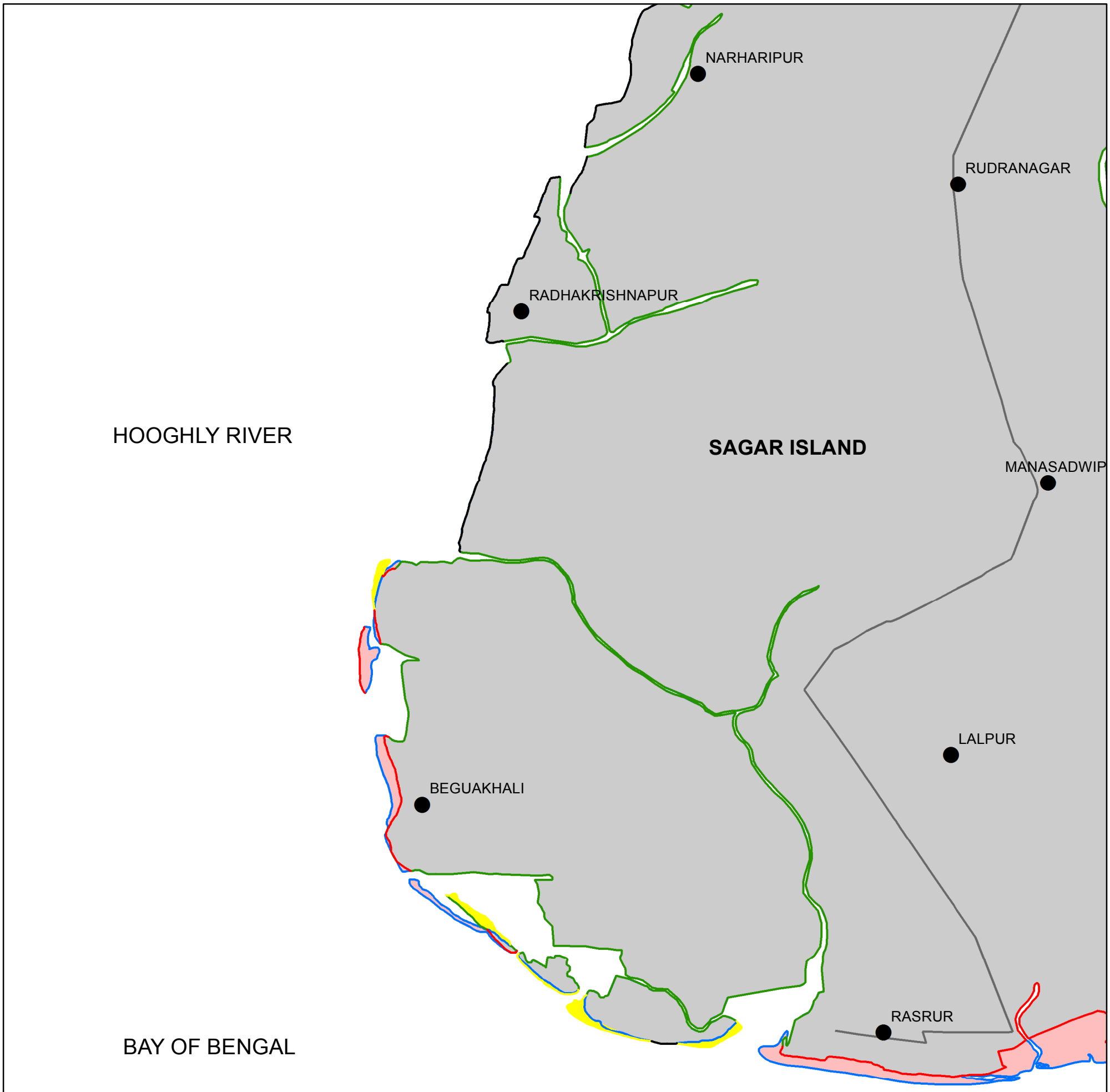
DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
SPACE APPLICATIONS CENTRE, ISRO, AHMEDABAD
AND CENTRAL WATER COMMISSION, NEW DELHI

SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

SOUTH 24 PARGANAS DISTRICT **WEST BENGAL** SHEET NO. 79C02NW



Legend

- EROSION
- ACCRETION
- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- ROAD
- HABITATION

N
W E
S

0 2 km

INDEX TO SHEETS

73O13SE	79C01SW	79C01SE
SEA	79C02NW	79C02NE
SEA	SEA	79C02SE

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
SPACE APPLICATIONS CENTRE, ISRO, AHMEDABAD
AND CENTRAL WATER COMMISSION, NEW DELHI

SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

SOUTH 24 PARGANAS DISTRICT **WEST BENGAL** SHEET NO. 79C02NE

HARADHANPUR

MURI GANGA

CHEMAGAR GANG

CHEMAGARI HAI

SHIBPUR

BAY OF BENGAL

RADHANAGAR

BAGDANGA

PITT'S CREEK

PATBUNIA

BALIARA

Legend

- EROSION
- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- ROAD
- JETTY
- HABITATION

N
W E
S

0 2 km

INDEX TO SHEETS

79C01SW	79C01SE	79C05SW
79C02NW	79C02NE	79C06NW
SEA	79C02SE	79C06SW

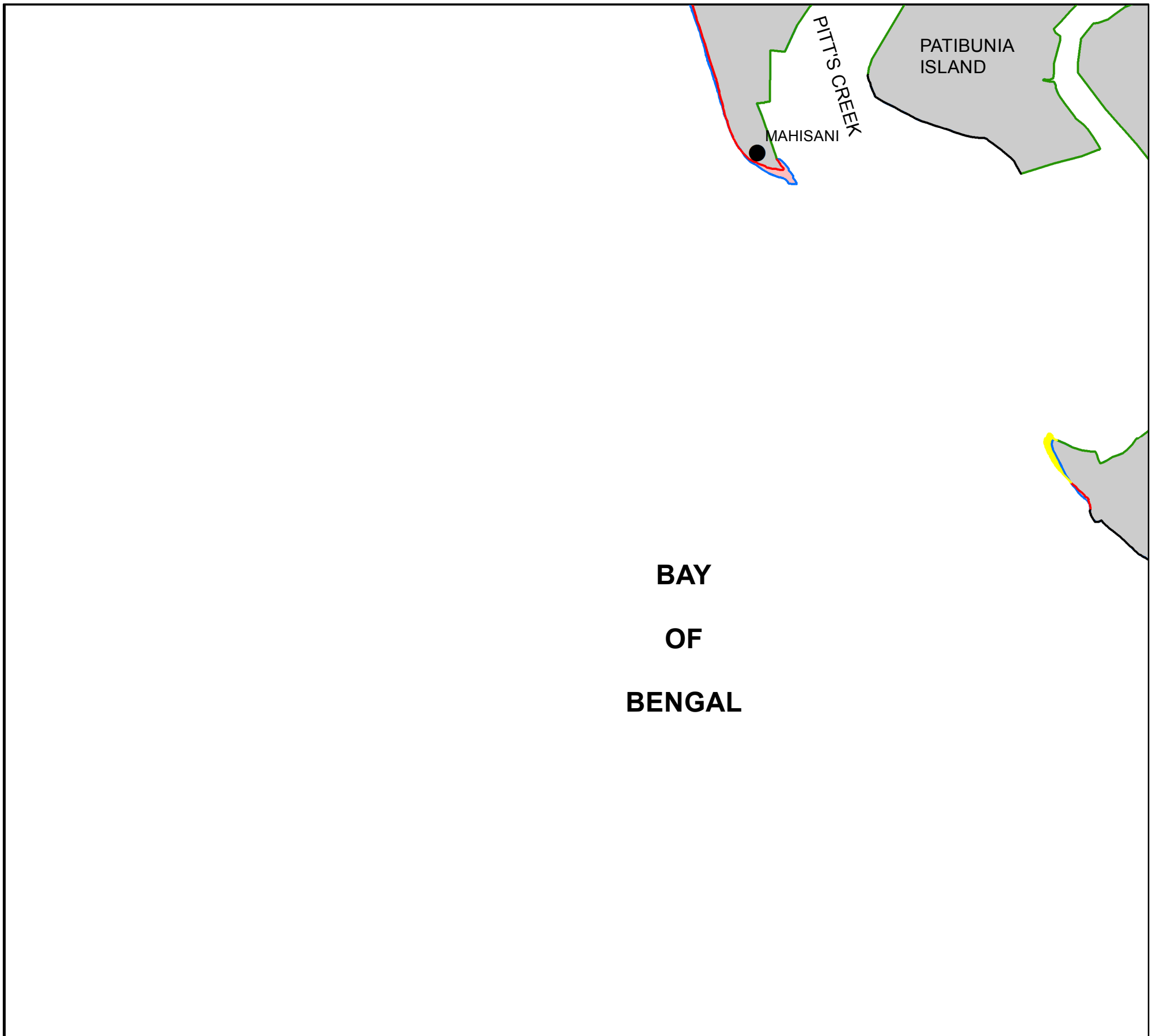
DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
SPACE APPLICATIONS CENTRE, ISRO, AHMEDABAD
AND CENTRAL WATER COMMISSION, NEW DELHI

SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

SOUTH 24 PARGANAS DISTRICT **WEST BENGAL** SHEET NO. 79C02SE



Legend

- EROSION
- ACCRETION
- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- HABITATION

N
W E
S

0 2 km

INDEX TO SHEETS

79C02NW	79C02NE	79C06NW
SEA	79C02SE	79C06SW
SEA	SEA	SEA

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
SPACE APPLICATIONS CENTRE, ISRO, AHMEDABAD
AND CENTRAL WATER COMMISSION, NEW DELHI

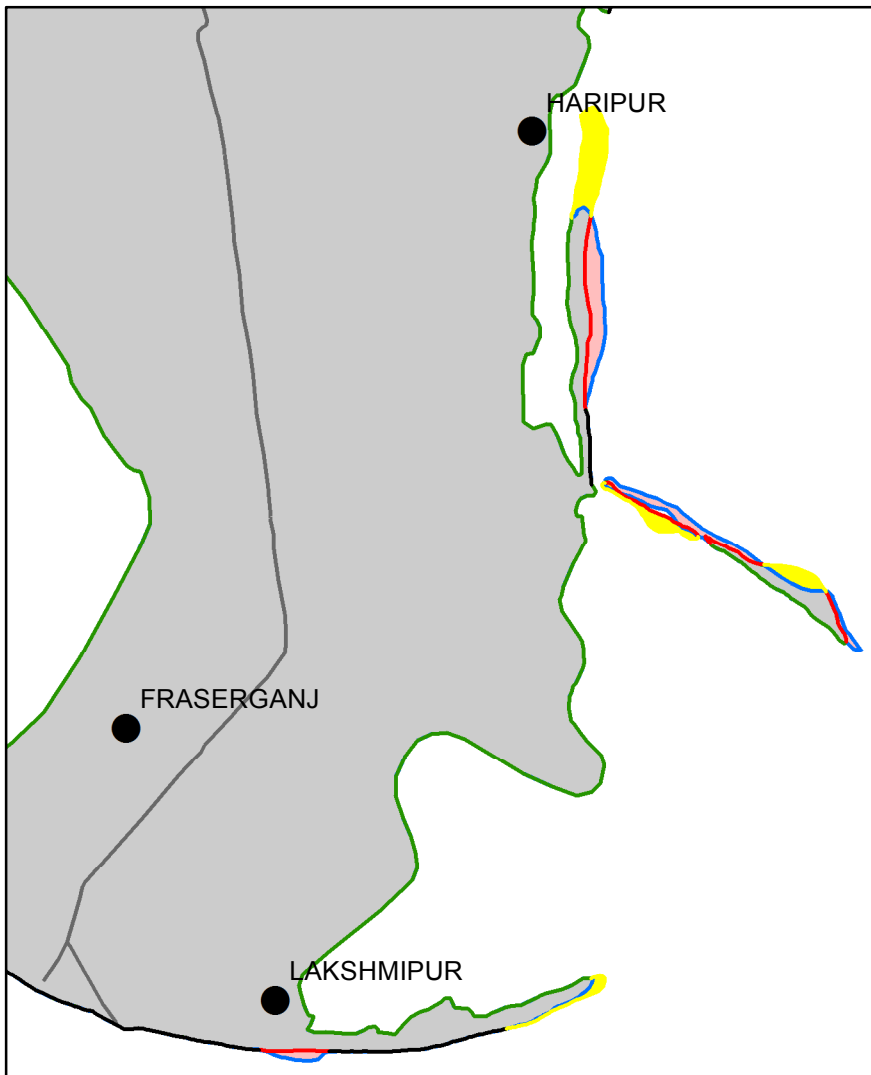
SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

SOUTH 24 PARGANAS DISTRICT

WEST BENGAL

SHEET NO. 79C06SW



BAY

OF

BENGAL

Legend

- EROSION
- ACCRETION
- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- ROAD
- HABITATION

N
W E
S

0 2 km

INDEX TO SHEETS

79C02NE	79C06NW	79C06NE
79C02SE	79C06SW	79C06SE
SEA	SEA	SEA

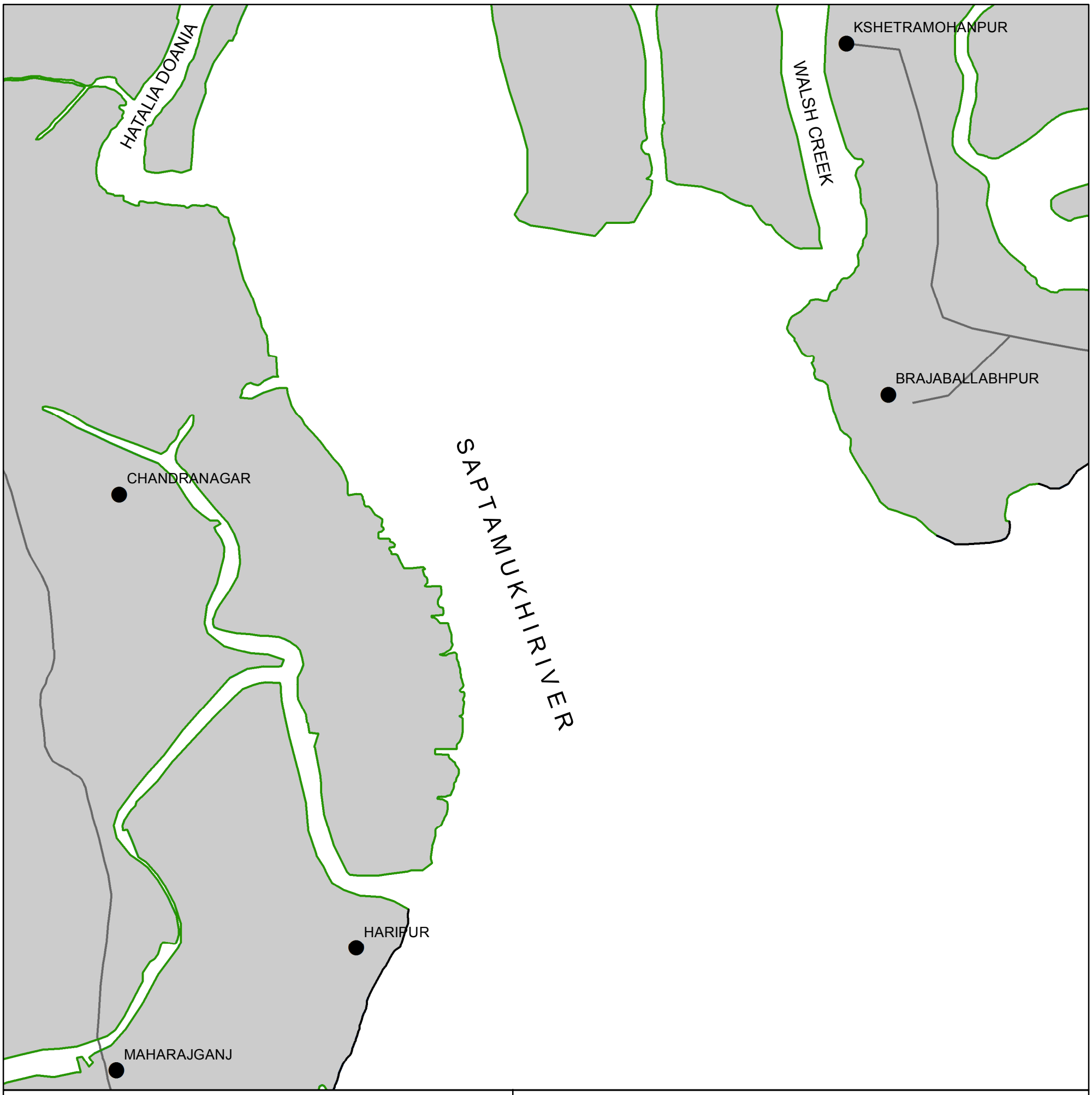
DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
SPACE APPLICATIONS CENTRE, ISRO, AHMEDABAD
AND CENTRAL WATER COMMISSION, NEW DELHI

SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

SOUTH 24 PARGANAS DISTRICT **WEST BENGAL** SHEET NO. 79C06NW



Legend

- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- ROAD
- HABITATION

N
W E
S

0 2 km

INDEX TO SHEETS

79C01SE	79C05SW	79C05SE
79C02NE	79C06NW	79C06NE
79C02SE	79C06SW	79C06SE

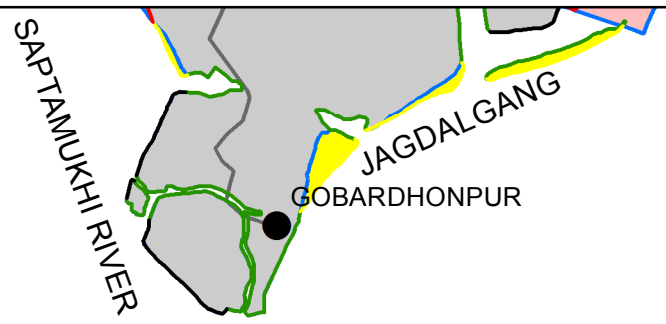
DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
SPACE APPLICATIONS CENTRE, ISRO, AHMEDABAD
AND CENTRAL WATER COMMISSION, NEW DELHI

SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

SOUTH 24 PARGANAS DISTRICT **WEST BENGAL** SHEET NO. 79C06SE



BAY

OF

BENGAL

Legend

- EROSION
- ACCRETION
- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- ROAD
- HABITATION

N
W E
S

0 2 km

INDEX TO SHEETS

79C06NW	79C06NE	79C10NW
79C06SW	79C06SE	79C10SW
SEA	SEA	SEA

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
SPACE APPLICATIONS CENTRE, ISRO, AHMEDABAD
AND CENTRAL WATER COMMISSION, NEW DELHI

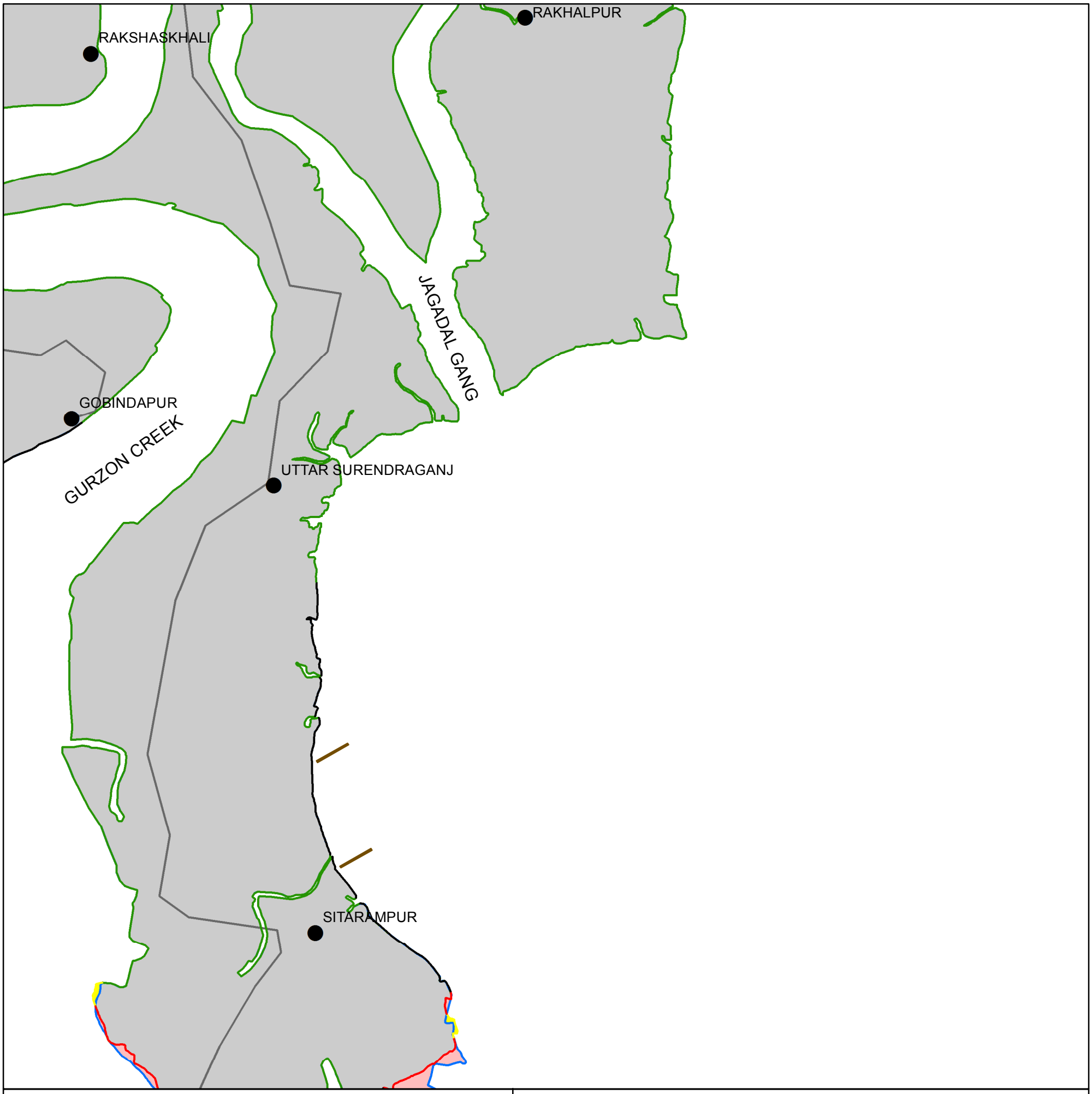
SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

SOUTH 24 PARGANAS DISTRICT

WEST BENGAL

SHEET NO. 79C06NE



Legend

- EROSION
- ACCRETION
- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- ROAD
- JETTY
- HABITATION

N
W E
S

0 2 km

INDEX TO SHEETS

79C05SW	79C05SE	79C09SW
79C06NW	79C06NE	79C10NW
79C06SW	79C06SE	79C10SW

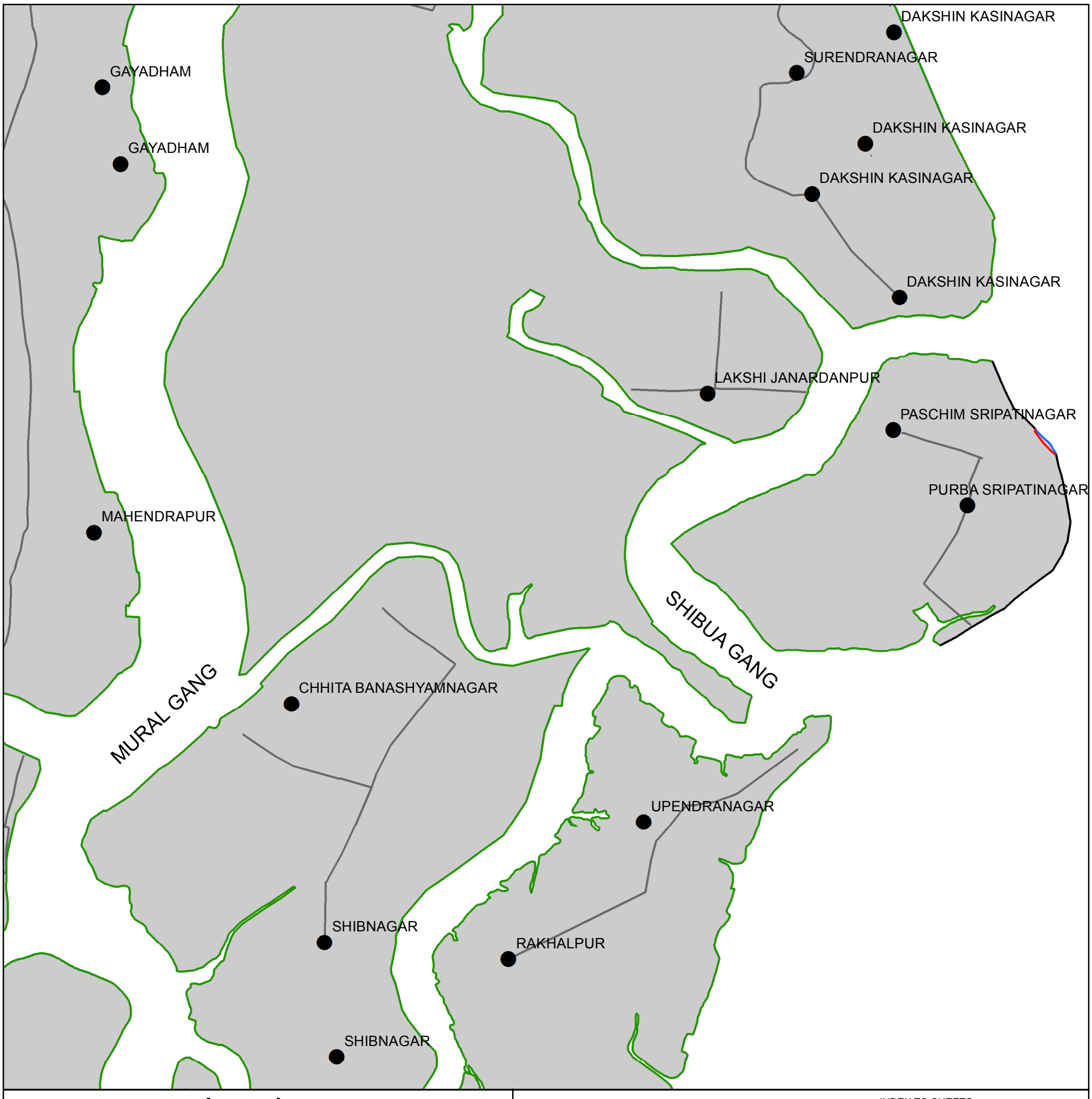
DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
SPACE APPLICATIONS CENTRE, ISRO, AHMEDABAD
AND CENTRAL WATER COMMISSION, NEW DELHI

