Anthropogenic Influences on Freshwater Resources versus Land Use and Cover Change (LUCC) in Palar and Tamiraparani River Basins – Study based on Multidate Remote Sensing Data Analysis and GIS Applications

R. Krishnamoorthy, N. Radhakrishnan*, S. Shifara, R. Karthikeyan & J. Antony Vinoth Kumar

Department of Applied Geology, School of Earth & Atmospheric Sciences

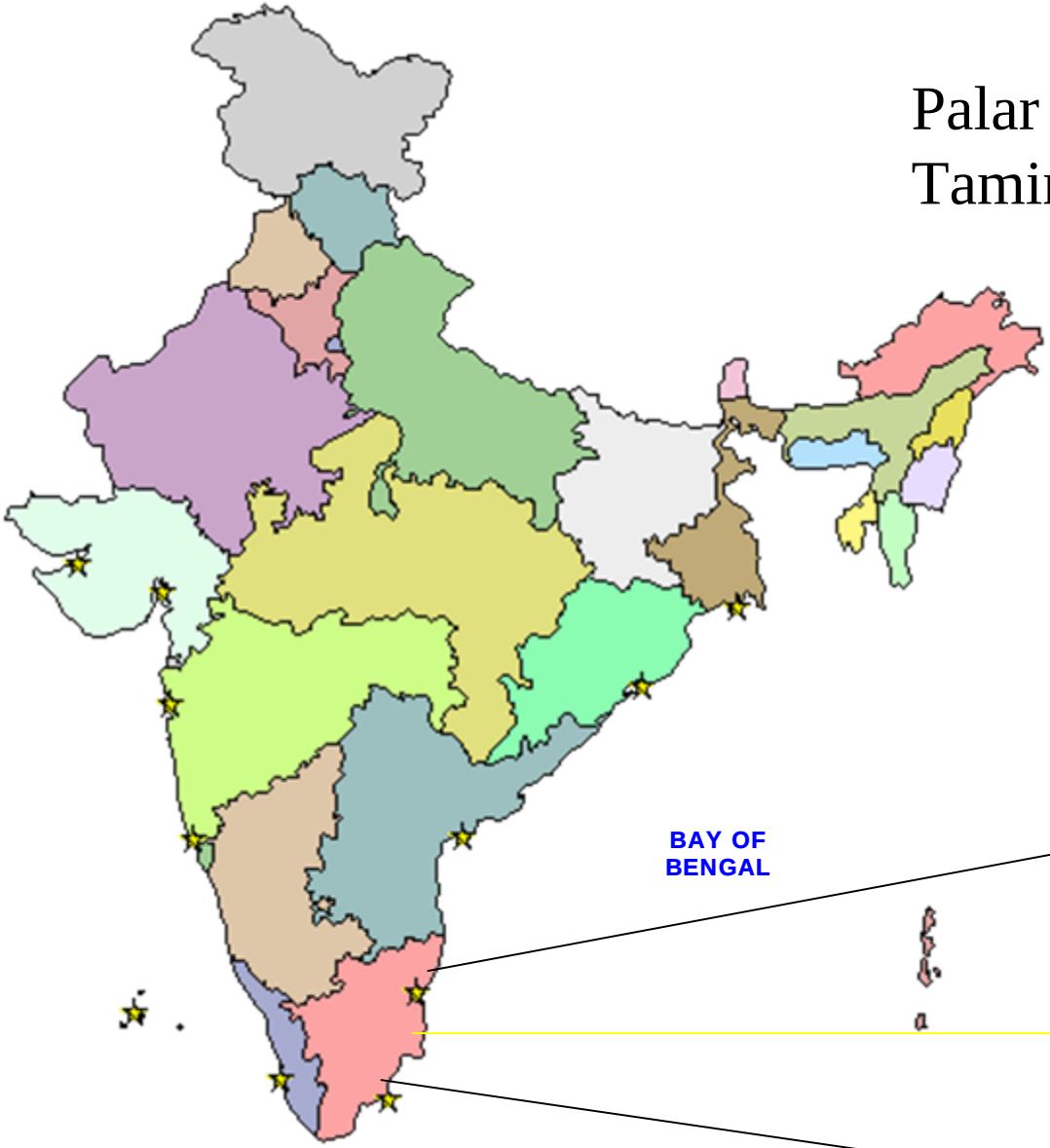
UNIVERSITY OF MADRAS, Post Bag # 5327, Guindy Campus

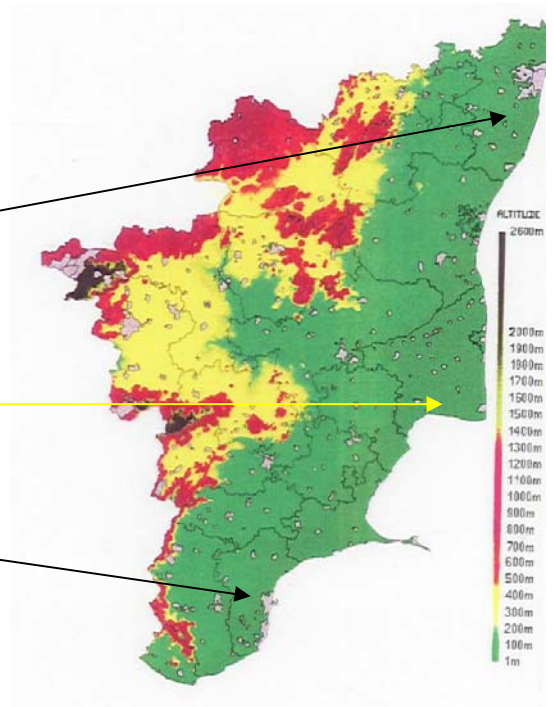
Chennai 600025, INDIA

*** Institute for Water Studies (PWD), Chennai, INDIA**

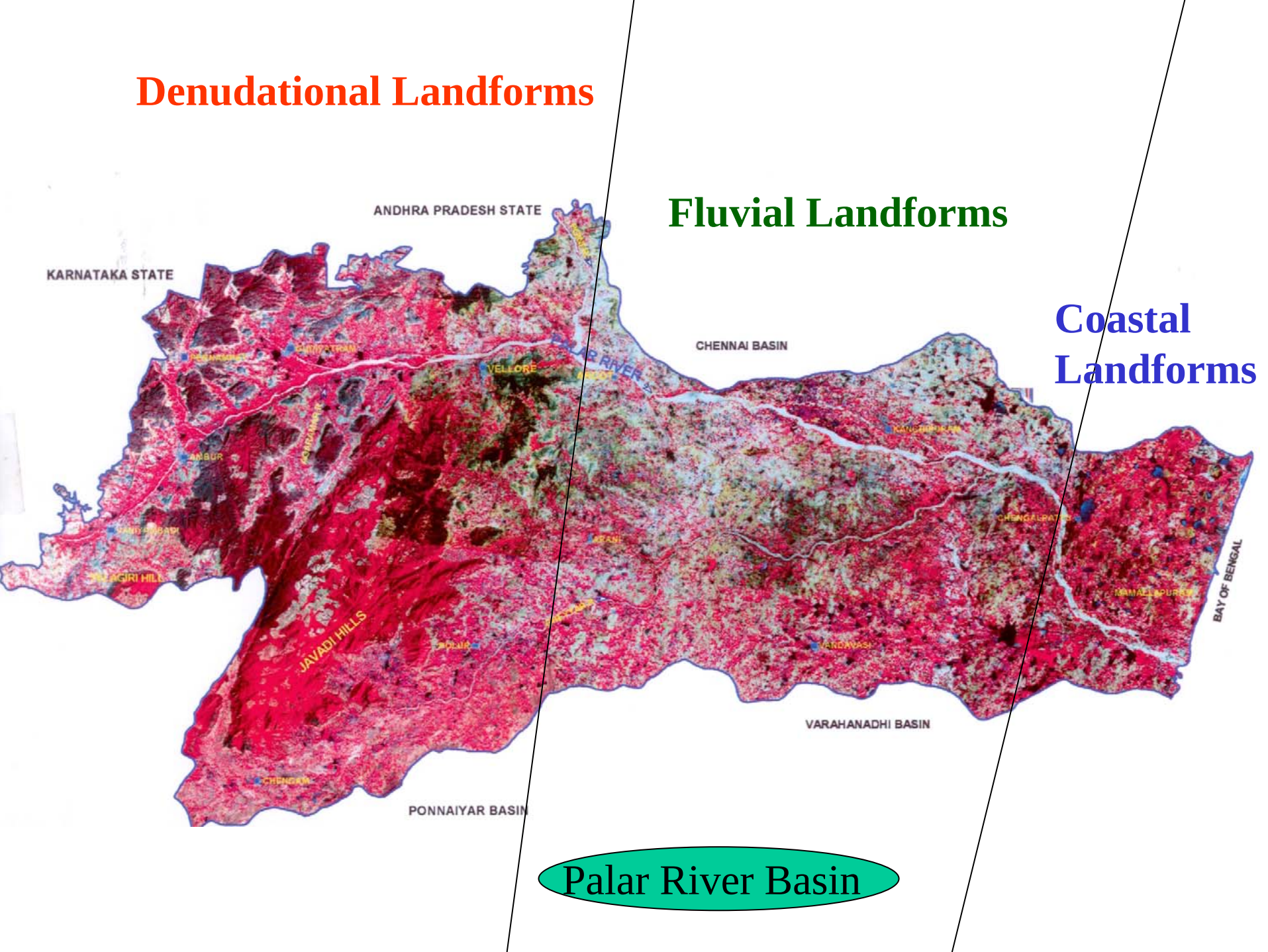
Email: rrkrishnamurthy@gmail.com

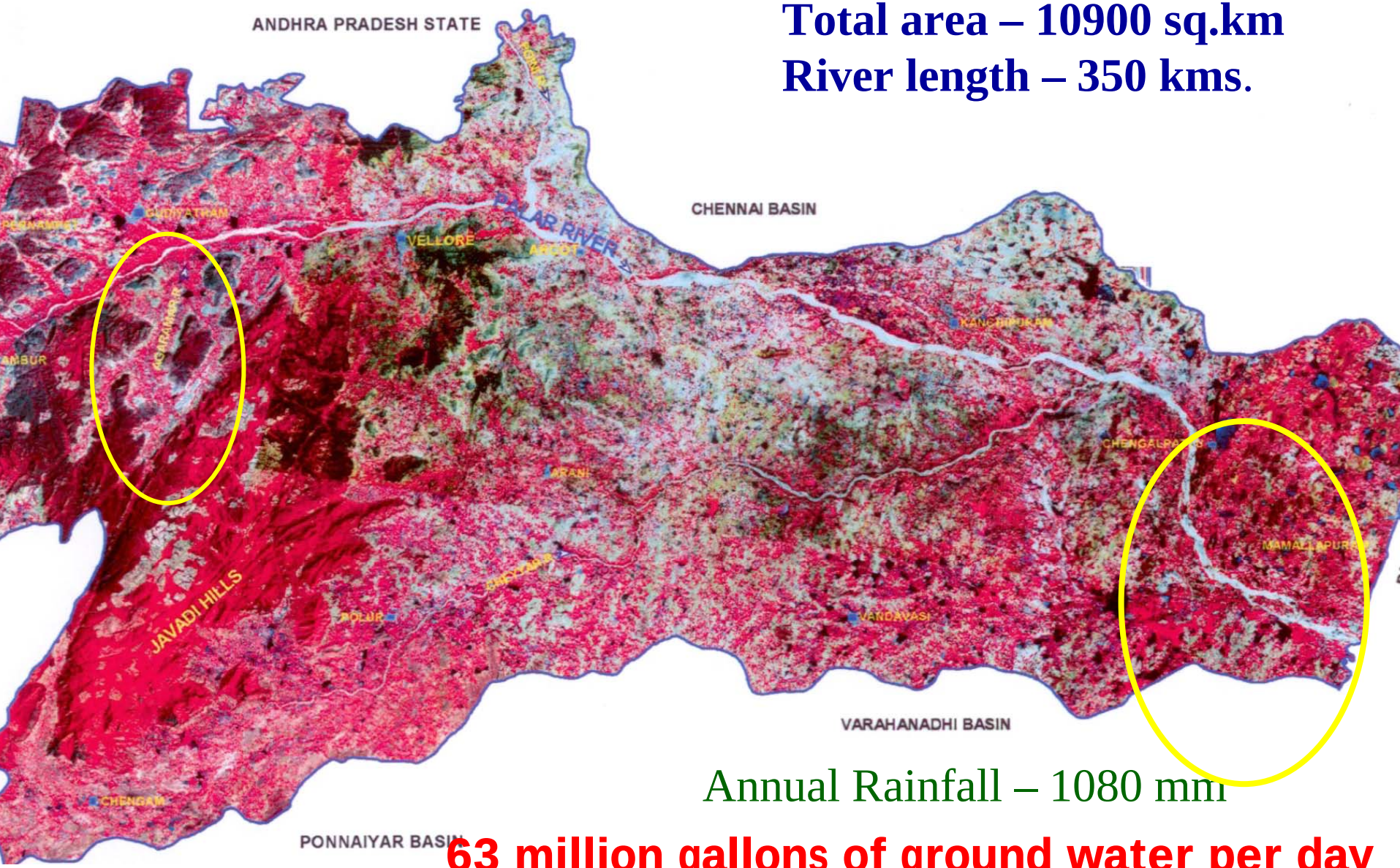
Palar River Basin
Tamiraparani River Basin






Aim is to study the land use and land cover change (LUCC)
due to the impact of freshwater potential changes in river basins


