TRANSBOUNDARY POLLUTION IN SRI LANKA:A CASE STUDY FROM THREE CITIES

Sri Lanka is expected to have a higher degree of pollution due to transboundary pollution from neighboring countries such as India and China during the north-east monsoon period.

Problems due to transboundary effects

- Formation of particle clouds (e.g.. Asian brown cloud)
- Occurrence of acid rain

  Acid deposition is mainly caused by sulphur & nitrogen emissions.

  Carried hundreds of miles & affect the ecosystem through wet deposition &/or dry deposition.

  Effects include the,

  - Reduction of crop yield
  - Impacts of human health
  - Impacts on corrosion on human made structures
  - Impacts on soil fertility
  - Impacts on forest & crop growth


INDIA
Kankesanturai
Point Pedro
Tondi
Palk Strait
Jaffna
Devipattinam
Delft Island
Palk Bay
NORTH EASTERN
Mullaittivu
Bay of Bengal
Dhanushkodi
Ferry
Mankulam
Mannar
Pulmoddai
Vavuniya
Trincomalee
NORTH CENTRAL
Anuradhapura
Yan Oya
Gulf of Mannar
Kalpitiya
Kala Oya
Puttalam
Habarane
Polonnaruwa
Maho
NORTH WESTERN
Batticaloa
NORTH EASTERN
Chilaw
Kurunegala
Matale
Mahaweli Ganga
Kandy
Amparai
Gal Oya
Negombo
Kegalla
CENTRAL
Nuwara Eliya
Kelani Ganga
Badulla
Colombo
UVA
Moneragala
Pottuvil
Moratuwa
WESTERN
Ratnapura
Kalu Ganga
Opanake
Kalutara
SABARAGAMUWA
Walawe Ganga
SOUTHERN
Hambantota
Galle
Matara
INDIAN OCEAN
Sri Lanka
National capital
Province boundary
Province capital
Railroad
Road
0 20 40 Miles
0 20 40 Kilometers
Base 802514 6-00

Dispersal of air pollutants

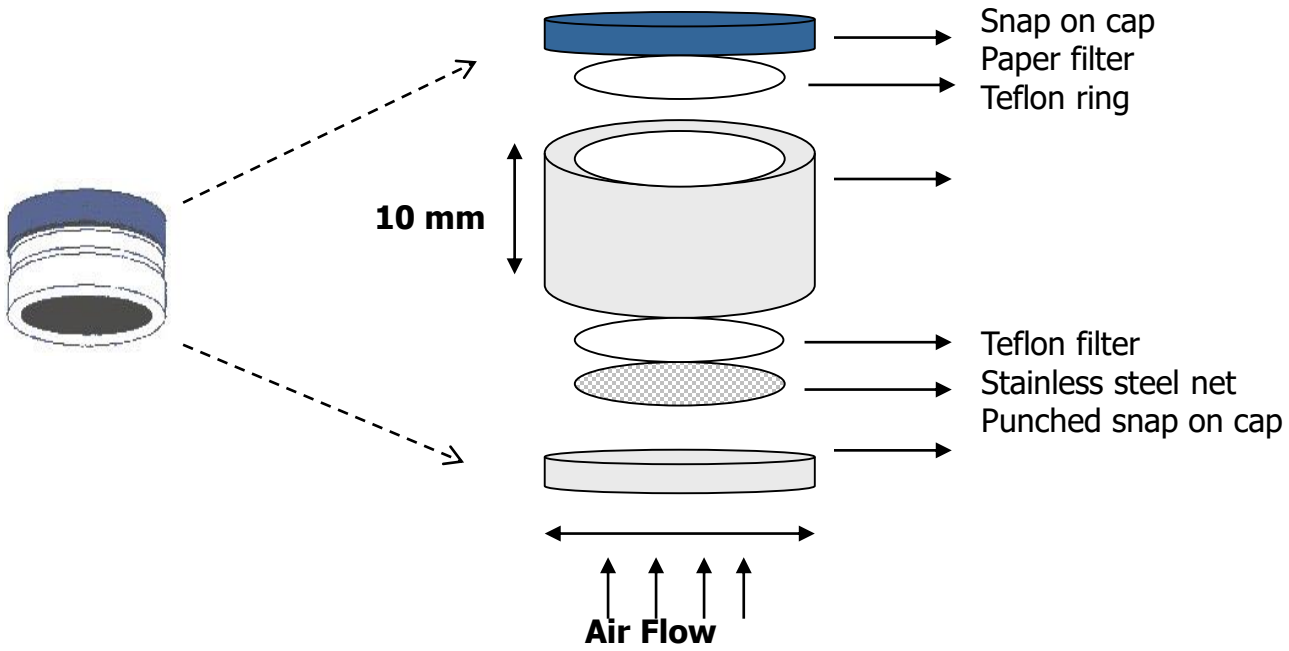
- Sri Lanka-Main monsoonal periods;

