

DOAR



Govt. of Odisha.

COASTAL EROSION ***in*** ***ODISHA.***

- a Presentation.



03-Mar-11

GP Roy,DD,FMIS

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Focus on Understanding ...

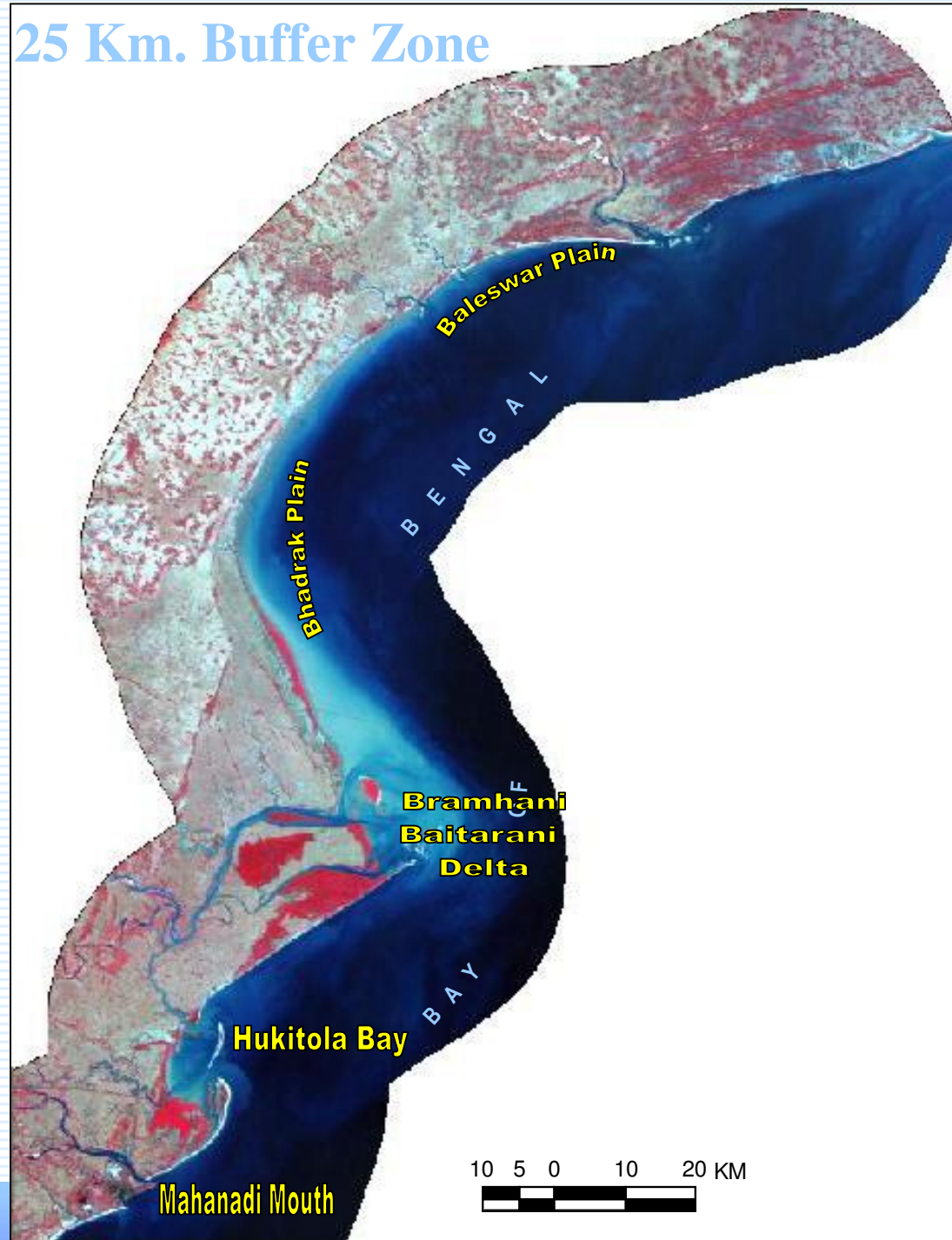
- **Coastal Vulnerabilities**
- **Coastal Erosion & Accretion**
- **Impact on People & Livelihood**
- **Possible Mitigation Options (Structural & Non-Structural)**
- **Protection measures in Odisha**





