Effects of Salinity Intrusion in Mangrove Wetlands Ecosystems in the Sundarbans:

An Alternative Approach for Sustainable Management

By

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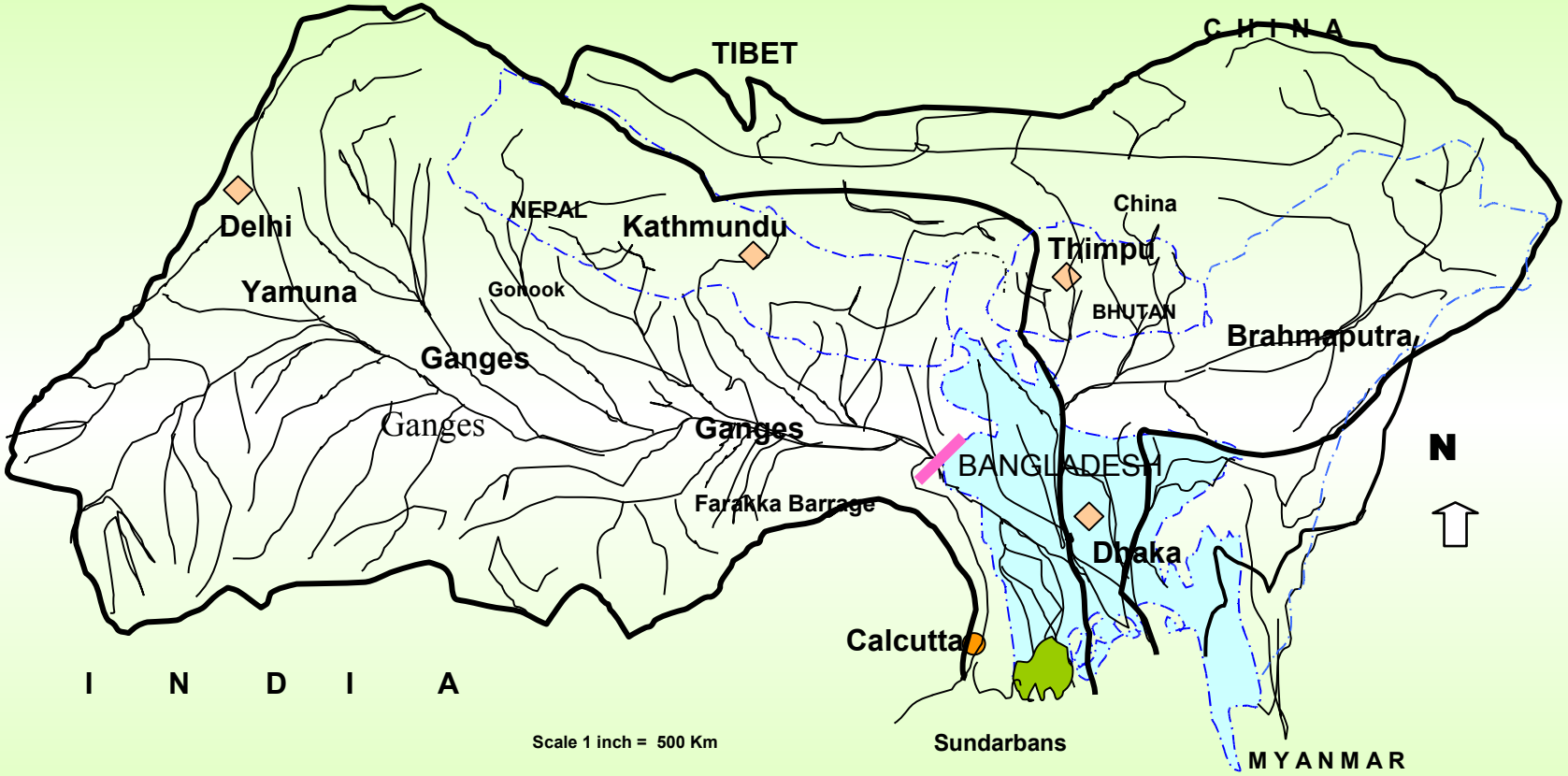
The Sundarbans Mangrove Wetlands Site Location in the Ganges Catchment Area



The Sundarbans Mangrove Forest covers 6017 sq.km : 62% lies in Bangladesh and rest of 38% in India. Latitude :21°31´N and 22°30´N. Longitude: 89°18´E and 90°18´E. Elevation: 0.9-2.1 m.

An Overview

- Wetlands constitute a part of Humans natural heritage. Wetlands have played a significant role in development of human society. The natural productivity of wetlands is an invaluable component of the environment, which is hotspot of biodiversity and the world‘s most productivie ecosystems.
- Mangrove wetlands is one of the productive ecosystems and provides ideal habitats for a variety of plants and animals.
- The Sundarbans reserve forest is one of the most important and largest contiguous mangrove forests in the world and has been significantly threatened from a number of directions for many years.
- It is a Natural World Heritage site (1400 km²) declared by UNESCO in 1997 and also Ramsar site Wetlands(601,700 ha 1992) basis of wetlands types:F, G, I , M and considered of the critiria 1c,2a,2b,2c,3b,4b, the largest living wetlands in the world.

Goemorphological and Wetlnads Importance

- Wetlands consists of a large number of fluvial and tidal landscapes, features created by three mighty rivers GBM. Annually 2.3 billion tons of sediment are transported by the major rivers of Bangladesh and having a profound effect on the floodplains and the coastal region.

- The Environment and Ecosystems of the coastal region is characterised by the unique geophysical phenomena, such as sea surges and waves, upland discharge and sedimentation, erosion and accretion, and storms and cyclones.

