

Land Cover and Environmental Hazards; Satellite Remote Sensing Approach and Solutions in Bangladesh



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Introduction

Bangladesh, a land area of 147,570 sq.km is located in the sub-continent bridging South Asia and South East Asia. It is surrounded by India on the west, north and northeast, Myanmar on the southeast and bay of Bengal on the south.



Introduction

The country is an unique example of active deltaic formation, Fertile land, abundant water bodies, world's largest single tract of natural Mangrove forest, Confluences of 3 mighty rivers, vast river network , long shore with marine resources, Abundant explore and unexplored gas and mineral resource.

Beside Bangladesh is one of the most disaster prone countries of the world because of it's geographical location.

Cyclone, Storm Surges, Floods, Nor`wester, deforestation, salinity intrusion, river erosion, water logging, desertification etc are common disaster events.

Topography

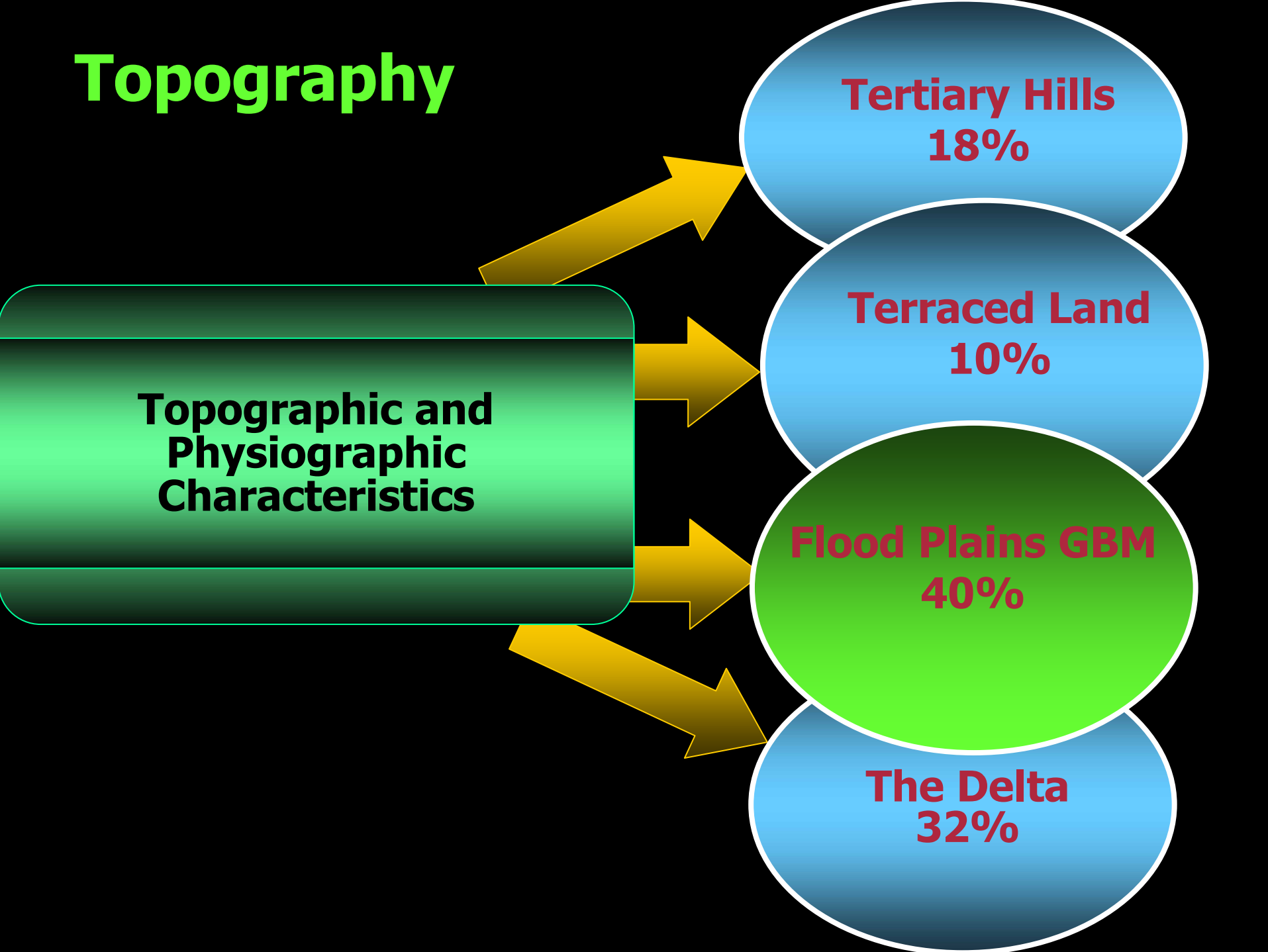
**Topographic and
Physiographic
Characteristics**

**Tertiary Hills
18%**

**Terraced Land
10%**

**Flood Plains GBM
40%**

**The Delta
32%**



Socio-Economic Condition

Basically agricultural country

Contributing 37% of GDP

Poor economic base

Large population

Frequent visit of natural calamities



Widespread poverty

Scope of Application of Remote Sensing Technology

- Considering geophysical & socio- economic condition, for a small country having vast population, geographically falls within an area vulnerable to all form of disasters, Bangladesh required proper utilization of resources for survival as well as development.
- Satellite Remote Sensing Technology could acts as appropriate tools for generation of information needed in planning and development efforts.
- Bangladesh is one of the early users of Satellite borne remote sensing data.
 - With a view to strengthening cyclone forecasting activities, it established an APT in 1968.

Scope of Application of Remote Sensing Technology

- Space technology application get momentum in 1970's and 1980's.
- SPARRSO established (1980) as national focal point of space applications and remote sensing activities of the country. It is devoted to applying space technology and GIS for surveying, mapping of natural resources, environment and disaster monitoring in the country.