Denudational Landforms
Fluvial Landforms
Coastal Landforms
ANDHRA PRADESH STATE
KARNATAKA STATE
CHENNAI BASIN
VELLORE
PALAR RIVER
AMBUR
JAVADI HILLS
VANDAVASI
VARAHANADHI BASIN
BAY OF BENGAL
PONNAIYAR BASIN
Palar River Basin



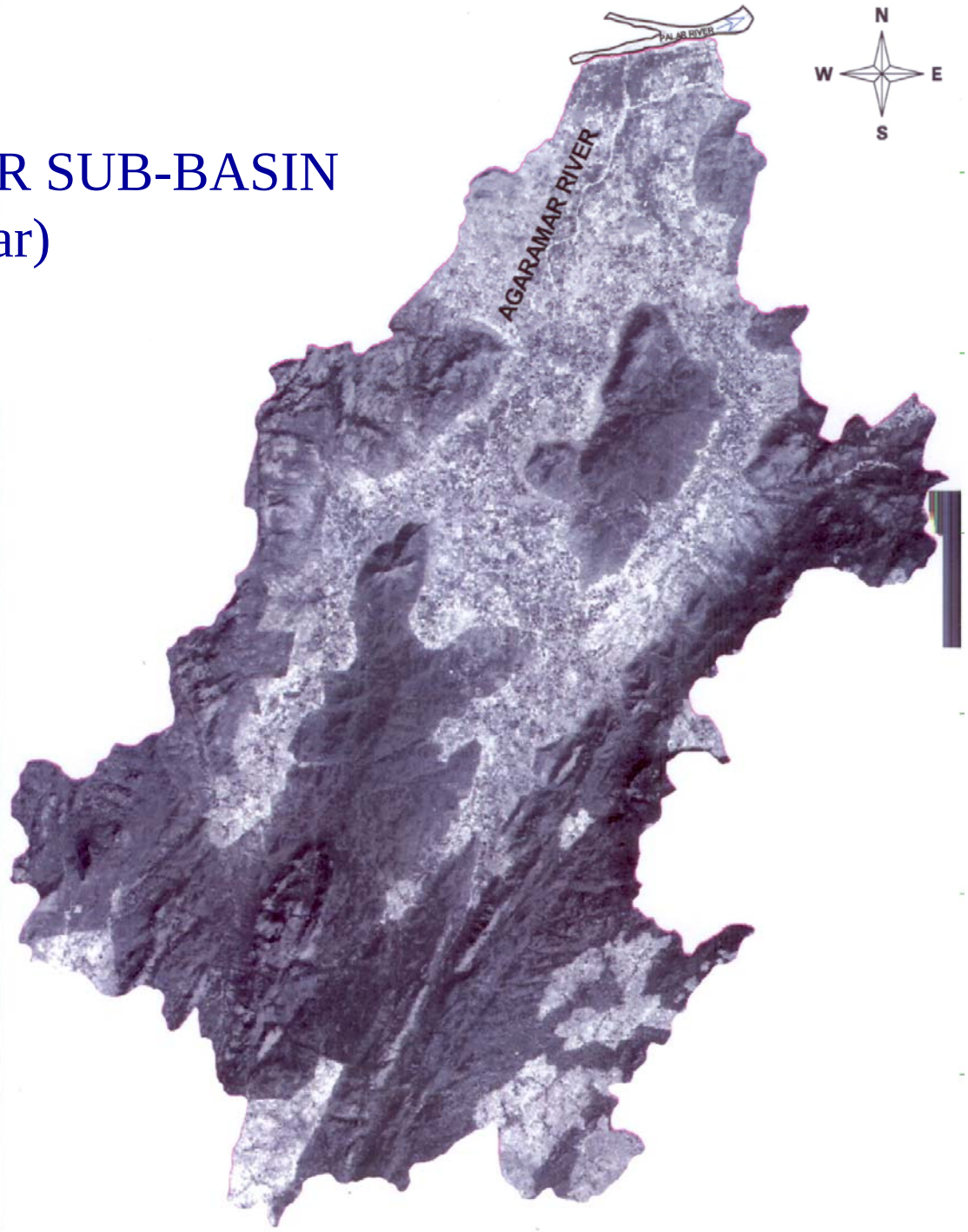
Total area – 10900 sq.km

River length – 350 kms.

Annual Rainfall – 1080 mm

63 million gallons of ground water per day

AGARMAR SUB-BASIN
(Upper Palar)



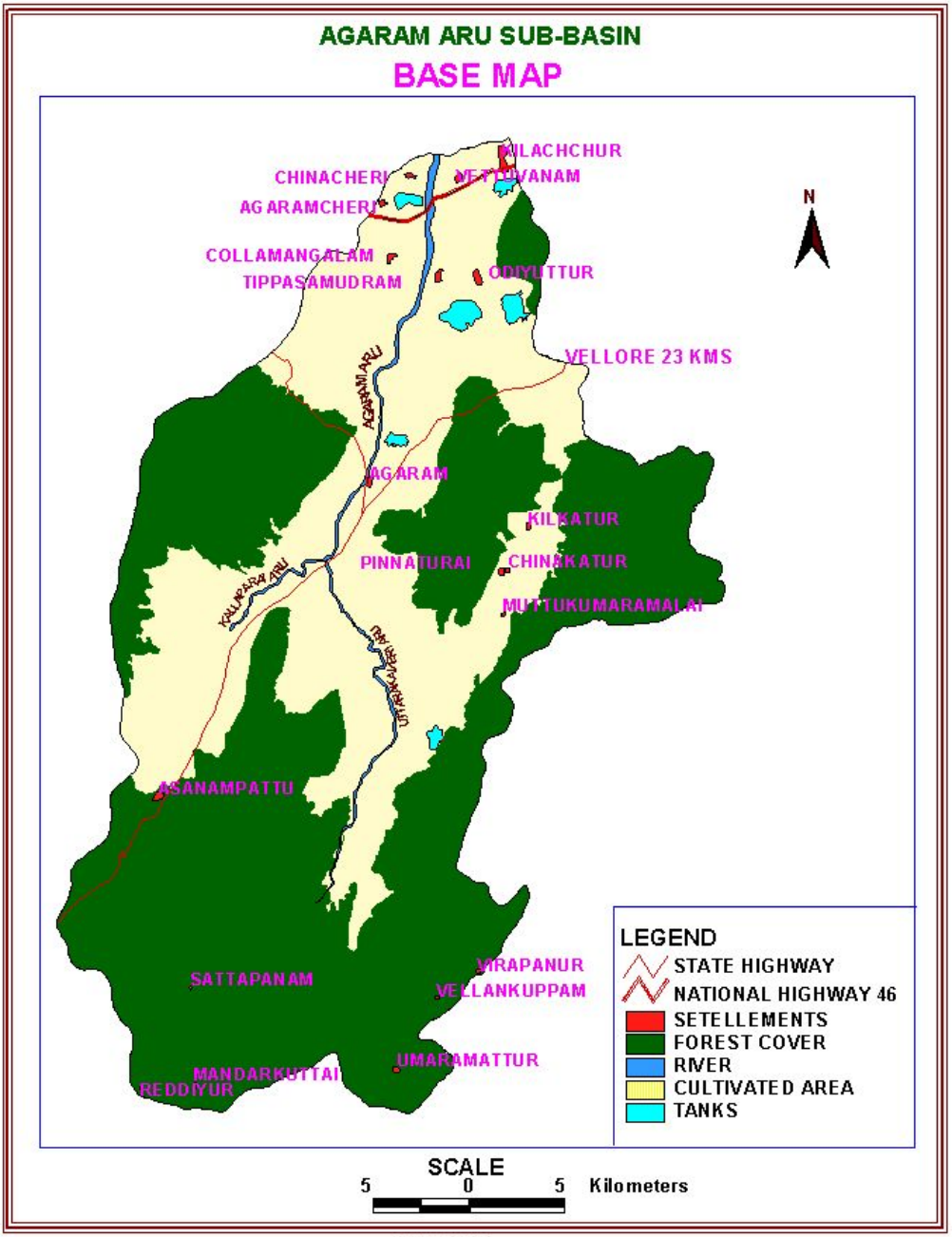
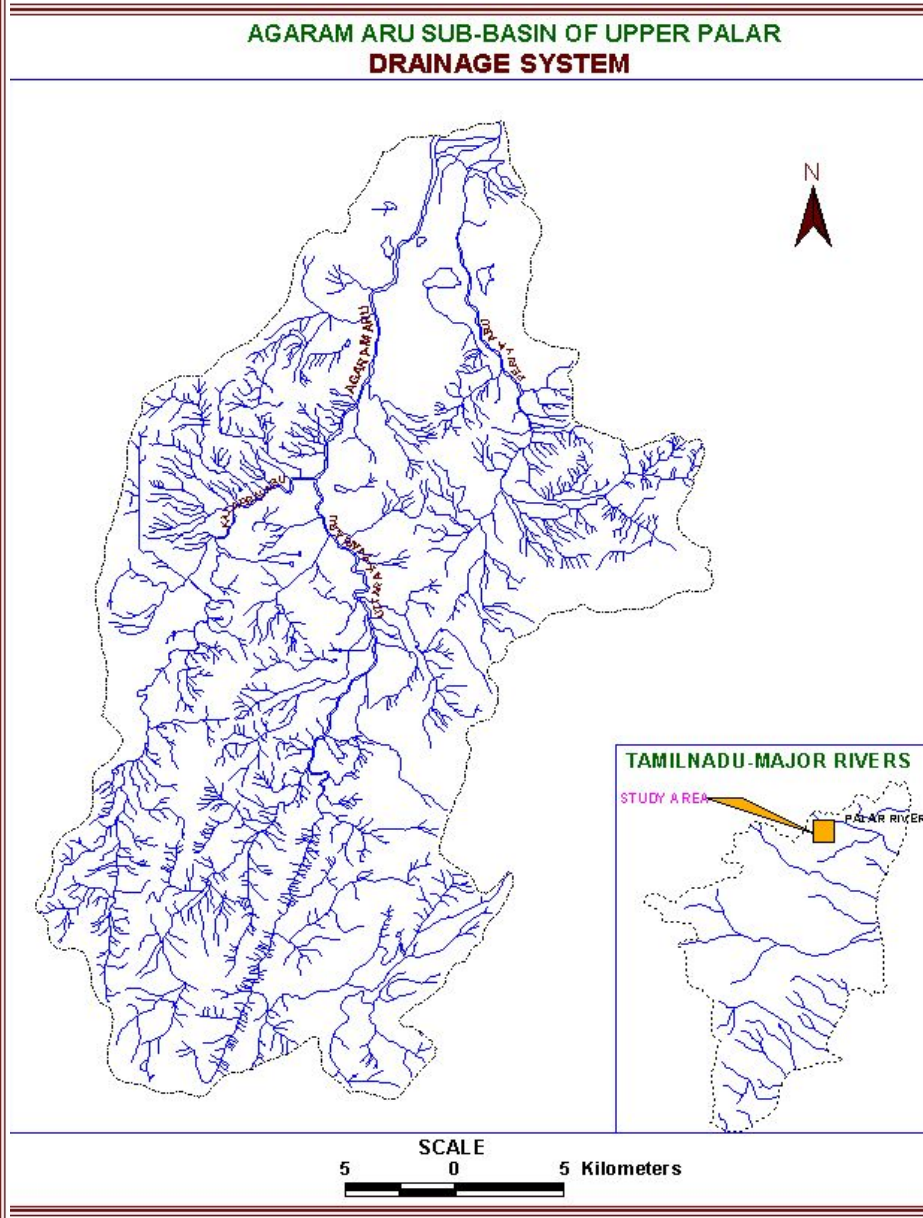
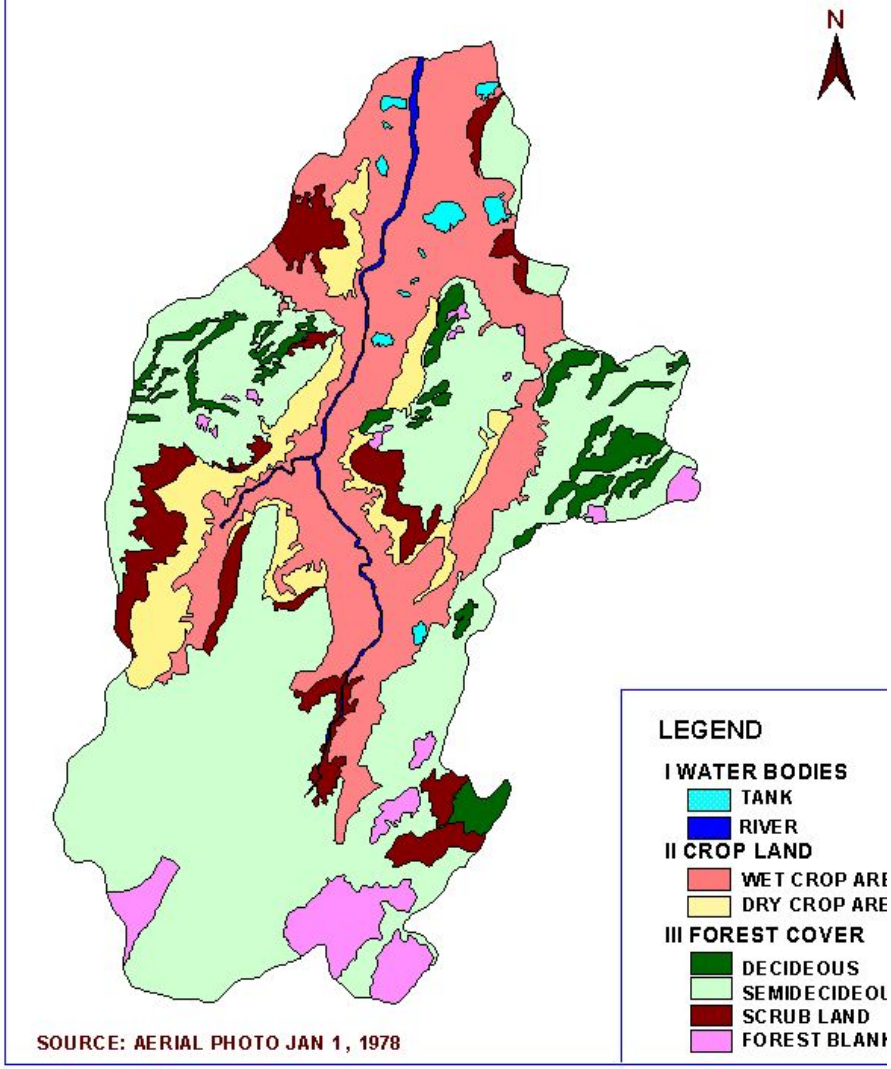

