

## Phase II

Malé Declaration on control and prevention of transboundary air pollution and its likely transboundary effects for South Asia

Nepal

Ministry of Population and Environment

International Centre for Integrated Mountain Development



# Site Information

|                     |                 |
|---------------------|-----------------|
| Site Classification | : Rural         |
| Latitude            | : 27° 38'52.88" |
| Longitude           | : 84° 20'47.73" |
| Altitude            | : 164.5m        |
| Height of Sampling  | : 1.5m          |

# Outline of Monitoring Plan

Current Monitoring site

Parameters Measured

Air Concentration      1

SO<sub>2</sub>, NO<sub>2</sub>, PM<sub>10</sub>, TSP

Wet Deposition      1

pH, EC, NH<sub>4</sub><sup>+</sup>, Na<sup>+</sup>, K<sup>+</sup>,  
Ca<sup>2+</sup>, Mg<sup>2+</sup>, SO<sub>4</sub><sup>2-</sup>, NO<sub>3</sub><sup>-</sup>, Cl<sup>-</sup>

# Measurement Method

PM10, TSP

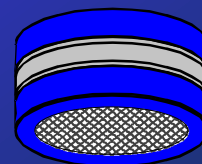
High Volume Sampler

*Envirotech model APM 460NL*

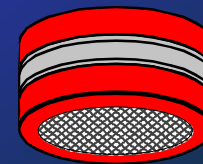
Gaseous Sampling

*Envirotech model APM 460NL with Gaseous Sampling*

IVL Passive Samplers



Sulphur dioxide



Nitrogen dioxide

# Laboratory Responsible for Monitoring Wet and Dry Deposition

Institute : Institute of Agriculture and Animal Science  
(IAAS)

Department : Soil Science

In Charge : Dr. Shri Chandra Jha

Address : Institute of Agriculture and Animal  
Science, Tribhuvan University, Rampur,  
Chitwan.