Land Cover



Forest

7.29%

Other wooded land 6.22%

**Other lands (Settle. Arable
land etc. 74.73**

Inland Water

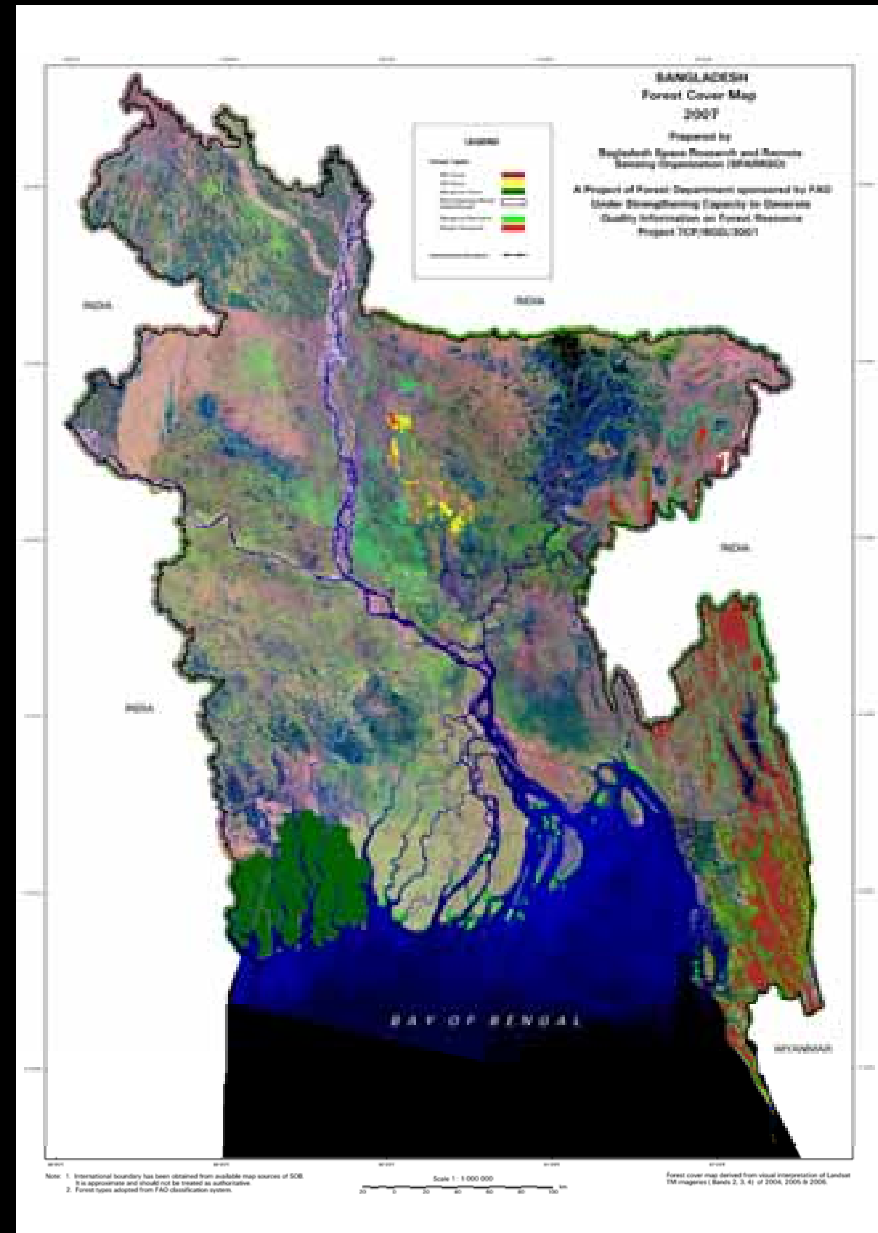
11.76

Land Cover

The vegetation coverage generated through the study reflects not only alarming but also bears serious consequences being an ideal environment.

An earlier RS study shows that from 1984 to 1981 a net depletion of 850 ha/year in a forest division has been occurred.

Agricultural encroachment, Shifting cultivation, illegal felling, fuel wood collection are the main causes of deforestation.



Land Cover (Mangrove Forest)

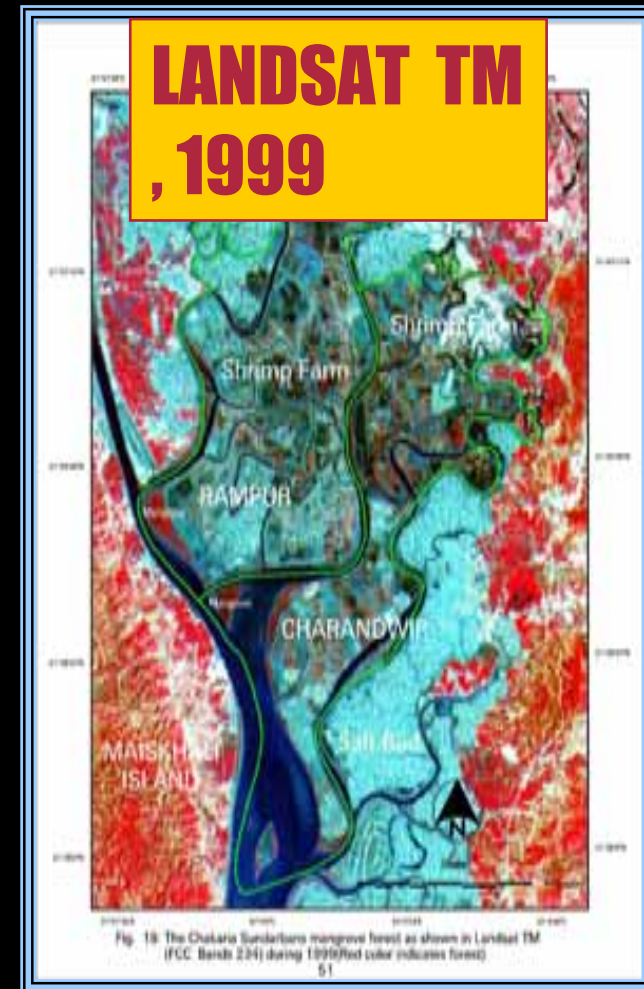
Sundarbans the world's
single largest
Mangrove forest
(about 6,000 sq
km)



Land Cover (Mangrove Forest)

A well known natural mangrove forest, Chakaria Sundarbans (about 7,000 ha), which has been fully denuded due to human interference

SPARRSO first reported this denudation status in 1980 using RS technique.



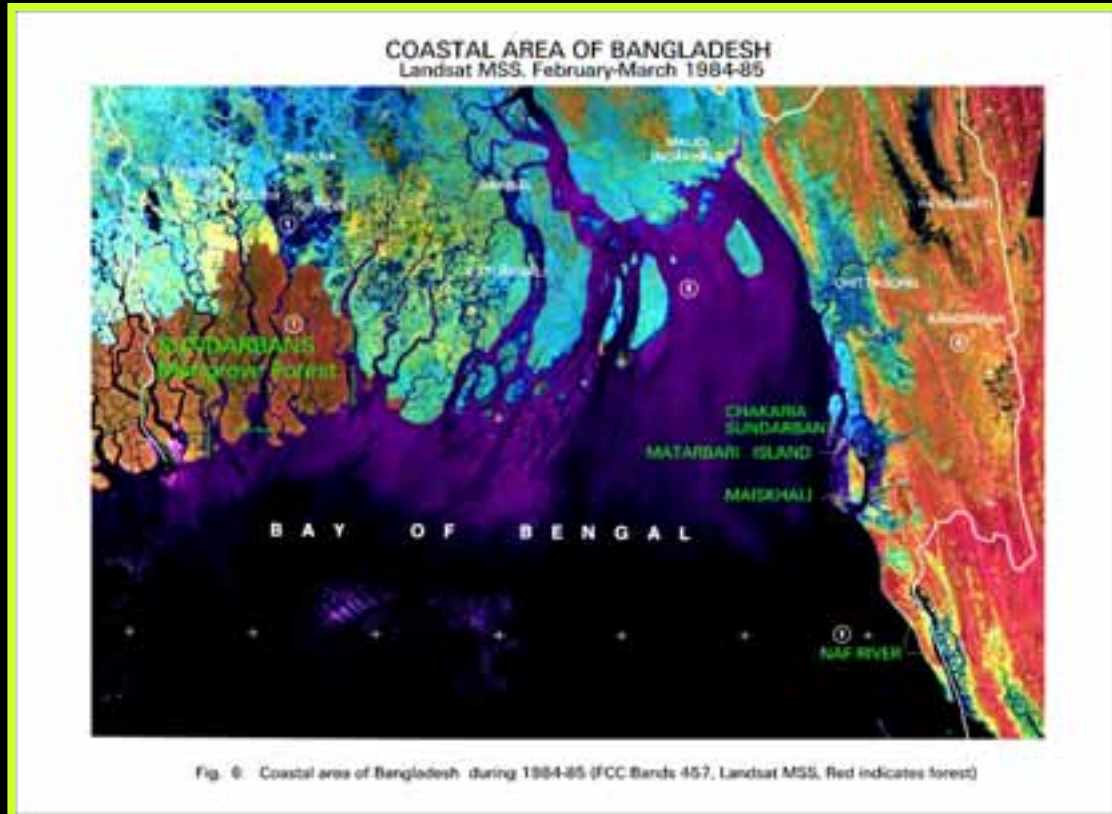
Land Cover (Mangrove Forest)

Based on RS study SPARRSO provided the dataset of available suitable land for mangrove afforestation to the Forest Department (FD) in late 70's.