Unique Aspect

Axis axis

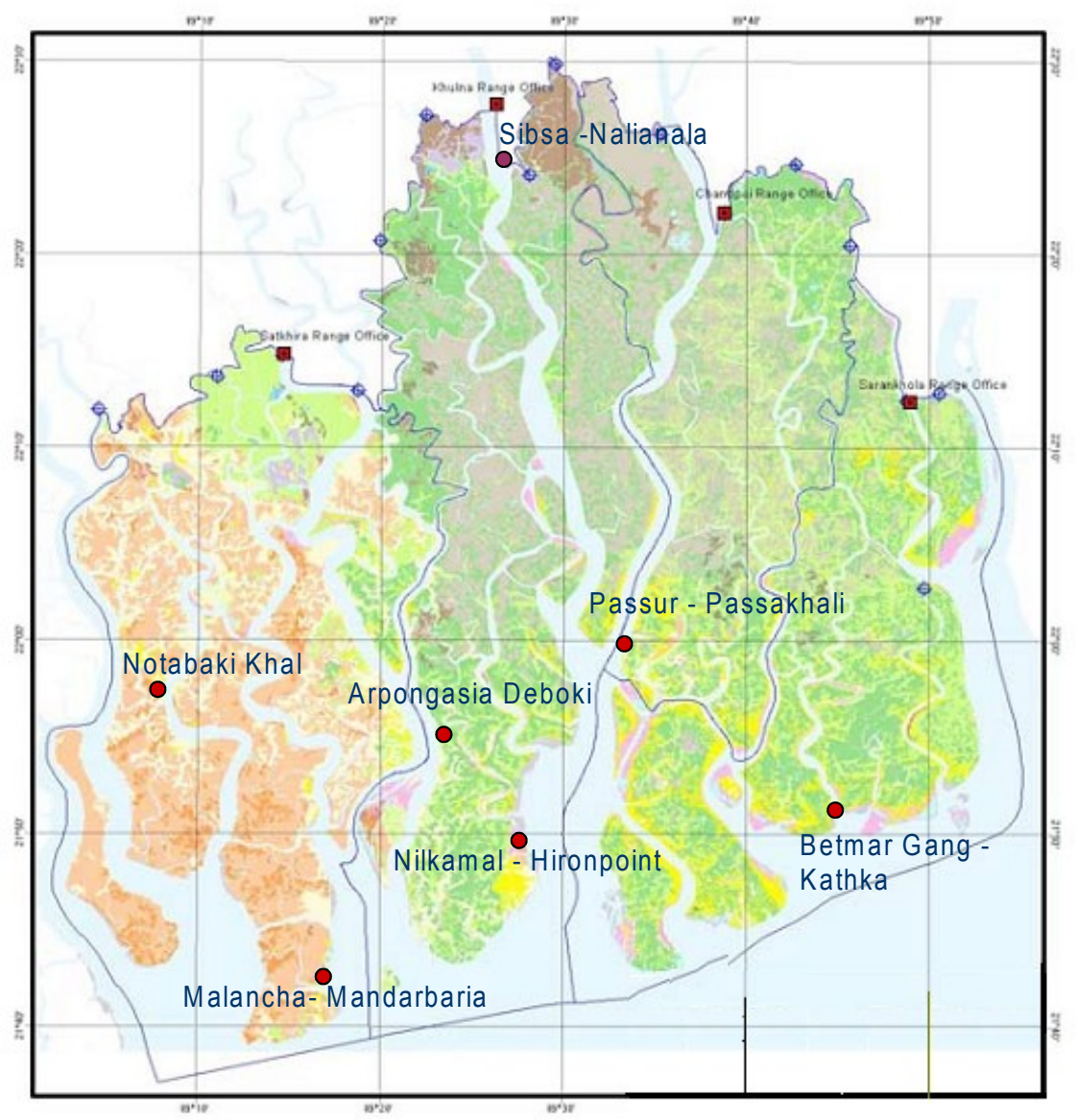
Heritiera fomes

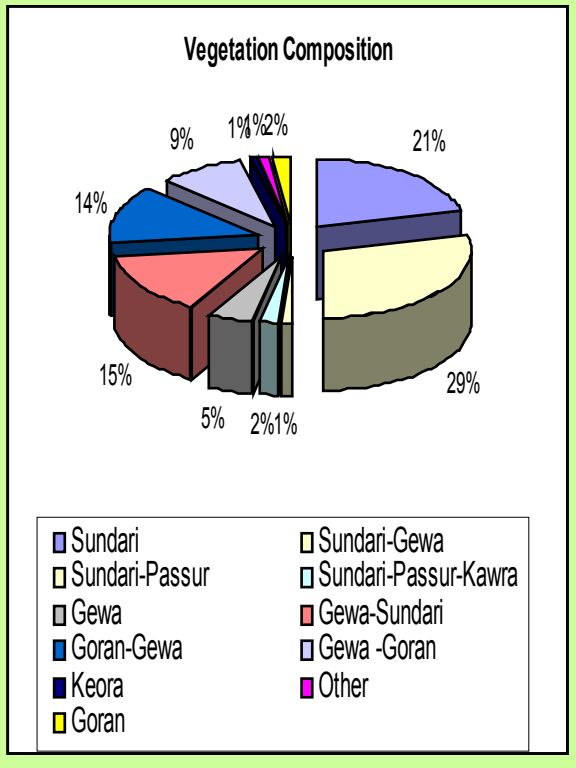
Nypa frutican

Panthera tigris tigris

Heritiera fomes

Vegetation Pattern in the Sundarbans





Heritiera fomes-21%

H. fomes-Excoecaria agallocha-29%

Excoecaria agallocha -5%

E.agallocha-h. fomes -15%

Cerops decandra- E.agallocha-14%

E. agallocha- C.decandra-9 %

Sonneratia apetala-1%

Tourism in the Sundarbans World Heritage Site

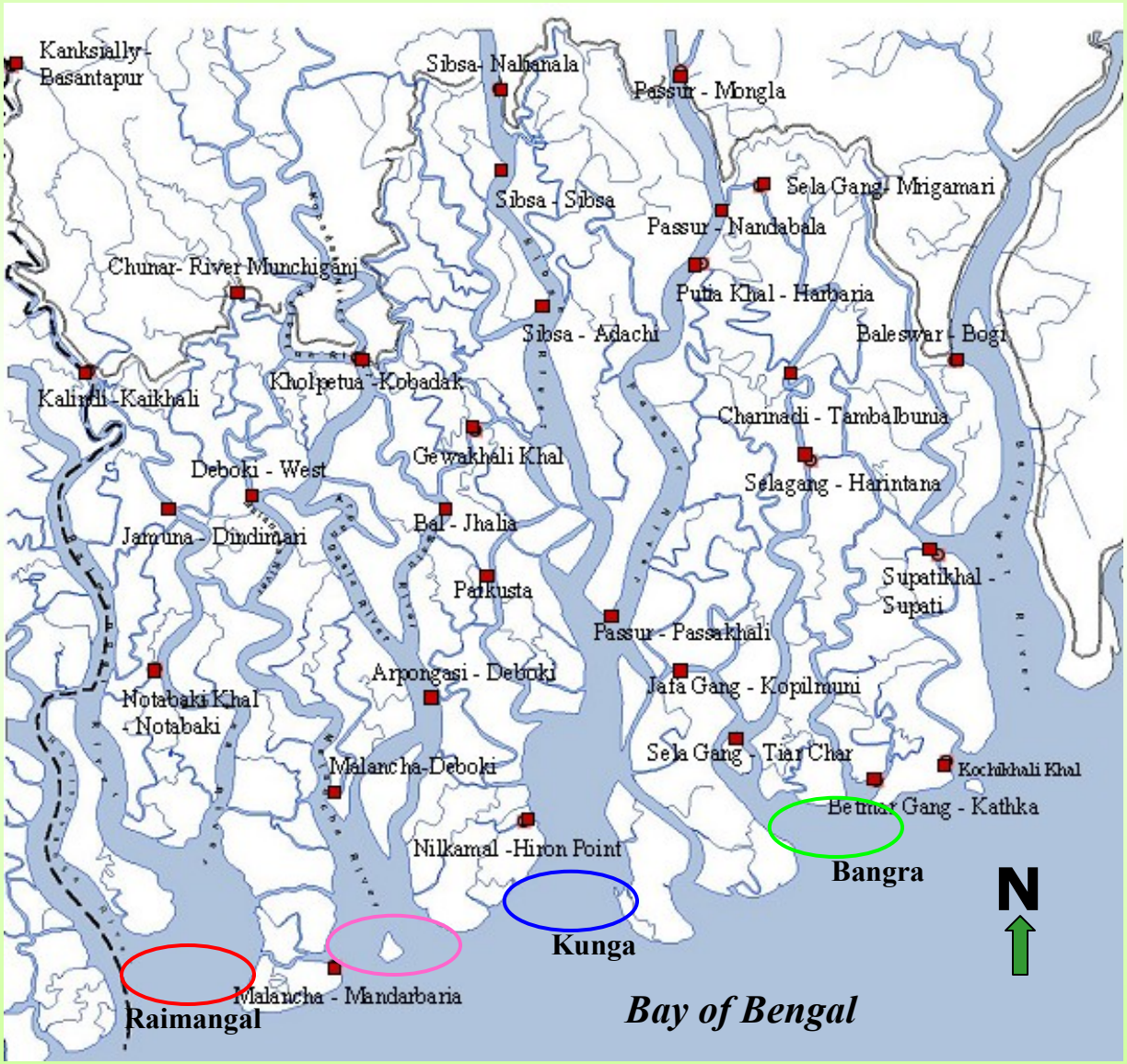
Annually 120,000 Tourists Visited the Sundarbans World Heritage Site

Socio-Economic Aspect

Socio-Economic Aspect

- Provides livelihood and employment to wood cutters, fishermen, collector of honey, wax, shell, shrimp fry , timber traders and other workers.
- 3.5 million people directly dependent and 6 million people are indirectly dependent on the Sundarbans resources

Deltaic Rivers System in the Sundarbans



Forest intersected by an elaborate network of rivers, channels and creeks, water area of 175,600 ha . Passur,Sibsa and Raimangol.

There are 4 estuaries and width of these estuaries are extended about 10 km.