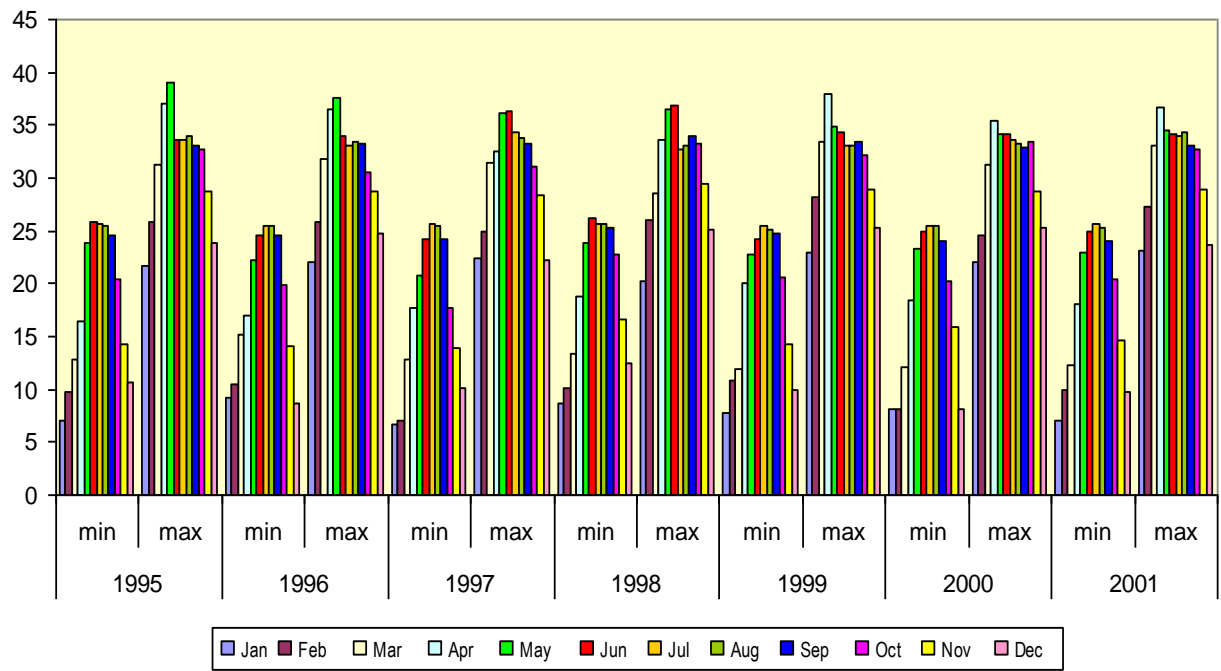
# Sample Collection

10 Days each month

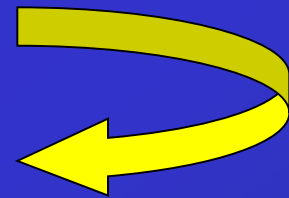
## Meteorological Observation

~ 780m

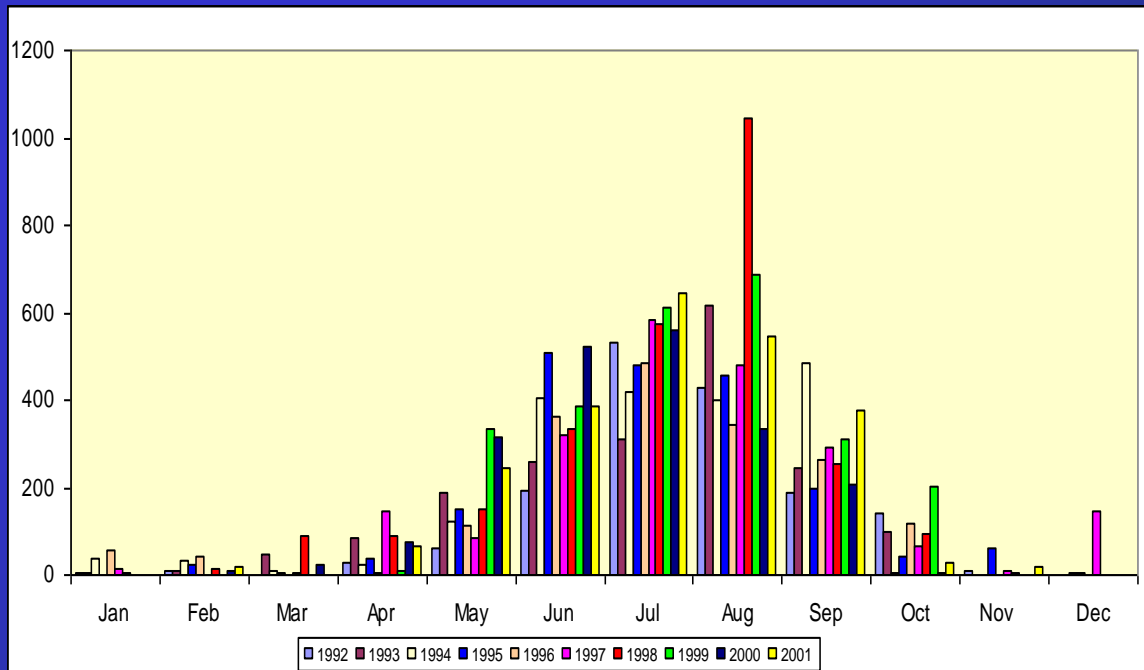
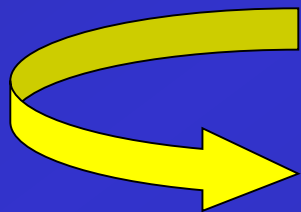
- Rainfall
- Temperature
- Humidity
- Sunshine
- Wind Velocity



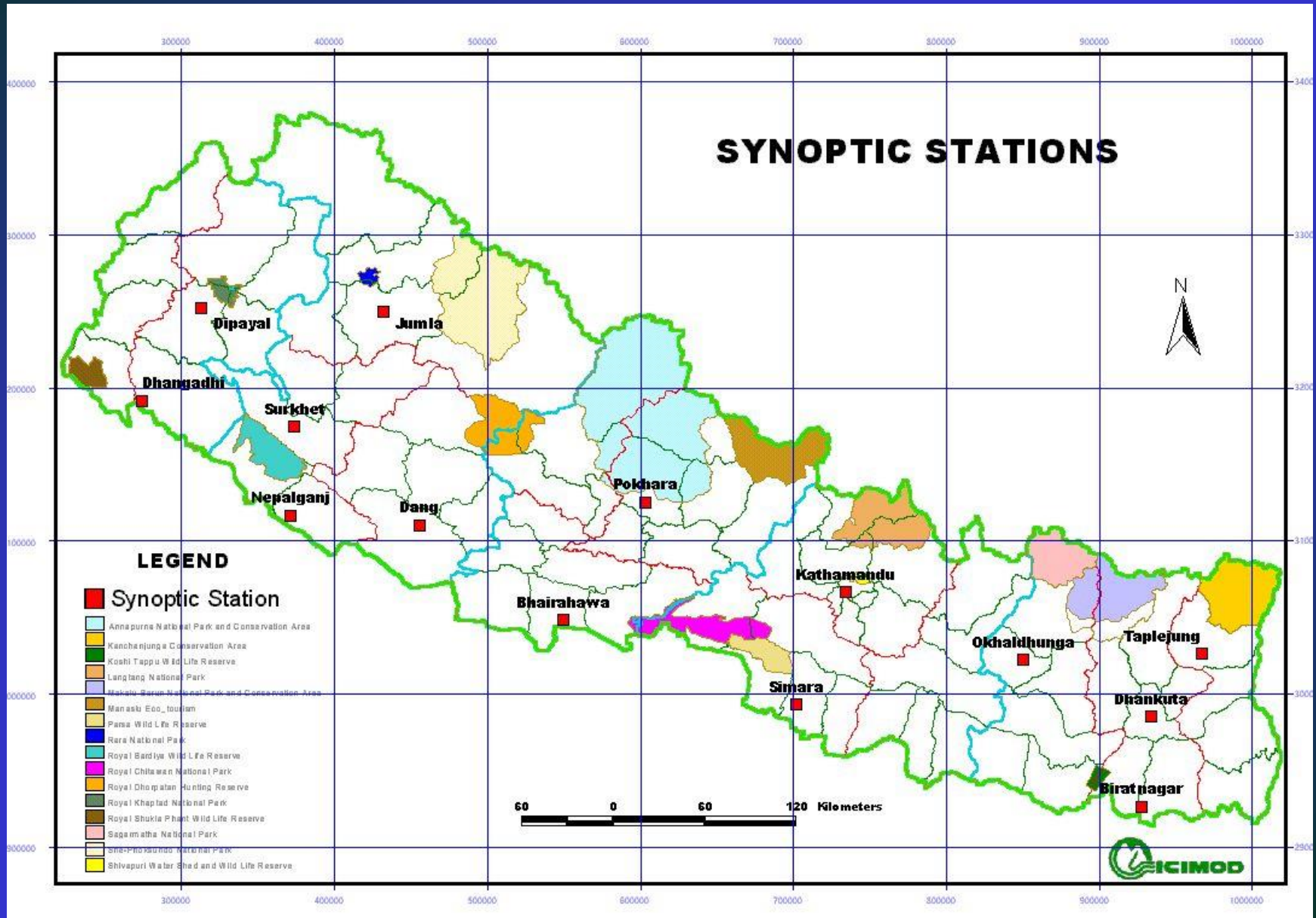
Temp.