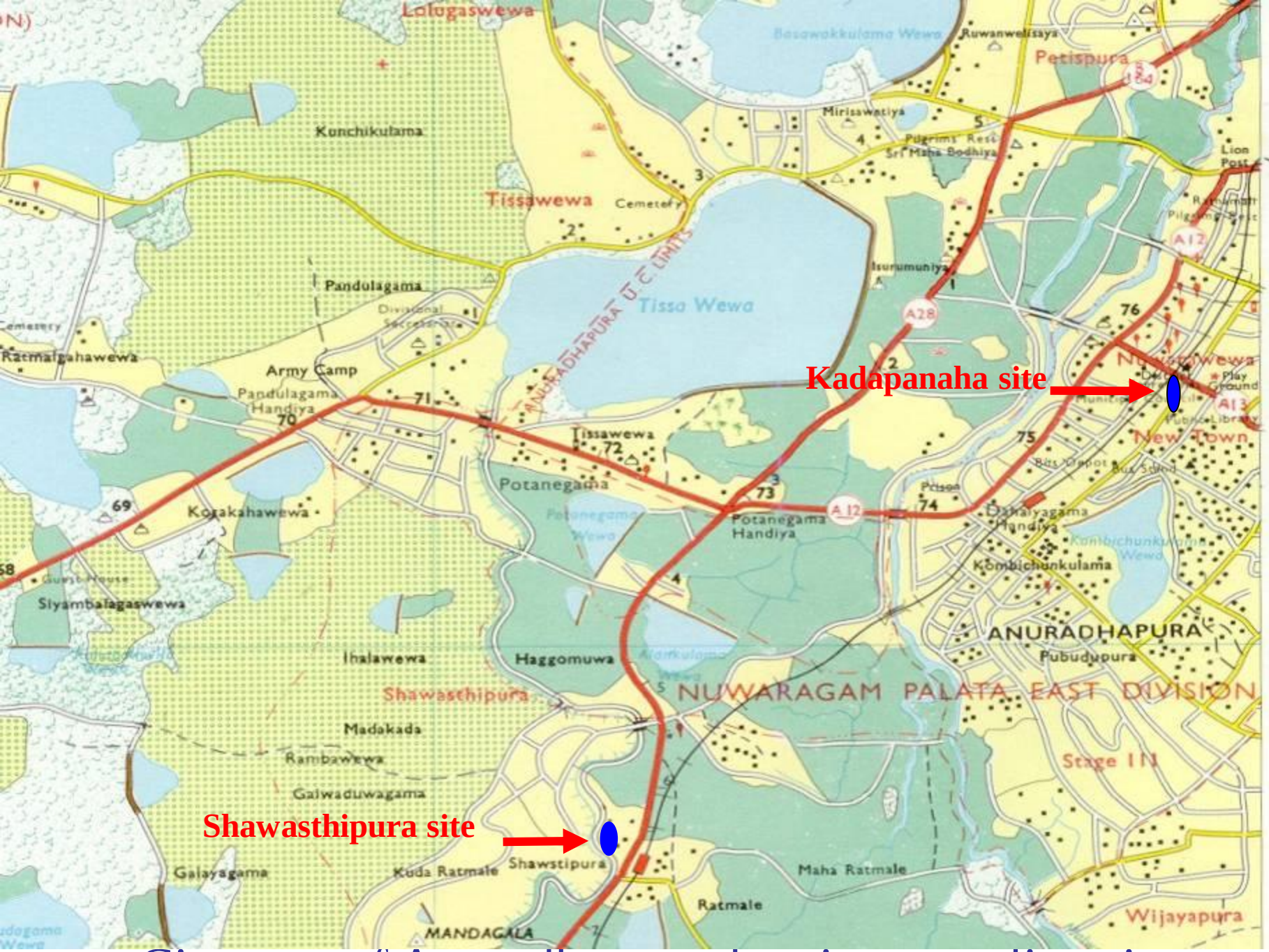
1. South west monsoon (May-August)
2. Northeast monsoon (November-February)
3. Two inter-monsoonal periods