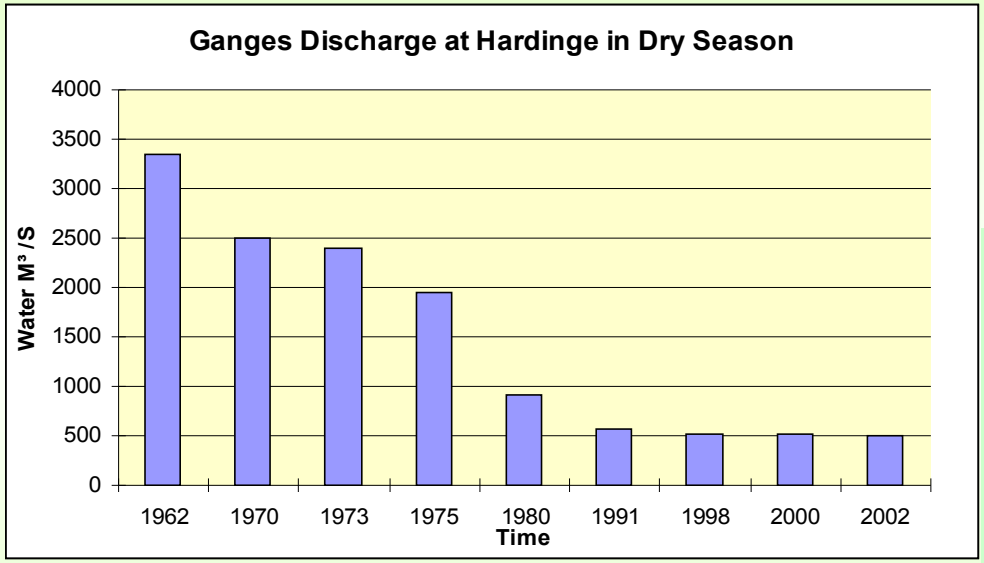
i.Bangra estuary

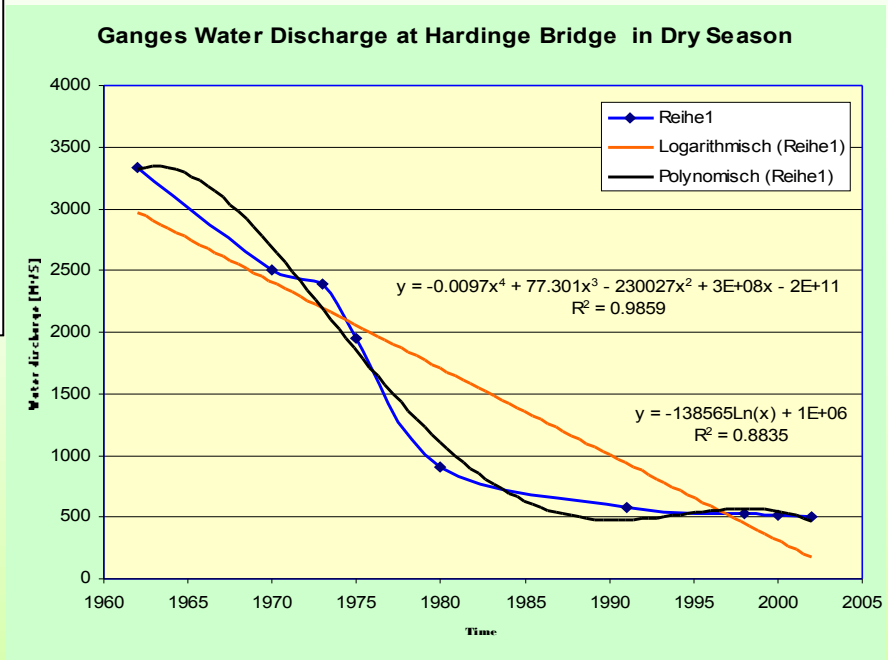
ii.Kunga estuary

iii.Malancha

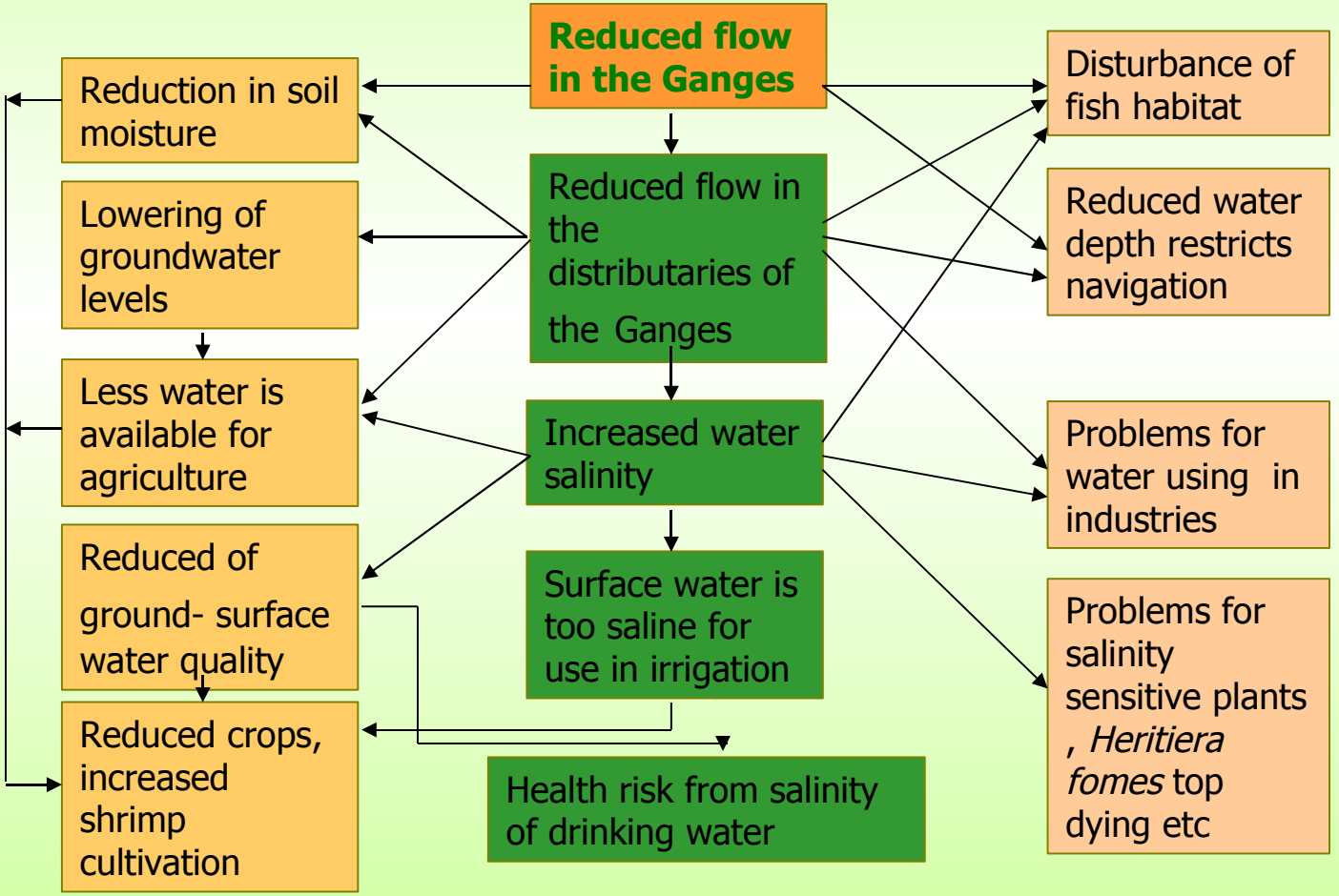
iv.Raimangol