Rainfall

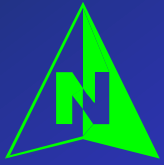


# DHM Synoptic Stations





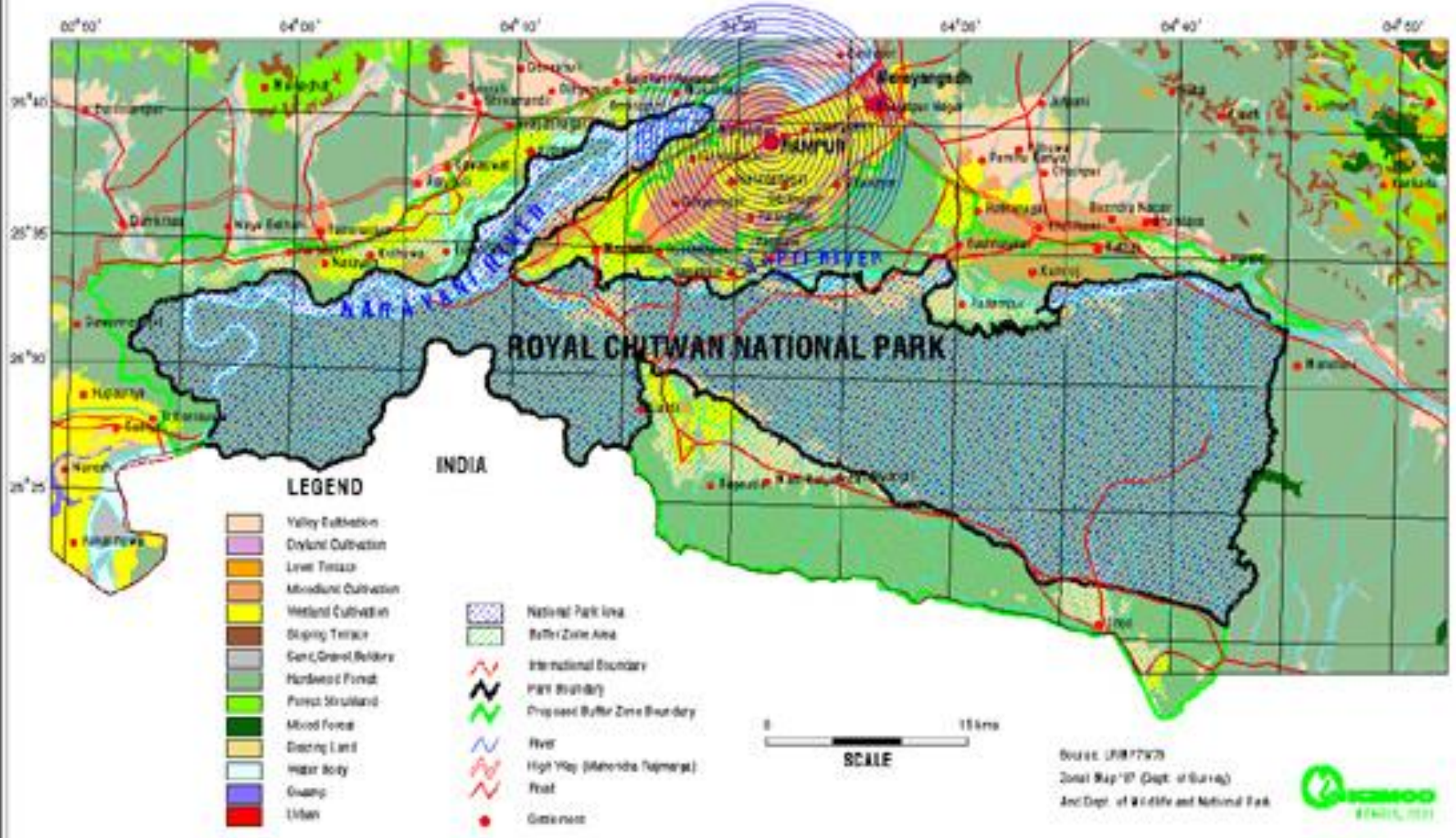
# On Site Scale (5m-250m)



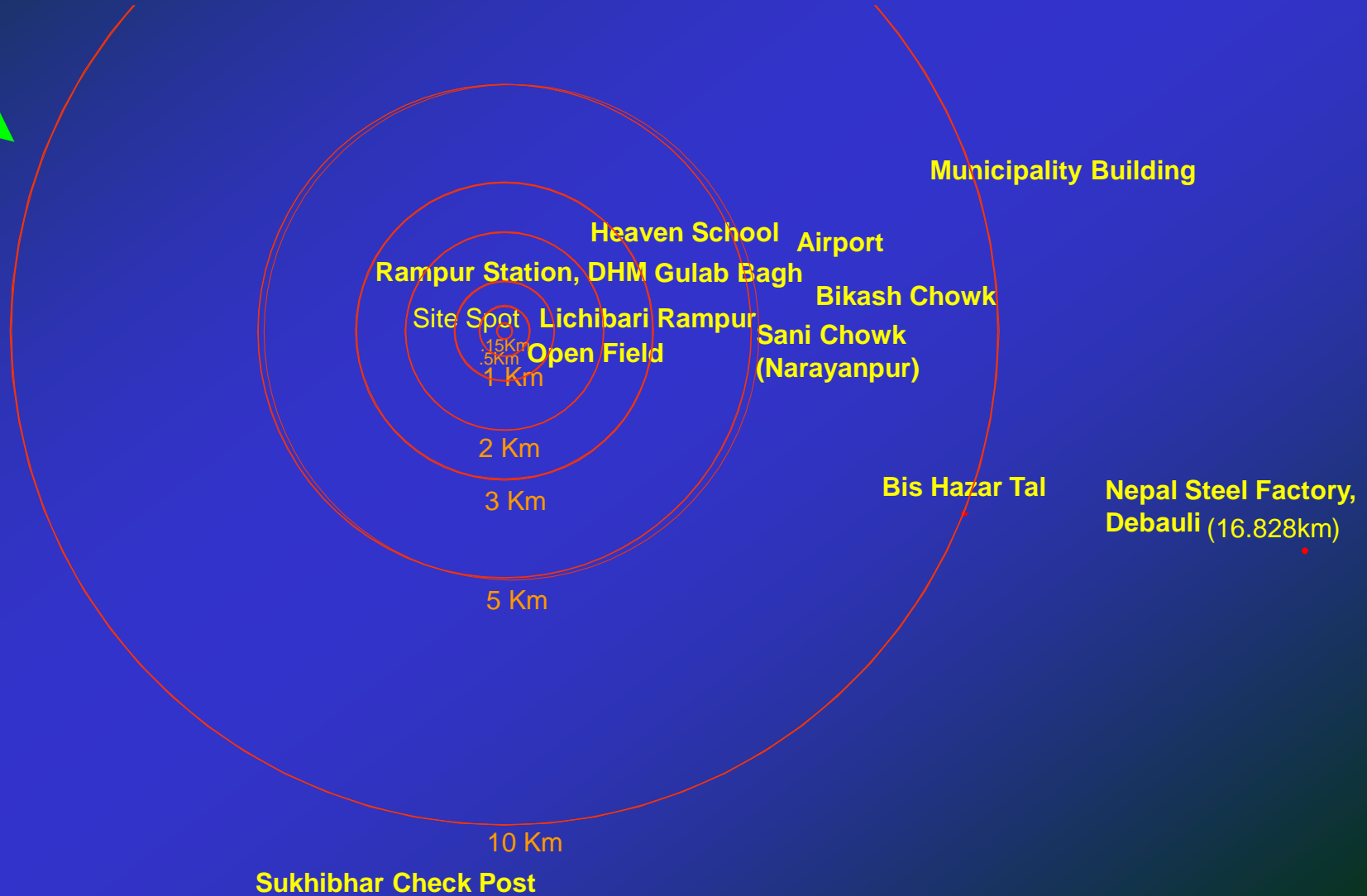
# On Site Scale (within 250m)