SHORELINE CHANGE MAP

FOR OFFICIAL USE ONLY

SOUTH 24 PARGANAS DISTRICT **WEST BENGAL** SHEET NO. 79C05SE



Legend

- EROSION
- HIGH-TIDE LINE 2014-16
- HIGH-TIDE LINE 2004-06
- STABLE
- ROAD
- HABITATION

N
W E
S

0 2 km

INDEX TO SHEETS

79C05NW	79C05NE	79C09NW
79C05SW	79C05SE	79C09SW
79C06NW	79C06NE	79C10NW

DATA SOURCE:
IRS LISS4 IMAGES OF 2004-06 & 2014-16

PREPARED BY:
SPACE APPLICATIONS CENTRE, ISRO, AHMEDABAD
AND CENTRAL WATER COMMISSION, NEW DELHI

HOT SPOTS OF SHORELINE CHANGE

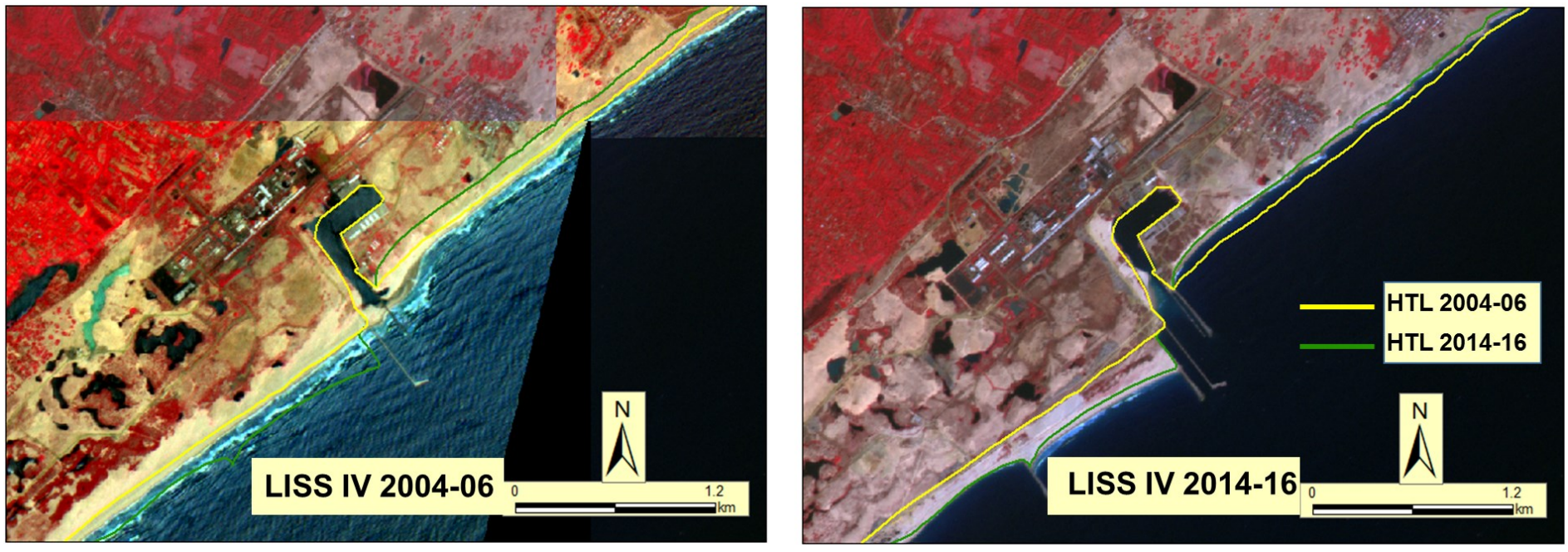


Plate 1: Shoreline change to the west and east coast of Gopalpur port (74A15SE) marked on LISS IV images of IRS P6 and Resourcesat-2

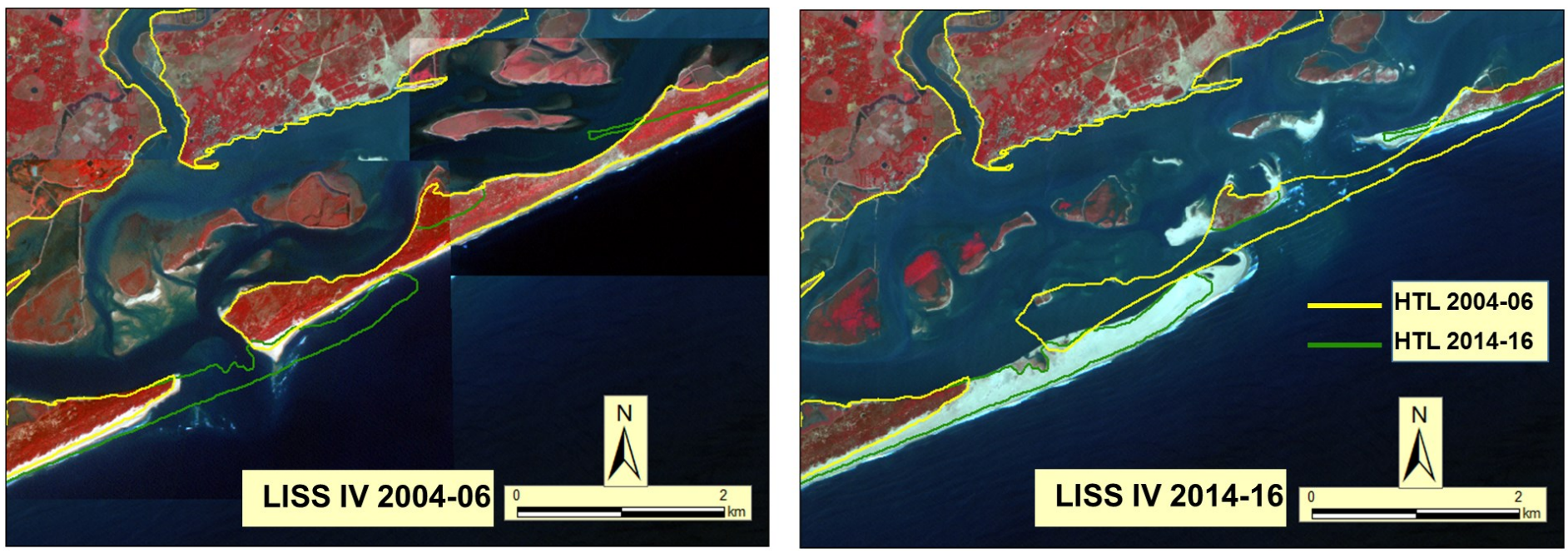


Plate 2: Shoreline changes along the Chilika spit (74E10NW) marked on LISS IV images of IRS P6 and Resourcesat-2