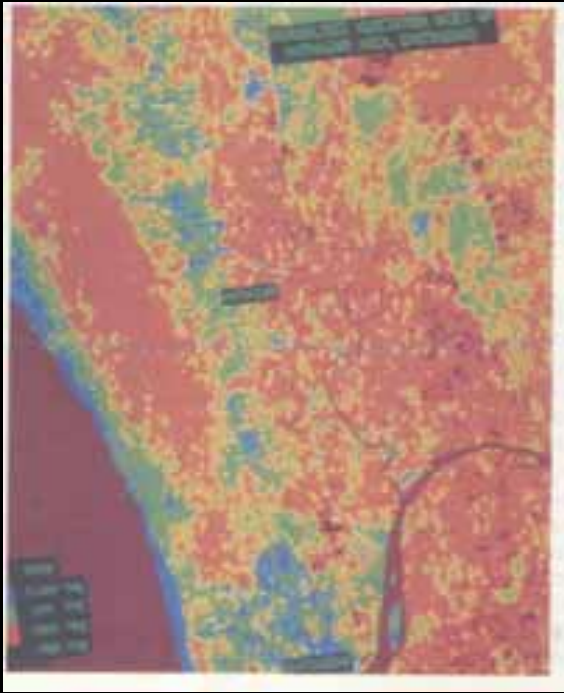
Based on this information FD implemented their afforestation program in 40,000 ha (approx.) newly accreted land.



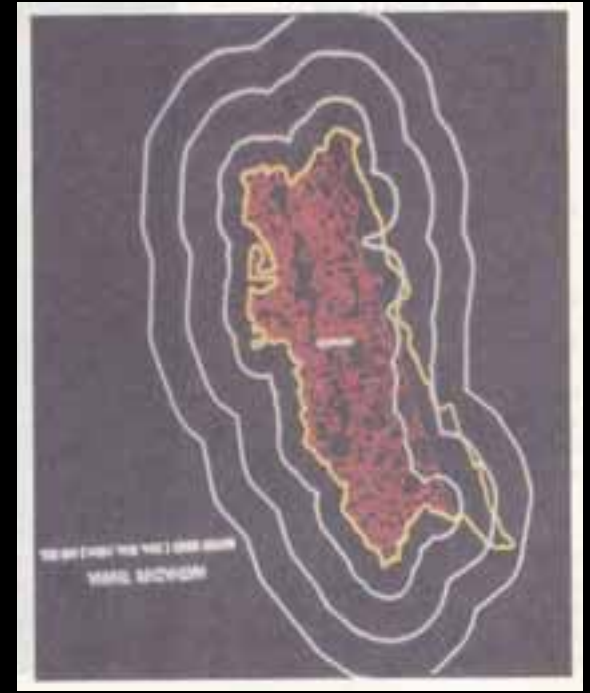
Land Cover (Mangrove Forest)



Land Degradation



Land degradation study in Sitakunda, Chittagong.



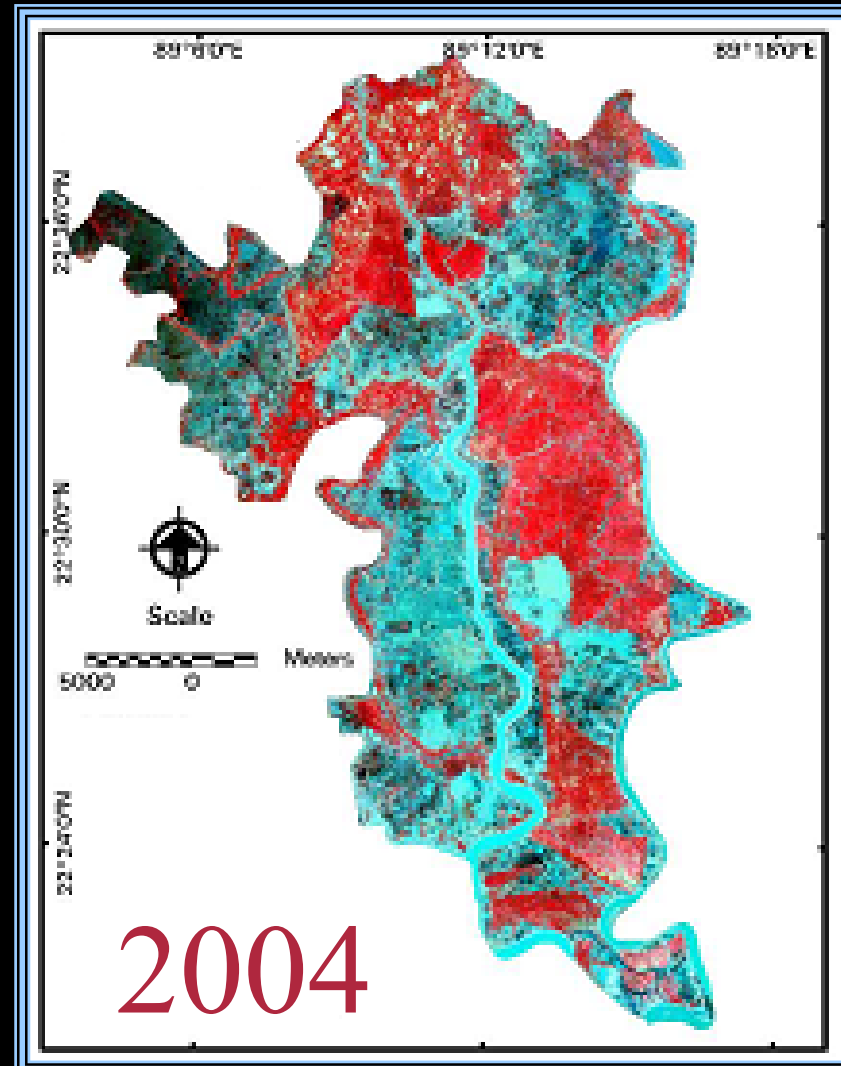
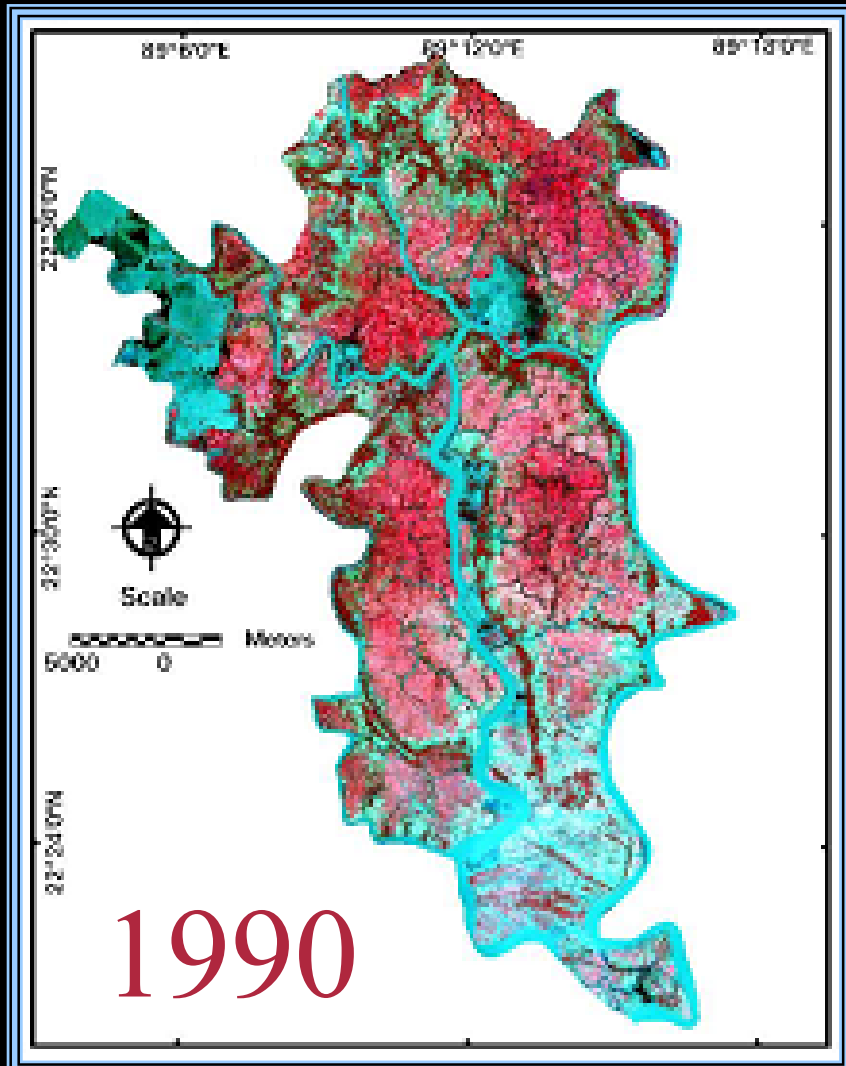
SPARRSO conducted a land degradation study in hilly terrain based on vegetation status, soil and land form and human interference as decision rules.