| Items  | north direction (NW-NE)                                      | east direction (NE-SE)  | south direction (SE-SW)                 | west direction (SW-NW) |
|--|--|---|---|------------------------|
| Existence of trees, poles and buildings, and the heights of those.   | Few planted trees avg. 4m, Cultivated land Buildings avg. 5m | Few planted trees avg. 4m, Cultivated land, Buildings avg. 5m | Few trees, Cultivated land, No building |                        |
| Existence of emission sources, cooking energy domestic heating, waste and agricultural products, dairy farm, and many livestock. | Refuse burning, Agriculture field, Cooking energy - gas      | Cooking energy – gas<br>Agriculture waste                     |   |                        |
| Ground Slope degree of the site. (+ for upwords)   | 0°   | 0°  | 0°                                      | 0°                     |
| Surface condition of the site. % surface covered by rock, concrete trees, home shads building, etc.                              | 10%  | 10%   | 0%                                      | 0%                     |
| Existence of a forest, river, lake, marsh, farm or fields.   | Field  | Field   | Field                                   | Field                  |
| Existence of roads, and their traffic densities.   | Few only   | No  | No                                      | No                     |

# MONITORING STATION AT RAMPUR, CHITWAN - ON LOCAL SCALE ( 10 Kms. circles at 500 m. interval)



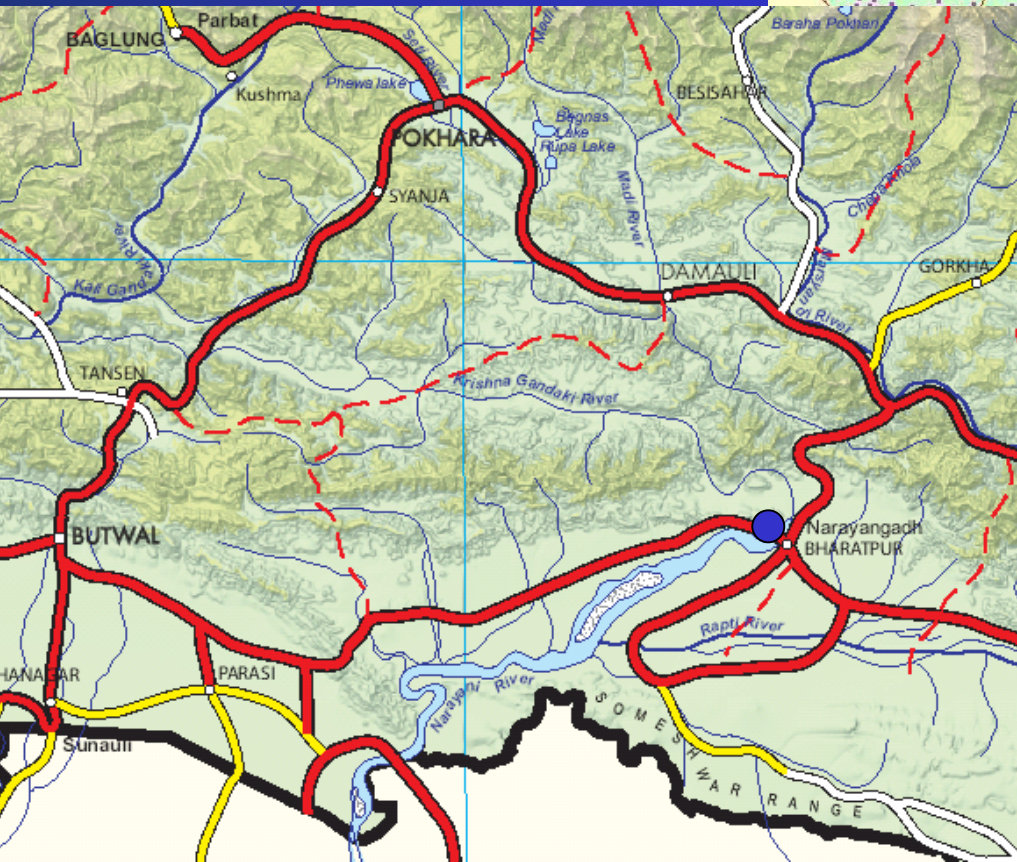
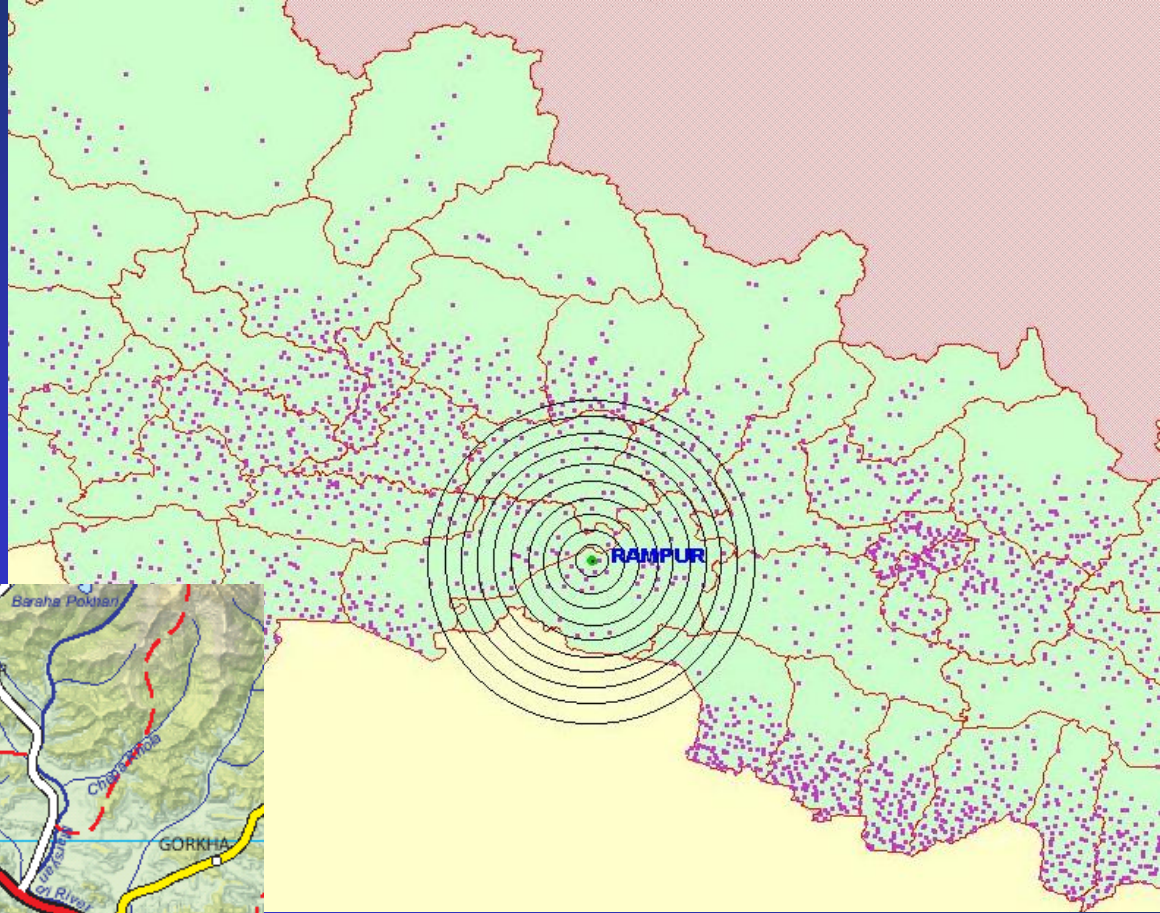
# Local Scale (150m-10km)