AGARAM ARU SUB-BASIN
BASE MAP
KILACHCHUR
CHINACHERI
VETTUVANAM
AGARAMCHERI
COLLAMANGALAM
TIPPASAMUDRAM
ODIYUTTUR
VELLORE 23 KMS
AGARAM ARU
AGARAM
KILKATUR
PINNATURAI
CHINNAKATUR
MUTTUKUMARAMALAI
KALLAPARAI ARU
PARAVAKKAL ARU
ASANAMPATTU
SATTAPANAM
VIRAPANUR
VELLANKUPPAM
UMARAMATTUR
MANDARKUTTAI
REDDIYUR
N
LEGEND
STATE HIGHWAY
NATIONAL HIGHWAY 46
SETELLEMENTS
FOREST COVER
RIVER
CULTIVATED AREA
TANKS
SCALE
5 0 5 Kilometers

FIGURE:1.1


AGARAM ARU SUB-BASIN OF UPPER PALAR
DRAINAGE SYSTEM
N
AGARAM ARU
PALAR
KALLAPARAI ARU
PARAVAKKAL ARU
TAMILNADU-MAJOR RIVERS
STUDY AREA
PALAR RIVER
SCALE
5 0 5 Kilometers

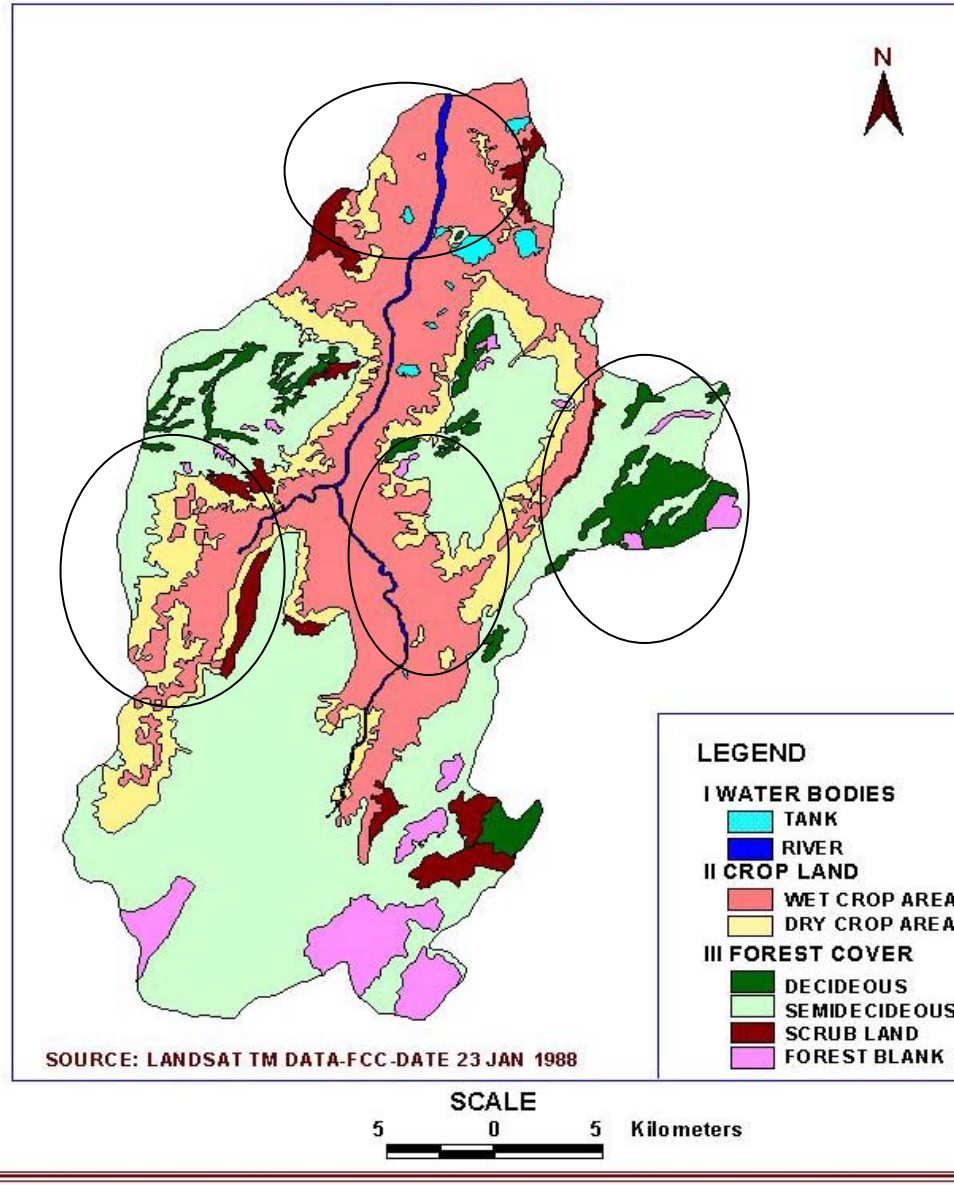
AGARAM ARU SUB-BASIN

LAND USE -1978



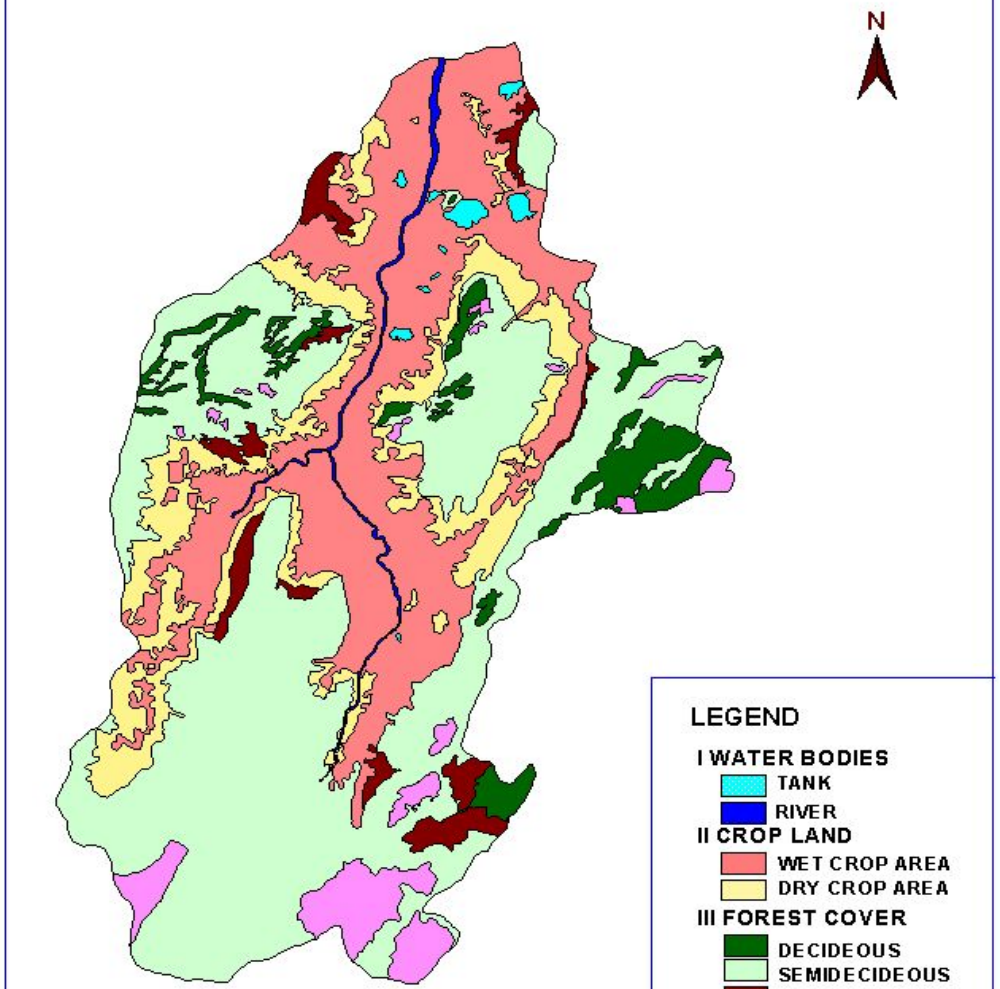
AGARAM ARU SUB-BASIN

LAND USE -1988



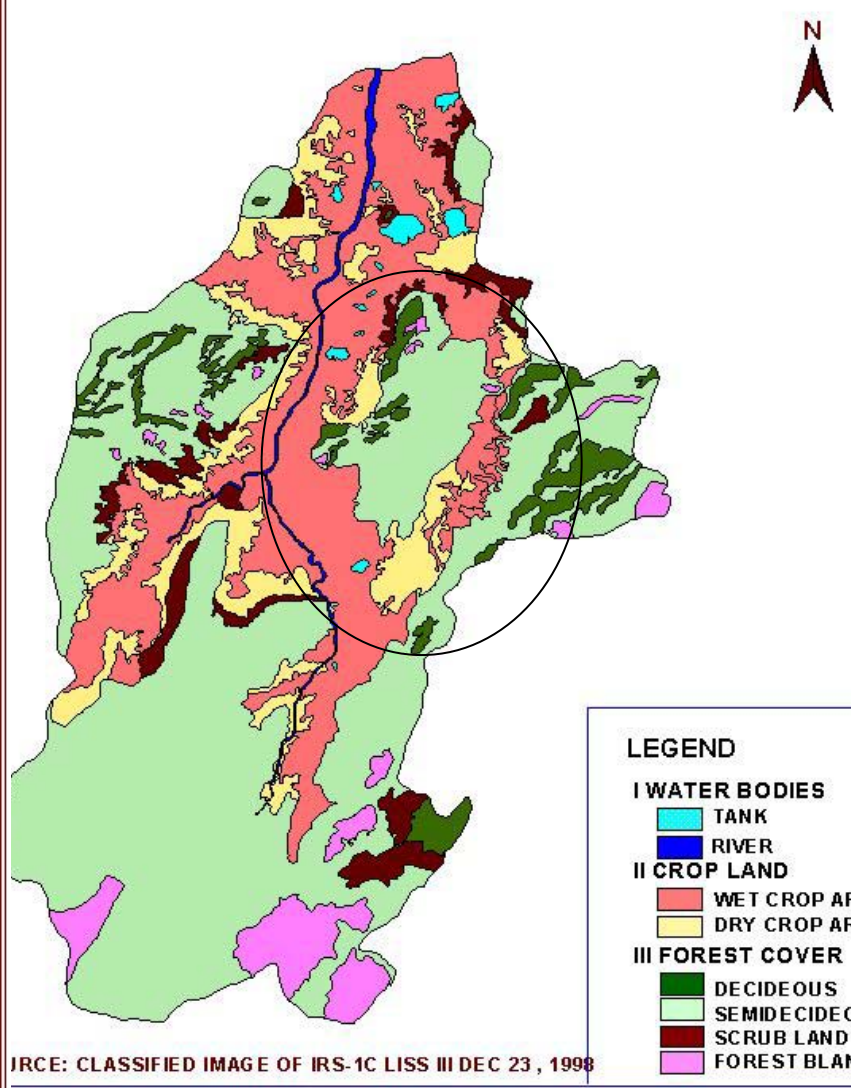
AGARAM ARU SUB-BASIN

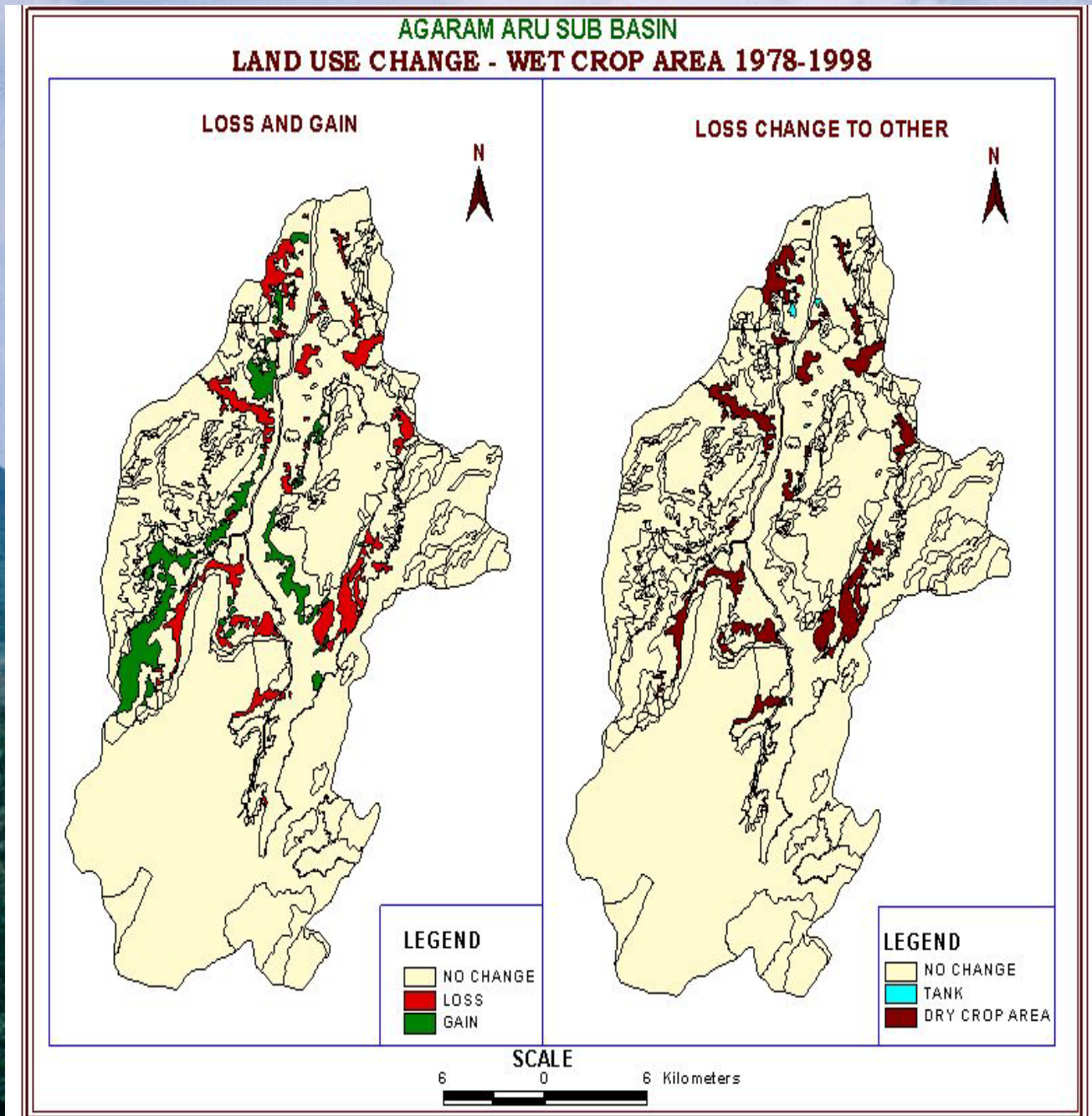
LAND USE -1988

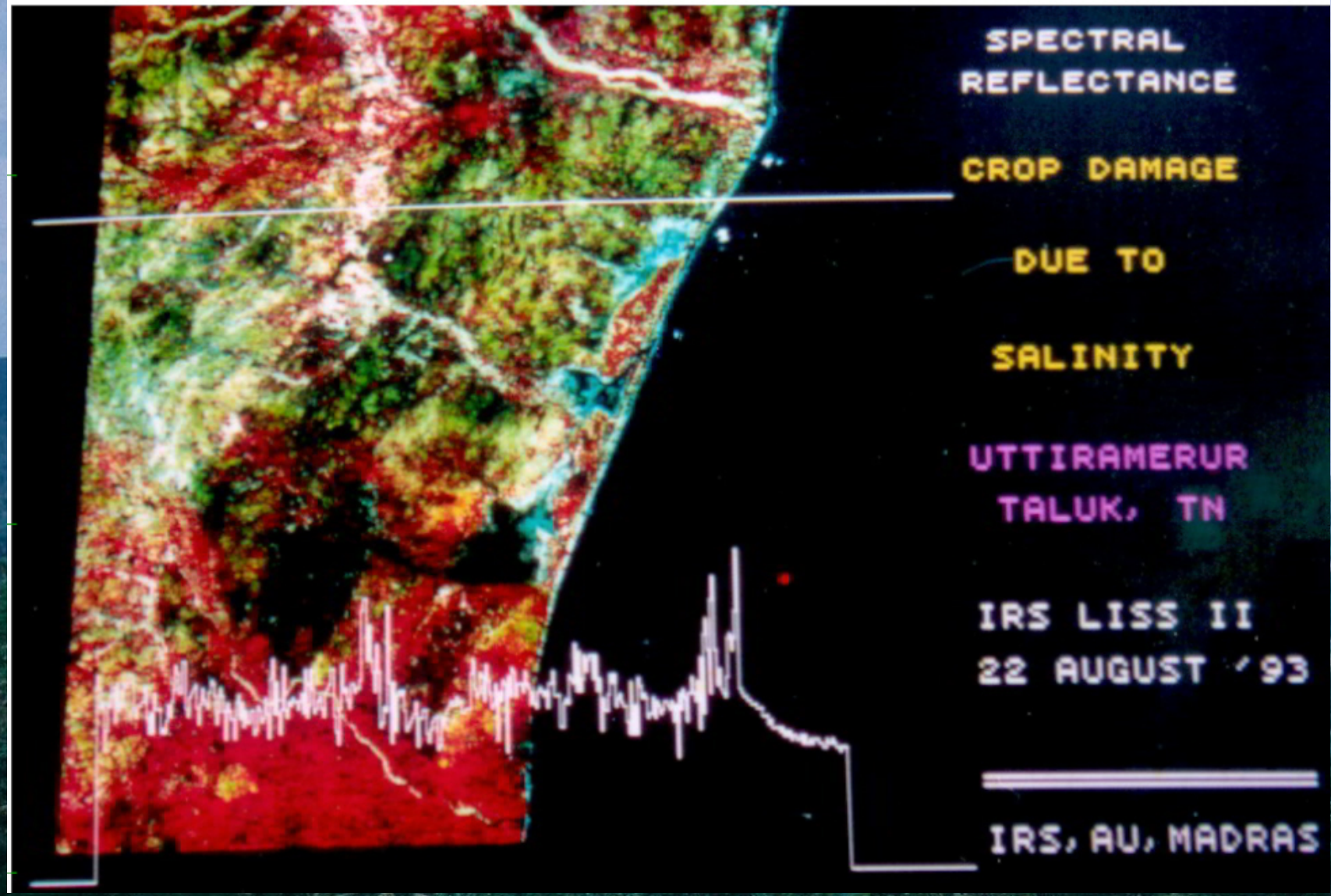


AGARAM ARU SUB-BASIN

LAND USE -1998

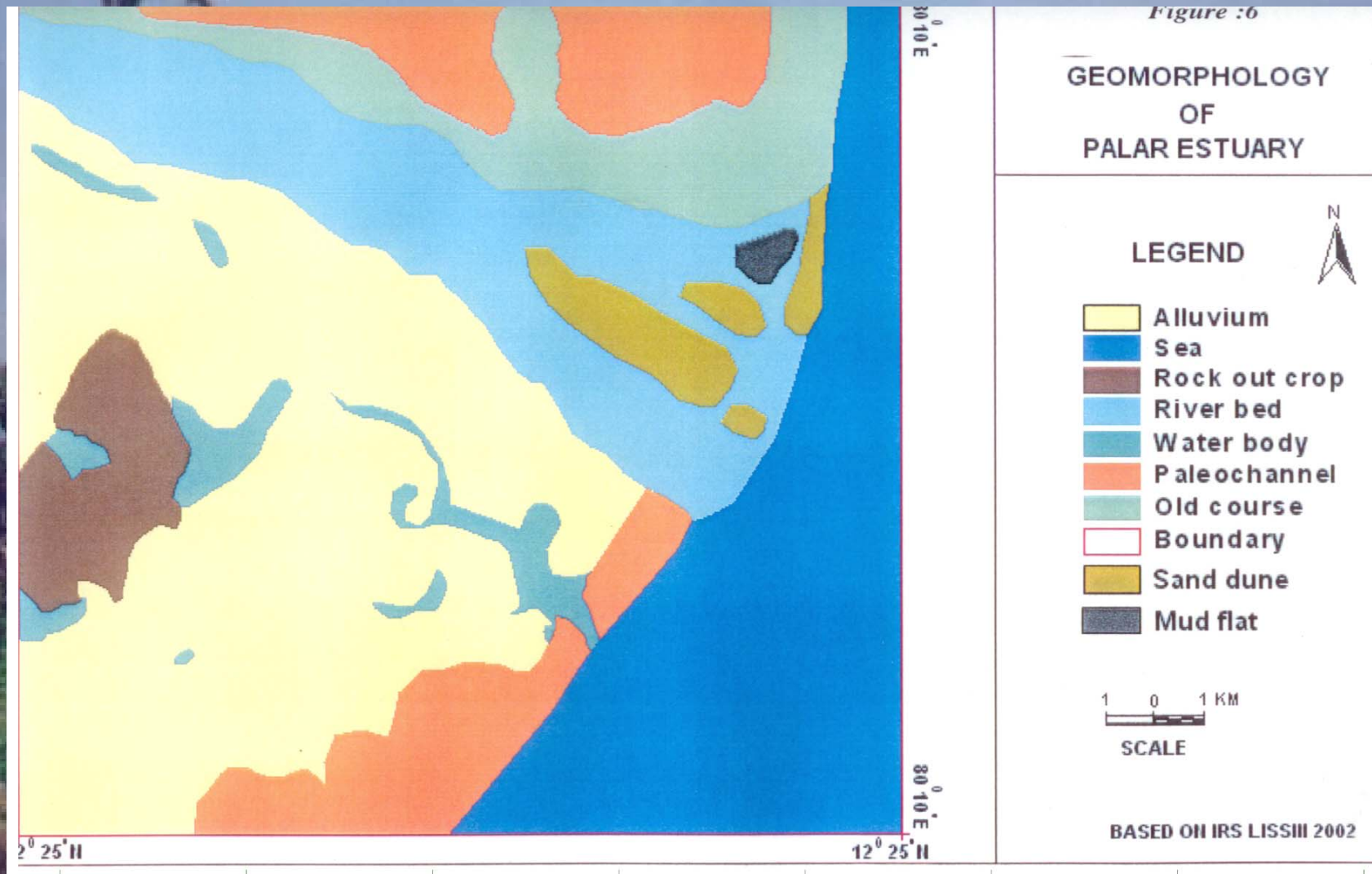



AGARAM ARU SUB BASIN
LAND USE CHANGE - WET CROP AREA 1978-1998
LOSS AND GAIN
N
LEGEND
NO CHANGE
LOSS
GAIN
LOSS CHANGE TO OTHER
N
LEGEND
NO CHANGE
TANK
DRY CROP AREA
SCALE
6 0 6 Kilometers