25 Km. Buffer Zone

Northern Part
Coastal Zone
from
Subarnarekha
Mouth to
Mahanadi
Mouth

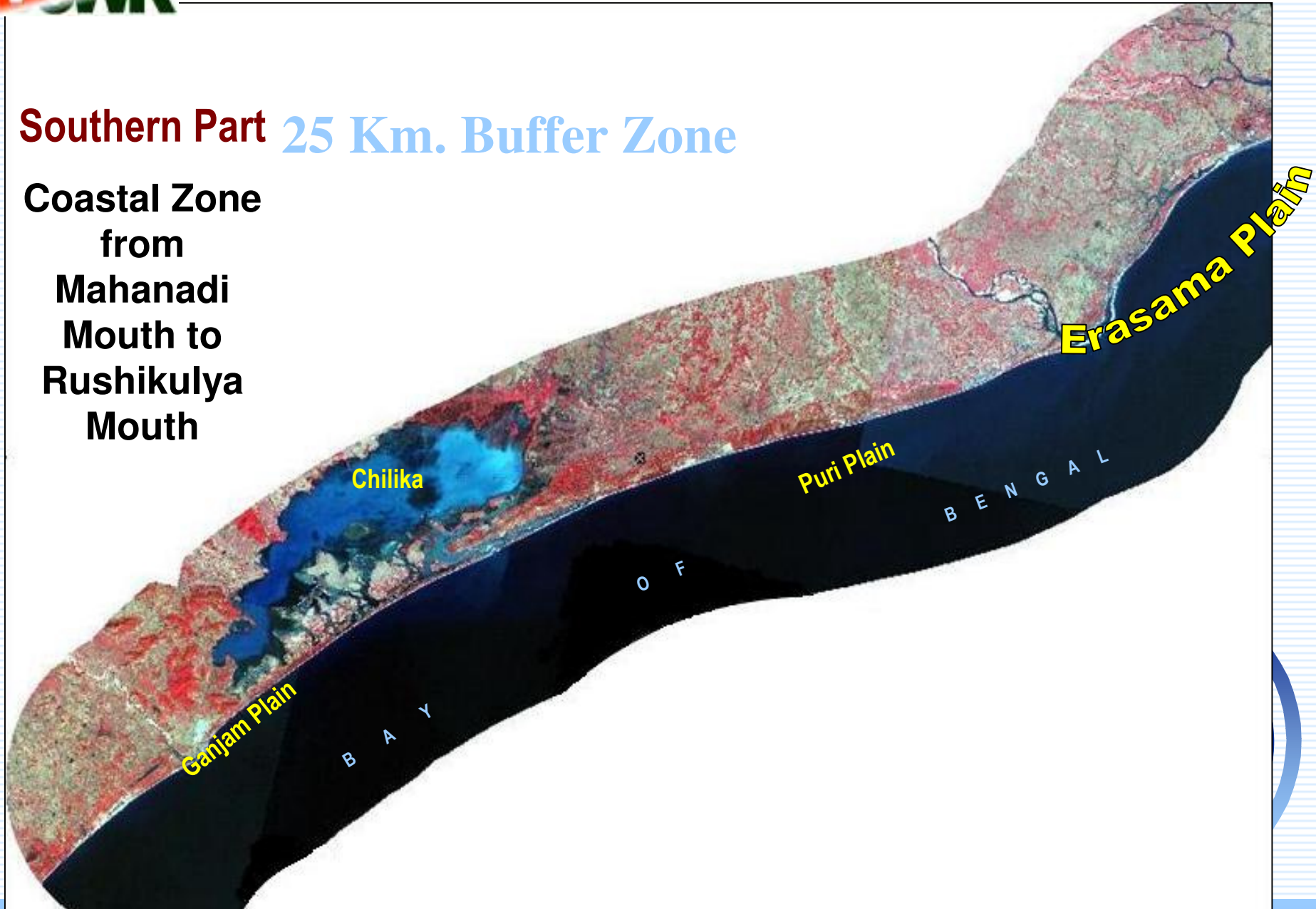


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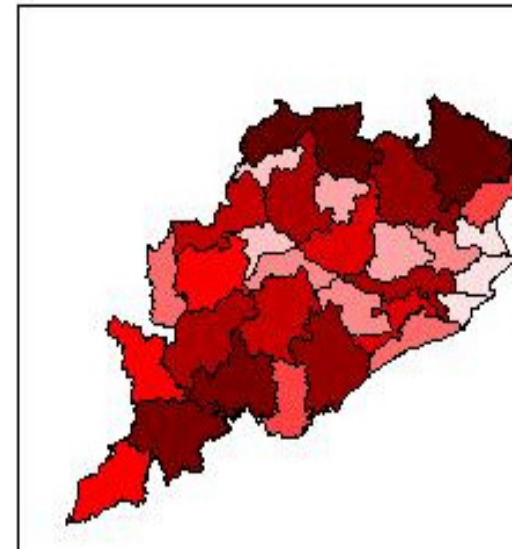
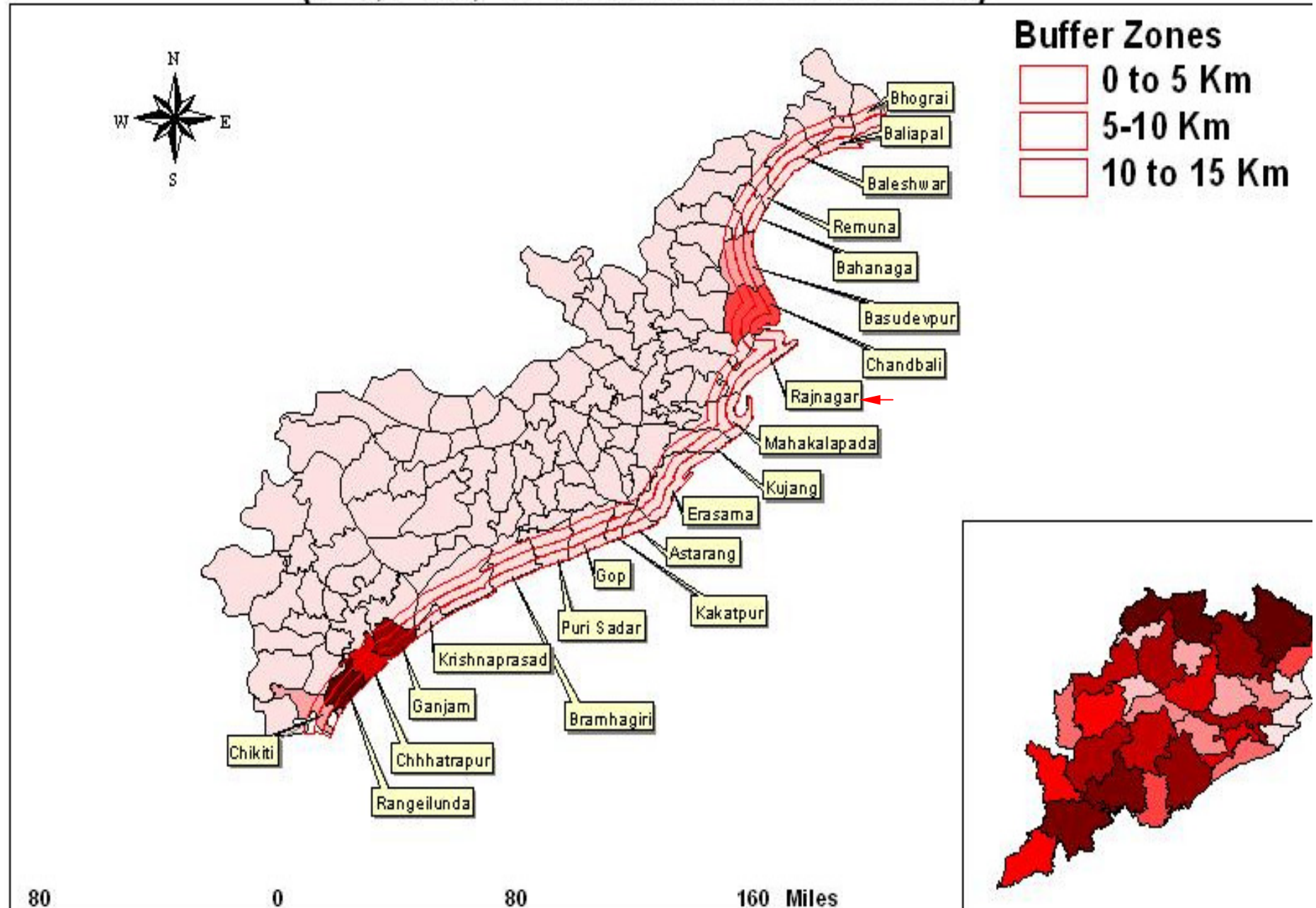


Southern Part 25 Km. Buffer Zone

**Coastal Zone
from
Mahanadi
Mouth to
Rushikulya
Mouth**



Coastal blocks of Orissa with buffer zones (0-5, 5-10, 10-15 Kms from the Sea)



The Odisha Coast (476 Km).