# Local Scale (150m - 10km)

| Items   | North direction (NW-NE)   | East direction (NE-SE)          | South direction (SE-SW)         | West direction (SW-NW)            |
|---|---|---------------------------------|---------------------------------|-----------------------------------|
| Information on trunk roads, expressways, and their traffic densities (with more than >1,000 vehicles/day).        | Side road nearly touching the main road Traffic density >1000   | Side roads Traffic density <200 | Side roads Traffic density <150 | Side roads Traffic density <100   |
| Lakes, rivers, streams<br>Marshes, forests, etc.  | Narayani river<br>Cultivated land   | Cultivated land                 | Cultivated land<br>Rapti river  | Narayani river<br>Cultivated land |
| Information on major emission sources such as industries, and power plants and their fuel consumptions and so on. | Brikuti Paper Mill (10Km)<br>Small food industries  |                                 |                                 |                                   |
| Information on houses/ settlements with more than 100 persons, and their population.                              | Settlement approx. 6000 people  | Settlement approx. 3000         | Settlement approx. 3000         | Settlement approx. 2000           |
| Descriptive information around the site such as Topography, Soils, land use, meteorological condition             | Area is plain, low elevated, river bed, mostly cultivated land with fertile soil. Narayani river – one of the major river, Tropical zone. |                                 |                                 |                                   |

Regional Scale  
(50km at 5km  
interval)




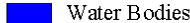




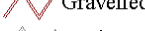


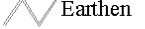


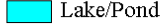
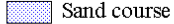