Fresh Water Discharge of Ganges River

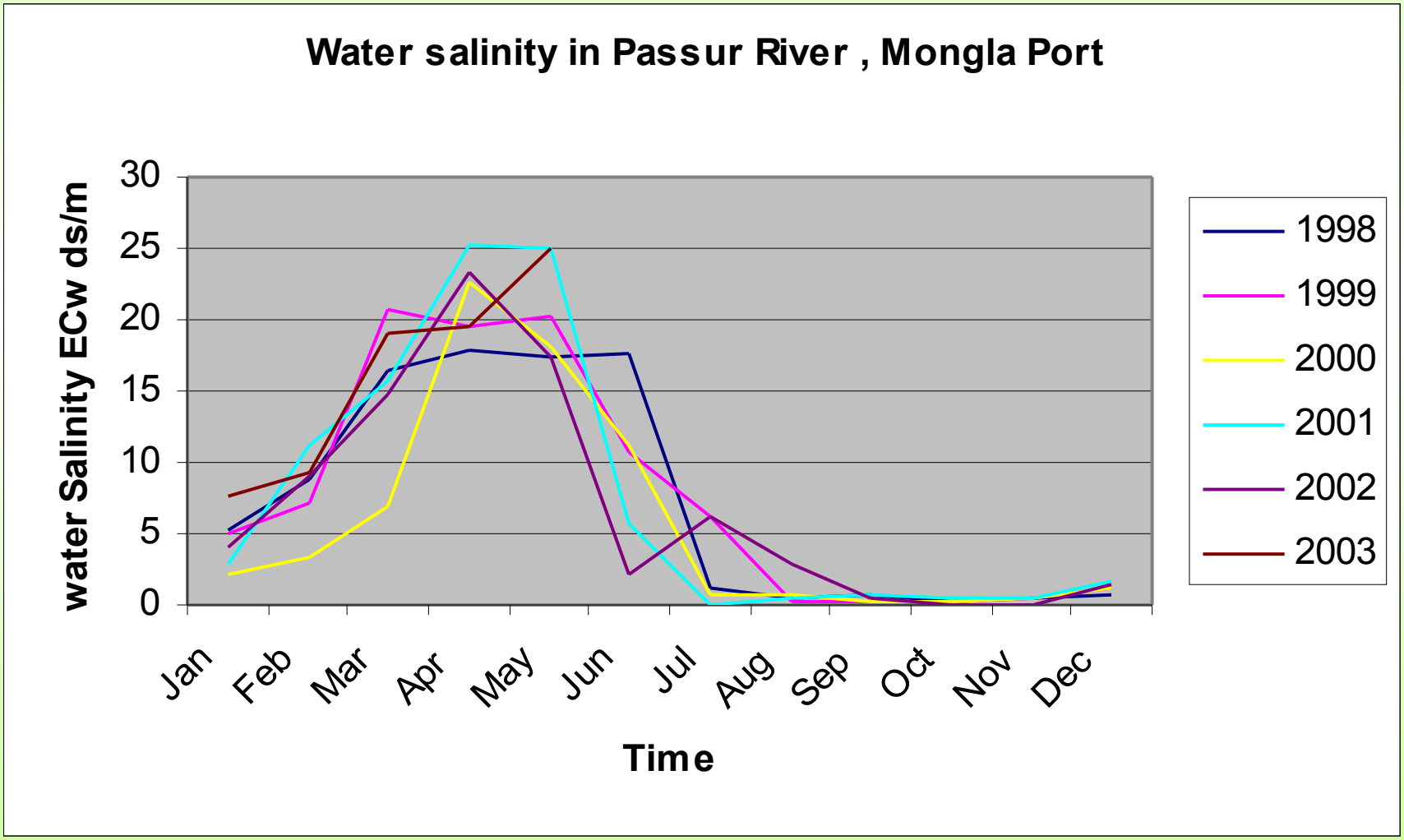




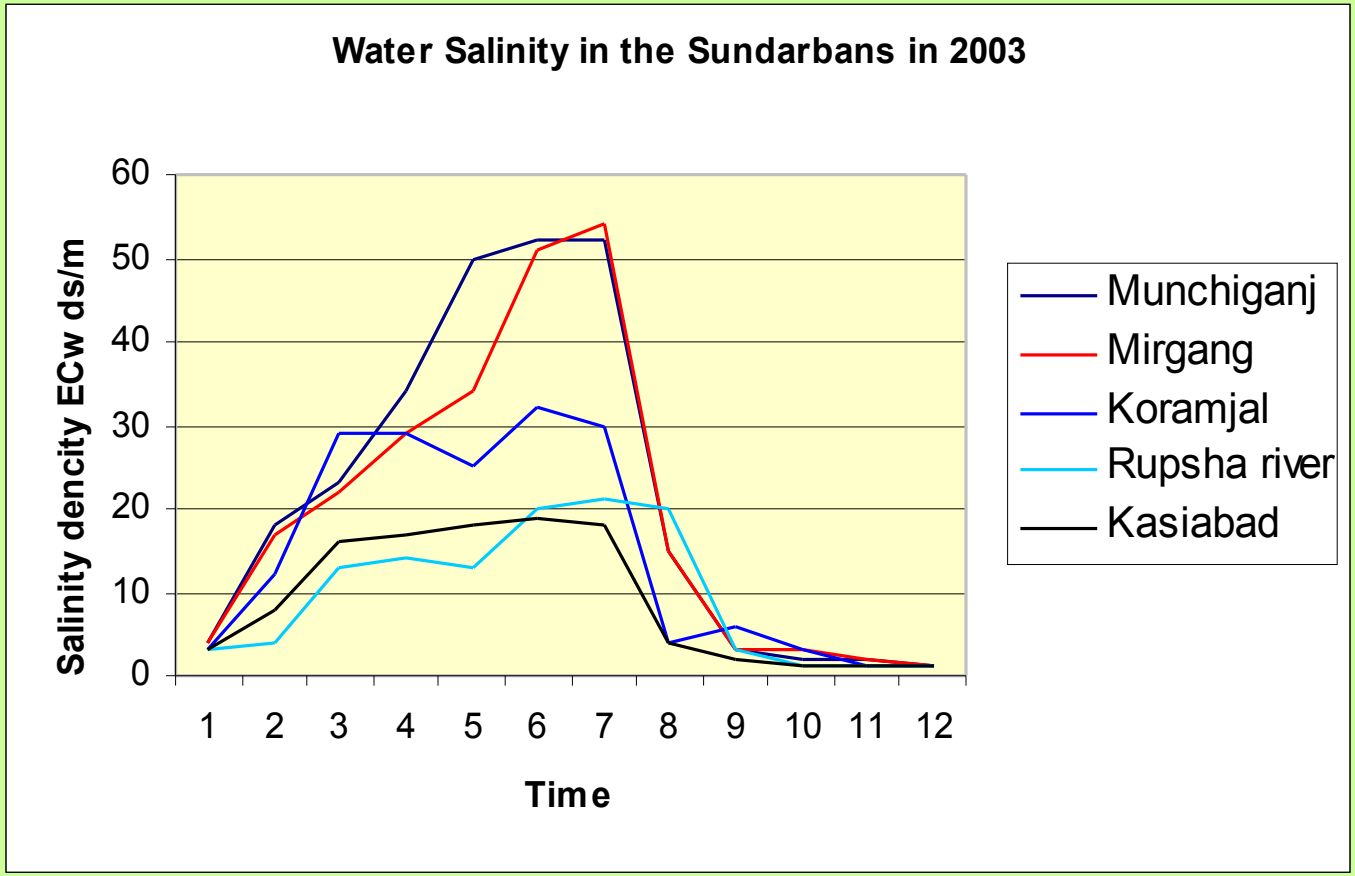
Shortage of Sweet Water Flow and Impact on the Mangrove Ecosystem