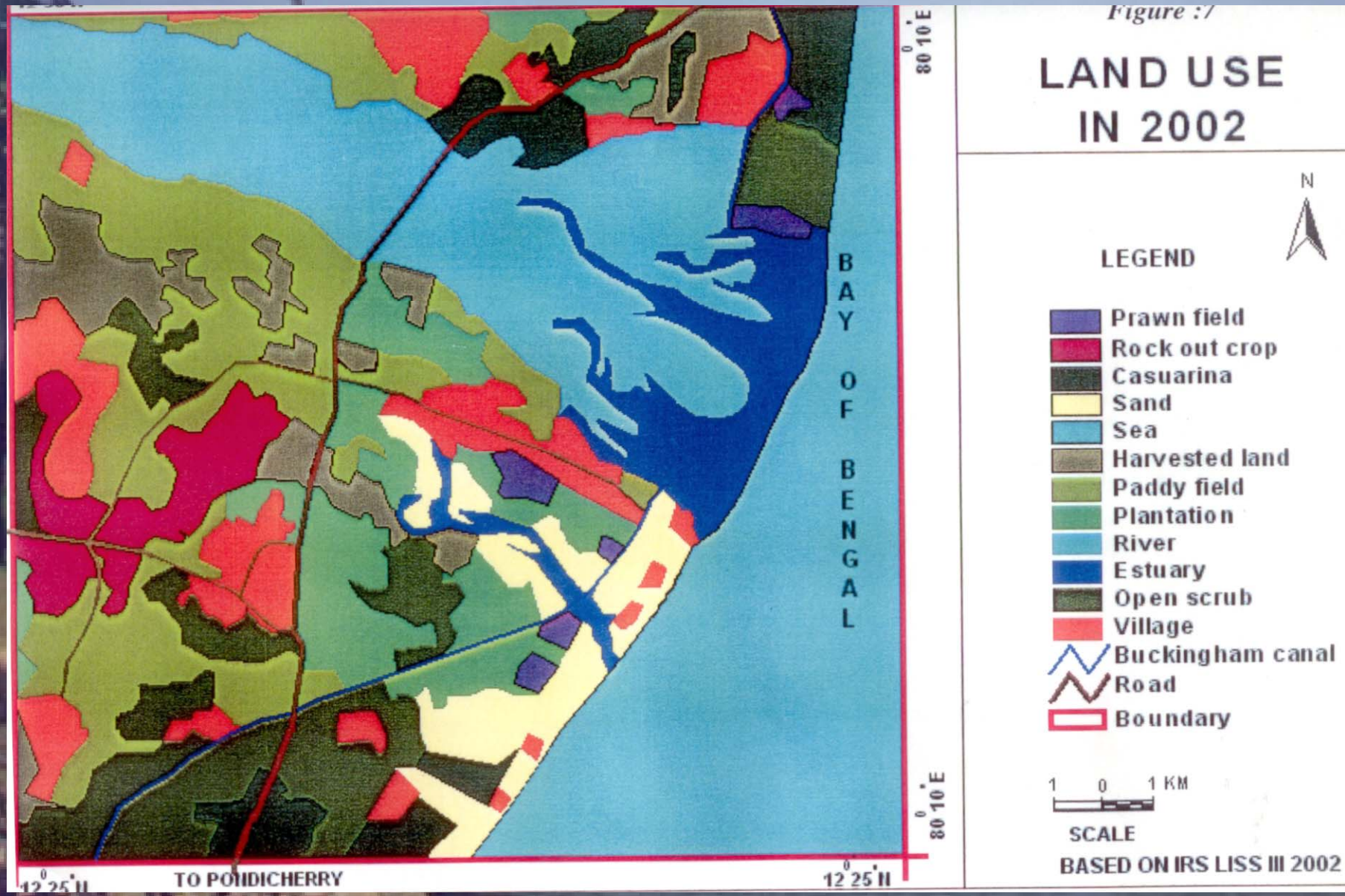


Application of multispectral high resolution data

Palar Estuary

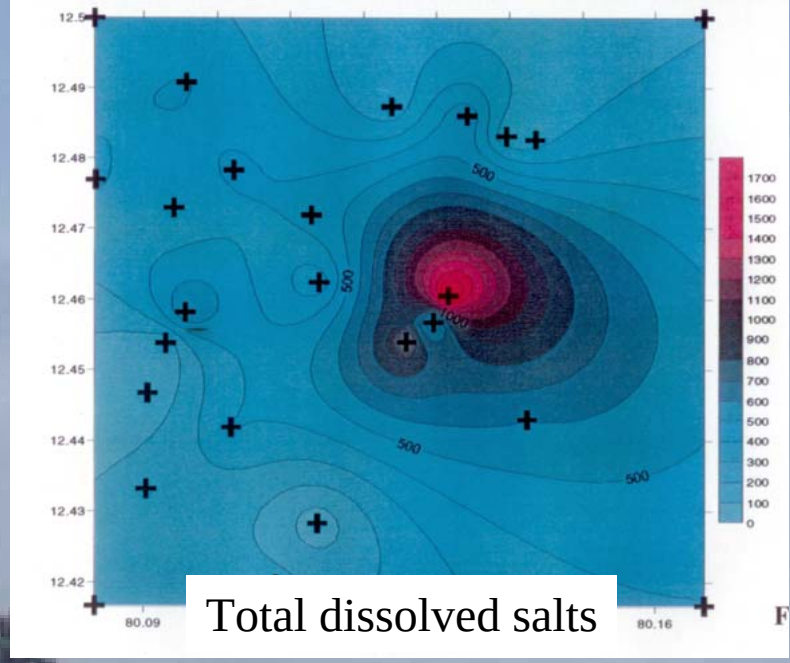


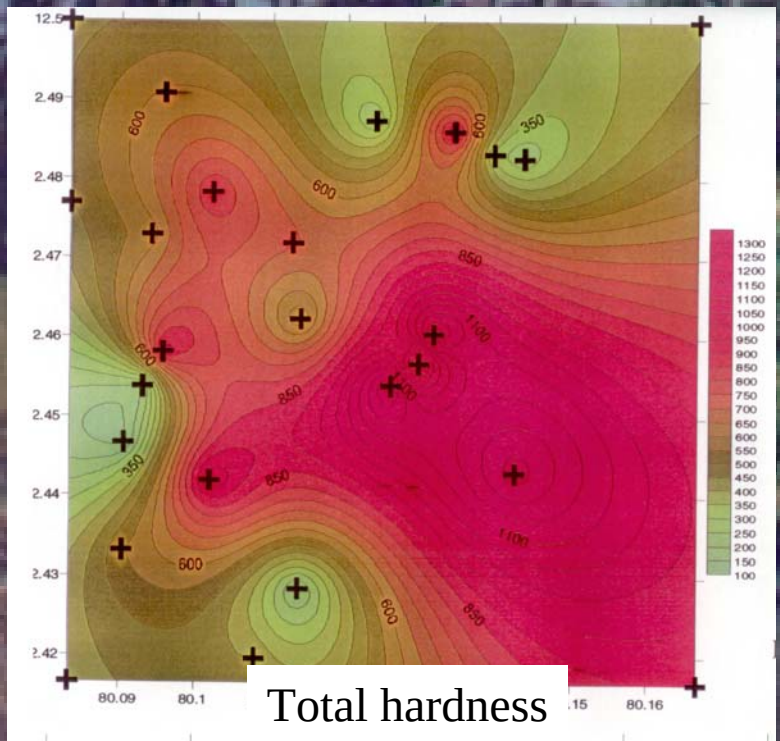
Major area covered by alluvial plain

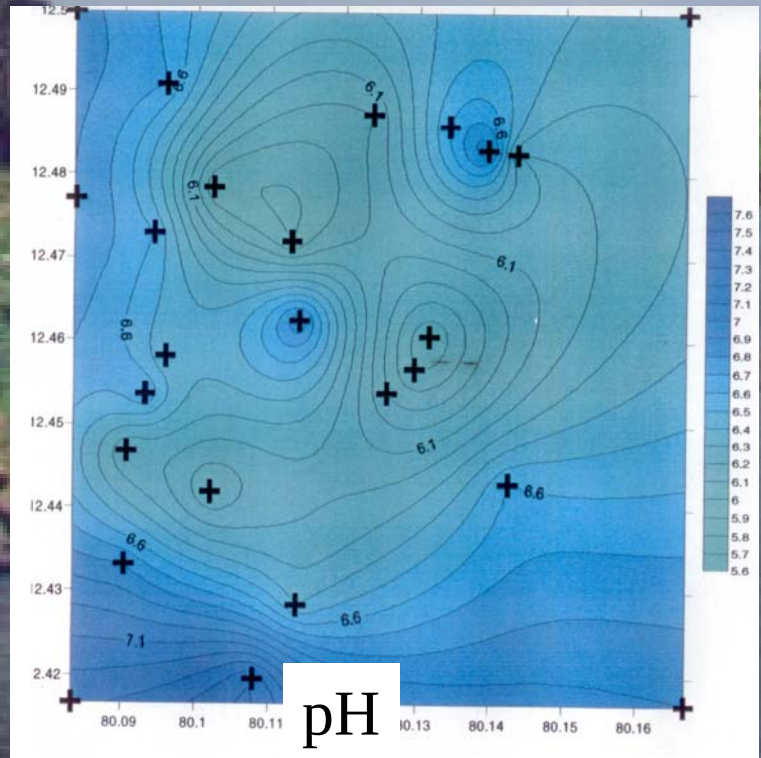


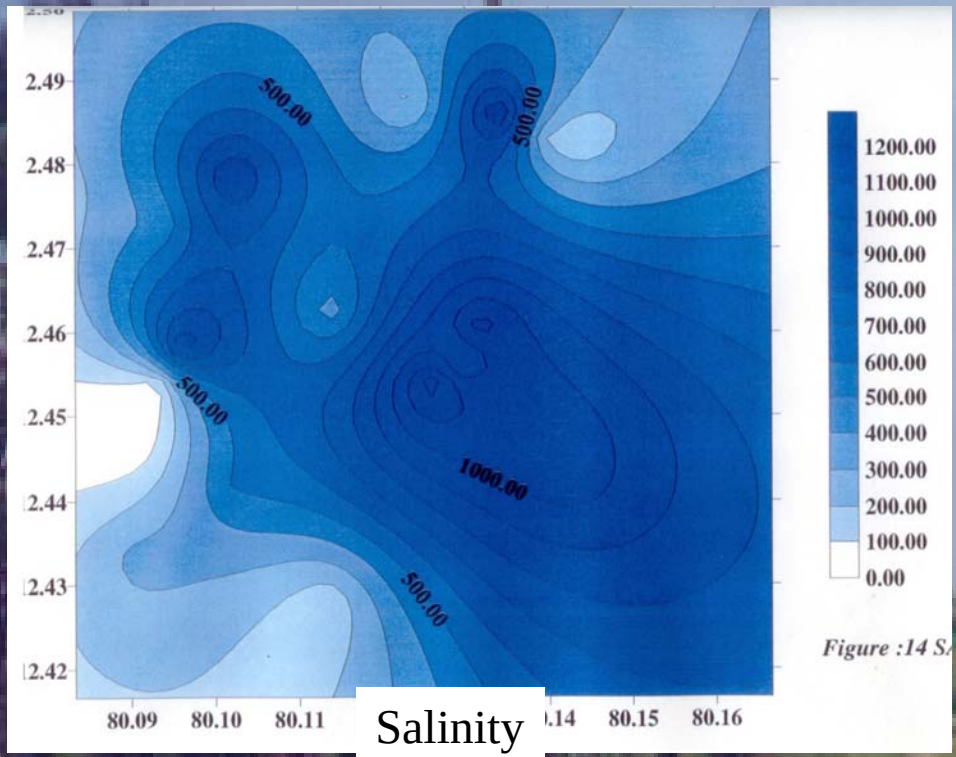
Paddy cultivation is high


BAY OF BENGAL