## Regional Scale (up to - 50km)

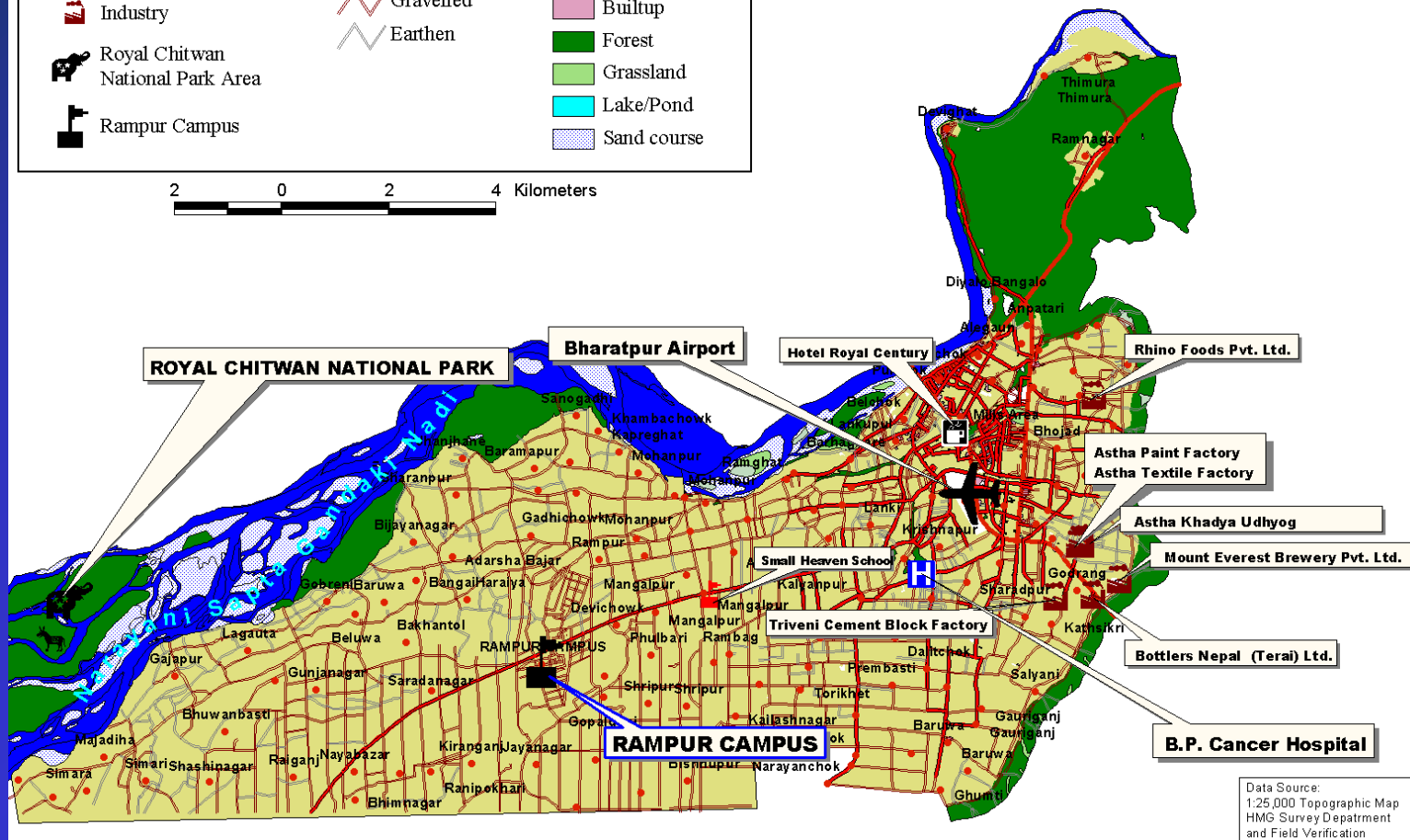
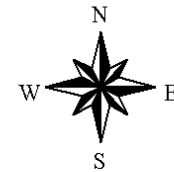
| Items  | North direction (NW-NE)                       | East direction (NE-SE)           | South direction (SE-SW)   | West direction (SW-NW)    |
|--|---|----------------------------------|---------------------------|---------------------------|
| Existence of major air pollution sources* - Industries (dist from Monitoring site and Sources strength in kg/day of SO <sub>2</sub> , NO <sub>2</sub> , SPM) | Brikuti Paper Mill and other small industries | Small Industries                 | Rice Mill, Saw Mill etc   | Rice Mill, Saw Mill etc   |
| Existence of roads with more than 5000 vehicles/day, and their traffic densities.  | East West Highway <5000 vehicles              | East West Highway <5000 vehicles | Side Roads <500 vehicles  | Highway / Side Road <4000 |
| Existence of settlements with the population more than 1500 persons.   | Population density <20,000                    | Population density <12000        | Population density <10000 | Population density <12000 |

# Chitwan

## Legend

|  |   |  |
|--|---|--|
|  B.P. Cancer Hospital             | <b>Road network</b>   | <b>Landuse</b>   |
|  Airport                          |  Highway   |  Water Bodies |
|  Industry                         |  Metalled  |  Agriculture  |
|  Royal Chitwan National Park Area |  Gravelled |  Builtup      |
|  Rampur Campus                    |  Earthen   |  Forest       |
|  |   |  Grassland    |
|  |   |  Lake/Pond    |
|  |   |  Sand course  |