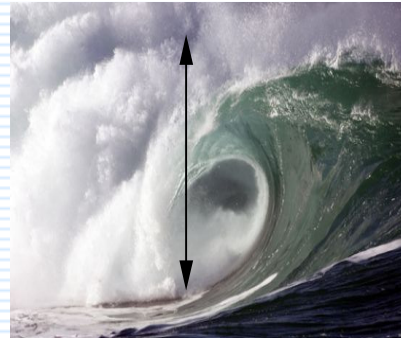
◆ From Rushikulya to Mahanadi Mouth

– Micro-Tidal (<2m) & High Wave Energy

◆ Mahanadi to Dhamra Mouth

– Estuarine, Mudflats and Mangrove Swamps

◆ Baleswar Coast



– Meso-Tidal(2-4m), Low Wave Energy, Silty and Muddy

◆ Sediments along the Coast

– Fluvial, Marine, Brackish, Lacustrine and Aeolian

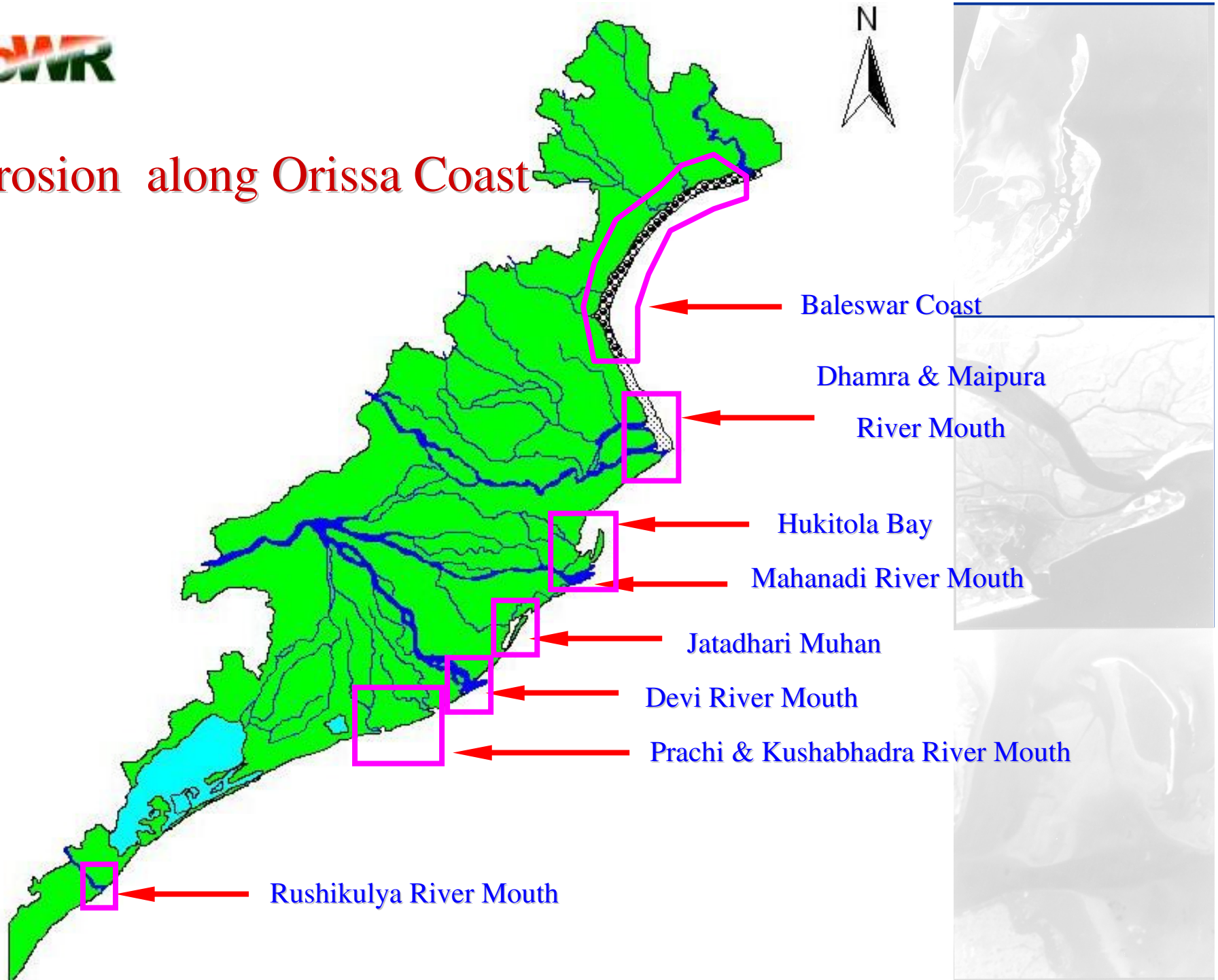
◆ Shoreline along the Delta

– Protruding(Extending) Seawards





Erosion along Orissa Coast



BHADRAK COAST



55 sq.km.
Forest in 1975

↓

25 sq.km.
Forest in 2008

&

15 sq.km.
aqua ponds

MAHANADI MOUTH & HUKITOLA BAY

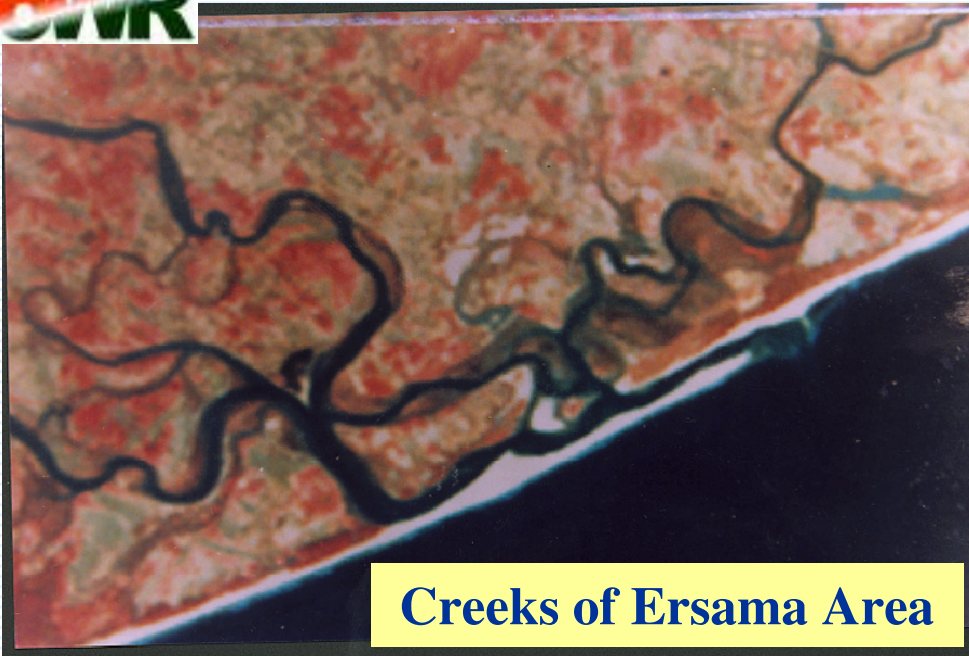


46 sq. km. of Forest in 1975

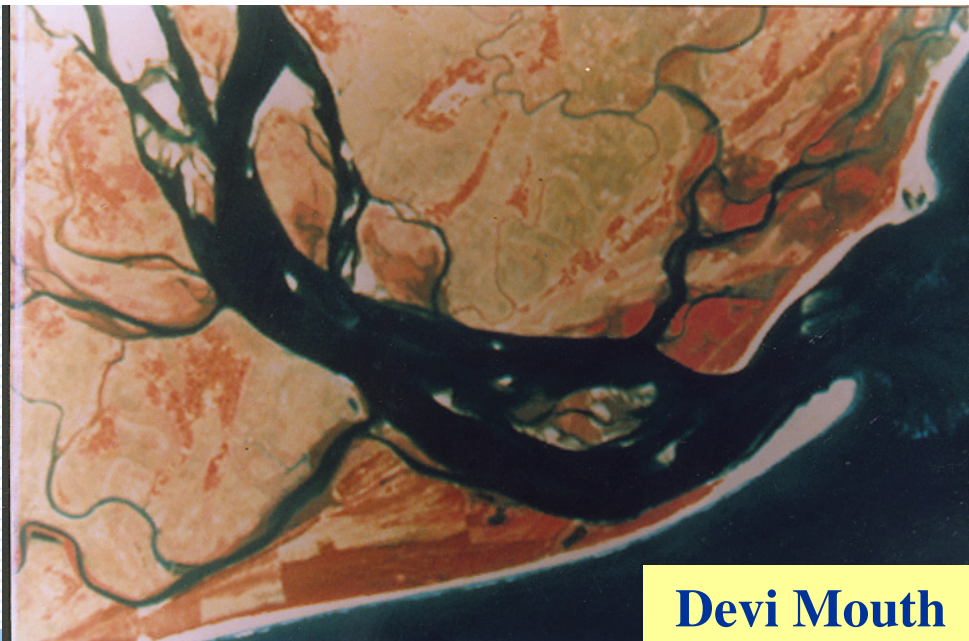


35 sq.km. Lost @ 1 sq.km./yr

9



Creeks of Ersama Area



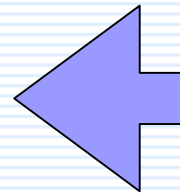
Devi Mouth

MIS

8 sq.km. of Forest in
1975

↓

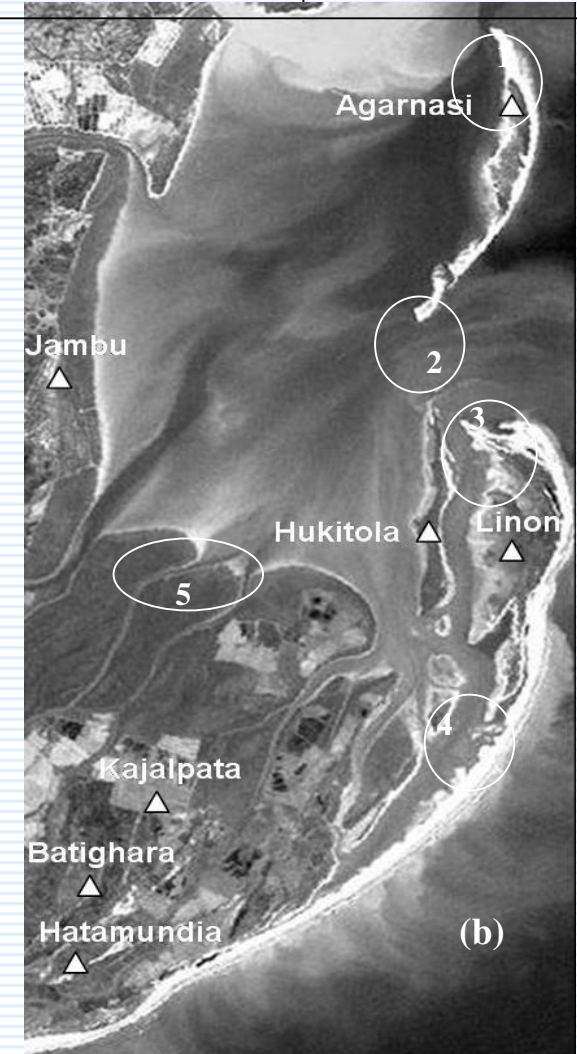
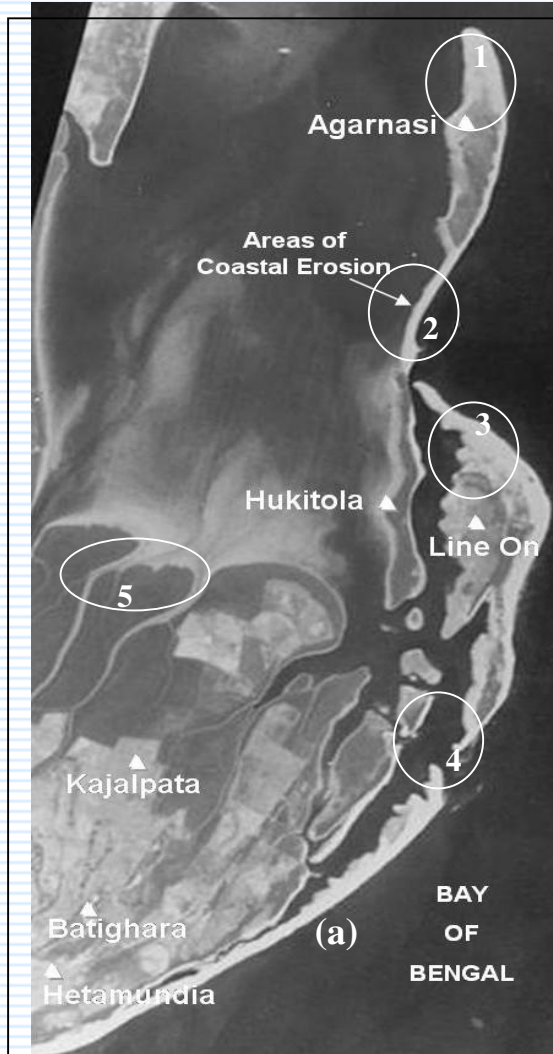
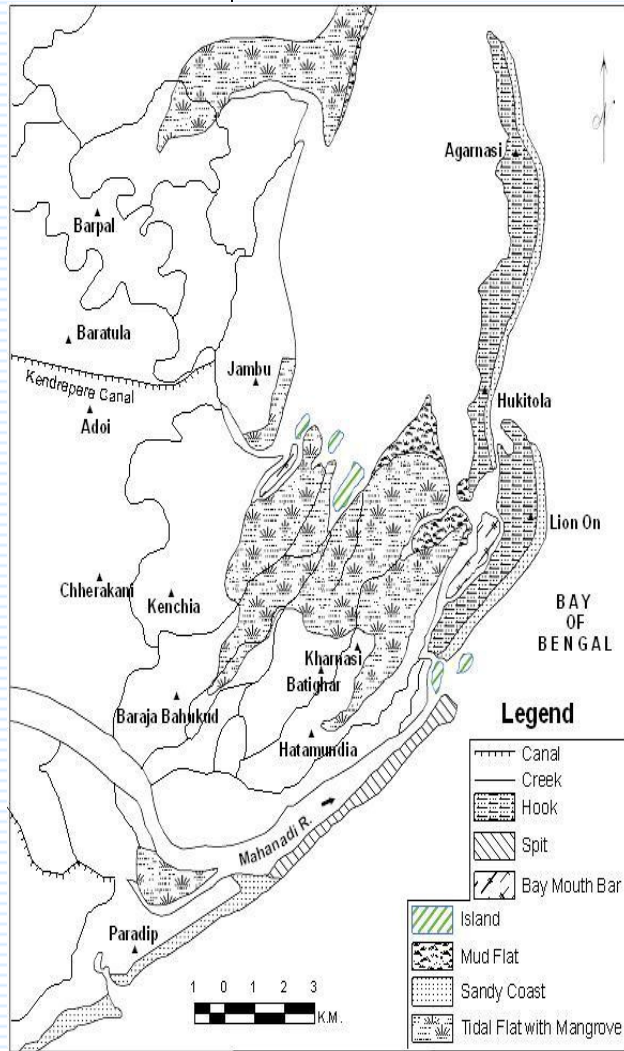
2 sq.km. in 2005