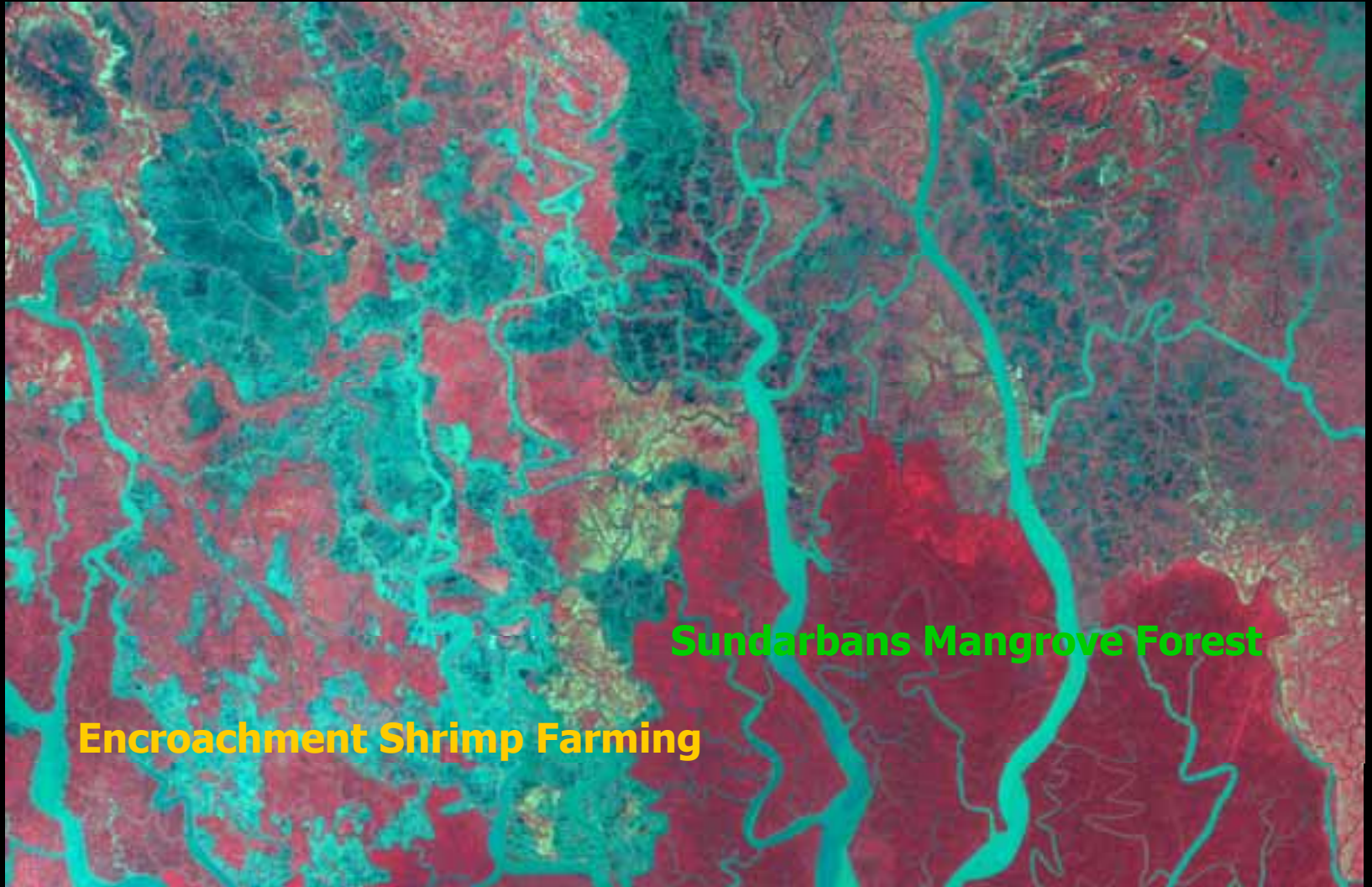
Bangladesh faced with problem of land degradation of different kinds.

Salinity Intrusion

In south western part of Bangladesh, land use pattern has significantly changed. Agricultural land has gradually been encroached and undergoes shrimp farming causing increase of salinity.



