

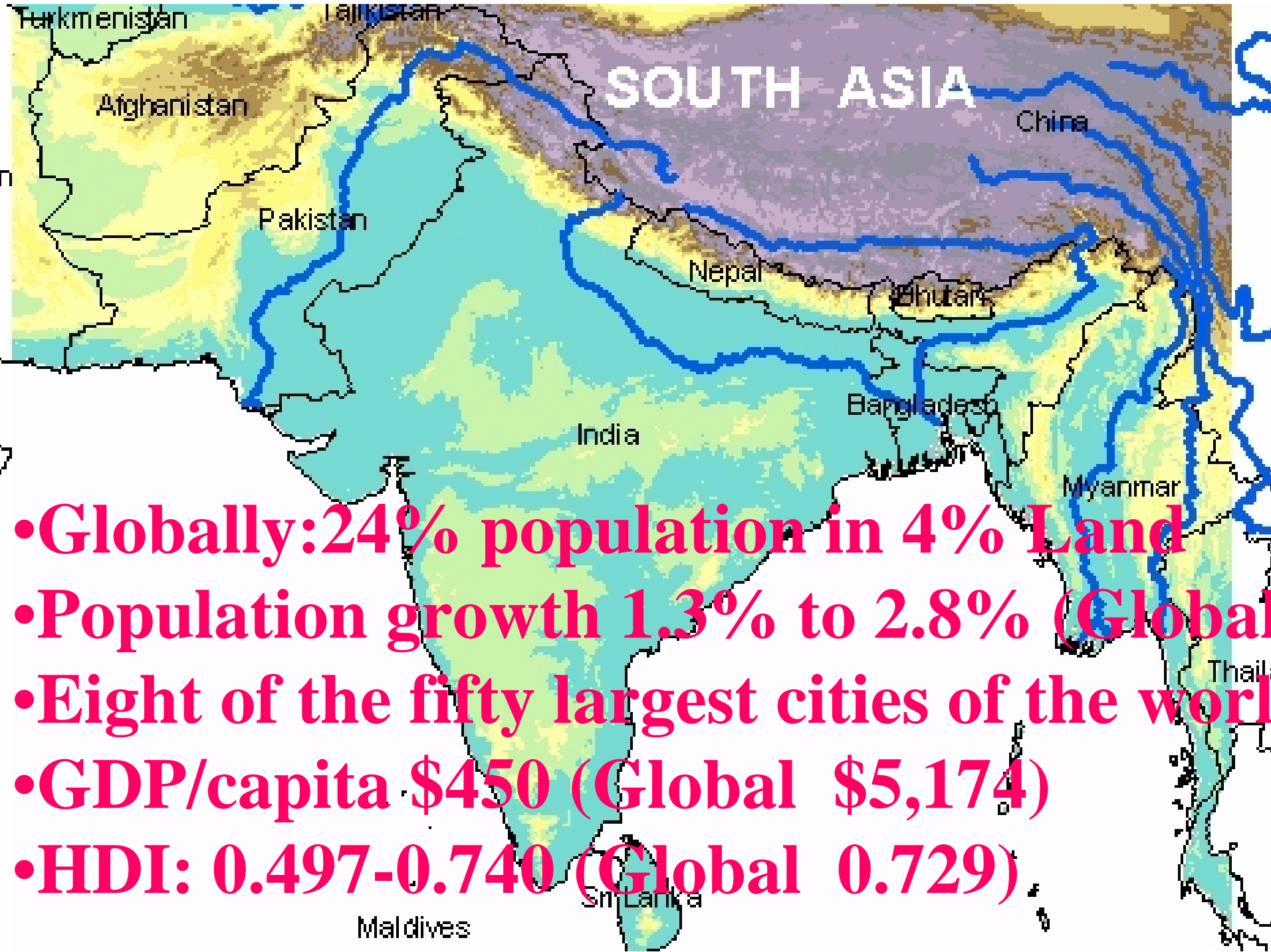


IMPACTS OF HUMAN ACTIVITIES ON REGIONWISE BUDGET AND OCEANWARD FLUX OF SEDIMENT IN SOUTH ASIA

KESHAV P. SHARMA

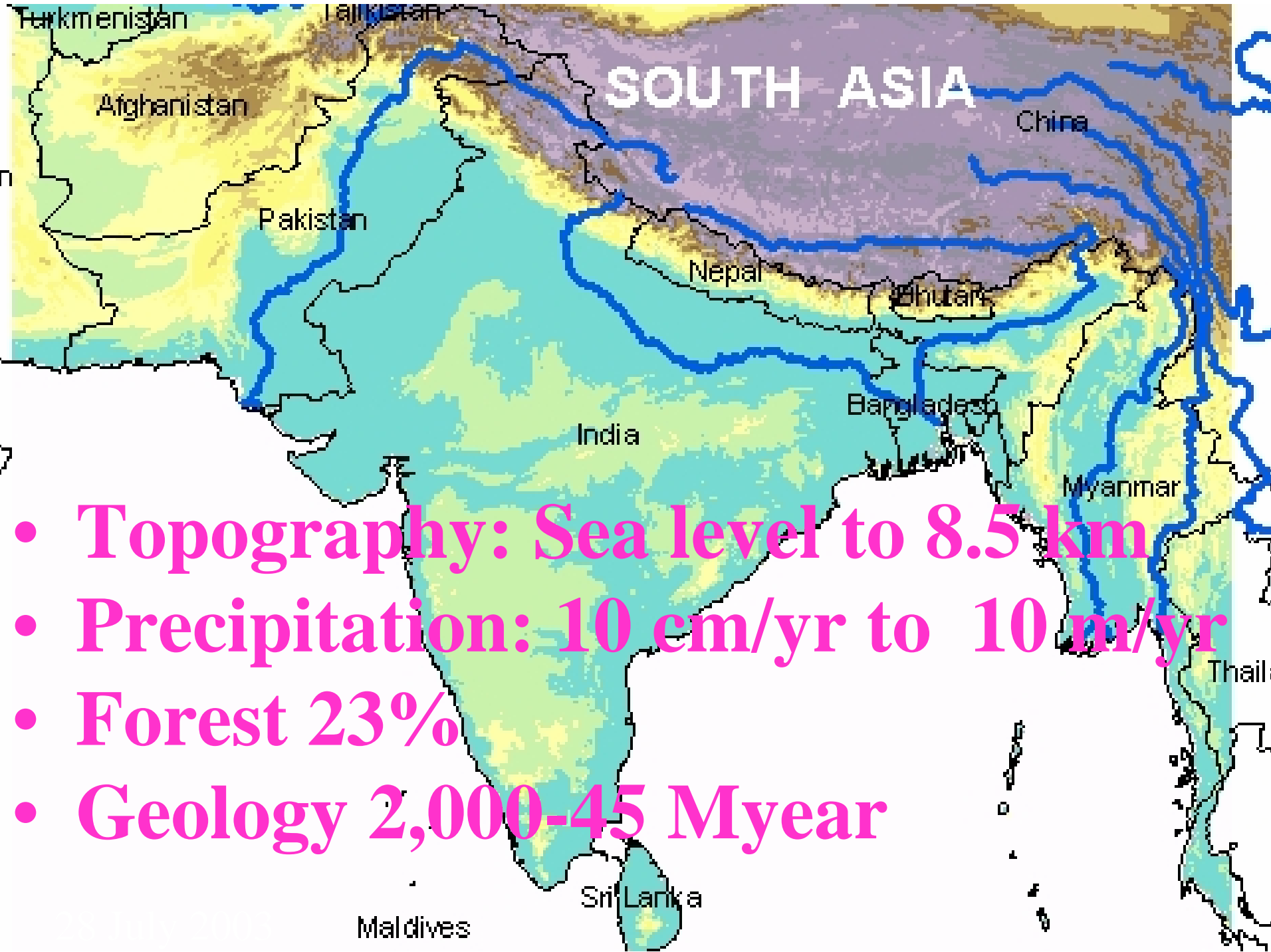
DEPARTMENT OF HYDROLOGY & METEOROLOGY

NEPAL



SOUTH ASIA

- **Globally: 24% population in 4% Land**
- **Population growth 1.3% to 2.8% (Global 0.9%)**
- **Eight of the fifty largest cities of the world are in South Asia**
- **GDP/capita \$450 (Global \$5,174)**
- **HDI: 0.497-0.740 (Global 0.729)**



SOUTH ASIA

- **Topography: Sea level to 8.5 km**
- **Precipitation: 10 cm/yr to 10 m/yr**
- **Forest 23%**
- **Geology 2,000-45 Myear**

SEDIMENT TRANSPORT



- Responsible Factors
- Estimates
- Issues

Seasonal Precipitation

Intense Storms

Recurrent Floods

GLOF



Photo: KP Sharma (1994)



Photo: KP Sharma (2002)



Photo: Mool (2000)



Photo: KP Sharmal 1988)

Steep slope

Deforestation

**The geodynamically restless
youngest mountain of the world**

High seismicity



Photo: KP Sharmal 1994)



Photo: KP Sharma 2002)