Asia

- Fossil fuel use for about 80% of energy consumption in Asia. Coal use is expanding at a rate of almost 7%per year.
- If current trends continue , SO_2 emissions from Asia may soon equal the emissions from North America & Europe combined.
- Without additional control measures, SO_2 emissions triple from a level of 34 million mt in 1990 to a 110 million mt in 2020.
- These increases-driven by rapid growth of Asian economics, the inefficiency of energy use ,the reliance on coal as the major energy supply & the rapid growth of motor vehicle transport.

Schematic diagram of the Passive sampler





City map of Anuradhapura showing sampling sites

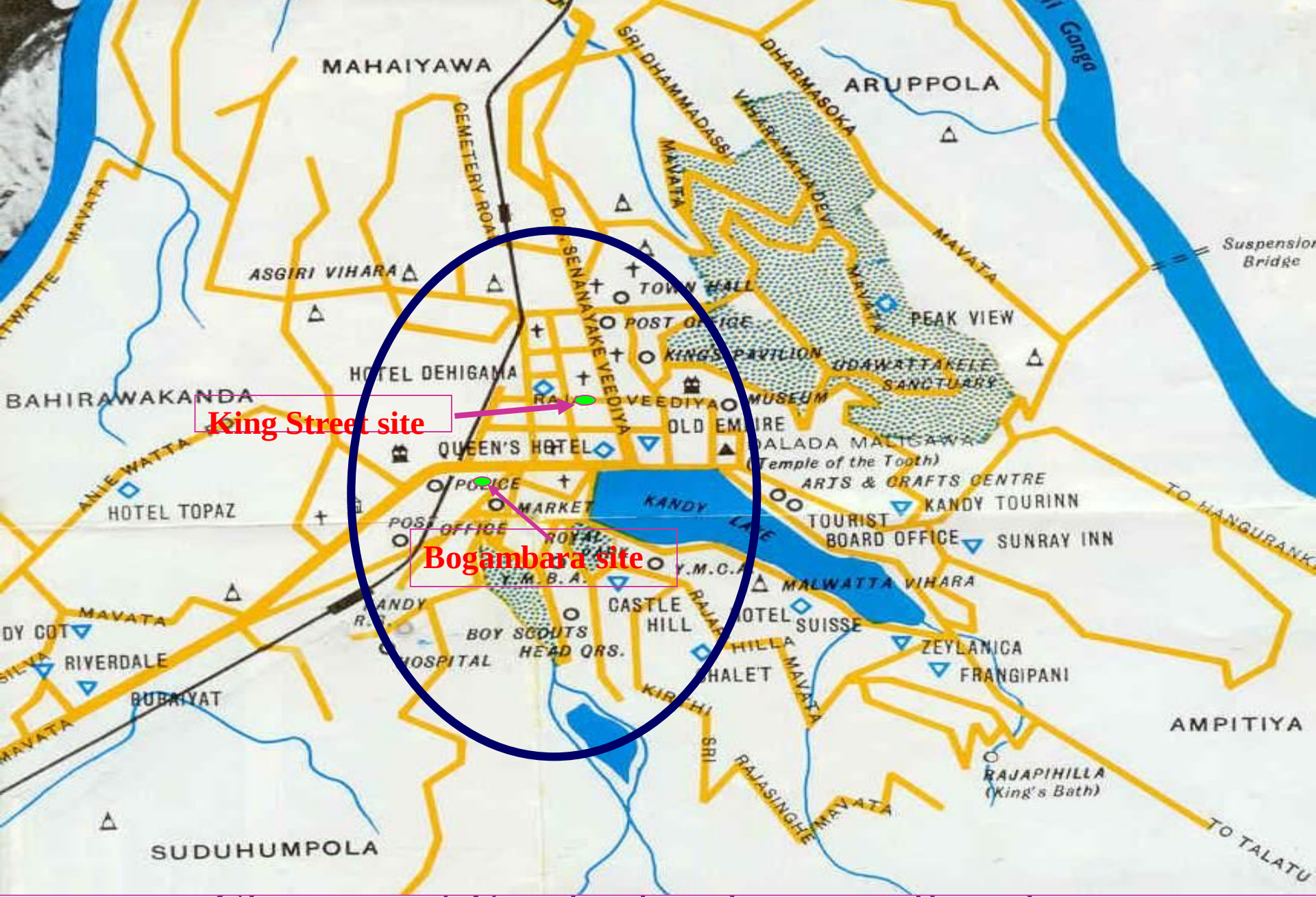
Salient features- Anuradhapura

- Higher levels of SO_2 and NO_2 during the November-January season (NE monsoon) at both locations indicating that it is not due to local pollution.

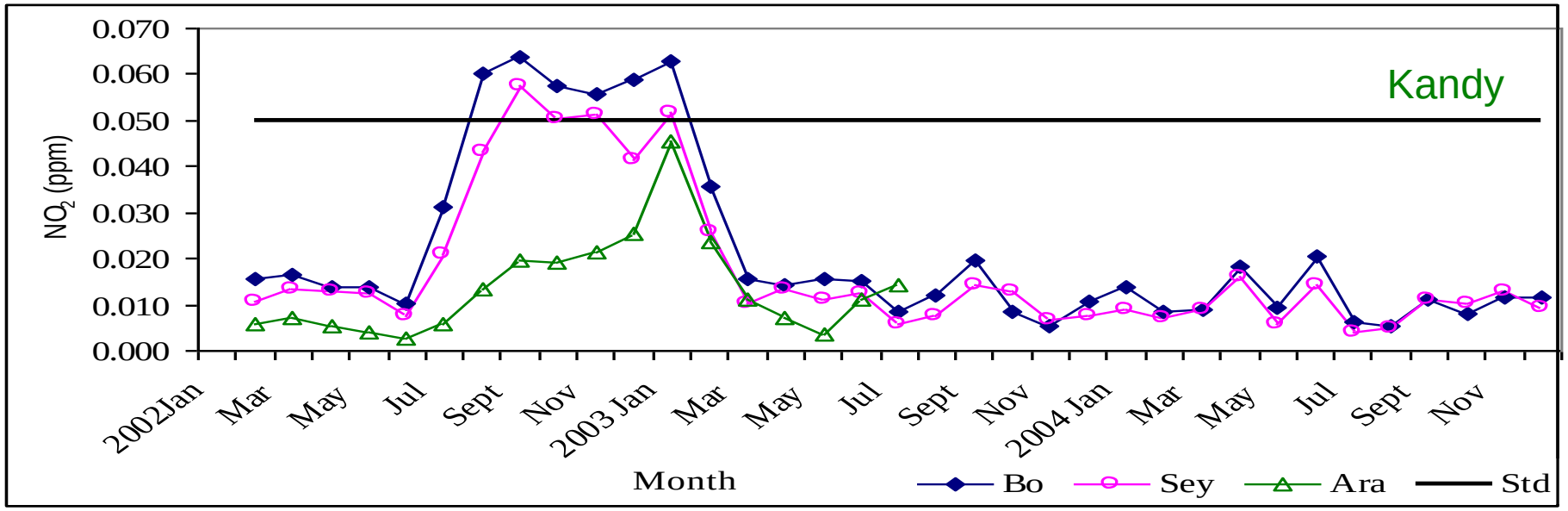
(During other months the city site had a higher level of pollution)