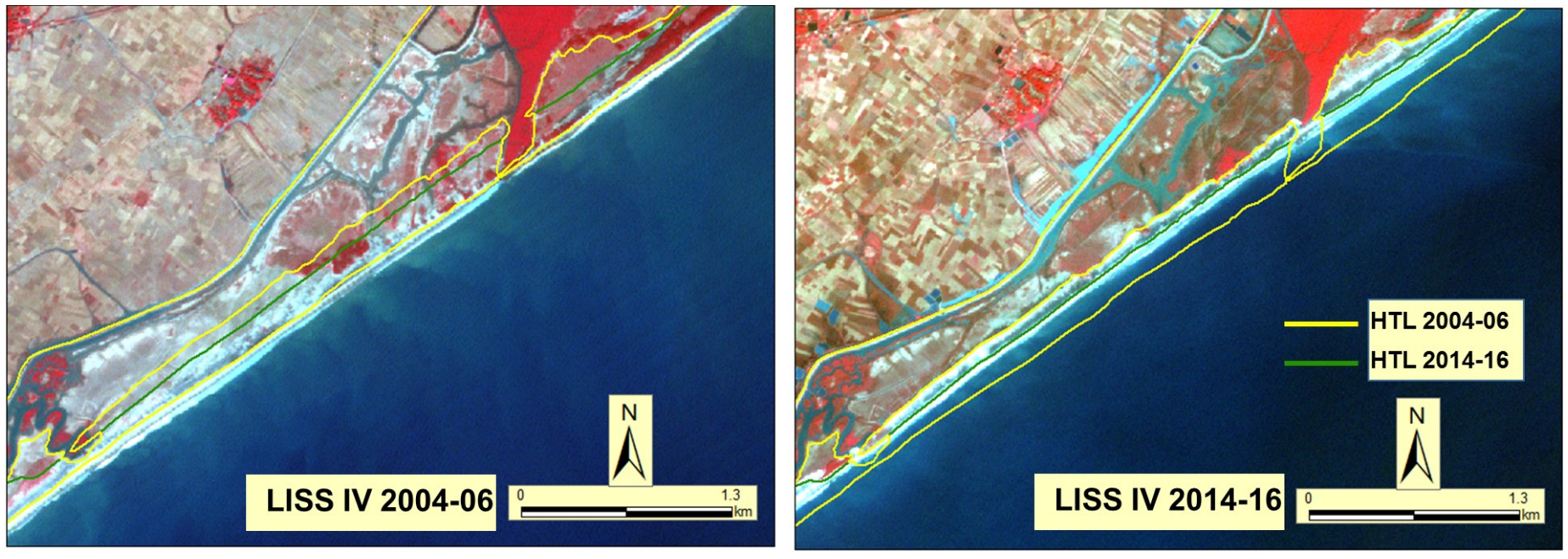


Plate 3: Coastal erosion along the coast at Uttampur (73L14SW) marked on LISS IV images of IRS P6 and Resourcesat-2

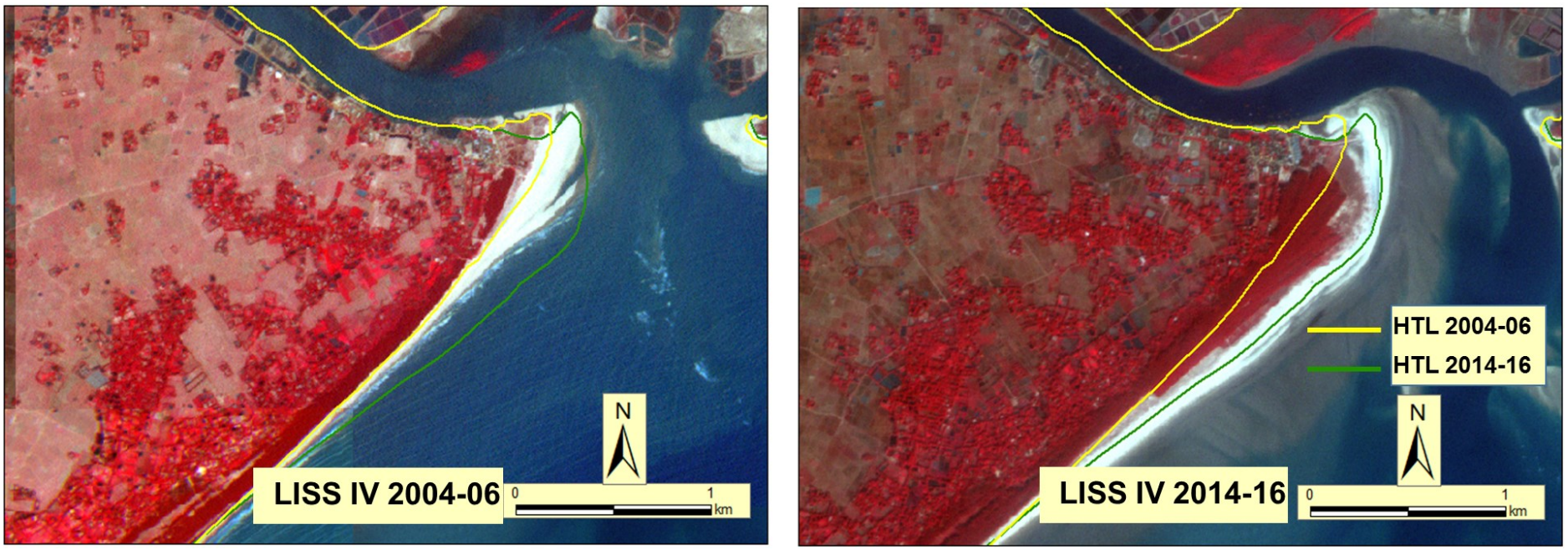


Plate 4: Accretion along the southern bank of Panchpara River (73O02SW) marked on LISS IV images of IRS P6 and Resourcesat-2

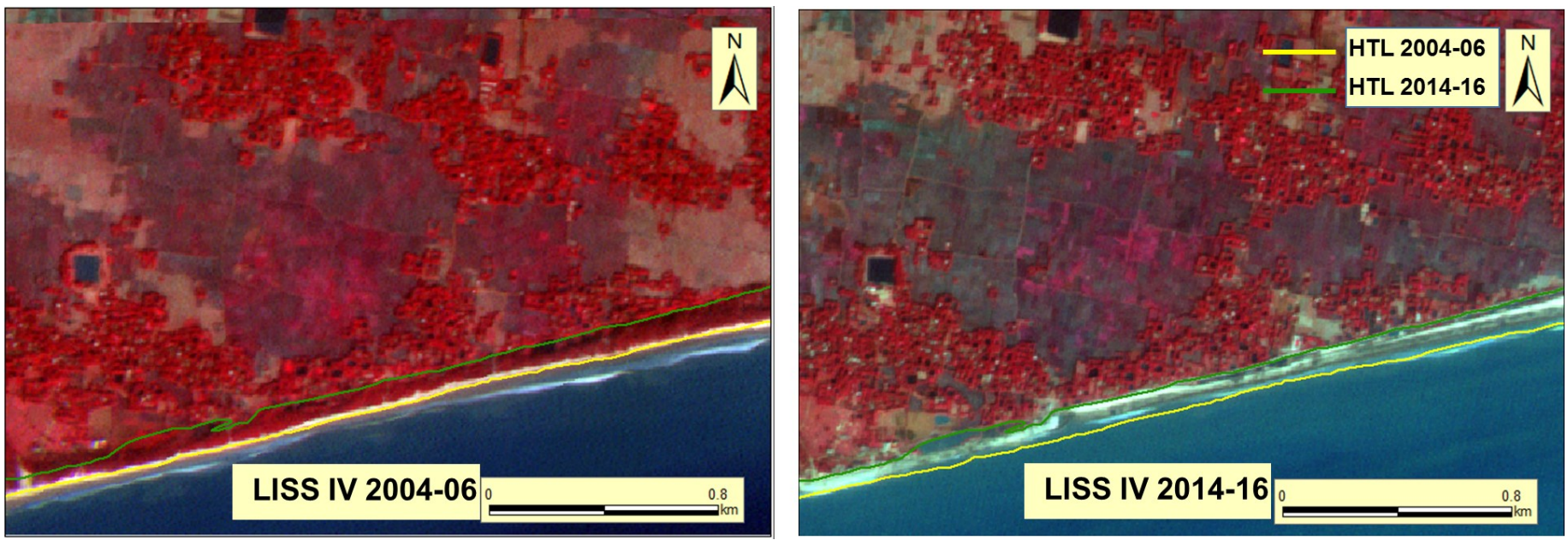


Plate 5: Coastal erosion at Jaldha (73O10NW) marked on LISS IV images of IRS P6 and Resourcesat-2