Soil Erosion

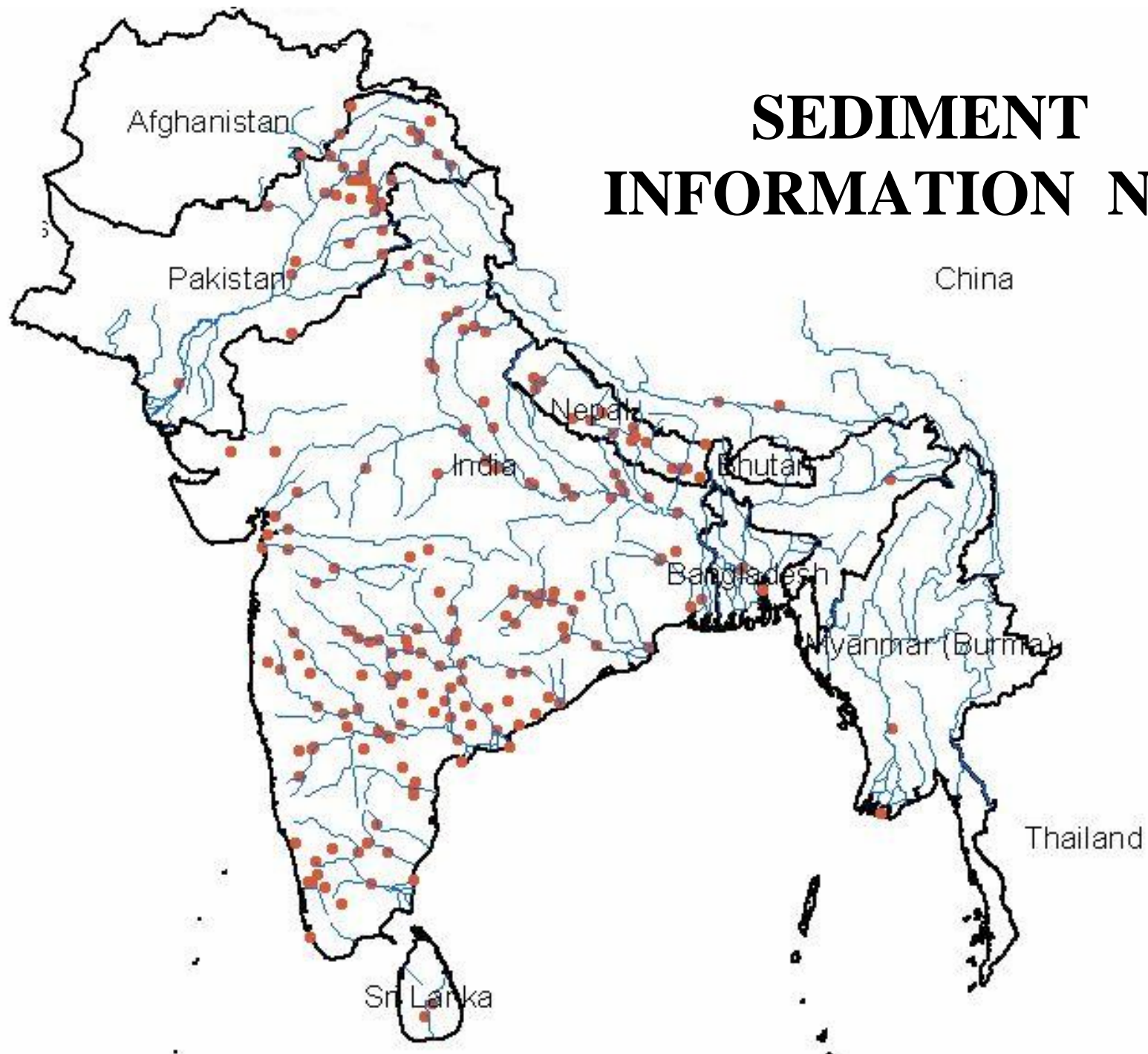
~ 10 km³/year



**More than 10,000
tanks and dams
including major dams
of the world**

**South Asian reservoirs store ~ 200 km³
out of 2700 km³ of surface water**

SEDIMENT INFORMATION NET



APN/LOICZ PROJECT

Sediment Yield in South Asian Basins