Kandy

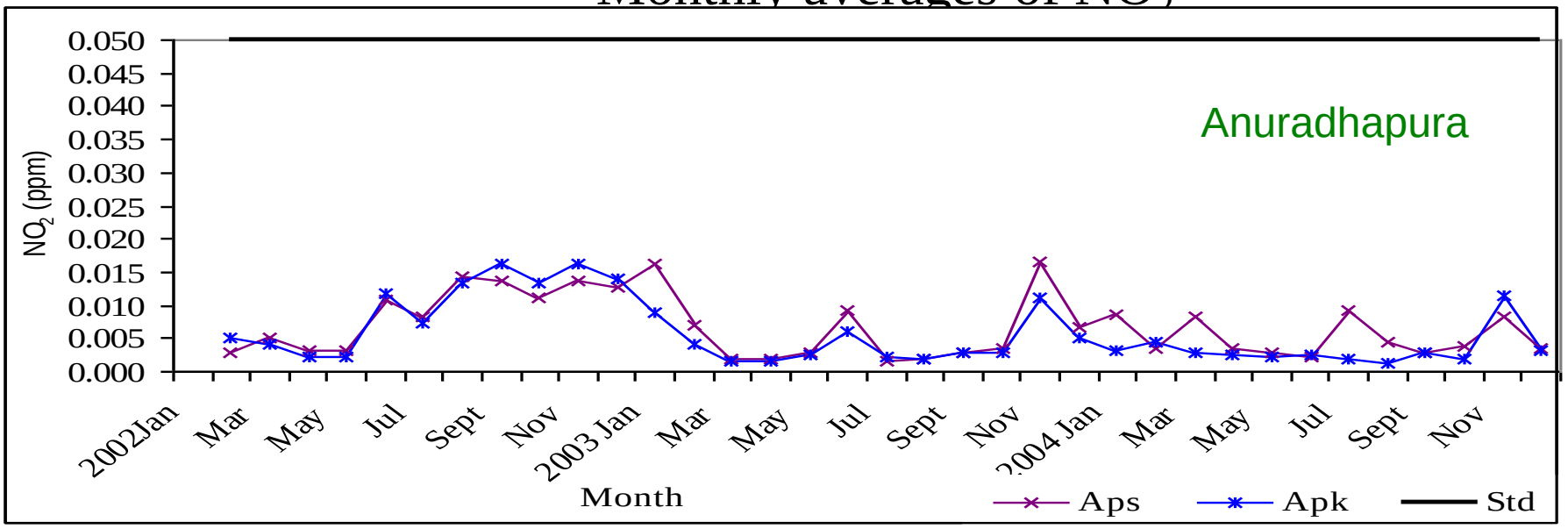
- Highest SO_2 deposition level
- The city of Kandy is situated in a valley between two mountain ranges, is expected to have even a higher degree of pollution .Most of the pollutants get trapped in the city due to the geographic location.
- Ever increasing number of motor vehicles entering the city
- The significant effect of transboundary pollution may cause an increase in SO_2 deposition