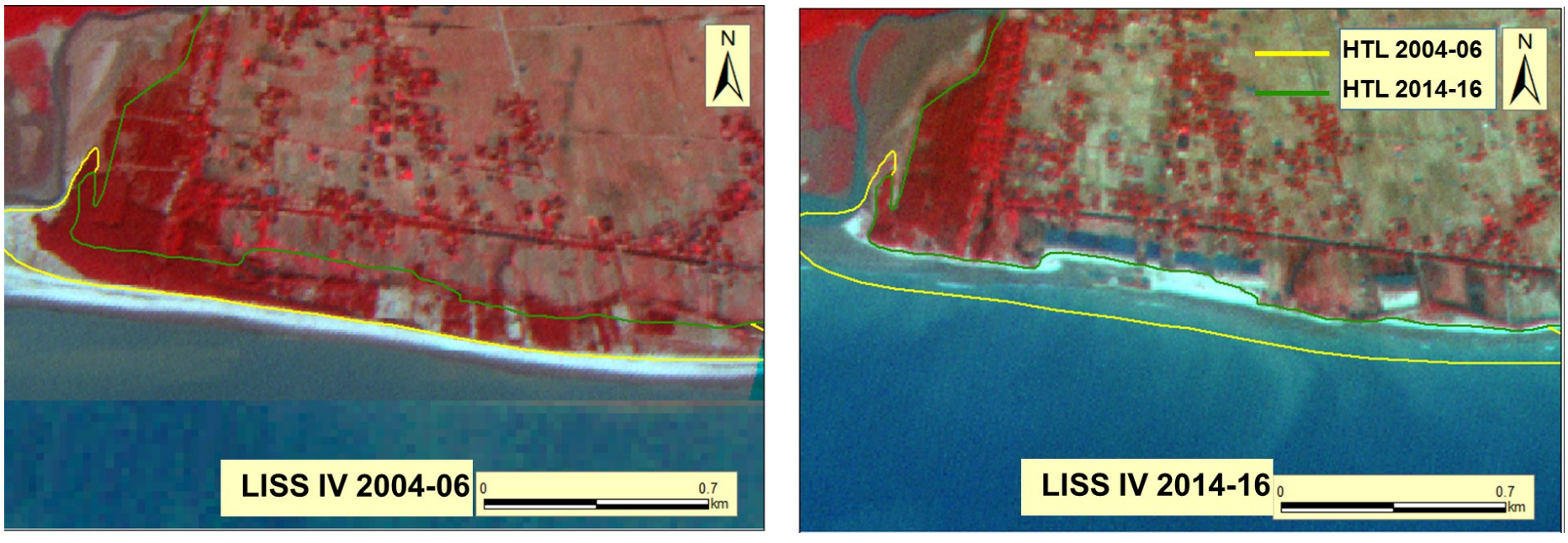


Plate 6: Coastal erosion at Rasrur (79C02NW) marked on LISS IV images of IRS P6 and Resourcesat-2

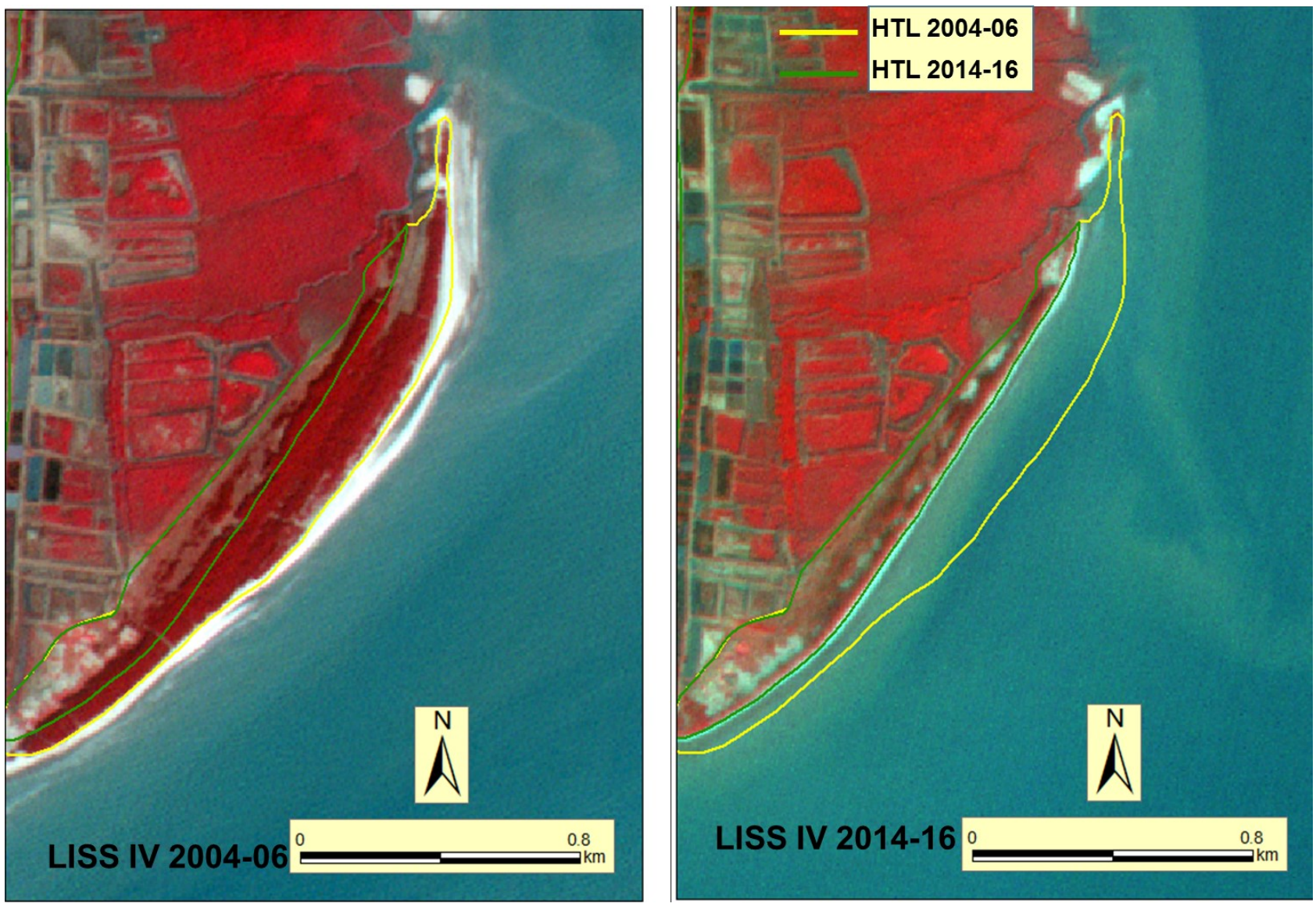


Plate 7: Erosion of spit to the southern bank of the river Muri Ganga (79C02NE) marked on LISS IV images of IRS P6 and Resourcesat-2