Salinity Intrusion



Salinity Intrusion

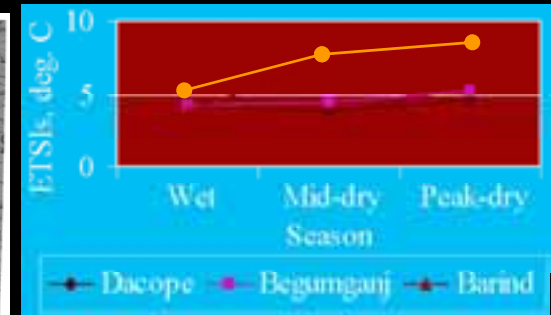
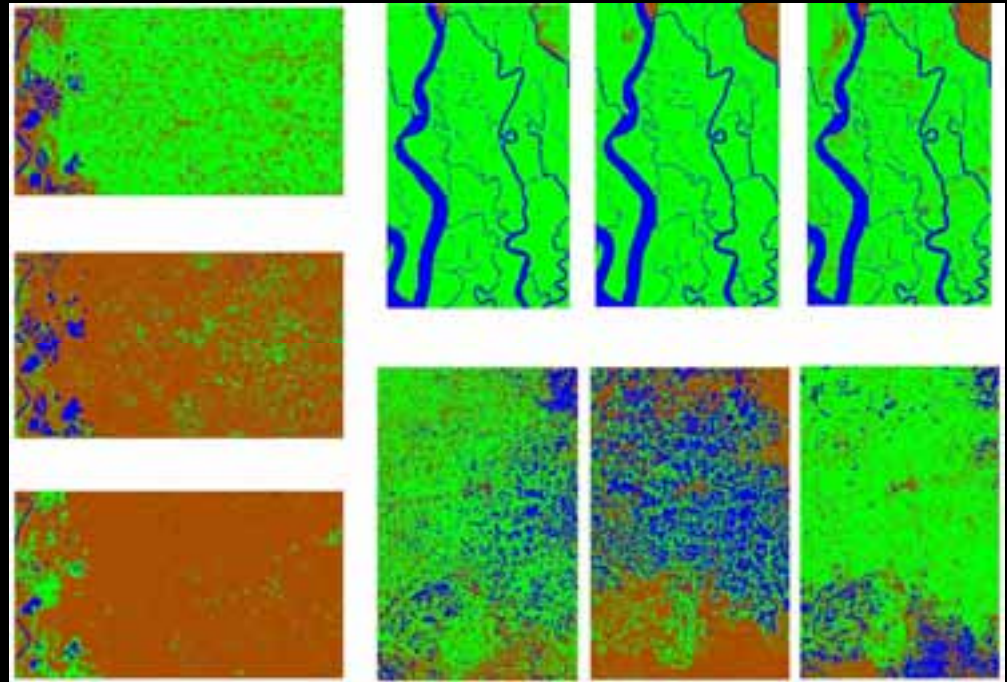
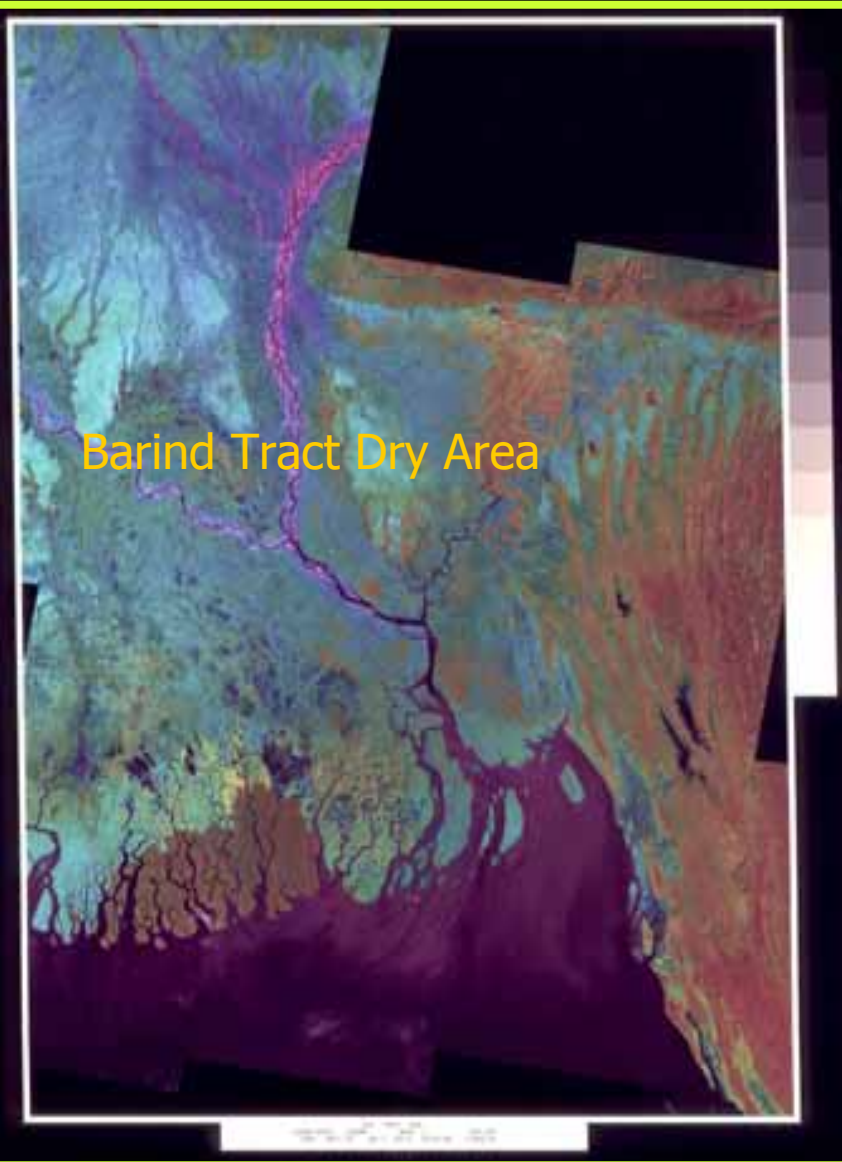
- **SPARRSO has carried out a research work on the impact of shrimp farming on rice and other agricultural land using remote sensing and GIS. Time series data of Landsat MSS and TM covering a period of about 31 years from 1975-2005 have been used.**
- **The study shows that there was no shrimp farm up to 1977. However, an area of 174 ha. was found to be under shrimp farming between 1977 to 2005.**
- **The study also indicates that much scale encroachment of agriculture land and degrading soil fertility.**

Water logging

- Water logging problem in the southern part of coastal region of Bangladesh is serious issues.
- In 1960 many polders were constructed in view to increase food production by reclaiming saline and swamp areas of coastal belt. After 20 years, the situation totally reverse. The channels are blocked by huge sedimentation. This is caused by low flow of Ganges water due to commissioning Farakka Barrage in upstream.
- SPARRSO conducted a time series analysis of water logging and generated data sets of its chronological extent and existing condition of the of the affected areas.