1929

1994

2008



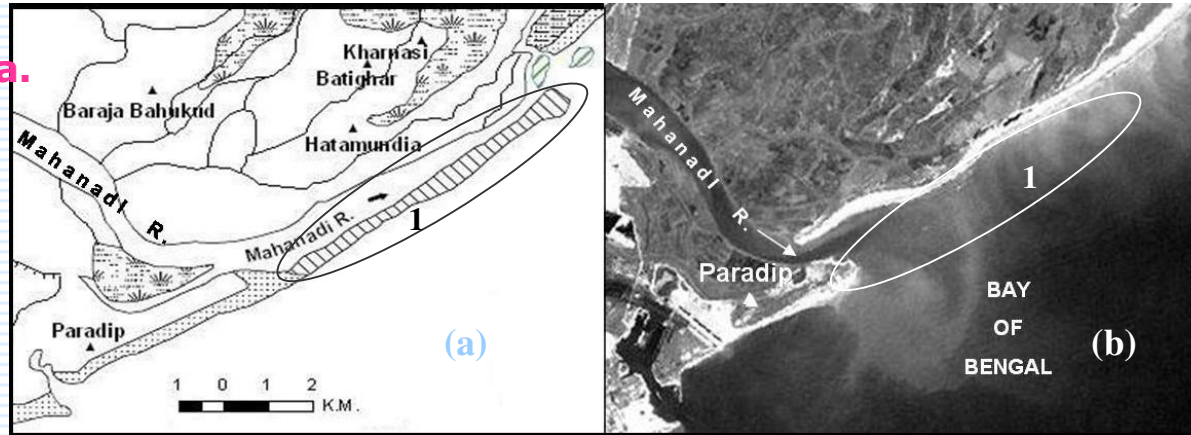
Changing Morphology of the Spits, Bay Mouth Bars & Islands around Hukitola Bay

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GP Roy, IIT, FMIS

11





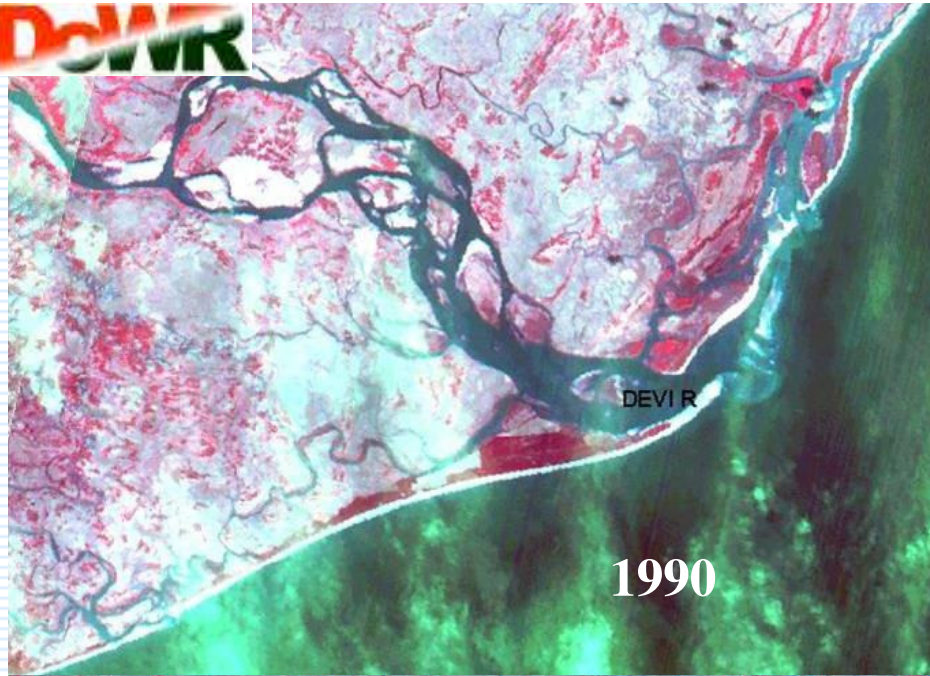
Changing Morphology of the Spits near Mahanadi Mouth as revealed from the (a) SOI Topomap, 1929 and (b) Landsat - 7, 2002.



Wave Erosion showing Cliff Face on the Sea Ward side of the Agarnasi Island adjoining Hukitola Bay (Photographed on 10th May 2006).



DoWR

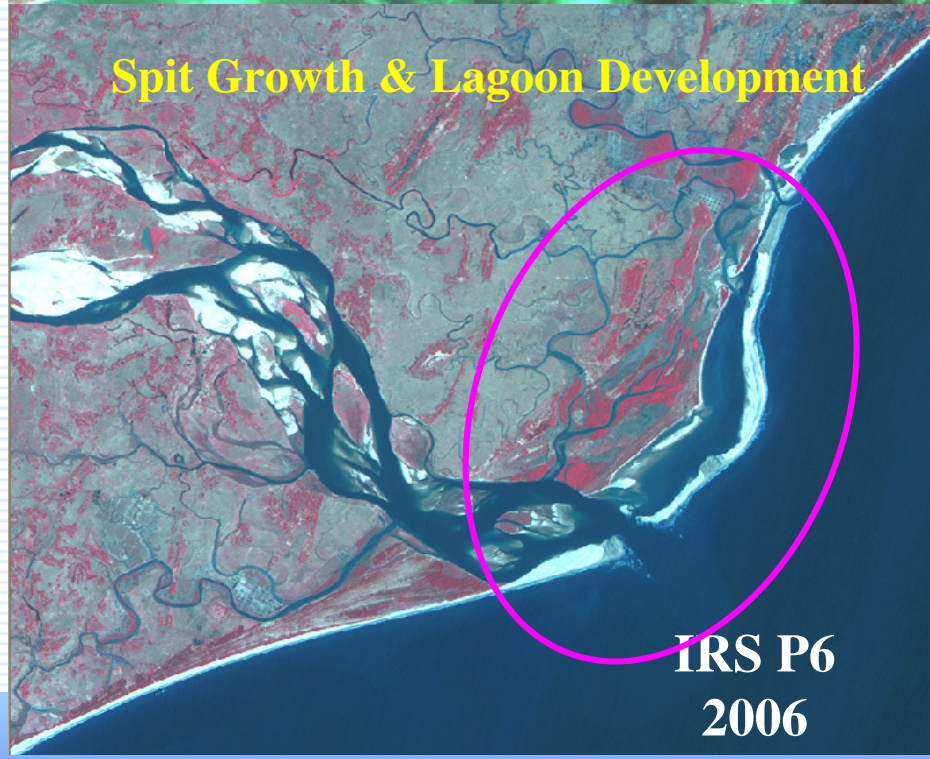


DEVI R

1990



2001



Spit Growth & Lagoon Development

IRS P6
2006

SHORELINE CHANGES ALONG ORISSA COAST FROM DEVI RIVER TO JATADHAR MUHAN NADI (1929 TO 2001)