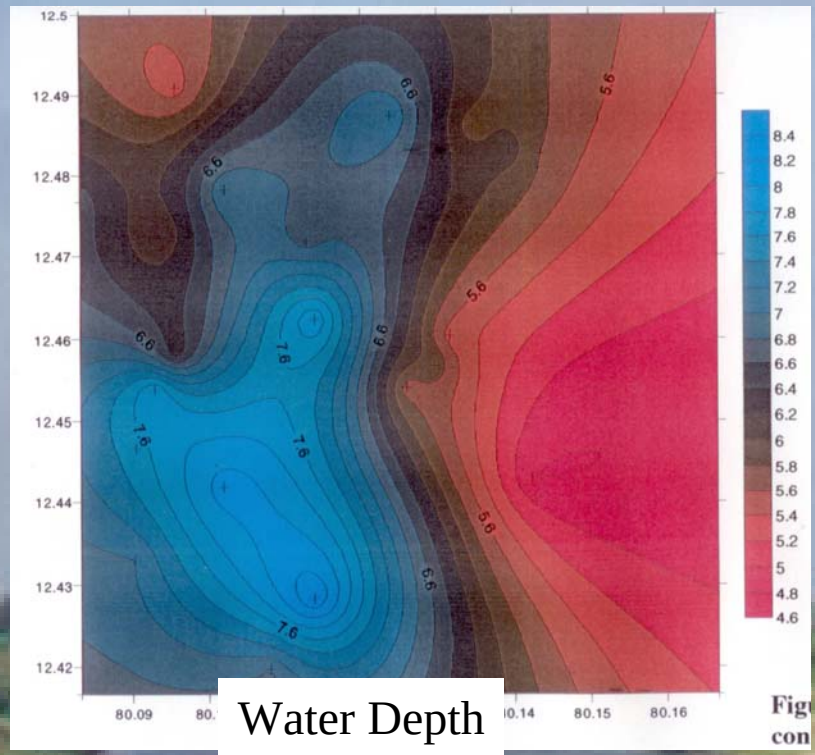

Total dissolved salts


Total hardness

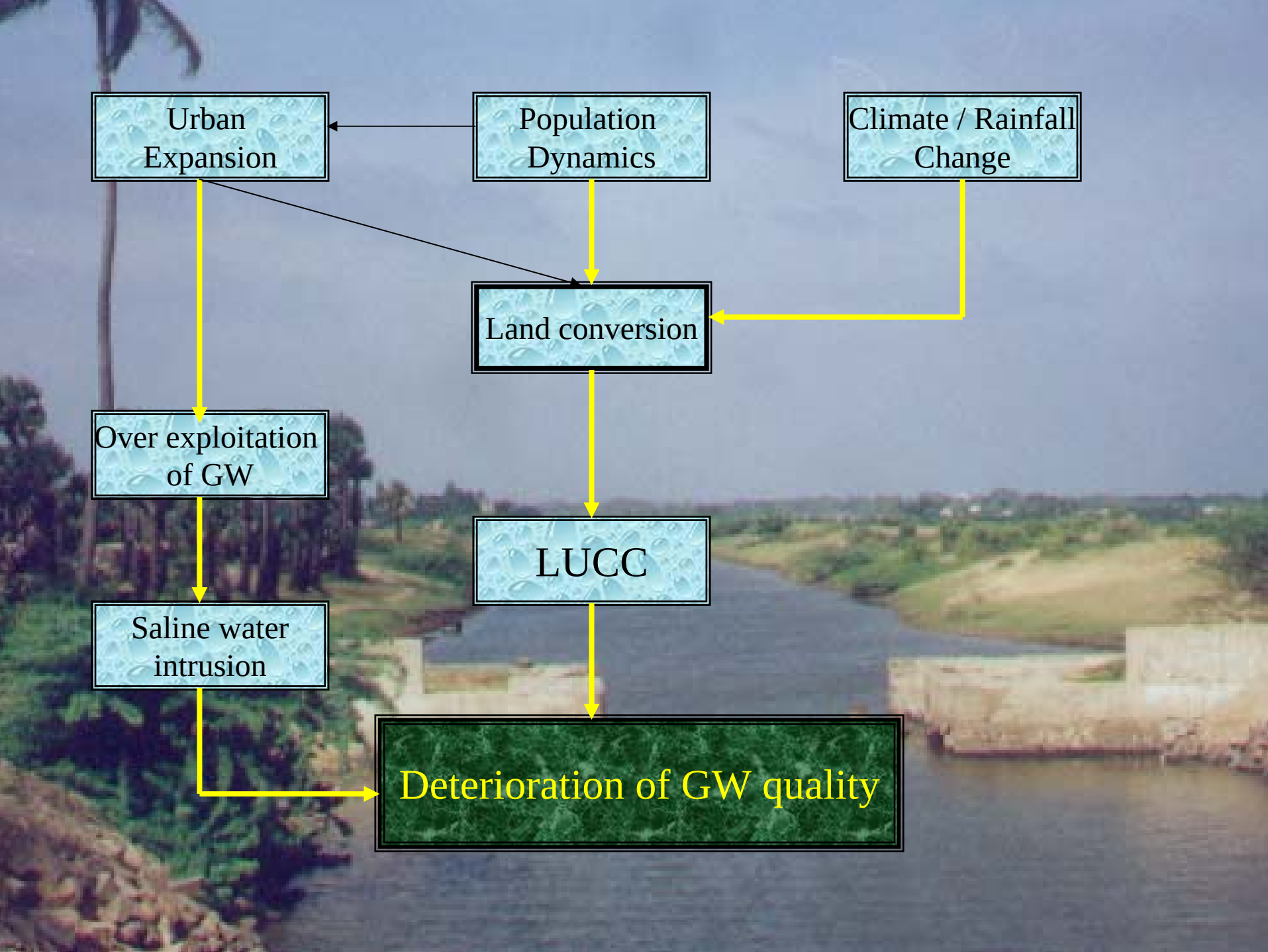

pH



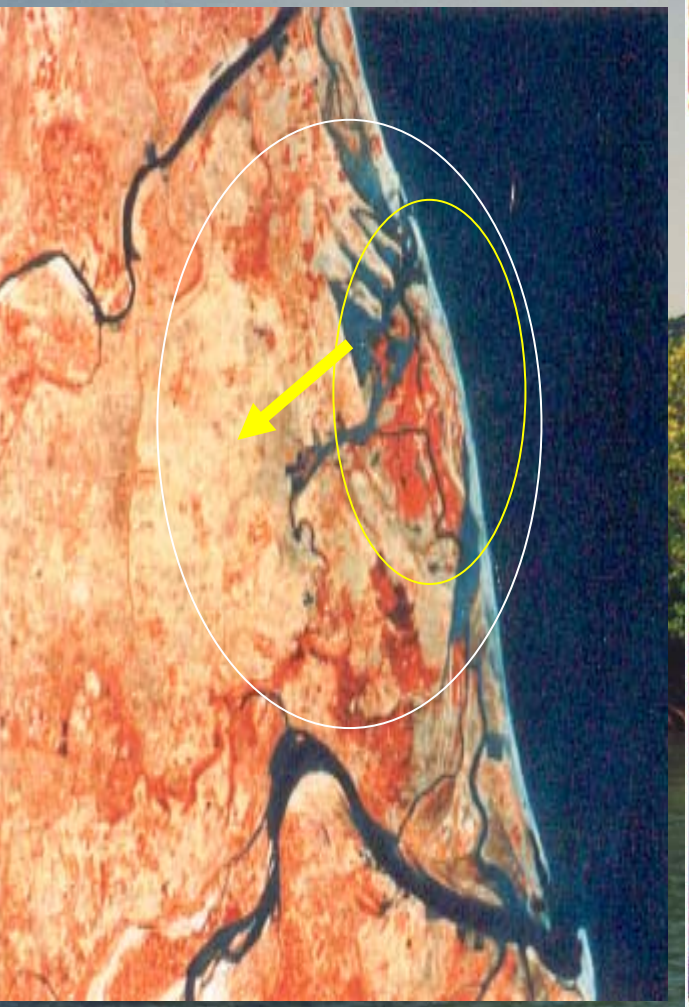
Salinity



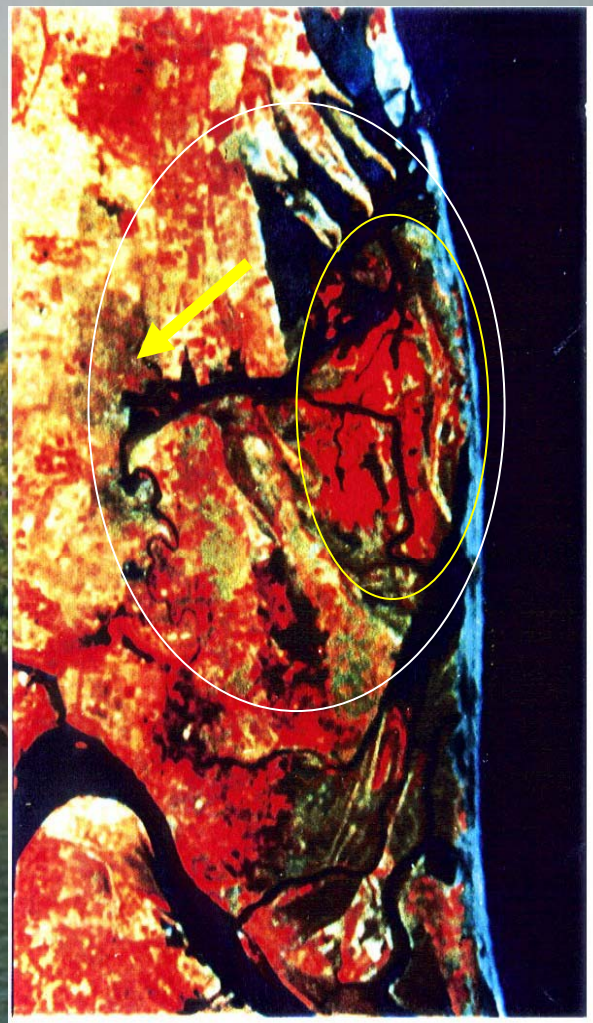
Water Depth


Urban Expansion
Population Dynamics
Climate / Rainfall Change
Land conversion
Over exploitation of GW
LUCC
Saline water intrusion
Deterioration of GW quality