Drought



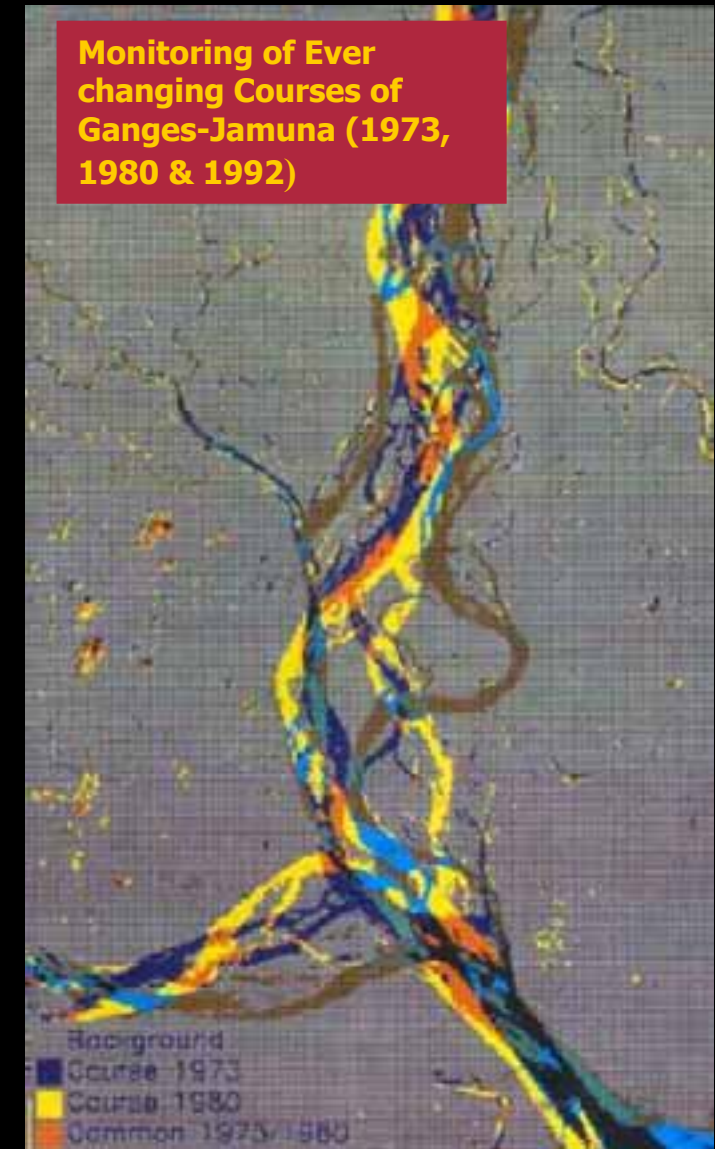
Droughts occur very often in the northern part of Bangladesh. SPARRSO is carrying out research for the development of a National Drought Monitoring System (NDMS) using remote sensing, GIS, and climatic data.

River Bank Erosion and Sedimentation



River bank erosion, sedimentation and shifting of channels are most devastating form of waterborne land degradation in Bangladesh.

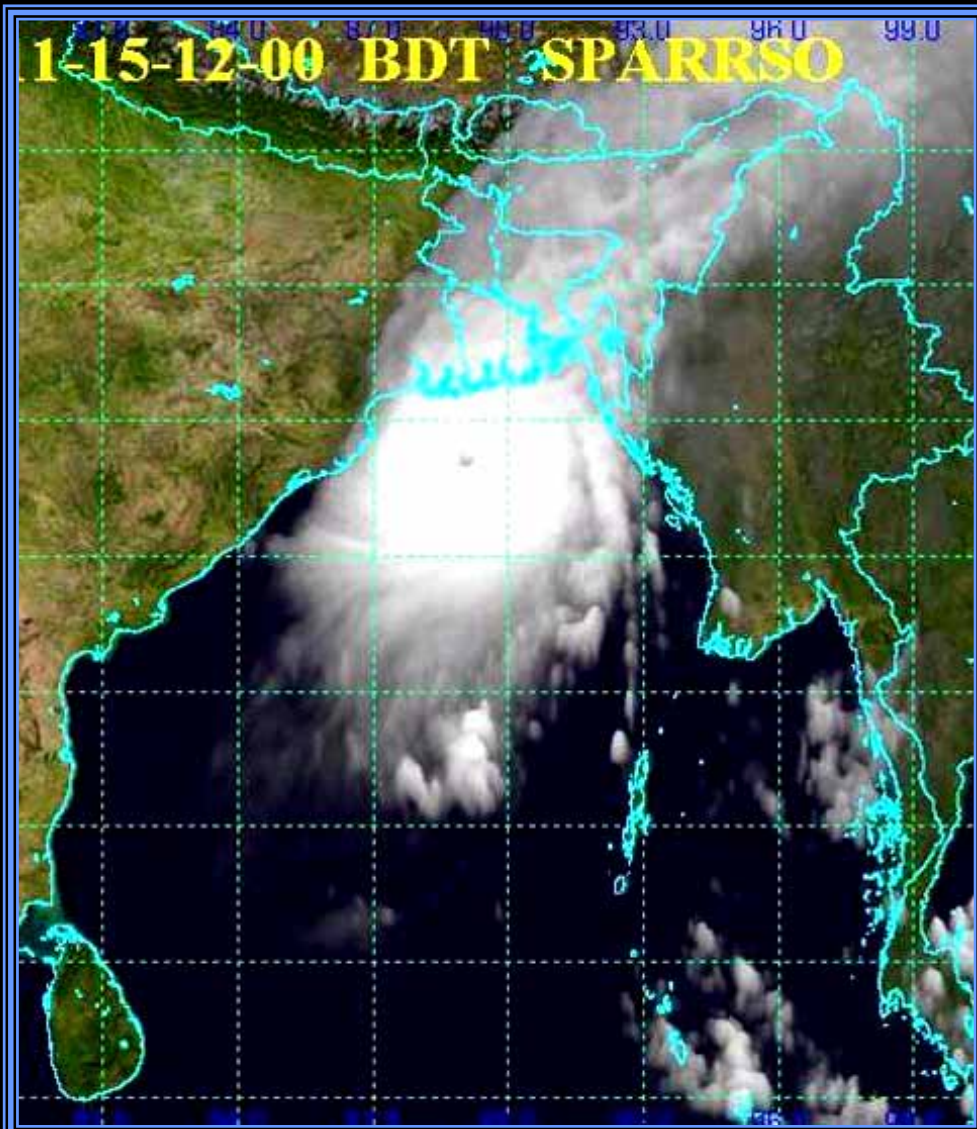
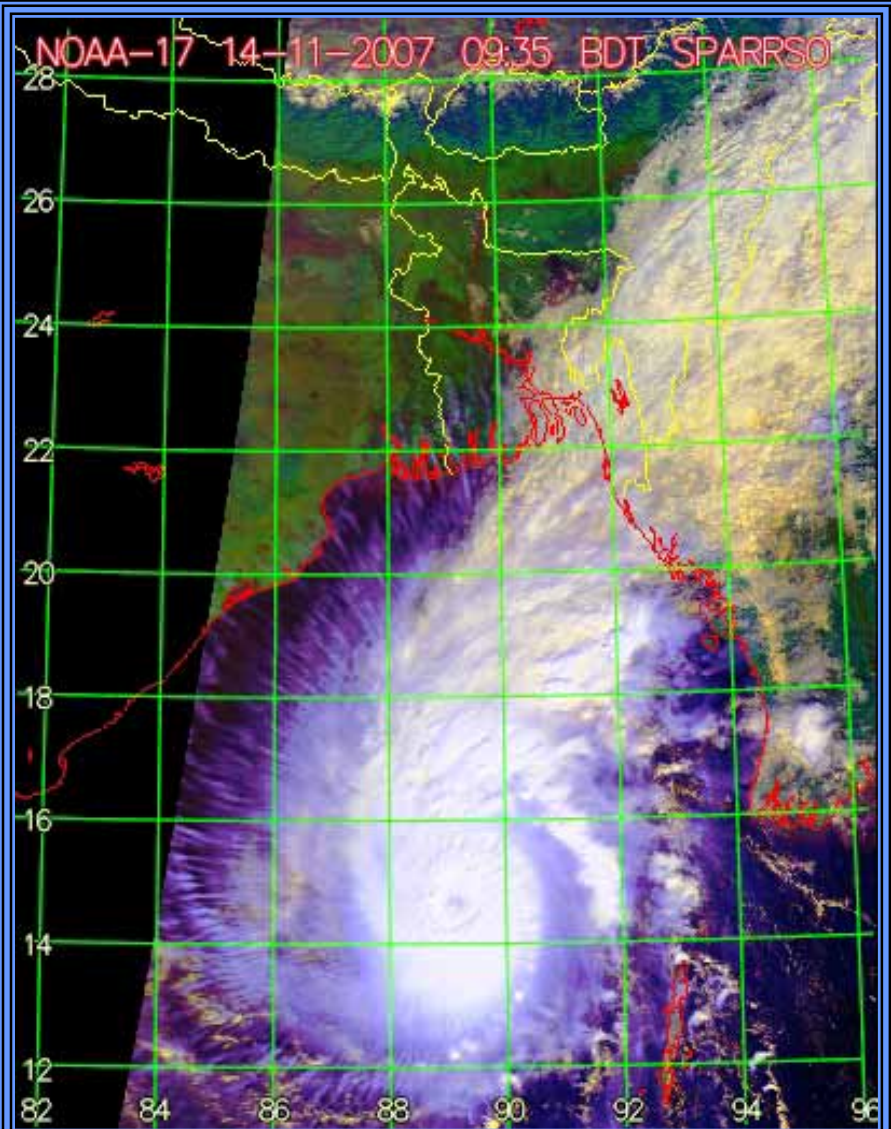
SPARRSO developed a methodological approach for prediction of erosion along the braided alluvial river Jamuna.