$$\log(Sy (t)) = 3.10435 + 0.929744 \log(\text{Area } (km^2))$$

$R = 0.484529$ $R^2 = 78.2\%$ $R^2(\text{adj}) = 78.1\%$

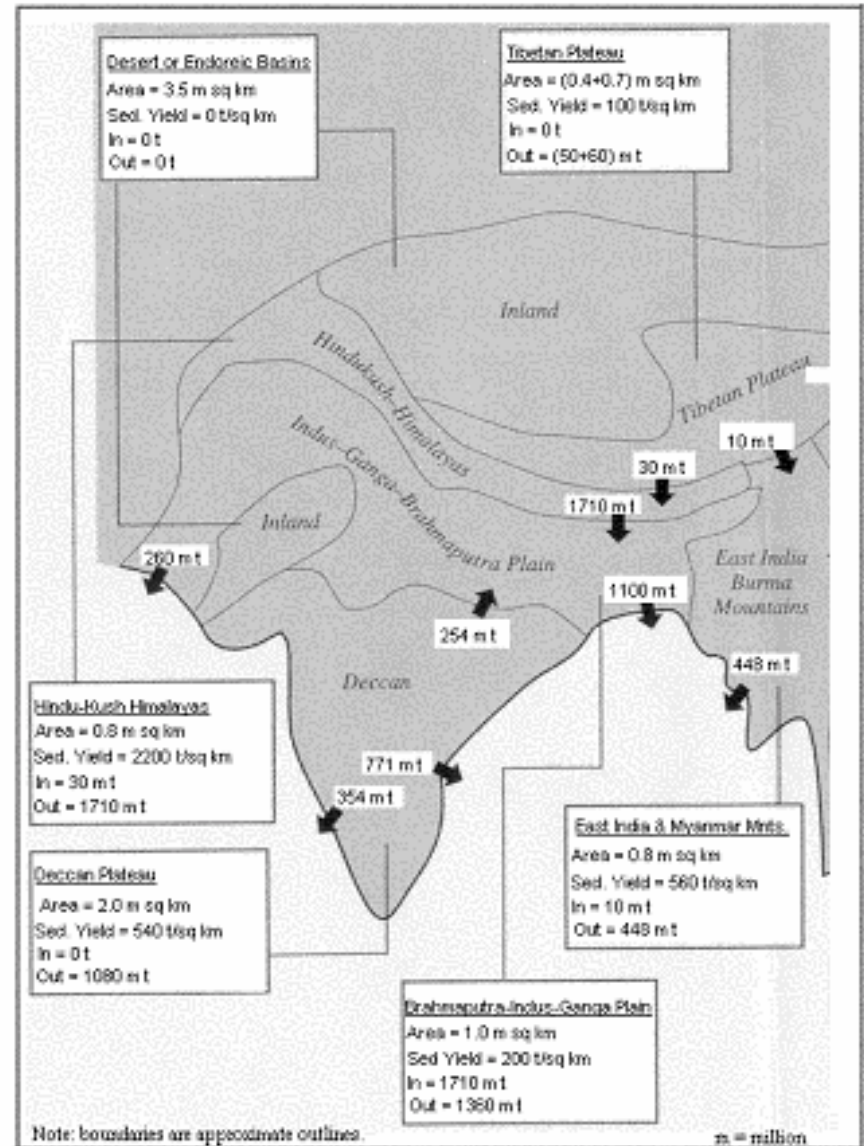
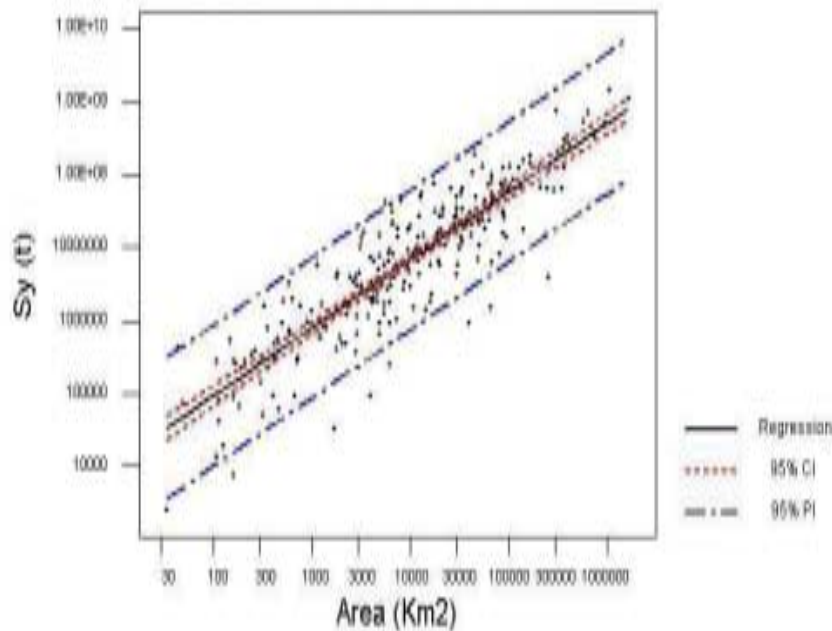
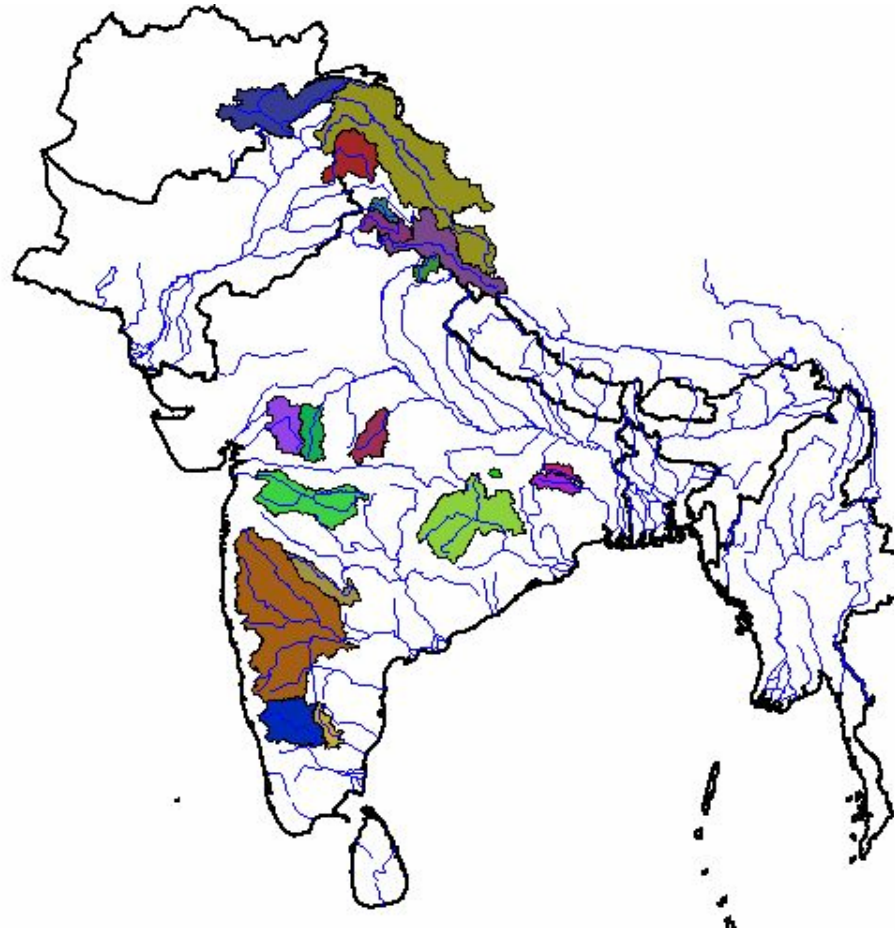
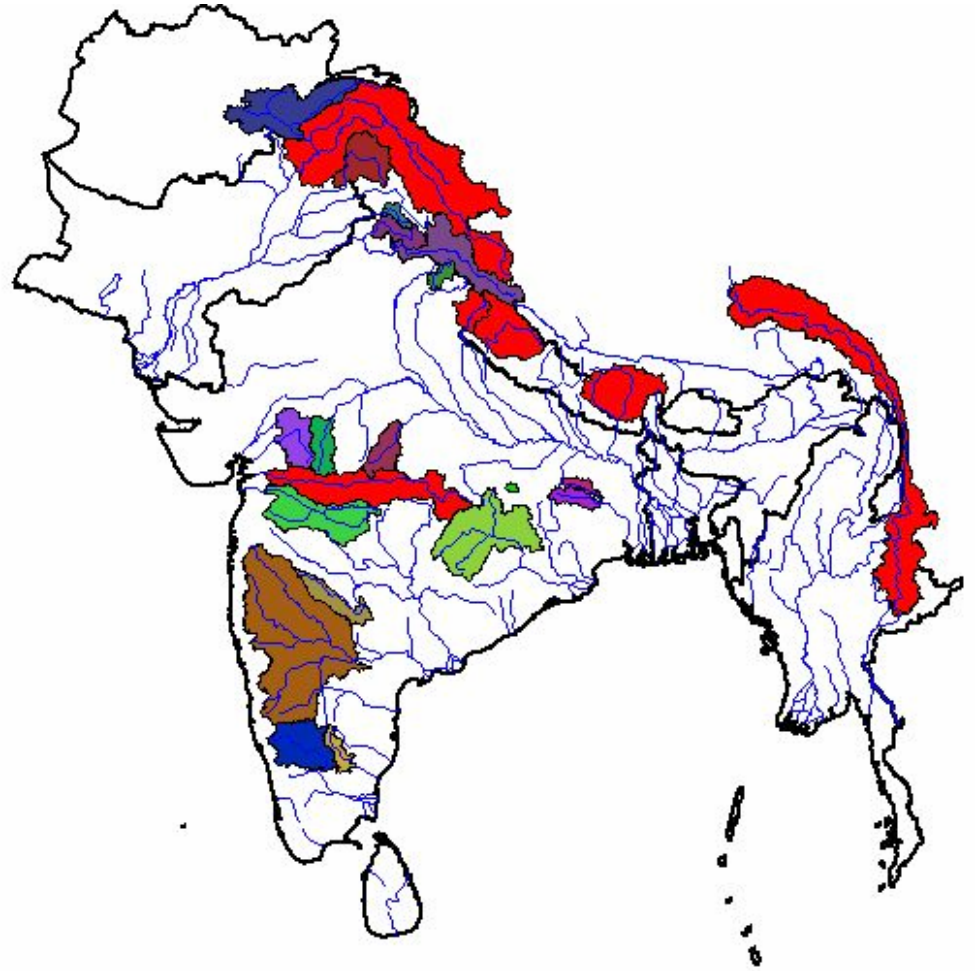