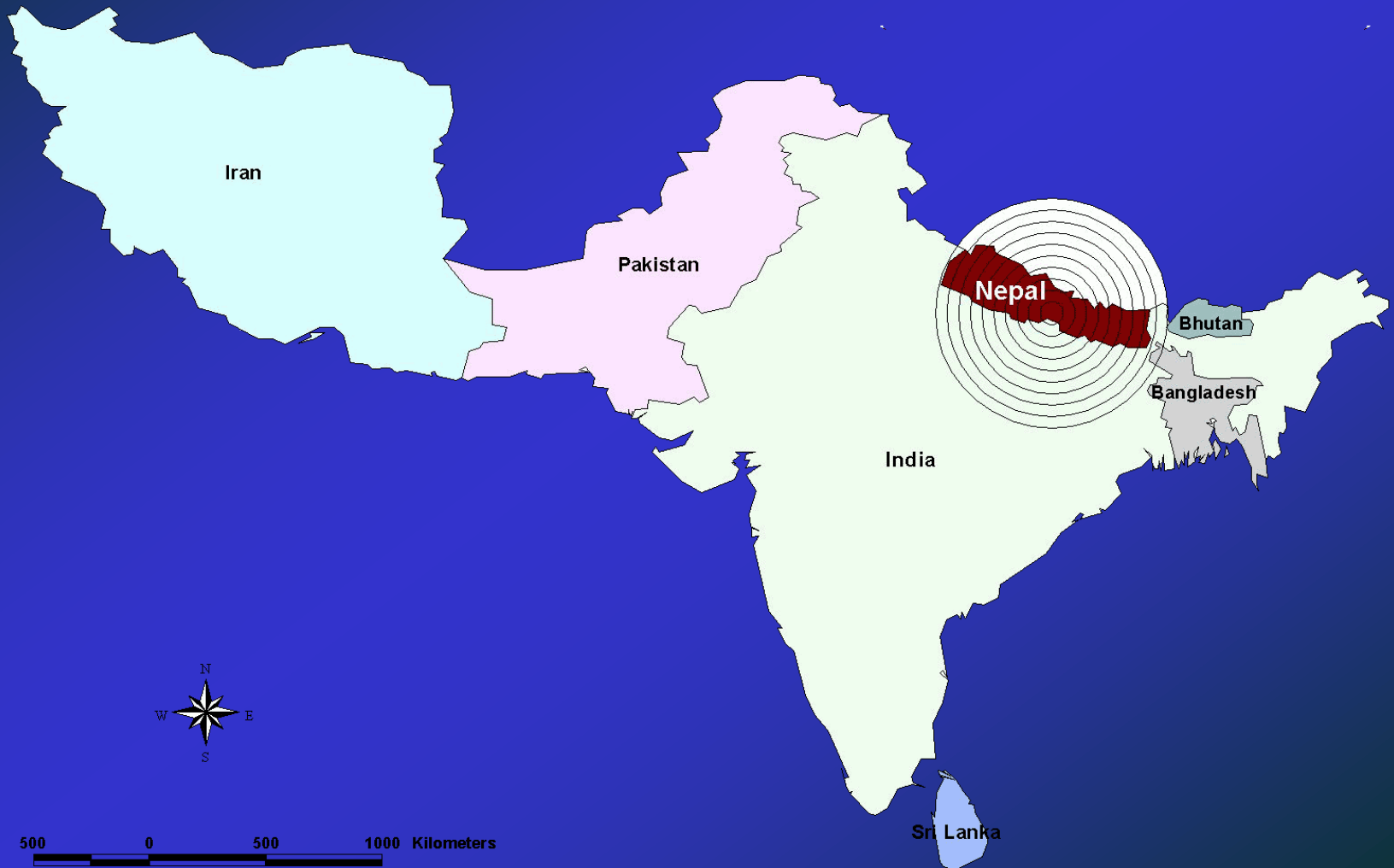
2 0 2 4 Kilometers



Data Source:  
1:25,000 Topographic Map  
HMG Survey Department  
and Field Verification

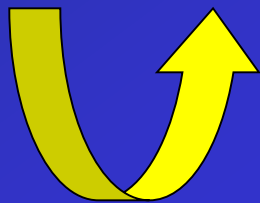
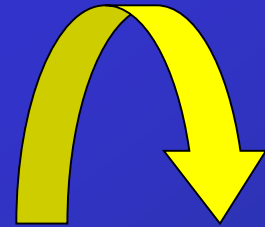


# Meo Scale (500km at 50km interval)





Site for Wet Deposition



Monitoring site



Sample preparation

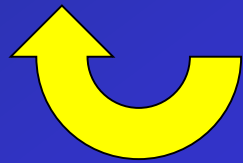
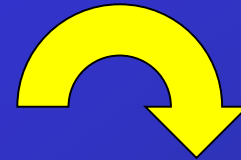


Sample Collection





DHM Station

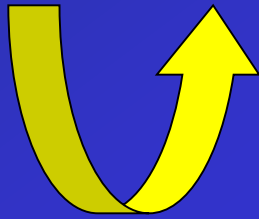
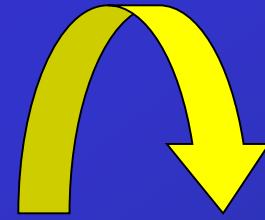


IAAS Lab.