0 5 10 Kilometers



Bay Of Bengal

LEGEND

- UNCHANGED
- EROSION
- DEPOSITION



1990



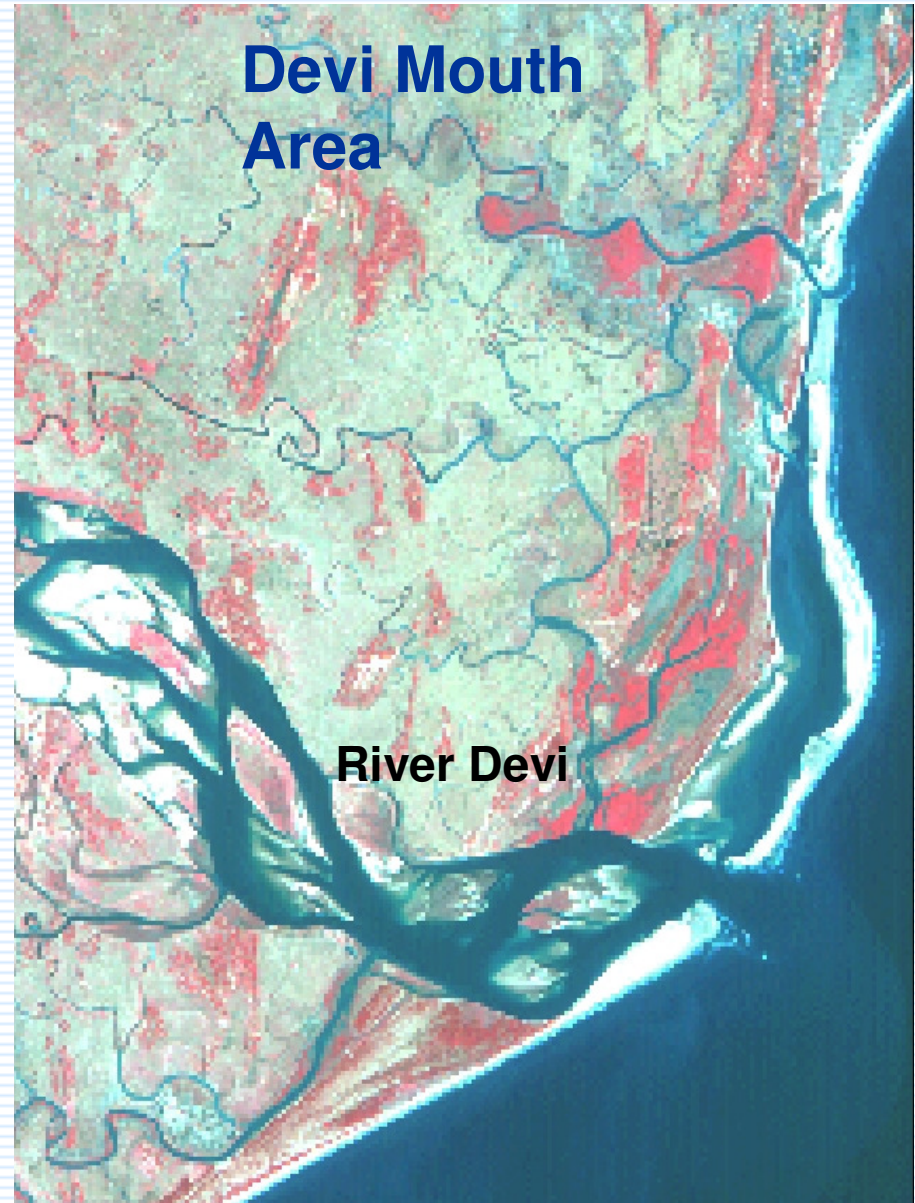
2002



IRS P6 DD,FMIS
2006

Rushikulya River Mouth.





Kushabhadra Mouth Area



River Kushabhadra

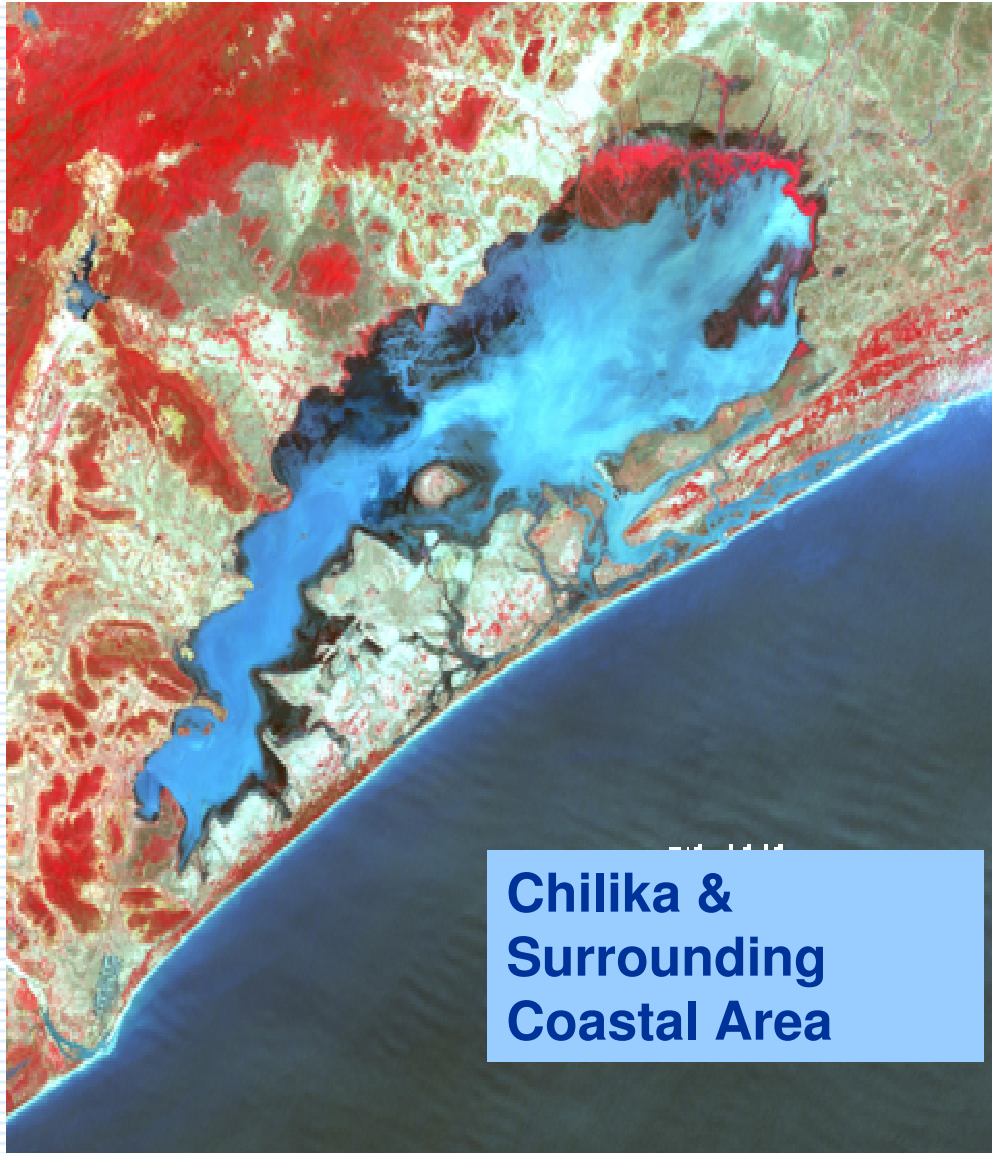
Puri Coastal Area



Puri Sea Beach

OD,





**Chilika &
Surrounding
Coastal Area**



Ganjam Coastal Area

Rushikulya River

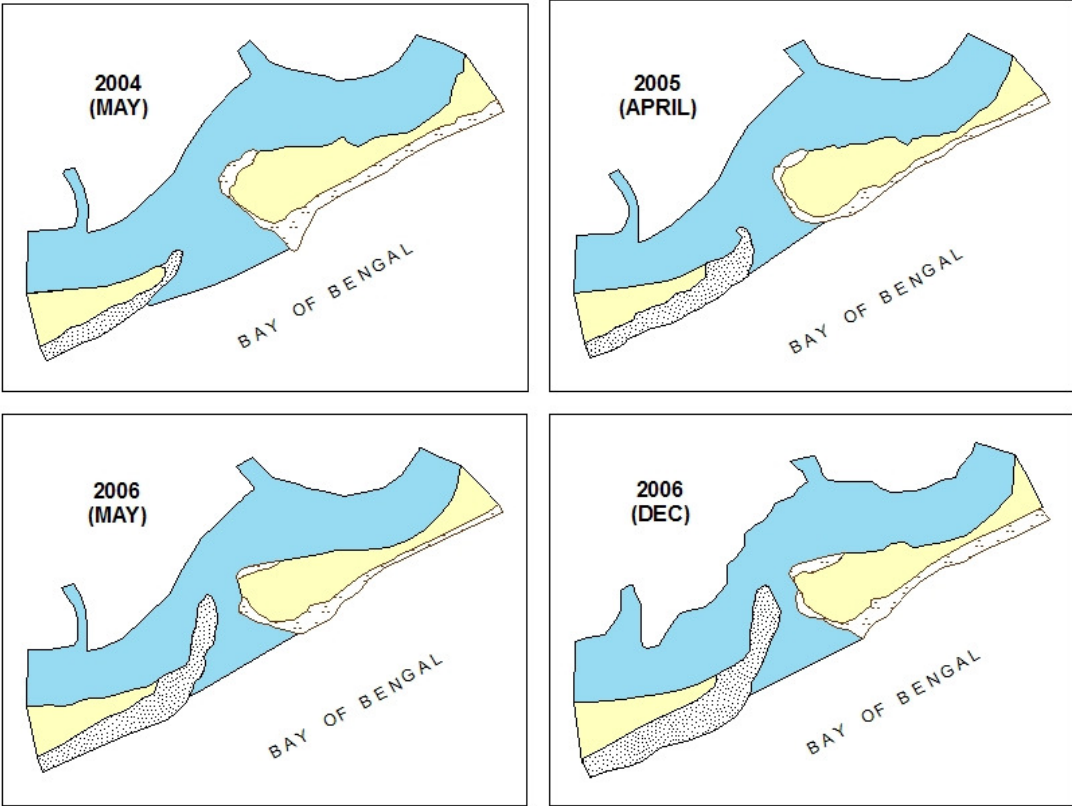


Spit Growth & Shifting of Chilika Mouth

INLET POSITION OF CHILIKA LAGOON

K.M. 0.7 0.35 0 0.7K.M.