Figure 2. Regression between the annual sediment yield and area of basin considering the whole of South Asia as a single region.

MAJOR BASINS - LARGE RESERVOIRS

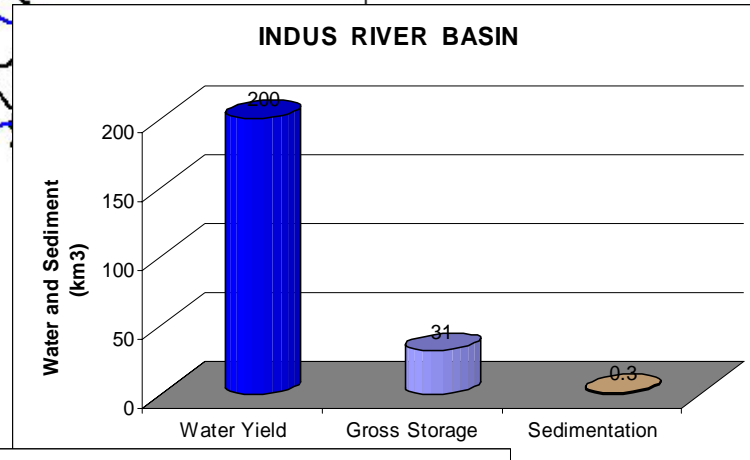
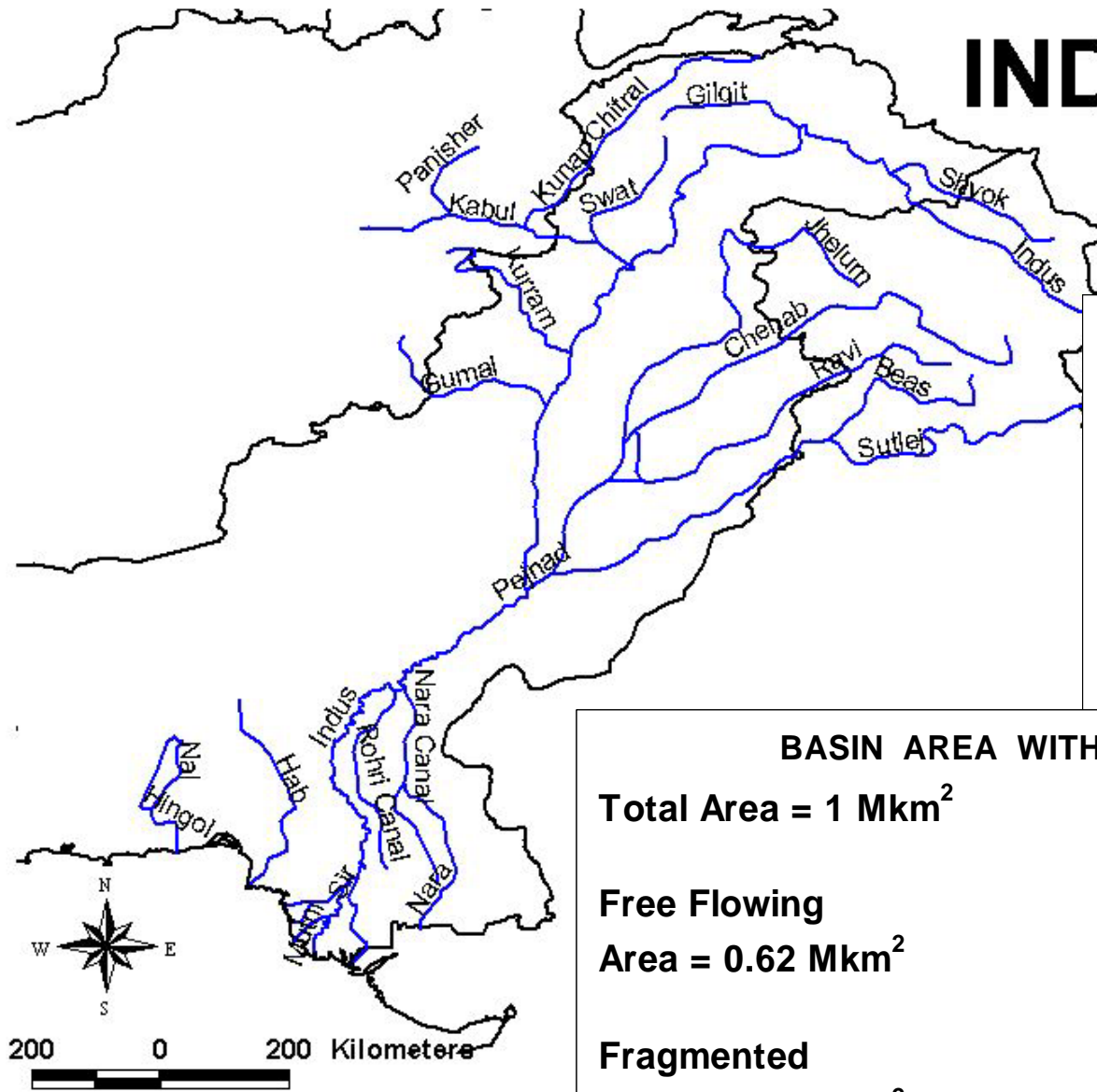