Cyclone Monitoring and Tracking

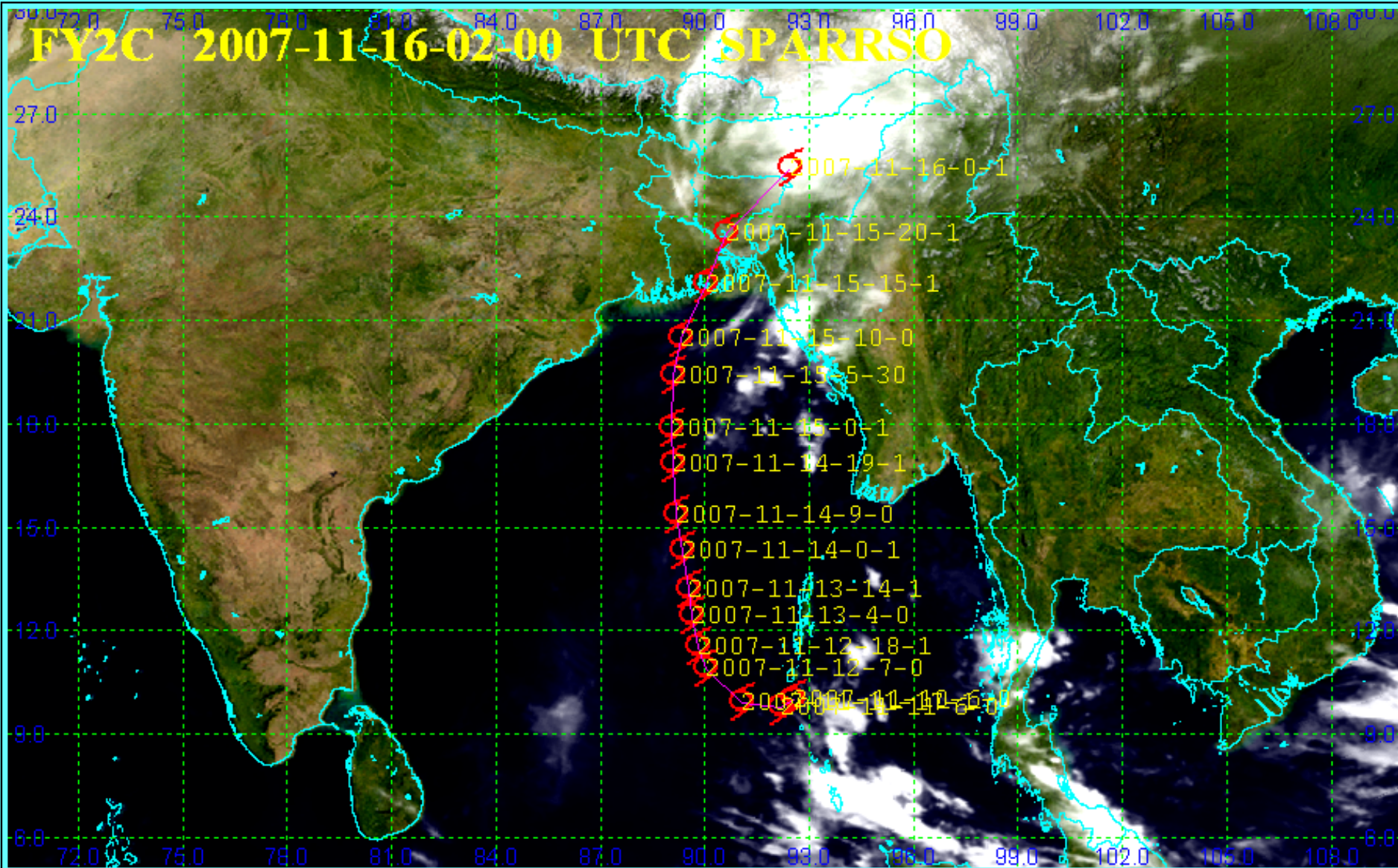
CYCLONE-SIDR FROM NOAA SATELLITE
NOV 14 2007, 9:35 BDT