IRS P6, LISS IV
December, 2006



03-Mar-11



Puri



Coastal Erosion in Orissa

Gopalpur



Chilika



Ersama



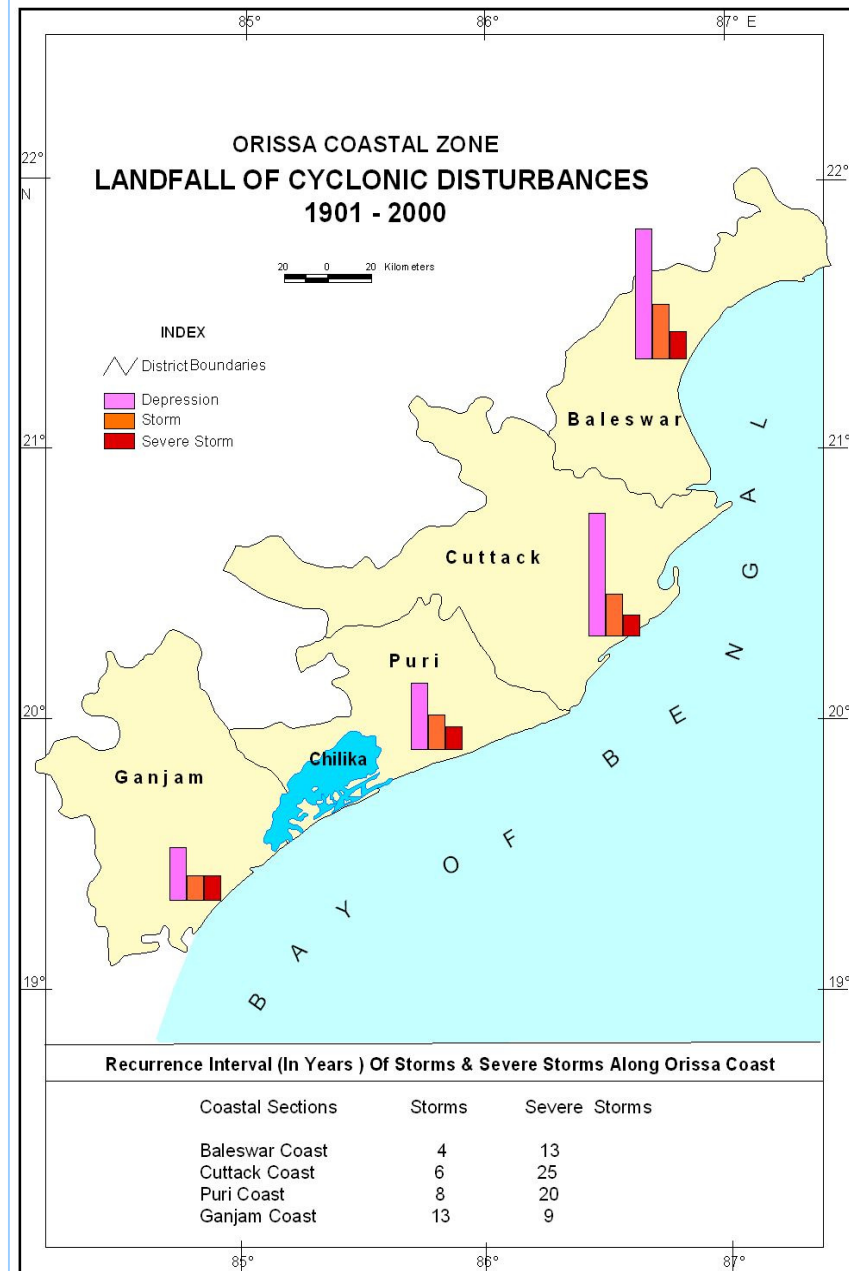
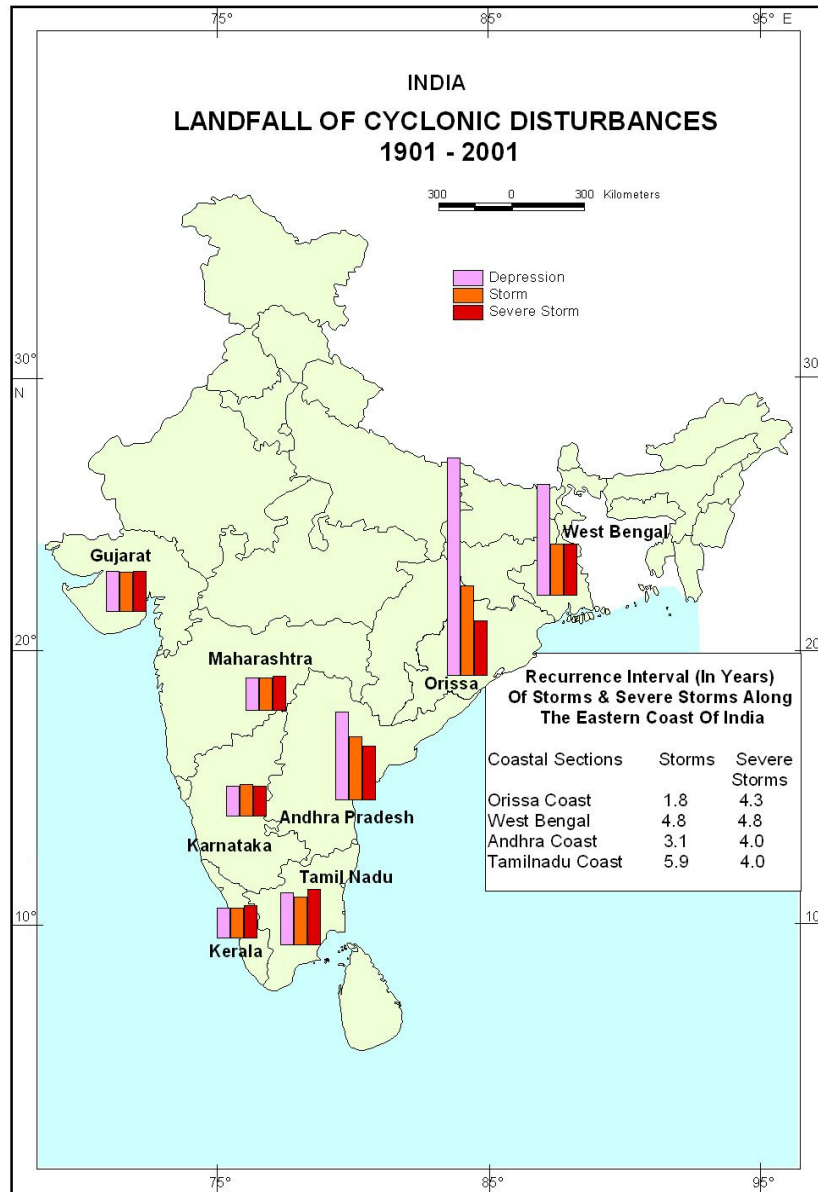