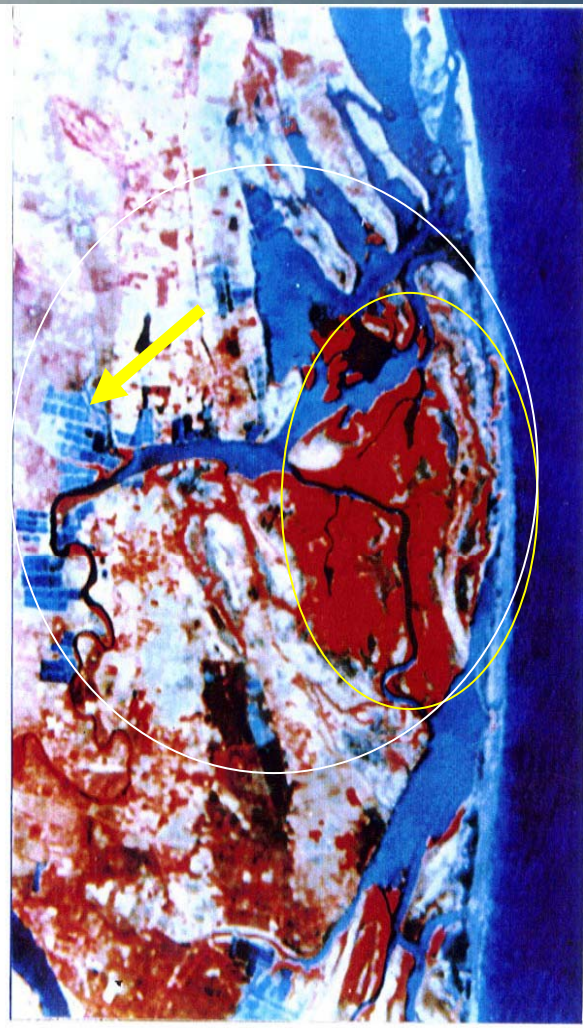
Change-detection



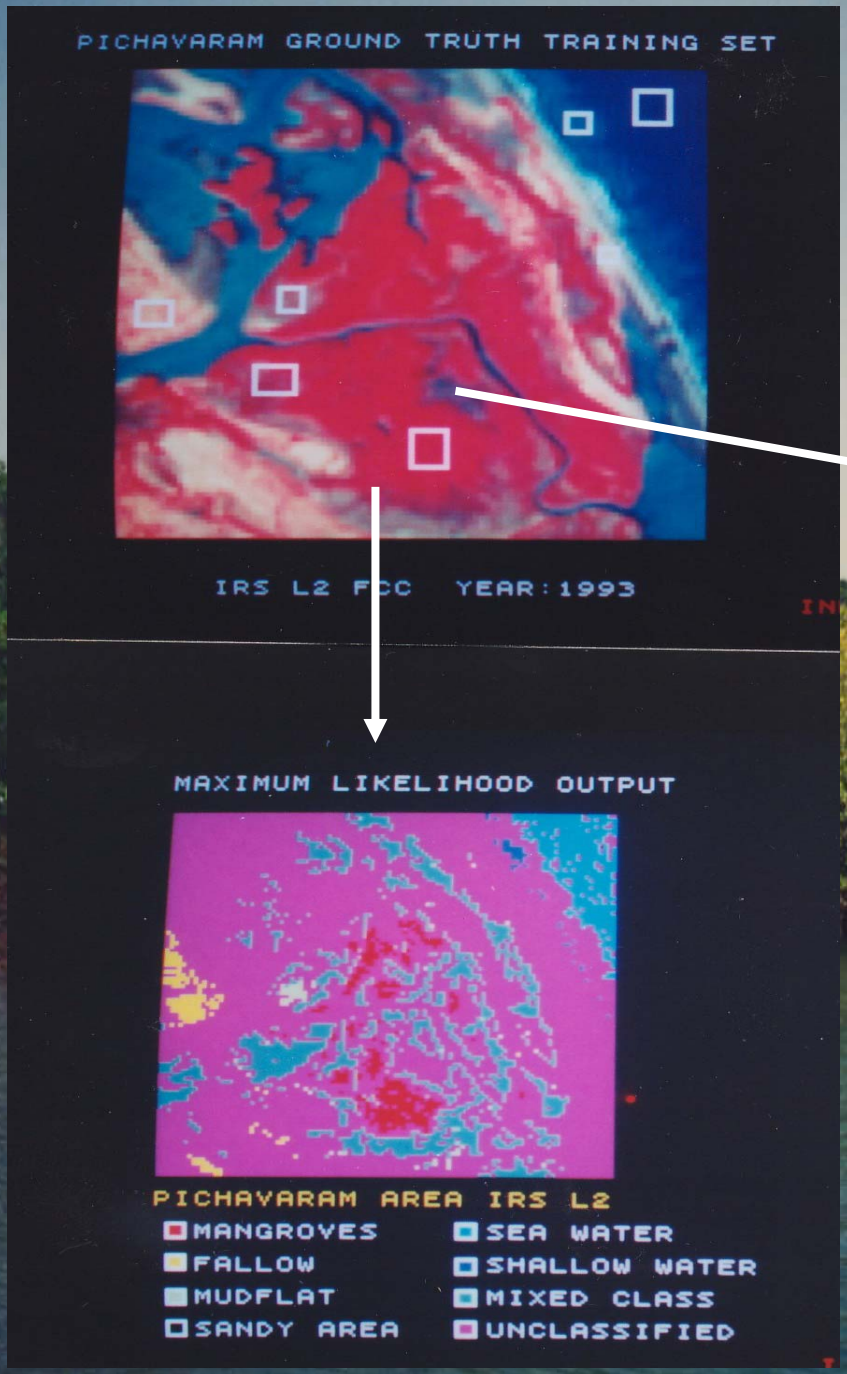
May 1987
Landsat - TM



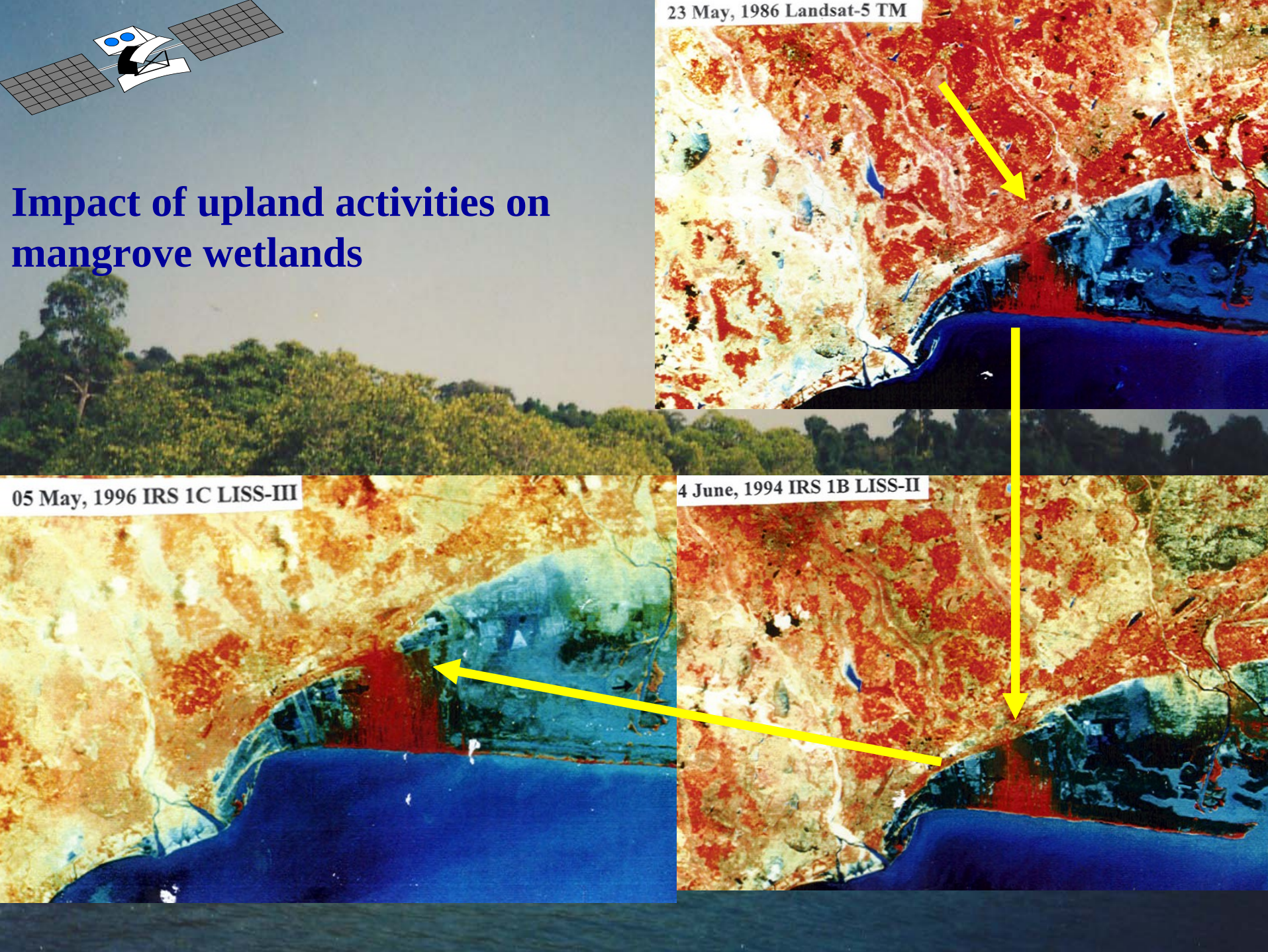
21 April, 1994
IRS-1B LISS-II

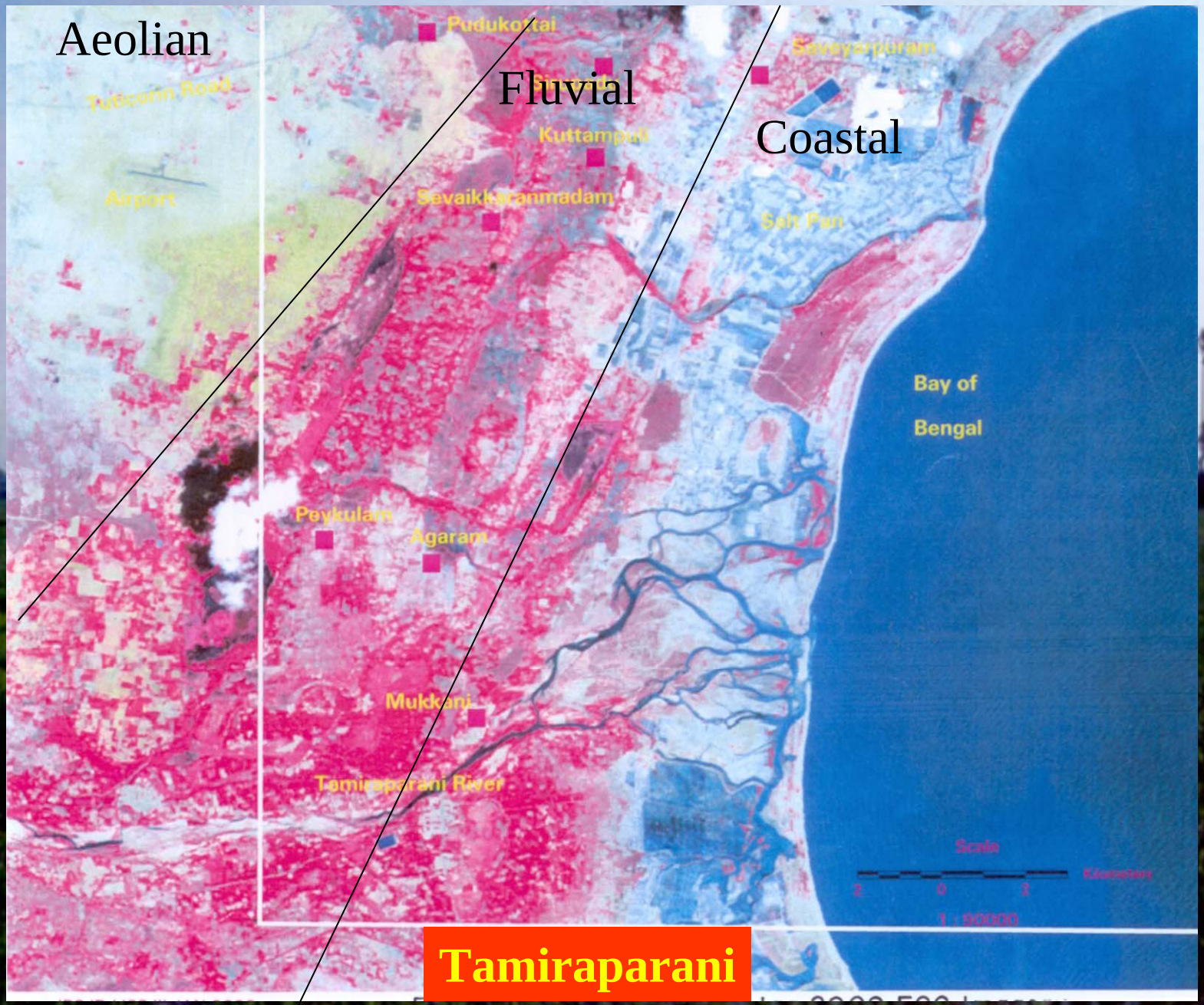


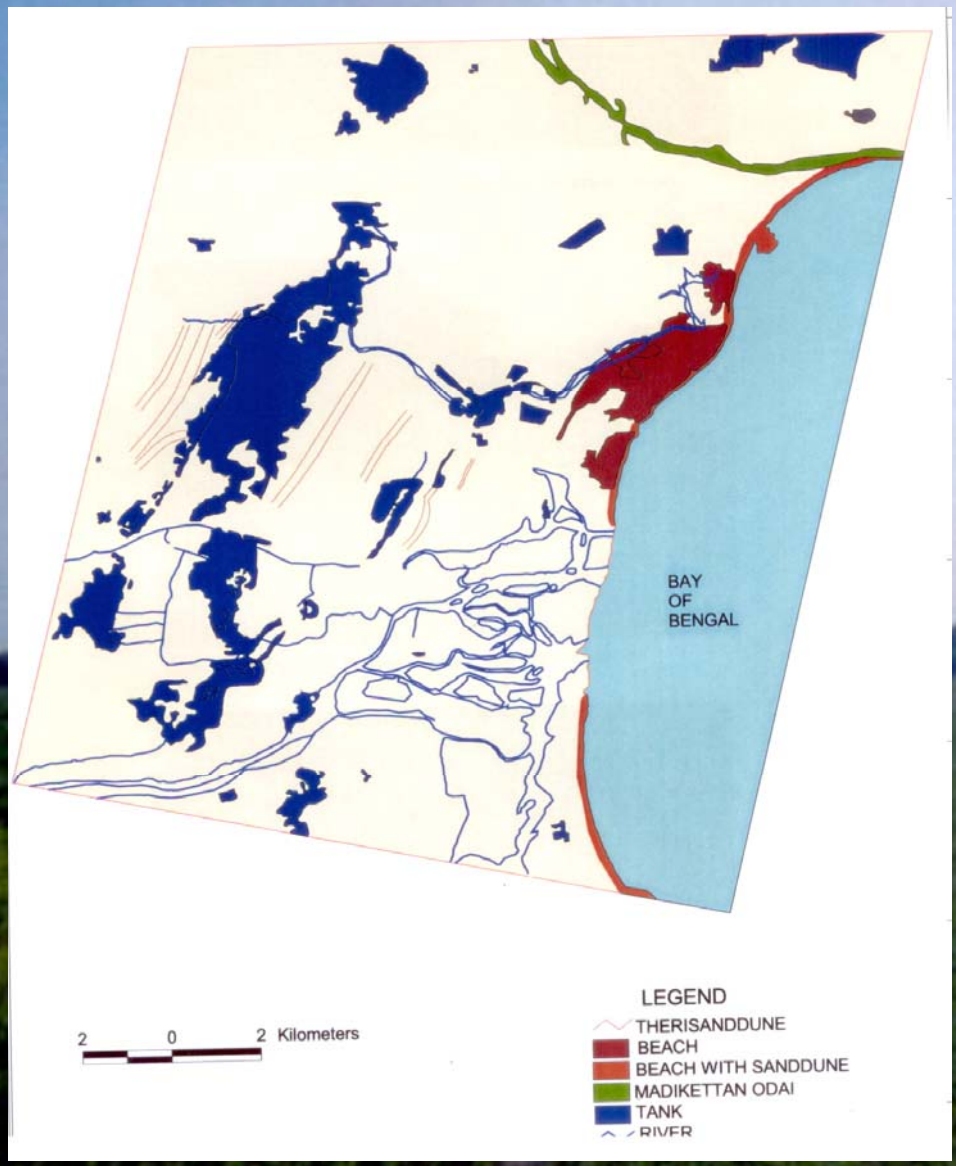
22 June, 1996
IRS-1C LISS-III

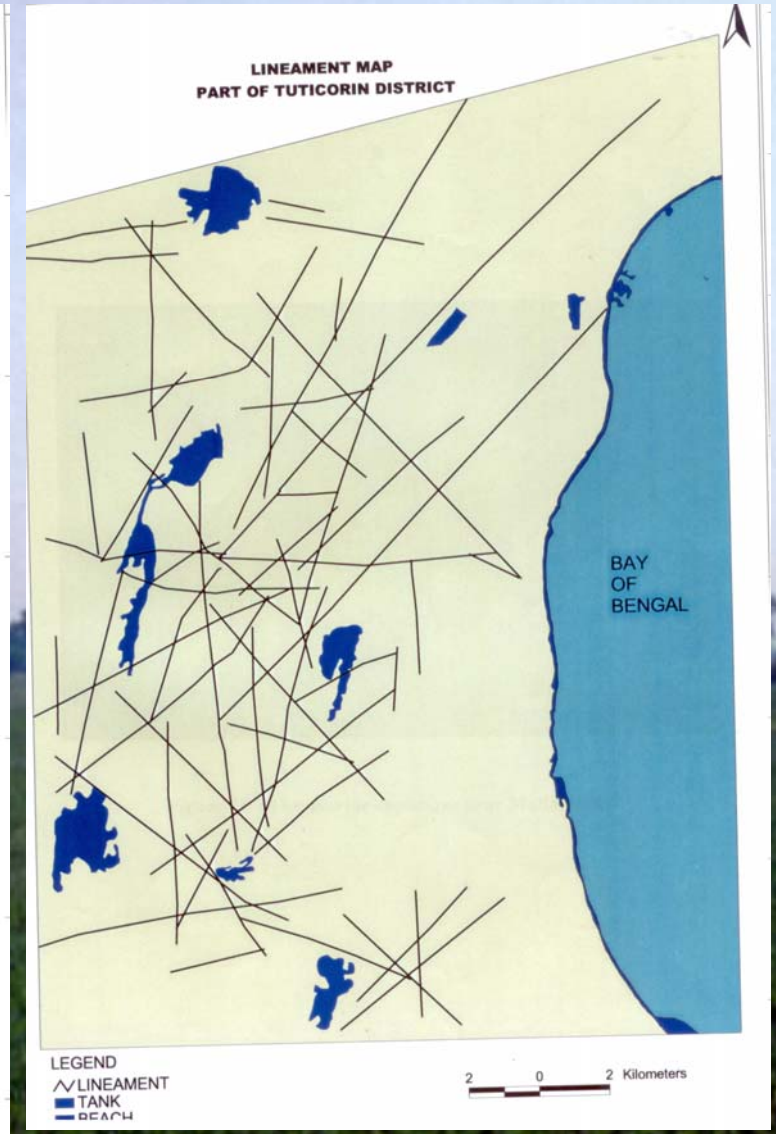

PICHAVARAM GROUND TRUTH TRAINING SET
IRS L2 FCC YEAR:1993
MAXIMUM LIKELIHOOD OUTPUT
PICHAVARAM AREA IRS L2
MANGROVES
FALLOW
MUDFLAT
SANDY AREA
SEA WATER
SHALLOW WATER
MIXED CLASS
UNCLASSIFIED