CYCLONE-SIDR FROM FY2C SATELLITE
NOV 15 2007, 12:00 BDT

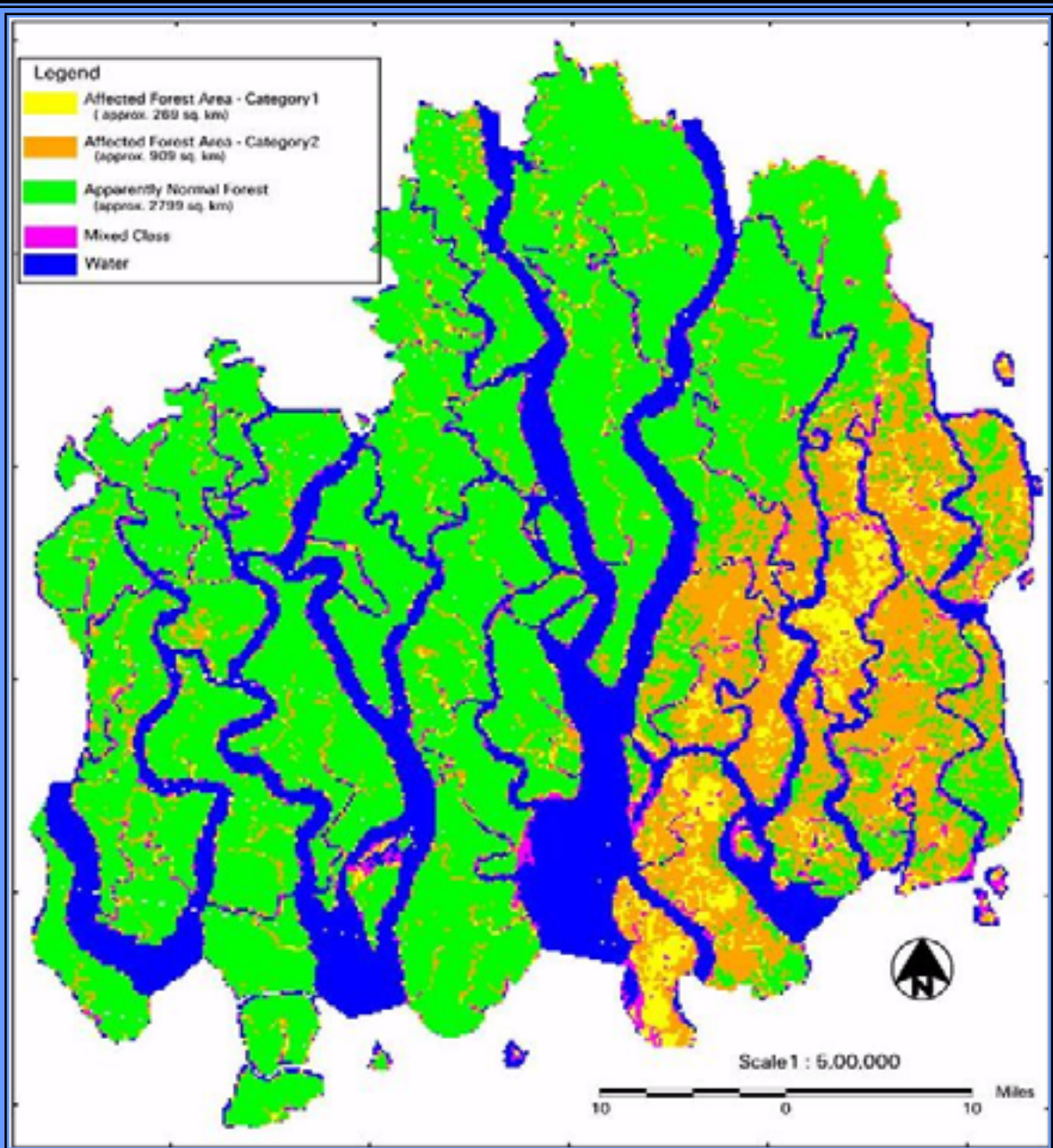


Cyclone Monitoring and Tracking

TRACKING OF CYCLONE-SIDR FROM SPACE DURING NOV. 10 – 16, 2007



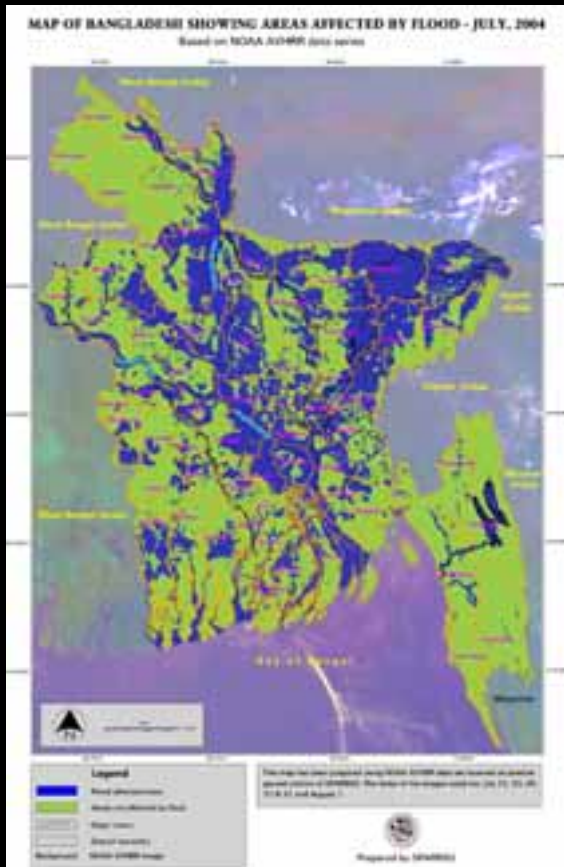
Sundarbans Damaged By Cyclone SIDR



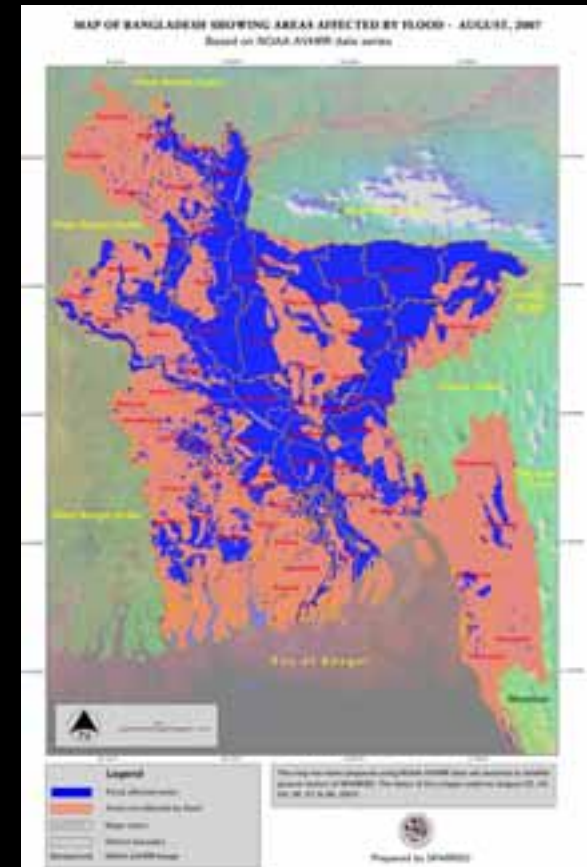
**SATELLITE BASED
OBSERVATION OF AFFECTED
AREAS OF SUNDARBANS DUE
TO CYCLONE SIDR, November
15, 2007**



Monitoring of Floods



Flood 2004



Flood 2007

Flood is most common and regular phenomena in Bangladesh. It is predominantly a result of high flows of three major rivers; the Ganges, the Brahmaputra and the Meghna. Most of the rivers are limited depth, sandy bottom, flat slope, meandering, erodable and shifting channels. Heavy incessant rain cause flooding due to drainage congestion, high ocean tides by obstructing drainage of upland discharge.

Monitoring of Floods

At present Bangladesh has 72 hours lead time forecast of rise/fall water level in various rivers. Thus, three hours lead time is not sufficient for taking precaution measures for disaster preparedness.

Recently the Flood Forecasting and Warning Center (FFWC) has taken a joint initiative to enhance the lead time 10 days by developing a model using satellite data.

SPARRSO has been working in monitoring flood since long. In 2007, Bangladesh was affected by a devastating flood. SPARRSO prepared a flood map based on NOAA-AVHRR data and information were supplied to the government and concern agencies.



Conclusion

- **An ideal land cover is always imperative need for a healthy environment of a geographical location.**
- **In Bangladesh population pressure on a small territory is the main problem in achieving balanced environment. However, Bangladesh is trying to maintaining its environment sound by various social activities.**
- **Bangladesh is significantly progressed in disaster mitigation activities by utilizing space technology. It would be an example of utilizing space technology for the benefit of vast population who are always been in threat to natural calamities round the year.**
- **Bangladesh with its limited resources has been trying to keep pace with the latest technological development particularly in space technology with regional and international collaboration and cooperation.**



THANK YOU