Present



Near Future

INDUS

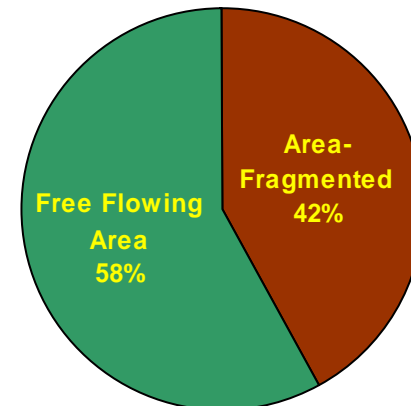


BASIN AREA WITH RESERVOIRS

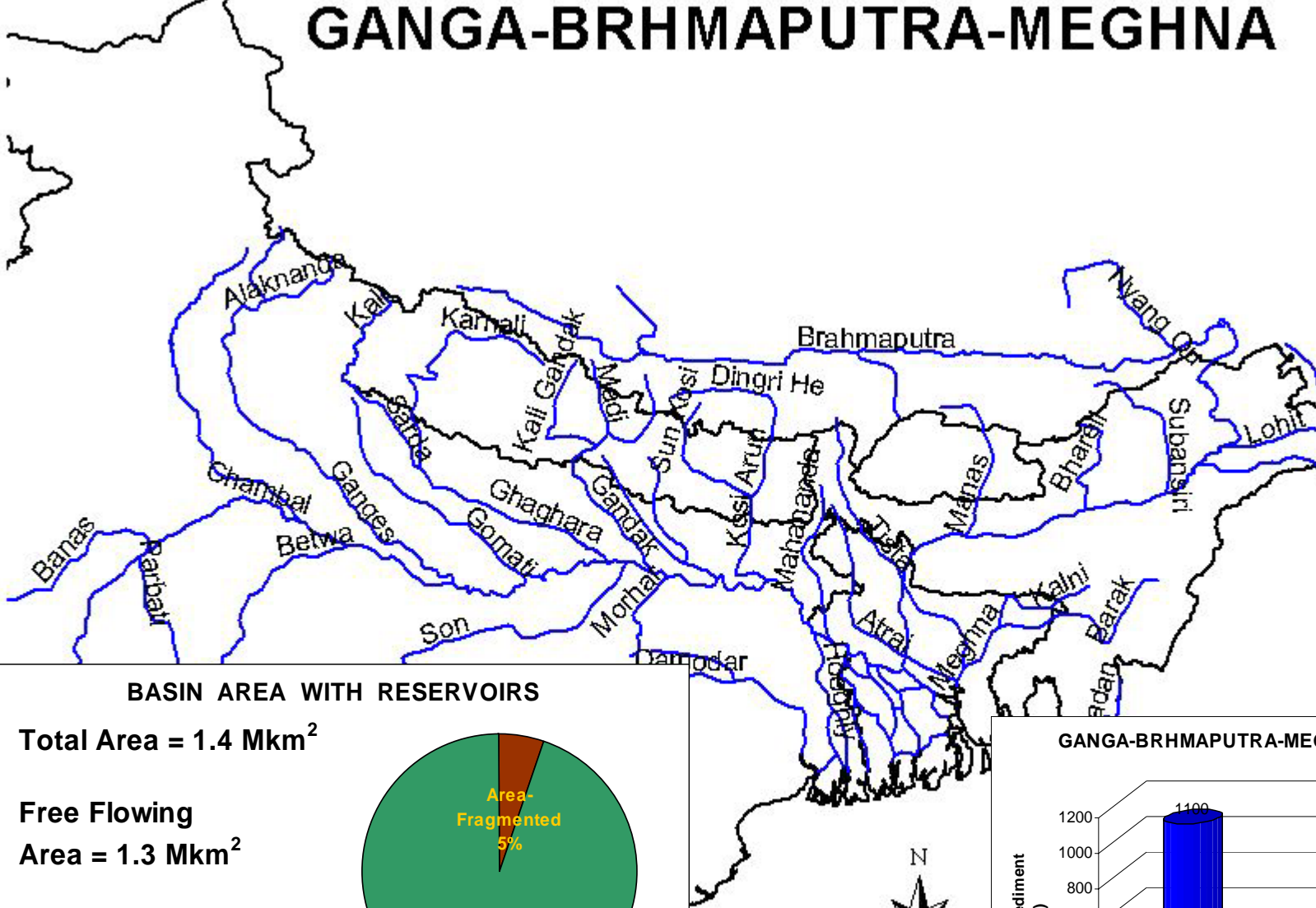
Total Area = 1 Mkm²

Free Flowing
Area = 0.62 Mkm²

Fragmented
Area = 0.45 Mkm²



GANGA-BRHMADPUTRA-MEGHNA