Impact of upland activities on mangrove wetlands

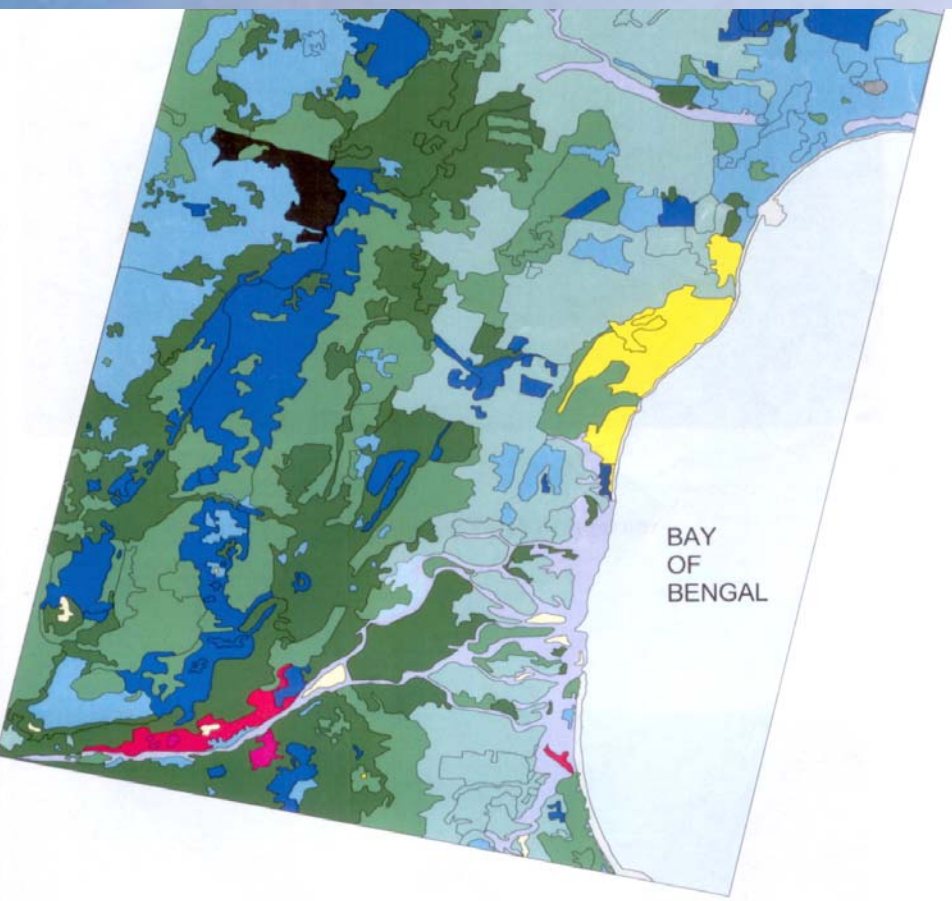



Aeolian
Fluvial
Coastal
Pudukottai
Seveyarpuram
Tuticorin Road
Kuttampuli
Airport
Sevaikkaranmadam
Salt Pan
Bay of
Bengal
Peykulam
Agaram
Mukkani
Tamiraparani River
Scale
Kilometers
2 0 2
1 : 90000
Tamiraparani


BAY
OF
BENGAL
2 0 2 Kilometers
LEGEND
THERISANDDUNE
BEACH
BEACH WITH SANDDUNE
MADIKETTAN ODAI
TANK
RIVER


LINEAMENT MAP
PART OF TUTICORIN DISTRICT
BAY
OF
BENGAL
LEGEND
LINEAMENT
TANK
BEACH
2 0 2 Kilometers

Rapid expansion of salt industries

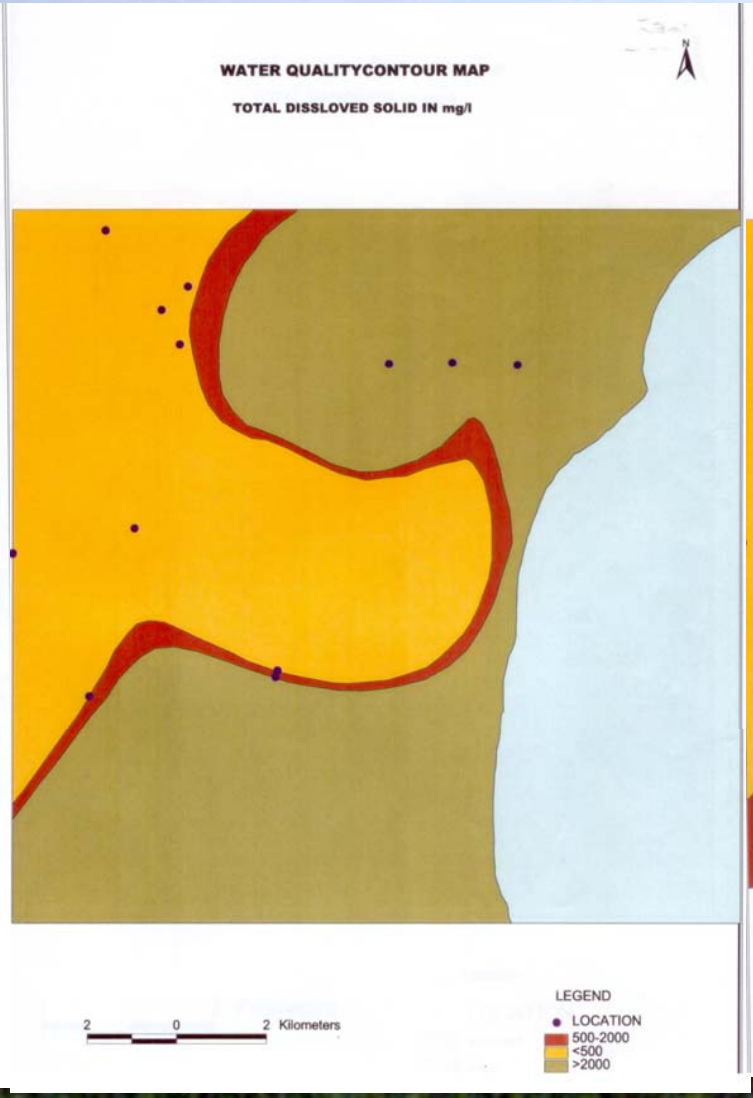


LEGEND

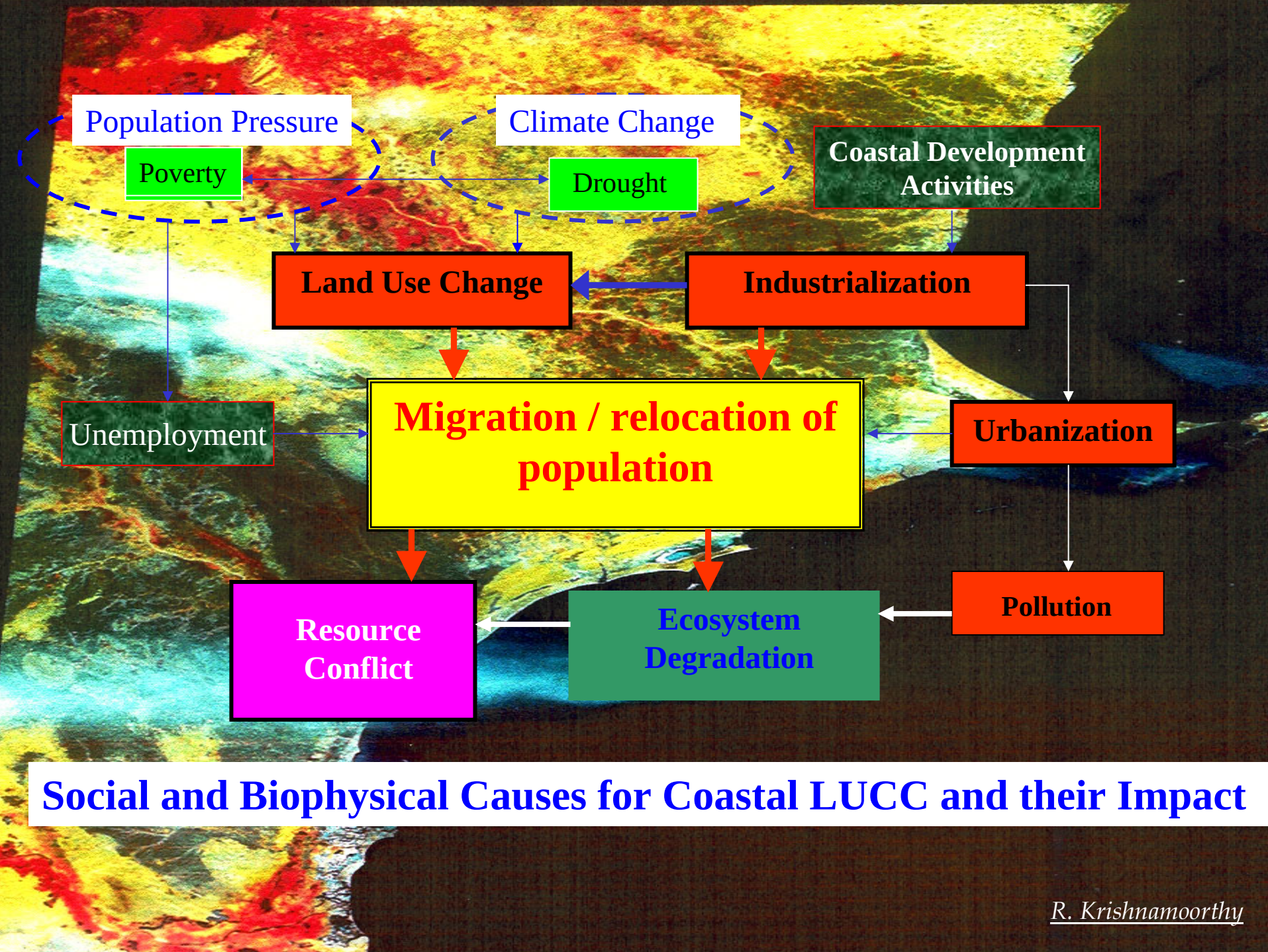
LAND USE & LAND COVER CLASSIFICATION

BEACH with Sand dune	SETTLEMENT
BARREN LAND	SALT PAN
BACK WATER	TANK
CANAL	VEGETATION
DRY VEGETATION	WATER BODY
FLOOD PLAIN	WASTE WATER
MUD	BARRENLAND
ODAI	DRY VEGETATION
SAND	RIVER


N
WATER QUALITY CONTOUR MAP
CHLORID IN mg/l
0 2 Kilometers
LEGEND
LOCATION
>2000
500-2000
<500
>2000

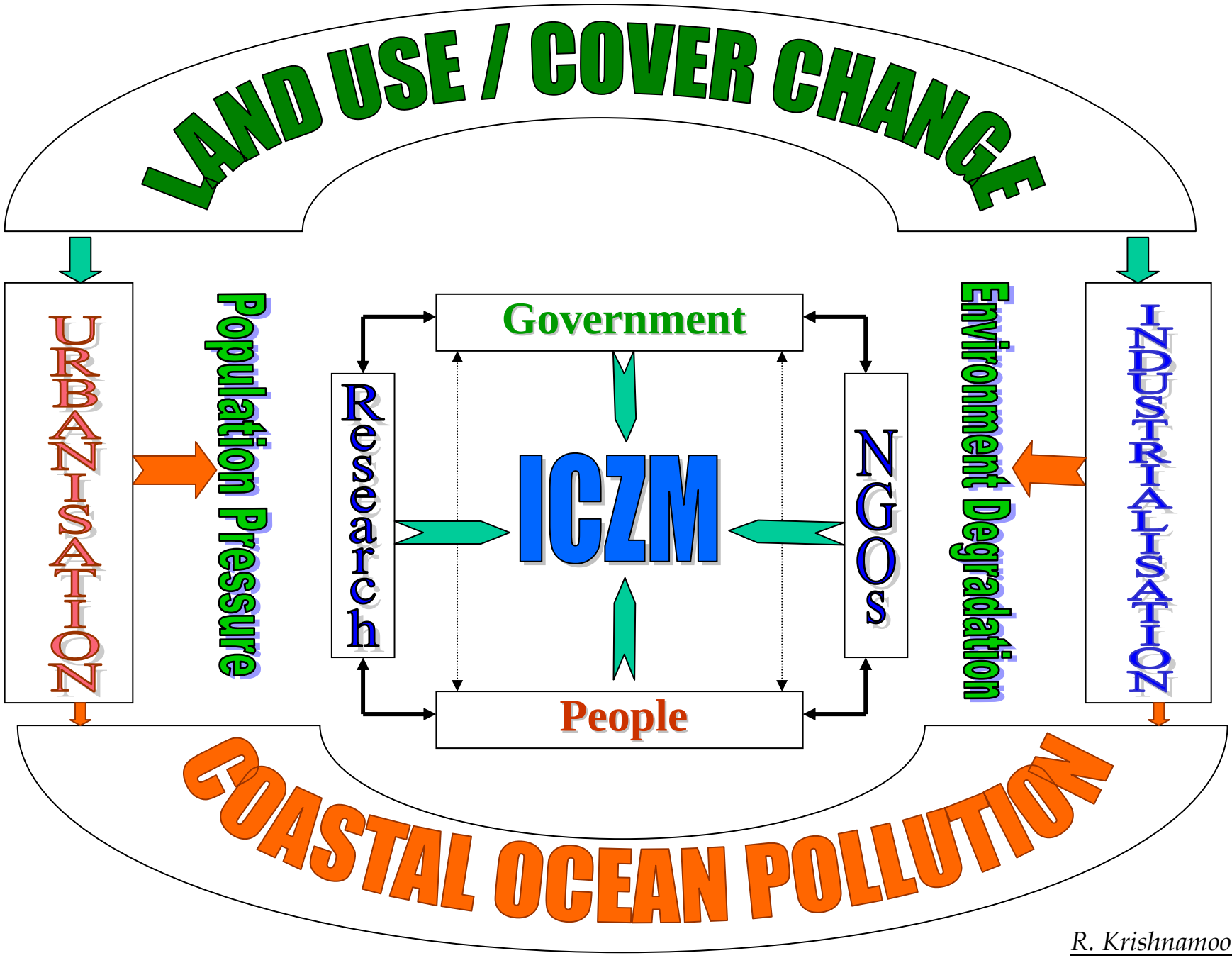

WATER QUALITYCONTOUR MAP
TOTAL DISSLOVED SOLID IN mg/l
2 0 2 Kilometers
LEGEND
LOCATION
500-2000
<500
>2000


WATER QUALITY COUNTOUR MAP
TOTAL HARDNESS IN mg/l
2 0 2 Kilometers
LEGEND
LOCATI
500-2000
<500



Social and Biophysical Causes for Coastal LUCC and their Impact

R. Krishnamoorthy



R. Krishnamoorthy

Conclusions

- Population explosion and over exploitation of ground water are the major causes for LUCC
- Land use management need to considered within the framework of ICZM involving stakeholders
- Multispectral multidate remote sensing data and GIS tools could be used effectively for science based people centered management plans