Water Salinity

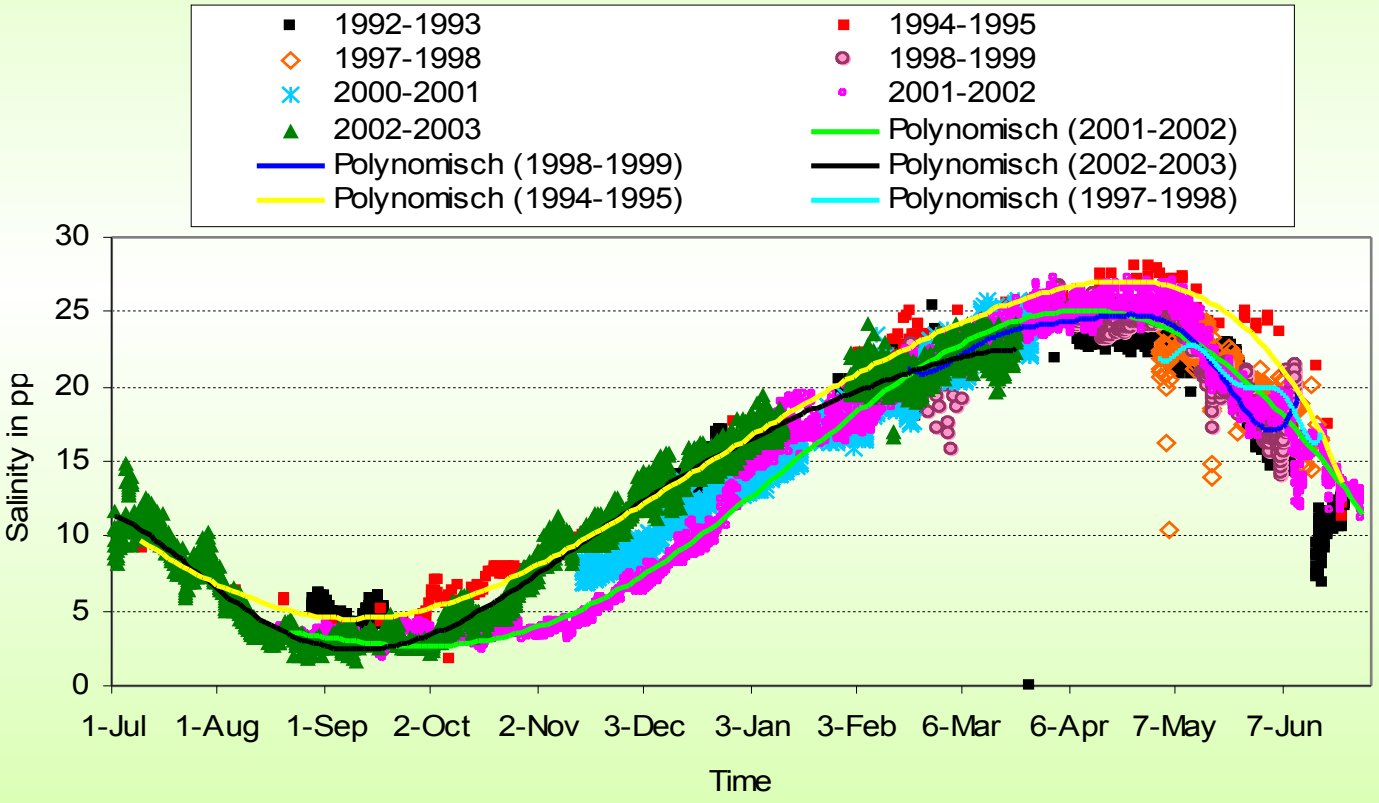


Salinity Increase at 5 Places



3rd Order Polynomial

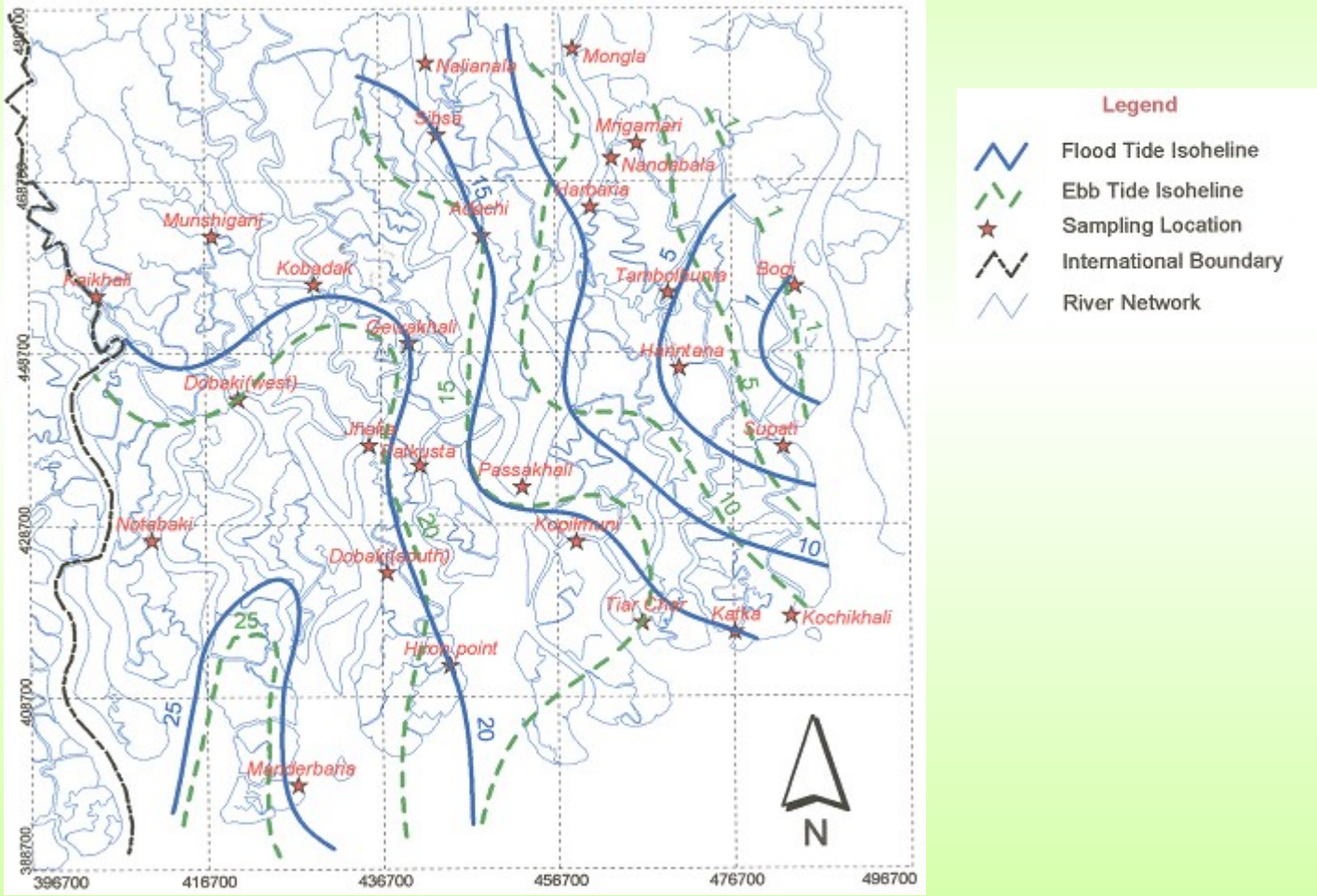
Salinity Model at NilKamol-HironPoint



Yearly Salinity Model

Data source: IWM 2003

Minimum Salinity Isohaline



Effects of Salinity

Mangrove Forest Destroying and Attracting for Shrimp Cultivation

Shrimp Cultivation and Changing of Landscapes

Shrimp Farming Extension Due to Salinity Intrusion in Sundarbans

Threatened Mangrove Wetlands Ecosystems

Topdying of Sundari(*Heritiera fomes*) Plants

- *Heritiera fomes* forest type is decreasing rapidly. At tpday's rate the forest will disappear within next 47 years.

- Moderately affected 255 Sq.km Severely affected 199 sq.km are severely affected.