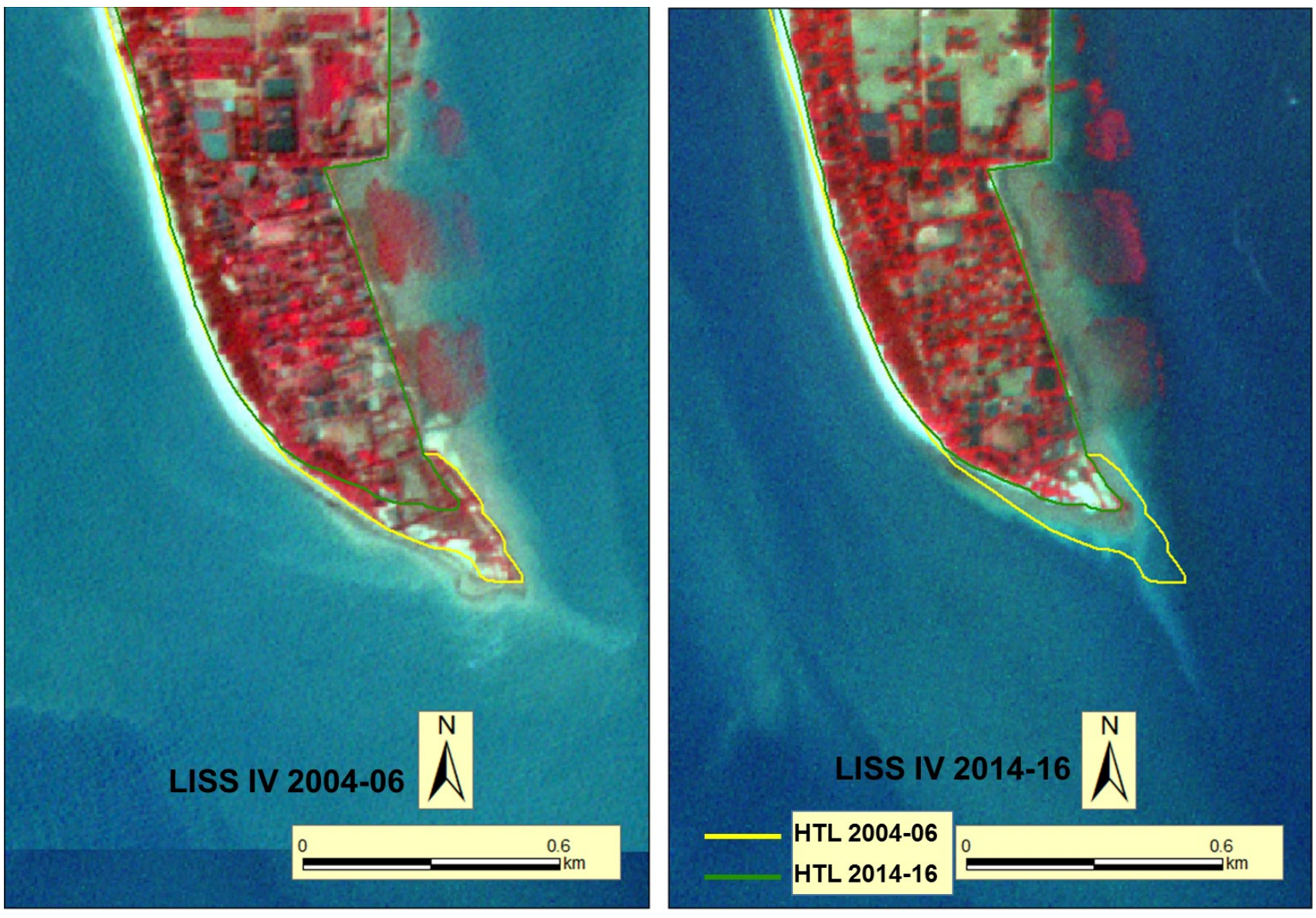


Plate 8: Erosion at Mahisani (79C02SE) marked on LISS IV images of IRS P6 and Resourcesat-2

List of Satellite Data Used

Table No. 3: Satellite data used for Odisha Coast (2004-06 time-frame)

Sr. No	Mapsheet No.	Satellite	Sensor	Orbit	Scene No	Date
1	73K14SE	IRS P6	LISS IV	7190	65	06-03-2005
2	73K15NE	IRS P6	LISS IV	7801	65	18-04-2005
3	73K15SE	IRS P6	LISS IV	7190	66	06-03-2005
4	73K15SW	IRS P6	LISS IV	7190	66	06-03-2005
5	73K16NW	IRS P6	LISS IV	7872, 7190	68, 67	23-04-05, 06-03-2005
6	73K16SE	IRS P6	LISS IV	7190	67	06-03-2005
7	73K16SW	IRS P6	LISS IV	7872	68	23-04-2005
8	73L04SE & 73L04NE	IRS P6	LISS IV	11680	76	16-01-2006
9	73L07SE	IRS P6	LISS IV	7801	70	18-04-2005
10	73L08NE	IRS P6	LISS IV	7190	72	06-03-2005
11	73L08SE	IRS P6	LISS IV	7190	72	06-03-2005
12	73L08SW & 73L08NW	IRS P6	LISS IV	11680	76	16-01-2006
13	73L09NE	IRS P6	LISS IV	7872, 7801	69, 67	23-04-05, 18-04-2005
14	73L09NW	IRS P6	LISS IV	11680	72	16-01-2006
15	73L09SE & 73L09SW	IRS P6	LISS IV	7801	68	18-04-2005
16	73L10NE	IRS P6	LISS IV	7872	70	23-04-2005
17	73L10NW	IRS P6	LISS IV	7190	69	06-03-2005
18	73L10SE	IRS P6	LISS IV	7190	70	06-03-2005
19	73L10SW	IRS P6	LISS IV	8142	69	12-05-2005
20	73L11NE	IRS P6	LISS IV	7872	71	23-04-2005
21	73L11NW	IRS P6	LISS IV	7190	71	06-03-2005
22	73L11SE & 73L11SW	IRS P6	LISS IV	7190	71	06-03-2005
23	73L12NE	IRS P6	LISS IV	7190	72	06-03-2005
24	73L12NW	IRS P6	LISS IV	7872	72	23-04-2005
25	73L13NE	IRS P6	LISS IV	7801, 7872	67, 69	18-04-05, 23-04-2005
26	73L13NW	IRS P6	LISS IV	7801	67	18-04-2005
27	73L13SE	IRS P6	LISS IV	7730, 7872	65, 69	13-04-05, 23-04-2005
28	73L13SW	IRS P6	LISS IV	7872	69	23-04-2005
29	73L14NE	IRS P6	LISS IV	12916	94	13-04-2006
30	73L14NW	IRS P6	LISS IV	7872	70	23-04-2005
31	73L14SE	IRS P6	LISS IV	7730	68	13-04-2005
32	73L14SW	IRS P6	LISS IV	7872, 7190	70, 70	23-04-05, 06-03-2005
33	73L15NW	IRS P6	LISS IV	7872	71	23-04-2005
34	73O02NW	IRS P6	LISS IV	7730	61	13-04-2005

35	73O02SE & 73O02SW	IRS P6	LISS IV	7730	063, 062	13-04-2005
36	73O03NW	IRS P6	LISS IV	7730	63	13-04-2005
37	73O06NE	IRS P6	LISS IV	6778	87	05-02-2005
38	73O06NW	IRS P6	LISS IV	6778	87	05-02-2005
39	73O06SE	IRS P6	LISS IV	6778	88	05-02-2005
40	73O06SW	IRS P6	LISS IV	12916	90	13-04-2006
41	74A15SE	IRS P6	LISS IV	7318	28	15-03-2005
42	74A16NE	IRS P6	LISS IV	7318	28	15-03-2005
43	74A16NW	IRS P6	LISS IV	6977	80	19-02-2005
44	74A16SW	IRS P6	LISS IV	6977	80	19-02-2005
45	74E02NE	IRS P6	LISS IV	6366	71	07-01-2005
46	74E02SE	IRS P6	LISS IV	11410	103-104	28-12-2005
47	74E02SW	IRS P6	LISS IV	7318	26	15-03-2005
48	74E03NE	IRS P6	LISS IV	7318	27	15-03-2005
49	74E03NW	IRS P6	LISS IV	7318	27	15-03-2005
50	74E03SW	IRS P6	LISS IV	7318	27	15-03-2005
51	74E05NE	IRS P6	LISS IV	6366	71	07-01-2005
52	74E05SE & 74E05SW	IRS P6	LISS IV	12987	97	18.04.06
53	74E06NE	IRS P6	LISS IV	6366	71	07-01-2005
54	74E06NW	IRS P6	LISS IV	7318	25	15-03-2005
55	74E06SE	IRS P6	LISS IV	7119	74	01-03-2005
56	74E06SW	IRS P6	LISS IV	7119	74	01-03-2005
57	74E09NW	IRS P6	LISS IV	12987		18-04-2006
58	74E10NE	IRS P6	LISS IV	12987	97	18-04-2006
59	74E10NW	IRS P6	LISS IV	12987	98	18-04-2006
60	74E13NE	IRS P6	LISS IV	11680	77	16-01-2005
61	74E13SW & 74E13SE	IRS P6	LISS III	106		21-01-2006
62	74I01NE & 74I01SE	IRS P6	LISS IV	11680	77	16-01-2005
63	74I05NE & 74I05NW	IRS P6	LISS III	107	58	26-01-2006

Table No. 4: Satellite data used for Odisha Coast (2014-16 time-frame)

S. NO.	MAPSHEET NO.	SATELLITE	SENSOR	PATH	ROW	SUBSCENE	DATE
1	73K15NE	IRS-R2	L4FX	107	57	C	15-01-2015
2	73K15SE	IRS-R2	L4FX	107	57	C	15-01-2015
3	73K15SW	IRS-R2	L4FX	107	57	C	15-01-2015
4	73K16NW	IRS-R2	L4FX	107	57	C	15-01-2015
5	73K16SW	IRS-R2	L4FX	107	57	C	15-01-2015
6	73L08NE	IRS-R2	L4FX	107	57	C	15-01-2015
7	73L08SE	IRS-R2	L4FX	107	57	C	15-01-2015
8	73L11NE	IRS-R2	L4FX	107	58	A	28-11-2014