Coastal Erosion in Pentha Village




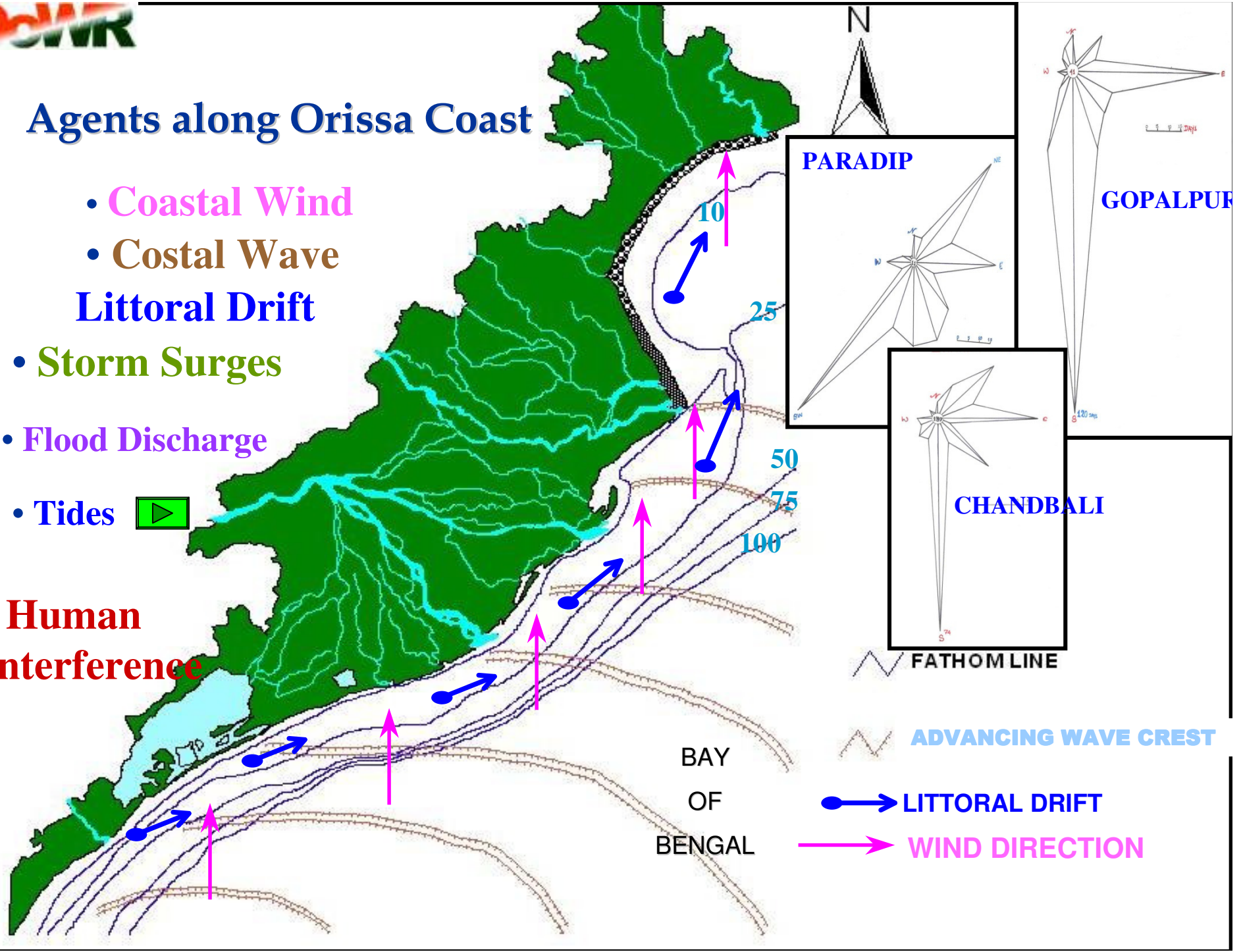
03-Mar-11

GP Roy, I



Agents along Orissa Coast

- Coastal Wind
- Costal Wave
- Littoral Drift
- Storm Surges
- Flood Discharge
- Tides 
- Human Interference



PARADIP

GOPALPUR

CHANDBALI

FATHOMLINE

ADVANCING WAVE CREST

LITTORAL DRIFT

WIND DIRECTION

BAY OF BENGAL

Possible Impacts on.....

- Coastal Habitation
- Fishing Communities
- Low & Marginal Farmers
- Daily Wagers & Ag. Laborers
- Agriculture & Plantations
- Small Traders & Business man



Possible measures to protect Erosion.

Coastal Defences

groynes

dissipates wave energy

sea wall

widens the beach to absorb wave energy

beach nourishment

protects vegetation to stabilise cliff

cliff fencing

prevent longshore drift



solve



Problems

- Cyclone & Storm Surges
- Flood & Tidal Inundations
- Coastal erosion
- Migration of Sand dunes.
- Popln. Pres. & LU change
- Coastal encroachments
- Loss of Mangroves
- Loss of Habitat &

Bio-Diversity

Potential.

- Mangrove Plantation
- Fishing & Aquaculture
- Eco-Tourism
- Plantations



Mitigation Options

- Interventions
- Capacity Building
- Knowledge Management
- Adaptations
- Policy and Programmes
- Research & Development



Interventions

1. Reduction of Climate Change Hazards through Coastal afforestation with community focus.
2. Providing drinking water to coastal communities to combat enhanced salinity due to sea level rise.
3. Construction of flood shelter, information and assistance centre to cope with enhanced recurrent floods in major floodplains.



Capacity Building



1. Capacity building for integrating Climate Change in planning, designing of infrastructure, conflict management and land-water zoning for water management.
2. Climate change and adaptation information dissemination to vulnerable community to raise awareness.
3. Mainstreaming adaptation to climate change into policies and Programmes in different sectors, focusing on disaster management, water, agriculture, health and industry.



Key Points for Local Rehabilitation Plan

1. Needs Assessment based on diff. degrees of impact to design diff. recovery and rehabilitation strategy & plan.
2. Design interventions (infrastructure, economic, institutional & social) according to priority of the needs
3. Participatory approach of local people & stakeholders to identify problems, needs & new deve. perspective.
4. Coordination with other agencies (GOs, NGOs, IOs, & civil society) for effective utilization of resources.
5. Integration of local rehabilitation plan within framework for long term sustainability



6. Inclusion of climate change issues in curriculum at secondary and tertiary educational institution.
(Awareness Raising)
7. Enhancing resilience of urban infrastructure and industries to impacts of climate change including floods and cyclone (Capacity Building)
8. Development of eco-specific indigenous knowledge on adaptation to climate variability to enhance adaptive capacity for future climate change.
(Intervention)
8. Promotion of research on saline tolerant varieties of crops to facilitate adaptation in future (Research)

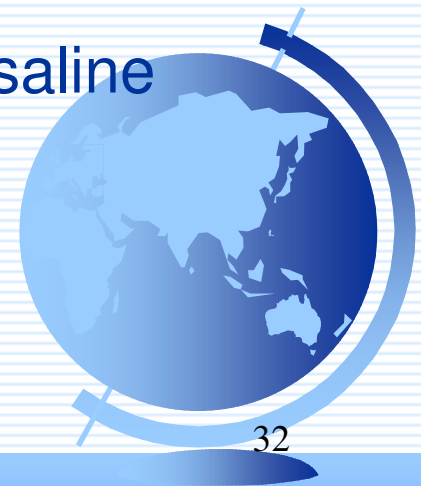


**COASTAL PROTECTION MEASURE FOR
CONTROL OF EROSION
under ICZMP
AT
PENTHA.**



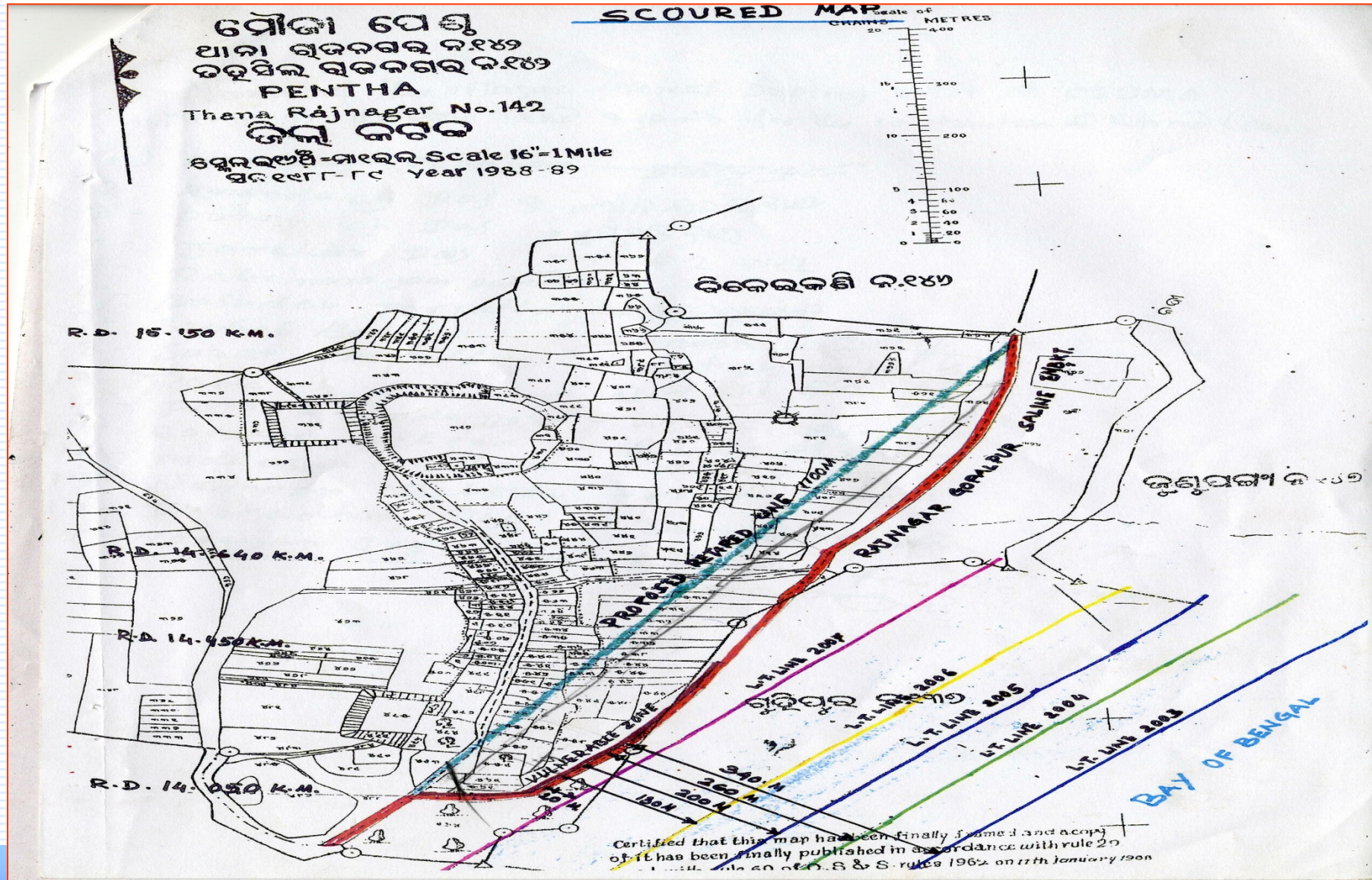
BRIEF HISTORY

- **Pentha** is a seashore village of Rajnagar block in Kendrapara district located south of dhamara in Paradeep~Dhamara stretch.
- Main cause of shore line erosion at **Pentha** is due to steep waves, strong winds during monsoon, sediment transport and litoral drift.
- The shoreline near the village has advanced about 1.5 km since 1999.
- It has almost eroded the Rajnagar~Gopalpur saline embankment for a stretch of 3.0 km.