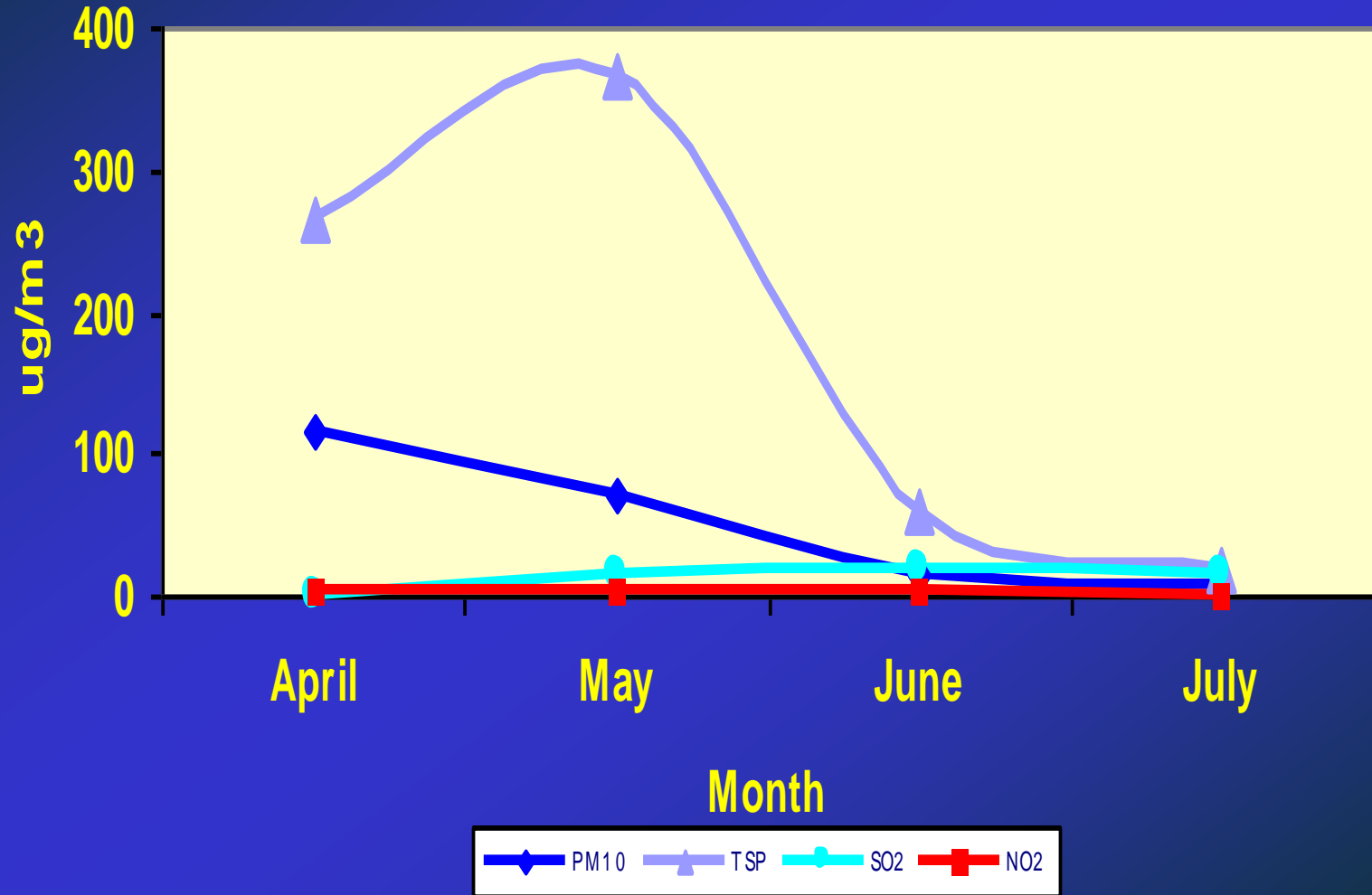
Bis Hazar Tal



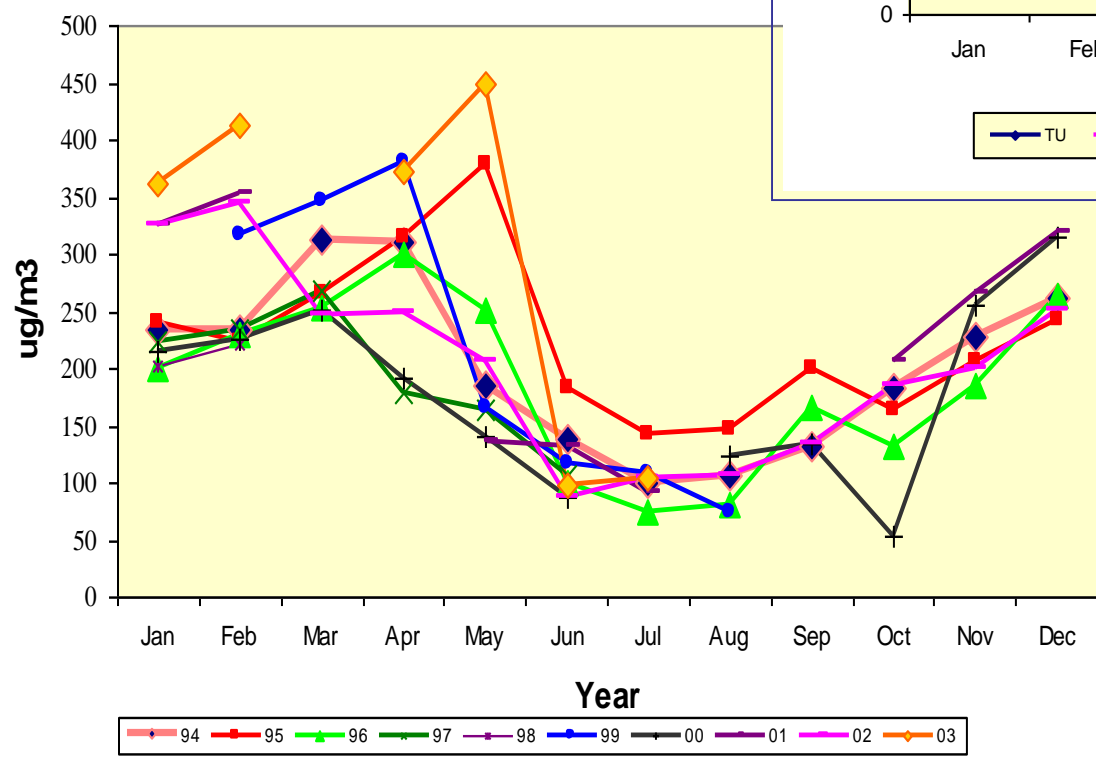
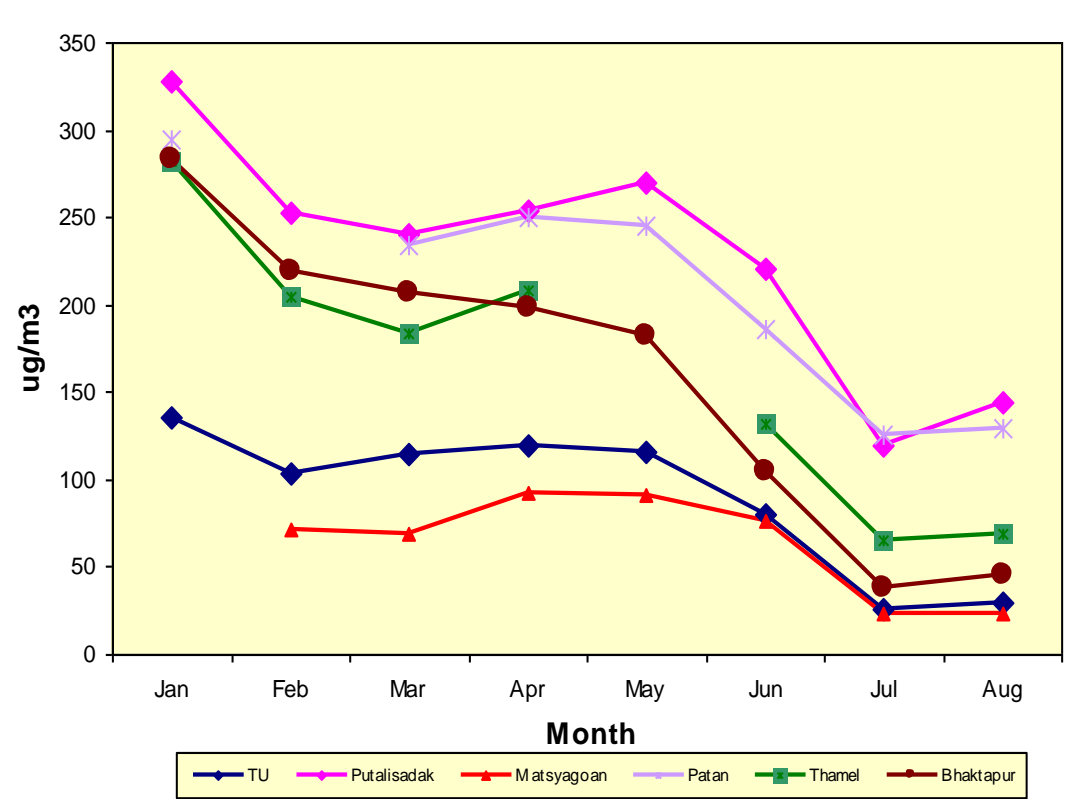
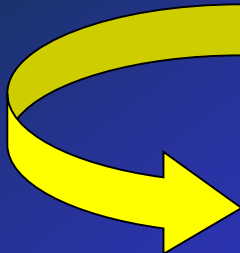
Narayani River



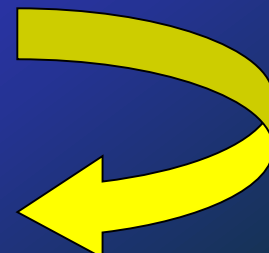
# Measured Data - Rampur



# PM10 ESPS



# TSP DHM



**Thank You**