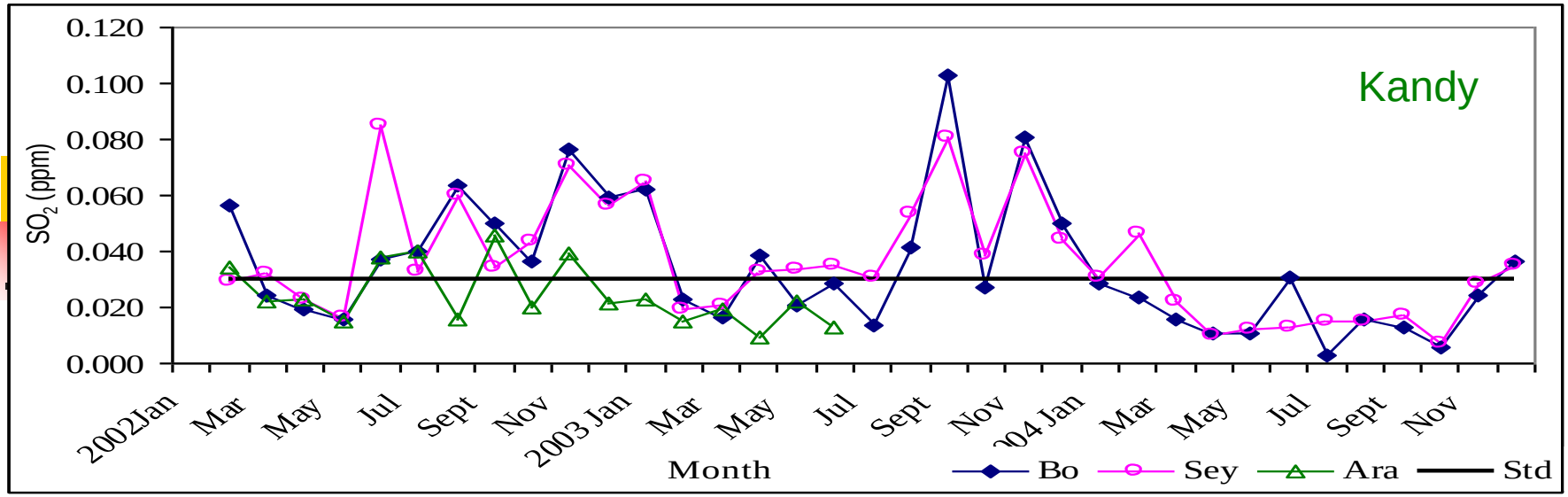


City map of Kandy showing sampling sites