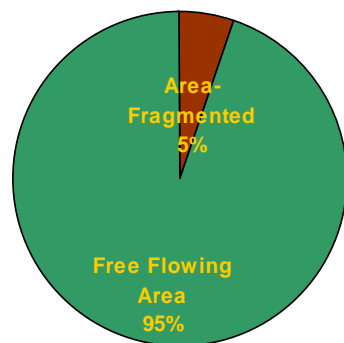


BASIN AREA WITH RESERVOIRS

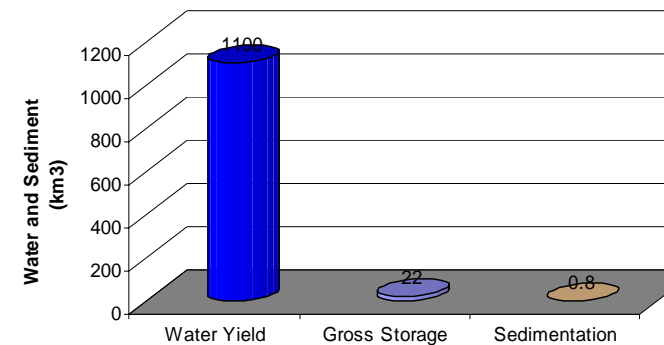
Total Area = 1.4 Mkm²

Free Flowing Area = 1.3 Mkm²

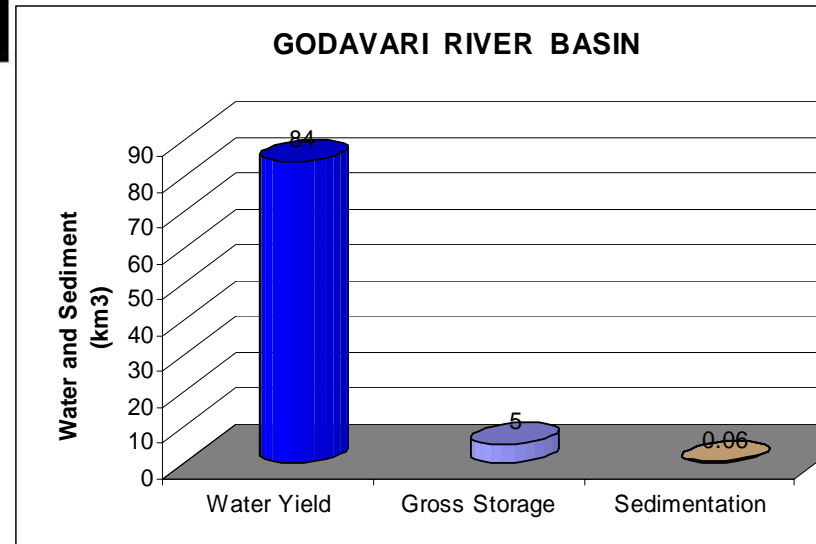
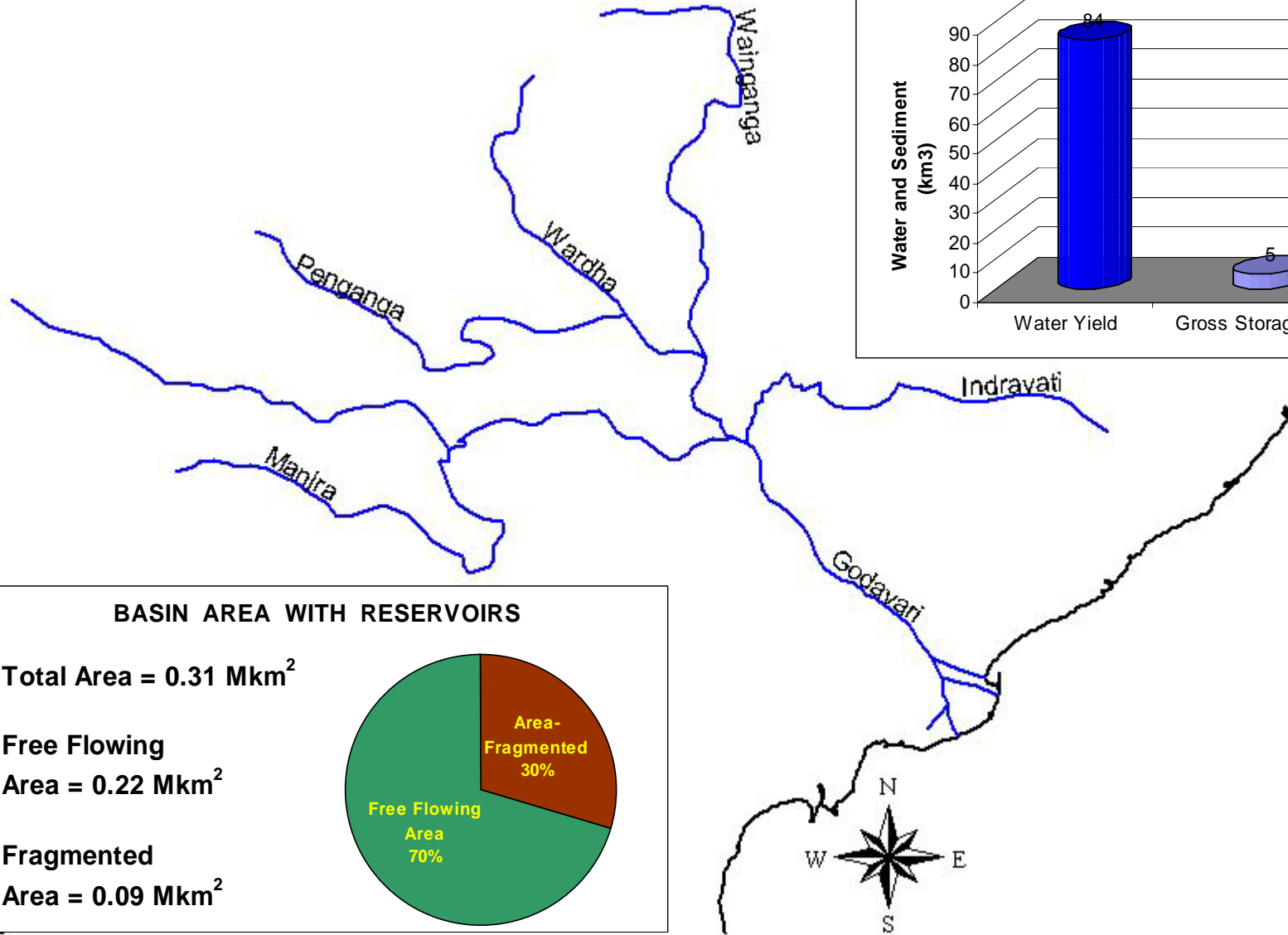
Fragmented Area = 0.07 Mkm²