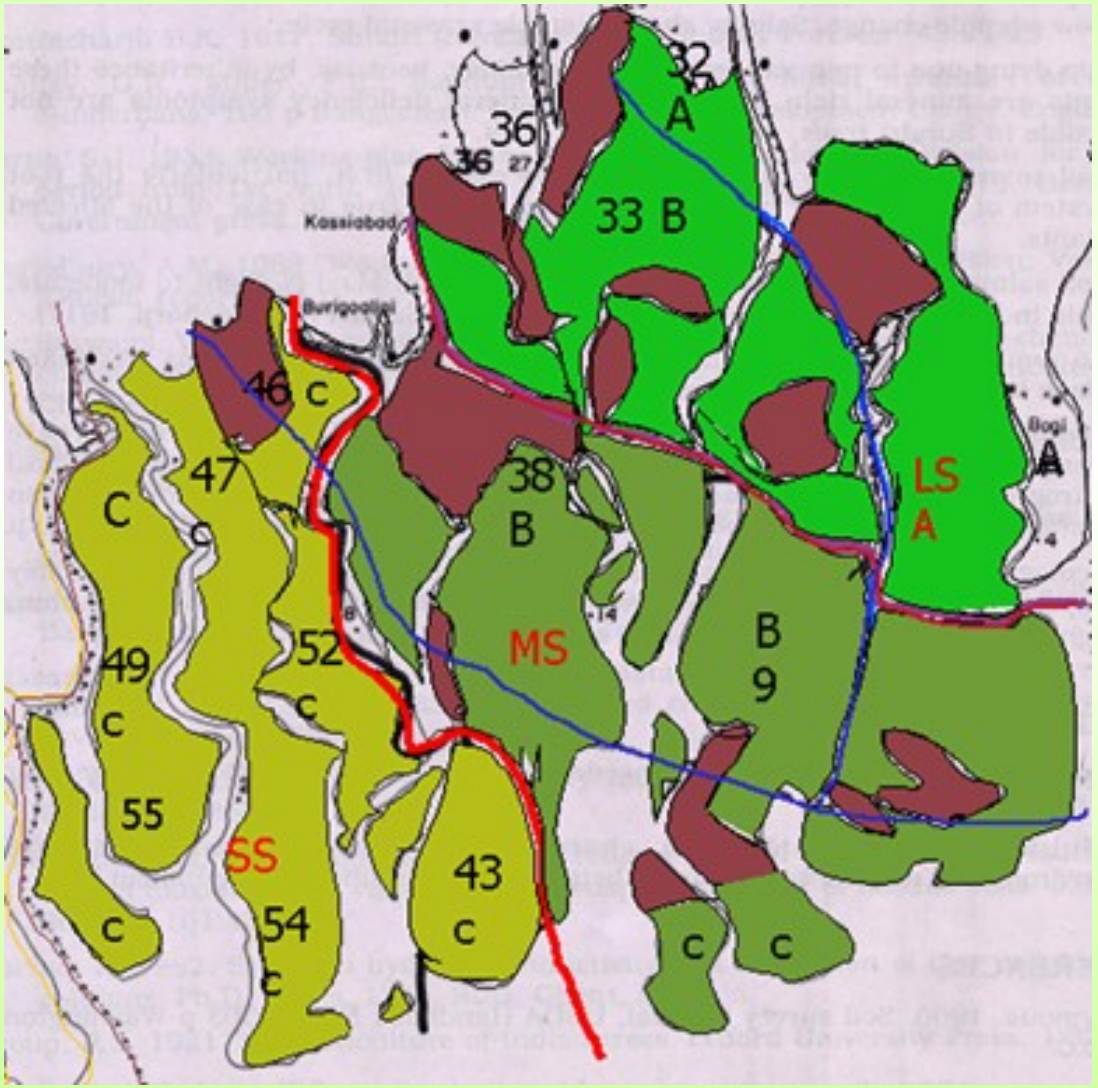
- Forest divides into

-Excoecaria agallocha,

-Heritiera fomes

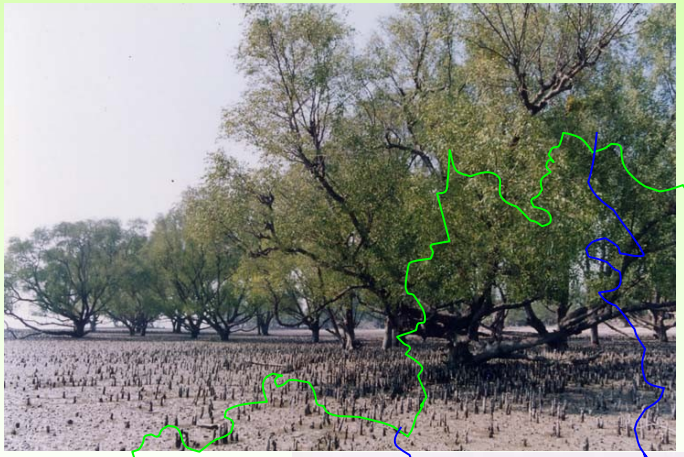
- Sonneratia apetala

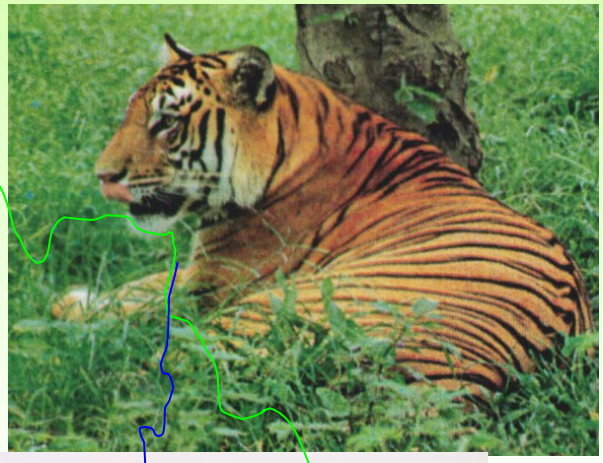
Working Cycle

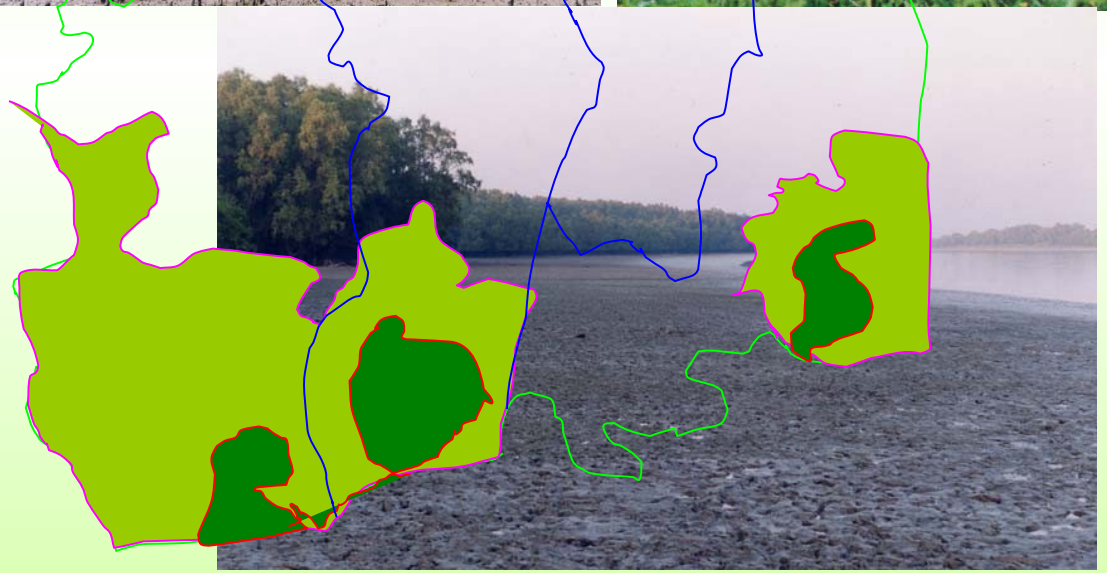


Loss of Biodiversity

- 20 mangrove species are available out of 70 species
- Large part 45% mangroves are disappeared
- High salinity has brough about a biodiversity loss
- Topdying process
- Reduction of fish habitat
- 12 species of plants and animals already vanished







Extinct animals: Javan rhinoceros, Single horned rhinoceros, Water buffalo, Swamp deer, Mugger Crocodile, Gaur and Hog Deer

The Sundarbans Mangrove Wetlands Management

- The present Sundarbans Management Plan it is forest wood harvesting plan only, so a integrated multidisciplinary plan is needed

- The national wetlands policy which has been drafted by MoEF, Until now it is not implemented. The main features of this policy are as follows;
  - Maintenance of Biodiversity
  - Maintenance of Ecosystems Functions
  - Promostion of Economical Development

- Principles for Sustainable Resource Utilisation

Alternative Approach for Management

- Ganges water diversion and sharing is not just a geo-techno-political issue it is also a humanitarian problem
- The dominant floral and fauna species are affected by topdying and some unknown disease which is recognised as key management concern in the Sundarbans wetlands
- Reduce substantial use of mangrove resources and establish eco-tourism considering 350 meters buffer zone for tourists and the shrimp fry collectors in the heritage site
- Interaction is needed between states where it is a common concern for wise use of Ganges water resources
- The community as a whole may participate in and all classes of benefits from biodiversity conservation and management
- An integrated planning and management tool based on GIS and a wetlands simulation Model and water quality indicators should be developed

Conclusions

- During the last 100 years the Sundarbans has lost over 12 species of plants and animals. Therefore the Community as Whole may participate in process of management , preservation and improvement.

- Initiatives are needed to develop strategies for adequate management plan based on monitoring of flora and fauna and water quality with co-operation and appreciation of local people and international community.

- To protect the mangrove wetlands ecosystems and endangered plant and animal species and their habitats high water salinity have to be reduced by increasing sweet water input.

Thank You

For Your Attention