9	73L11SE	IRS-R2	L4FX	107, 107	58, 58	C, A	15-01-2015 28-11-2014
10	73L12NE	IRS-R2	L4FX	107	58	C	15-01-2015
11	73L12NW	IRS-R2	L4FX	107	58	C	15-01-2015
12	73L13NE	IRS-R2	L4FX	107	58	C	15-01-2015
13	73L13NW	IRS-R2	L4FX	107	58	C	15-01-2015
14	73L13SE	IRS-R2	L4FX	107	58, 58, 57	A, B,C	28-11-2014 04-11-2014 15-01-2015
15	73L14NE	IRS-R2	L4FX	107	58	A, B	28-11-2014 04-11-2014
16	73L14SE	IRS-R2	L4FX	107	58	A	28-11-2014
17	73L14SW	IRS-R2	L4FX	107	58	A	28-11-2014
18	73L15NW	IRS-R2	L4FX	107	58	A	28-11-2014
19	73L15SW	IRS-R2	L4FX	107	58	A	28-11-2014
20	73O02SE	IRS-R2	L4FX	107	57	C, B	15-01-2015 08-02-2015
21	73O02SW	IRS-R2	L4FX	107	57	C	15-01-2015
22	73O03NW	IRS-R2	L4FX	107	57	C	15-01-2015
23	73O06SE	IRS-R2	L4FX	107	57	B	08-02-2015
24	73O06SW	IRS-R2	L4FX	107	57	B	08-02-2015
25	73P02NW	IRS-R2	L4FX	107	58	A, B	28-11-2014 04-11-2014
26	74A15SE	IRS-R2	L4FX	105	59	B	22-02-2015
27	74A16NE	IRS-R2	L4FX	105	59	B	22-02-2015
28	74A16NW	IRS-R2	L4FX	105	59	B	22-02-2015
29	74A16SW	IRS-R2	L4FX	105	59	B	22-02-2015
30	74E02SE	IRS-R2	L4FX	105, 106	59, 58	B, C	22-02-2015 23-03-2015
31	74E03NE	IRS-R2	L4FX	105, 106	59, 58	B, C	22-02-2015 23-03-2015
32	74E03NW	IRS-R2	L4FX	105, 106	59, 58	B, C	22-02-2015 23-03-2015
33	74E03SW	IRS-R2	L4FX	105, 106	59, 58	B, C	22-02-2015 23-03-2015
34	74E06NE	IRS-R2	L4FX	106	58	C	23-03-2015
35	74E06SE	IRS-R2	L4FX	106	58	C	23-03-2015
36	74E06SW	IRS-R2	L4FX	105, 106	59, 58	B, C	22-02-2015 23-03-2015
37	74E09SE	IRS-R2	L4FX	106, 106	58, 58	C, D	23-03-2015 10-01-2015
38	74E10NE	IRS-R2	L4FX	106	58	C	23-03-2015
39	74E10NW	IRS-R2	L4FX	106	58	C	23-03-2015
40	74E13SE	IRS-R2	L4FX	106	58	D	10-01-2015
41	74E13SW	IRS-R2	L4FX	106, 106	58, 58	C, D	23-03-2015 10-012-015
42	74I01NE	IRS-R2	L4FX	106, 107	58, 58	D, C	10-01-2015 15-01-2015
43	74I01SE	IRS-R2	L4FX	106	58	D	10-01-2015
44	74I01SW	IRS-R2	L4FX	106	58	D	10-01-2015
45	74I05NE	IRS-R2	L4FX	107	58	C	15-01-2015
46	74I05NW	IRS-R2	L4FX	106, 107	58, 58	D, C	10-01-2015 15-01-2015

Table No. 5: Satellite data used for West Bengal Coast (2004-06 time-frame)

S. No.	MAPSHEET NO.	SATELLITE	SENSOR	ORBIT NO.	SCENE NO.	DATE
1	73O10 NW	IRS P6	LISS IV	6636	67	26-01-2005
2	73O14 NW	IRS P6	LISS IV	6849	63	10-02-2005
3	73O13 SW	IRS P6	LISS IV	6849	63	10-02-2005
4	73O13 SE	IRS P6	LISS IV	6579	82	10-02-2005
5	73O10 NE	IRS P6	LISS IV	6636	66	26-01-2005
6	79C01SE	IRS P6	LISS IV	11765	56	22-01-2006
7	79C06 NE	IRS P6	LISS IV	11822	62, 63	26-01-2006
8	79C06 NW, SW	IRS P6	LISS IV	12092	44 & 45	14-02-2006
9	79C06 SE	IRS P6	LISS IV	11822	64	26-01-2006
10	79C09SW, NW	IRS P6	LISS IV	11822	62 & 63	26-01-2006
11	79C05 SE	IRS P6	LISS IV	11822	62, 63	26-01-2006
12	79C05 NW, SW	IRS P6	LISS IV	12092	43, 44	14-02-2006
13	79C01 NE	IRS P6	LISS IV	11765	57	22-01-2006
14	79B04 SW	IRS P6	LISS IV	11751, 6579	44, 81	21-01-2006, 21-01-2006
15	79B04 SE	IRS P6	LISS IV	11765, 10529, 1663	56, 66, 80	22-01-06, 27-10-05, 11-02-04
16	79F03 SW	IRS P6	LISS IV	1893, 11964	20 & 21, 83	31-01-06, 05-02-06
17	79B04 NE	IRS P6	LISS IV	11751	43	21-01-2006
18	79B04 NW	IRS P6	LISS IV	7048, 6849	60, 61	24-02-2005, 10-02-2005
19	79C01NW	IRS P6	LISS IV	11751	44	21-01-2006
20	79C02 NE, SE, SW	IRS P6	LISS IV	11765	57, 58	22-01-2006
21	79C02 NW	IRS P6	LISS IV	11751	45	21-01-2006
22	79C01 SW	IRS P6	LISS IV	11751	45	21-01-2006
23	79B12 SE	IRS P6	LISS IV	11495	51	03-01-2006
24	79B15 SW	IRS P6	LISS IV	7403, 11495	52, 49	21-03-2005, 03-01-2006
25	79B16 SE	IRS P6	LISS IV	11623, 11964	61, 84	12-01-2006, 05-02-2006
26	79B16 NE	IRS P6	LISS IV	11893	21	31-01-2006
27	79B16 NW	IRS P6	LISS IV	6508	59	17-01-2005
28	79G02 NW	IRS P6	LISS IV	11623	62, 63	12-01-2006
29	79B12 NE	IRS P6	LISS IV	11495, 6508	50, 59	03-01-2006, 17-01-2005
30	79B15 SE	IRS P6	LISS IV	11893	20	31-01-2006
31	79B12 NW	IRS P6	LISS IV	12092	42	14-02-2006
32	79F04 NW	IRS P6	LISS IV	11623	60	12-01-2006

Table No. 6: Satellite data used for West Bengal Coast (2014-16 time-frame)

S. No.	MAPSHEET No.	Satellite	Sensor	PATH	ROW	SUBSCENE	DATE
1	73O06SE	IRS-R2	L4FX	107	57	B	08-02-2015
2	73O10NE	IRS-R2	L4FX	107, 108	57	B, C	08-02-2015 01-01-2014
3	73O10NW	IRS-R2	L4FX	107	57	B	08-02-2015
4	73O10SW	IRS-R2	L4FX	107	57	B	08-02-2015
5	73O13SE	IRS-R2	L4FX	107, 108	57	B, C	08-02-2015 01-01-2014
6	73O13SW	IRS-R2	L4FX	107, 108	57	B, C	08-02-2015 01-01-2014
7	73O14NW	IRS-R2	L4FX	107, 108	57	B, C	08-02-2015 01-01-2014
8	79C01NE	IRS-R2	L4FX	108	57	C	01-01-2014
9	79C01SE	IRS-R2	L4FX	108	57	C	01-01-2014
10	79C01SW	IRS-R2	L4FX	108	57	C	01-01-2014
11	79C02NE	IRS-R2	L4FX	108	57	C	01-01-2014
12	79C02NW	IRS-R2	L4FX	108	57	C	01-01-2014
13	79C02SE	IRS-R2	L4FX	108	57	C	01-01-2014
14	79C05SE	IRS-R2	L4FX	108	57	A	15-01-2016
15	79C06NE	IRS-R2	L4FX	108	57	A	15-01-2016
16	79C06NW	IRS-R2	L4FX	108	57	C, A	01-01-2014 15-01-2016
17	79C06SE	IRS-R2	L4FX	108	57	A	15-01-2016
18	79C06SW	IRS-R2	L4FX	108	57	C, A	01-01-2014 15-01-2016