GANGA-BRHMADPUTRA-MEGHNA RIVER BASIN



GODAVARI

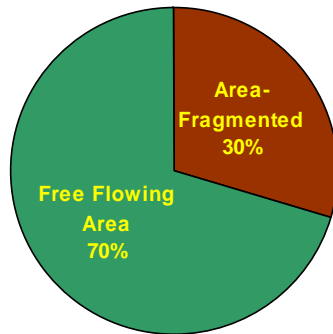


BASIN AREA WITH RESERVOIRS

Total Area = 0.31 Mkm²

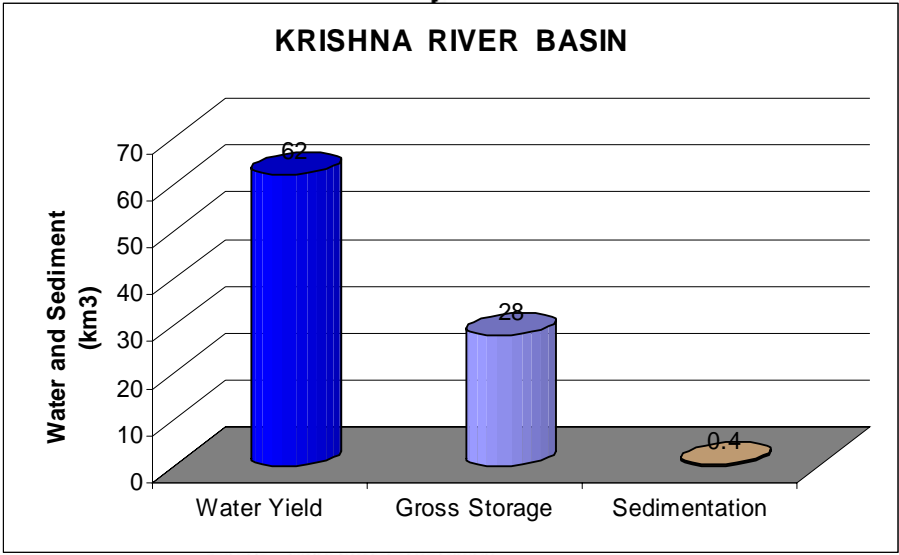
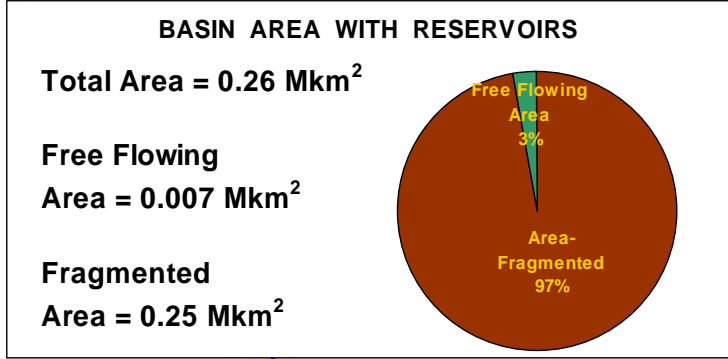
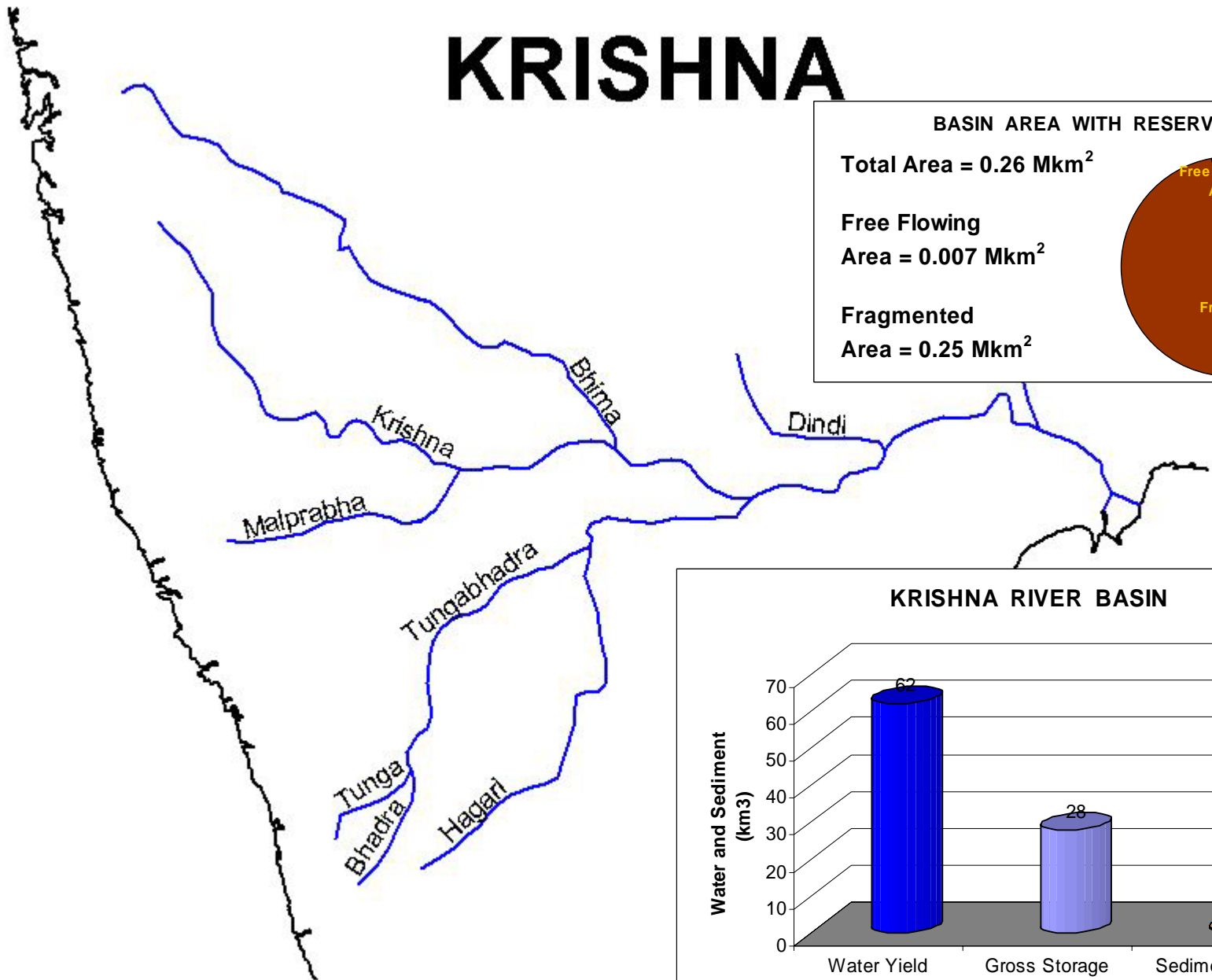
Free Flowing
Area = 0.22 Mkm²