Proposed Retarded Line 1100 m in the project area.





CONSTRUCTION STRATEGY.

- Geo tubes with polypropylene woven geotextiles.
- Gabion boxes.
- Geo textile filter materials.
- Gabion mattress for protecting the seashore.





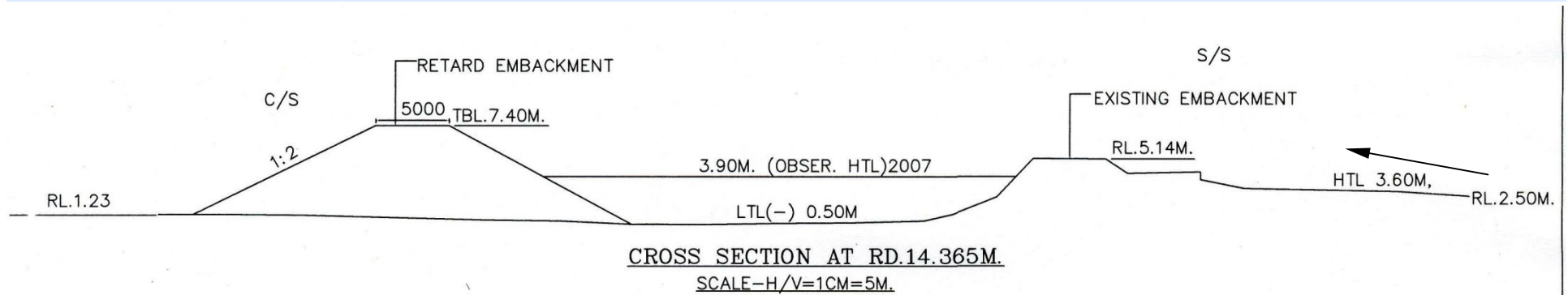
PRESENT PROPOSAL.

- Portion of 700m of the embankment near village Pentha will be protected using geo-tubes.
- Coastal afforestation for 2200m along the coast with a width of 3.5m between sea and geo-tube embankment.
- Construction of 3 Km of approach road leading to the village.
- Construction of office cum monitoring room.





Cross Section of Retard Embankment with existing Embankment



Present Proposal: Why?

- Shore line has advanced more than 1.5 Km. from 1999.
- Sea waves have already damaged the existing embankment.
- Traditional method of protection using wooden piles, sand bags and brushwood every year proved to be unsuccessful.
- Other protection strategies such as dumping stones, Concrete or masonry wall in the countryside seems to be unworkable as,
 - Foundation soil found to be loose and black cotton
 - Country side do not have mangroves
 - Immediate lands are cultivable lands
 - No permanent approach to the area
 - Carriage of construction materials to the site are difficult.



Present Proposal: Arrangements

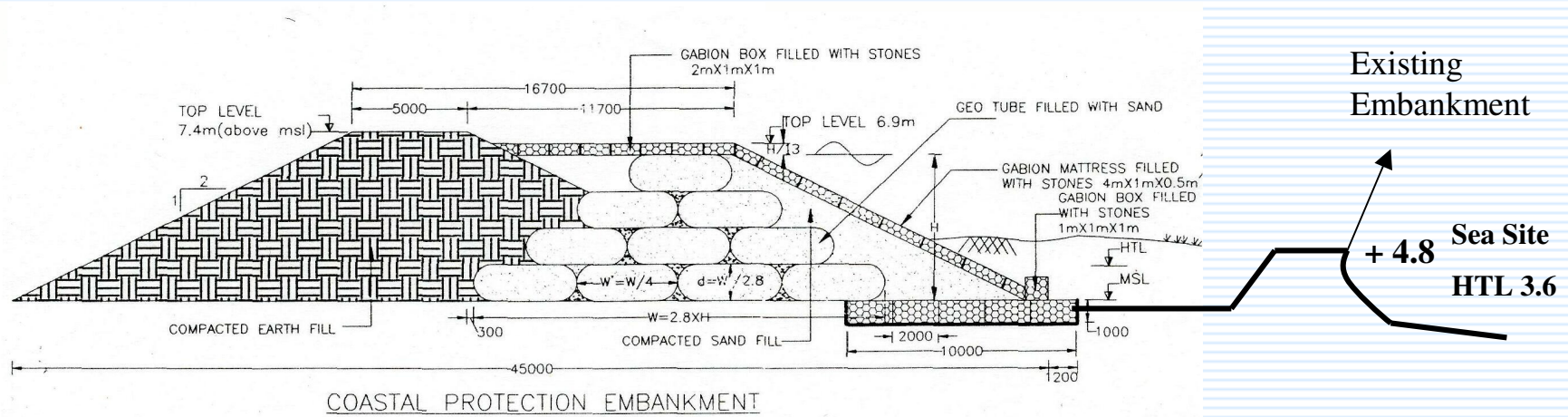
- For a long term and workable solution Technical advice from Ocean Engineering Department of IIT, Madras was taken.

As per the suggestions:

- Raising & strengthening of saline embankment to be taken up.
- The cross section will be as shown in the figure next.
- Top level of embankment shall be kept at 7.5 m above M.S.L.
- Plantation to be carried out from toe of embankment wall as the first line of defense.



Present Proposal: Typical sketch.



- NOTE.
- 1.GEO TUBE FILLED WITH SAND MADE WITH POLYPROPYLENE WOVEN GEOTEXTILE
 - 2.GABION BOX 9mm 4 STRAND PP TARRD ROPE GABION BOX OF MESH SIZE 150mmX150mm FILLED WITH STONES GREATER THEN 150mm SIZE
 - 3.GEOTEXTILE FILTER MADE WITH WOVEN POLYPROPYLENE MATERIAL
 - 4.GABION MATTRESS 9mm 4 STRAND PP TARRD ROPE GABION BOX OF MESH SIZE 150mmX150mm FILLED WITH STONES GREATER THEN 150mm SIZE
 - 5.ALL THE LEVELS ARE WITH REFERENCE TO THE MEAN SEA LEVEL(MSL).



Present Proposal: Details and scope.

Details:

- Construction of the compacted earthen embankment keeping top level at 7.5m above MSL with top width of 5.0m, Sea side protected by stone packing.
- Sea side area to be covered with plantation

Scope:

- Length of the embankment to be raised - 1005m.
- Length of afforestation - 2200m.
- Cost of Project (2009) : Rs.1890.691 Lakhs





Present Proposal: Impacts and benefits

- **Impacts:**

The project will have no negative environmental and social impacts. By afforestation coastal flora & fauna will be preserved.



Pictures of the site: (Dt. 25.09.2007)



Pictures of the site: (Dt. 25.09.2007)



Pictures of the site: (Dt. 25.09.2007)



Pictures of the site: (Dt. 14.11.2007)



Pictures of the site: (Dt. 08.05.2008)



Pictures of the site: (Dt. 08.05.2008)



Pictures of the site: (Dt. 08.05.2008)









Present coastal protection activities.

- Similar arrangements as in Pentha have been proposed for protection to Puri town near Mangala river mouth. Cost Rs.9.0 crores (2009 Price level).
- Proposals under National Cyclone Risk Management Programme (NCRMP), Reconstruction and new saline embankment of 150 Km. Protection measures on the sea face, Construction of 165 sluices on the embankments. Cost Rs.150.00 crores (2009 Price level).
- Protection measures in other vulnerable areas beyond Pentha in Northern coast (Proposal under preparation Rs.500 crores)
- Protection measures in other vulnerable areas beyond Puri in Southern coast (Proposal under preparation Rs.400 crores)
- Construction of coastal highway (from Gopalpur to Digha) after necessary protection made to the coast.





Present coastal protection activities.

- The proposal for Pentha has been included under WB funded ICZMP.
- Protection at Puri is being proposed under JNNURM.
- NCRMP is under WB assistance.
- Other proposed measures may considered under FMP.



Issues for consideration.

- Funding arrangements for proposed suitable interventions.
- Model study on performance of river mouth dredging in Odisha.
- Assessment of Optimal dimensions of Groynes to check littoral drift in Odisha coast.
- Research directive for forecasting tidal surge.
- Recommendation for construction of Saline embankments with specific free board.
- Study on scour due to tidal waves, which can be used in design practices.
- Study on possible implication on use of locally available fine aggregates and saline water for construction of masonry structures.



Proposed arrangements.

- Following cost proposals for different coastal protection measures in the state have been prepared.

On an average, 70% of the coast length of the state out of 476 Km is either affected by erosion or, anticipated.

* Protection measures for these can be done using

- (a) Sea wall construction using Concrete, Masonry or, Dry rock.
- (b) Sea wall construction using geo-tubes and locally available materials.
- (c) Large scale plantations.

CONTROL OF EROSION AT SATABHAYA.



DoWR







05-Mar-11

GP ROY,DD,FMIS



- **Acknowledgements:**
 - **Dr.GK Panda, Utkal University.**
 - **Deptt. of Ocean Engg. IIT, Madras.**
 - **NRSC, Hyderabad.**
 - **EE, Coastal Embankment Divisions.**



THANK YOU.