Fragmented
Area = 0.09 Mkm²

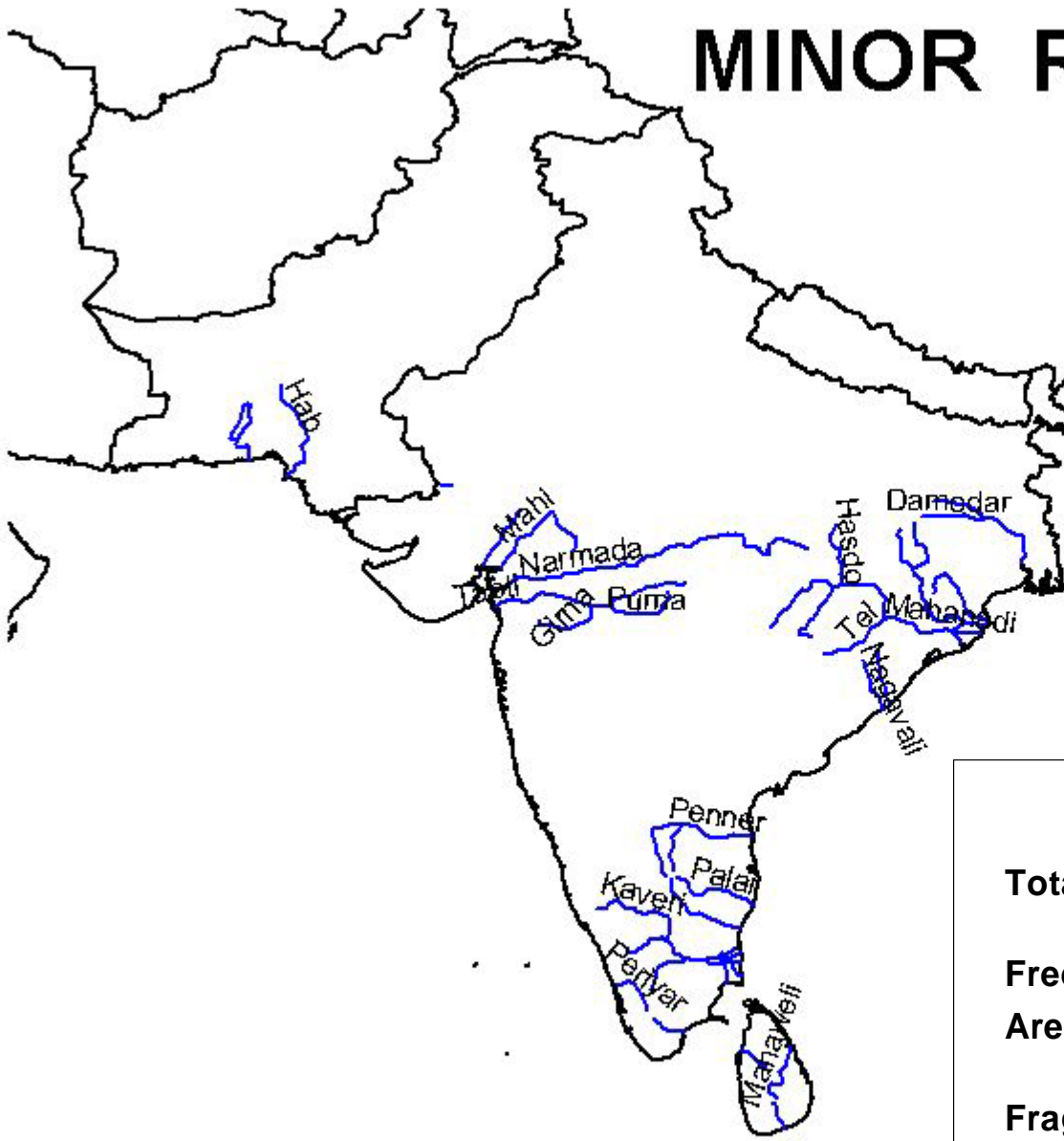


0 300 Kilometers

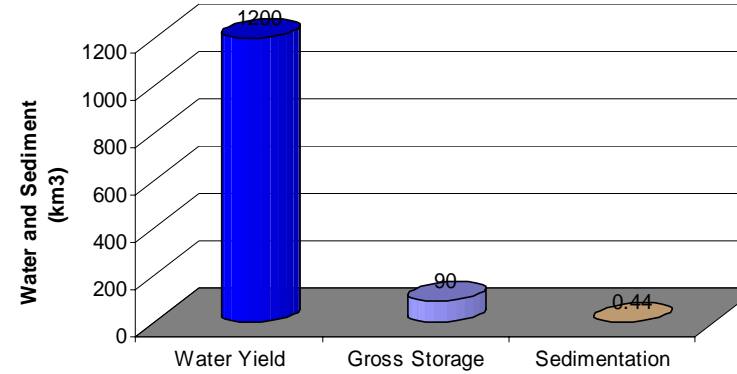
KRISHNA



MINOR RIVERS



GANGA-BRHMADPUTRA-MEGHNA RIVER BASIN

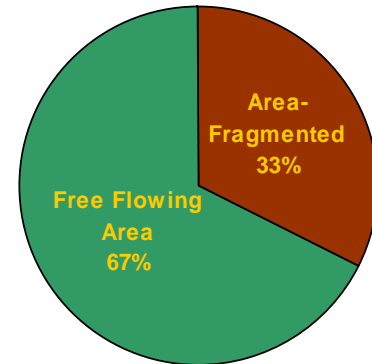


BASIN AREA WITH RESERVOIRS

Total Area = 1.4 Mkm²

Free Flowing Area = 1.3 Mkm²

Fragmented Area = 0.07 Mkm²



The background image shows a construction site with a concrete structure, possibly a dam or reservoir wall, and a red container or piece of equipment. The scene is outdoors with a dirt ground and some vegetation in the distance.

PRELIMINARY ESTIMATES

- **Natural sediment flux: four km³**
- **Sediment trapped by reservoirs: two km³**
- **Sediment flux with reservoir impacts three km³**

ADDITIONAL AREAS OF CONCERN

- **Additional Reservoirs Construction**
- **Climatic Changes**
- **River Embankments**
- **Water Diversion Schemes**
- **Data Information and Research Issues**

The End

THANK YOU