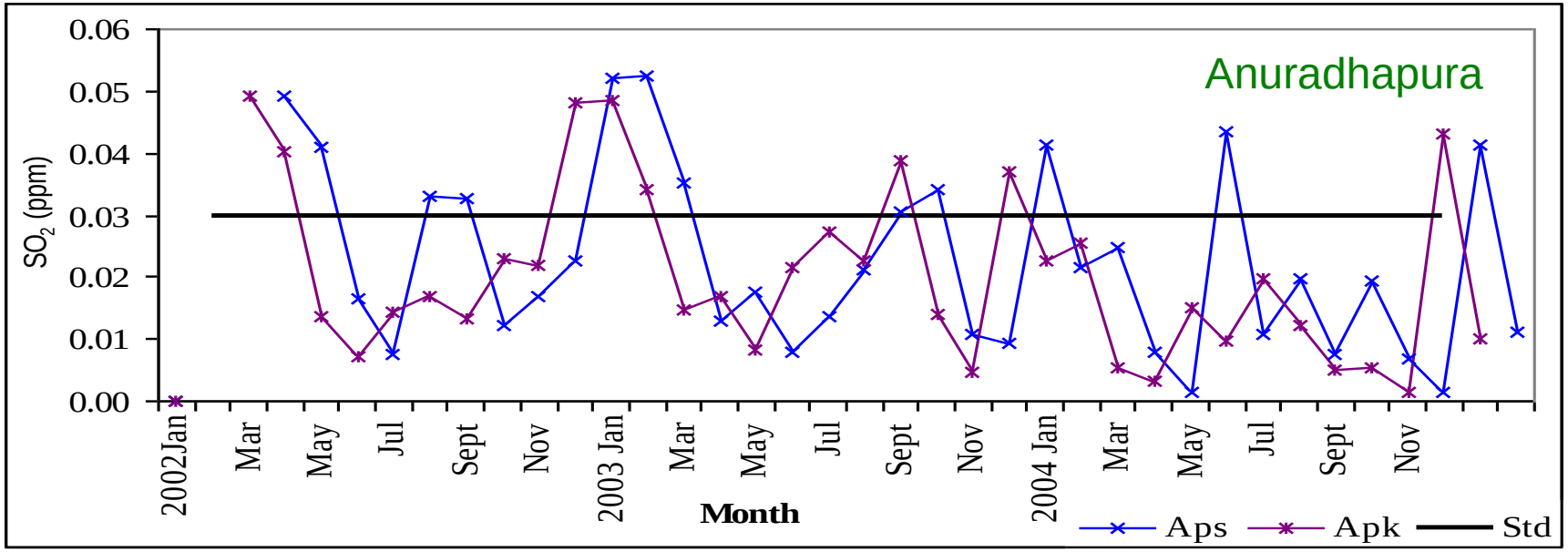


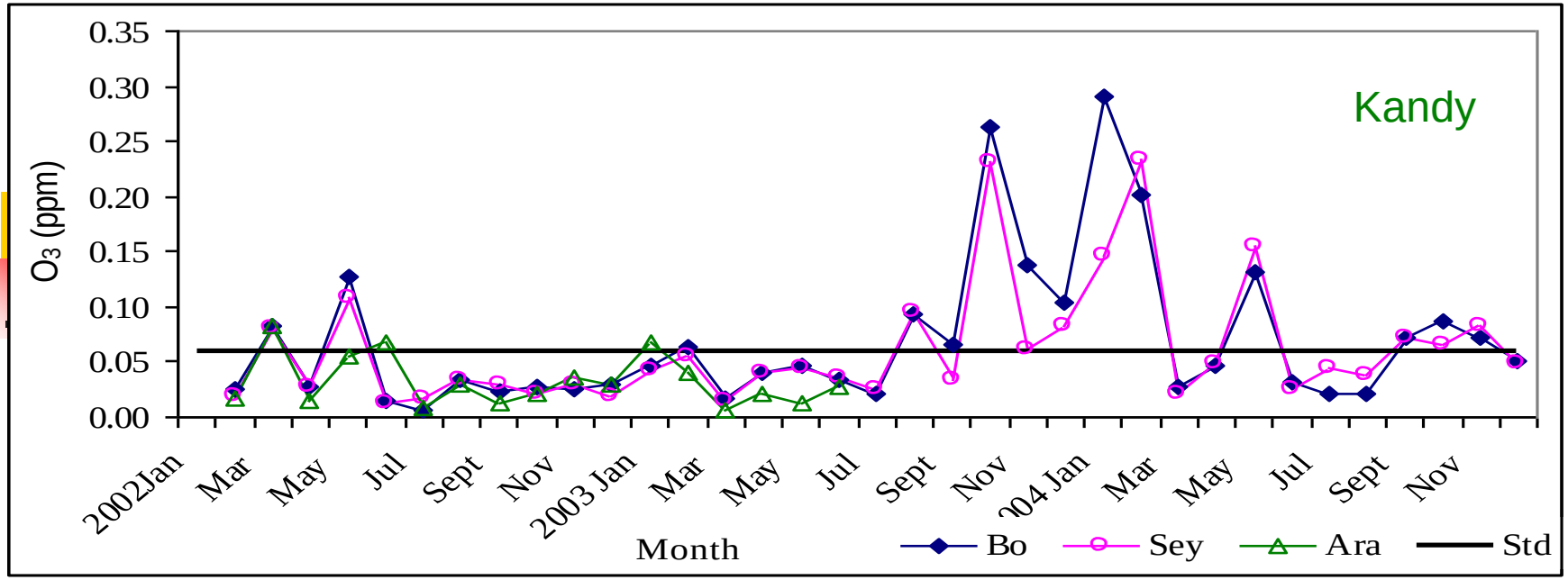
Monthly averages of NO_2



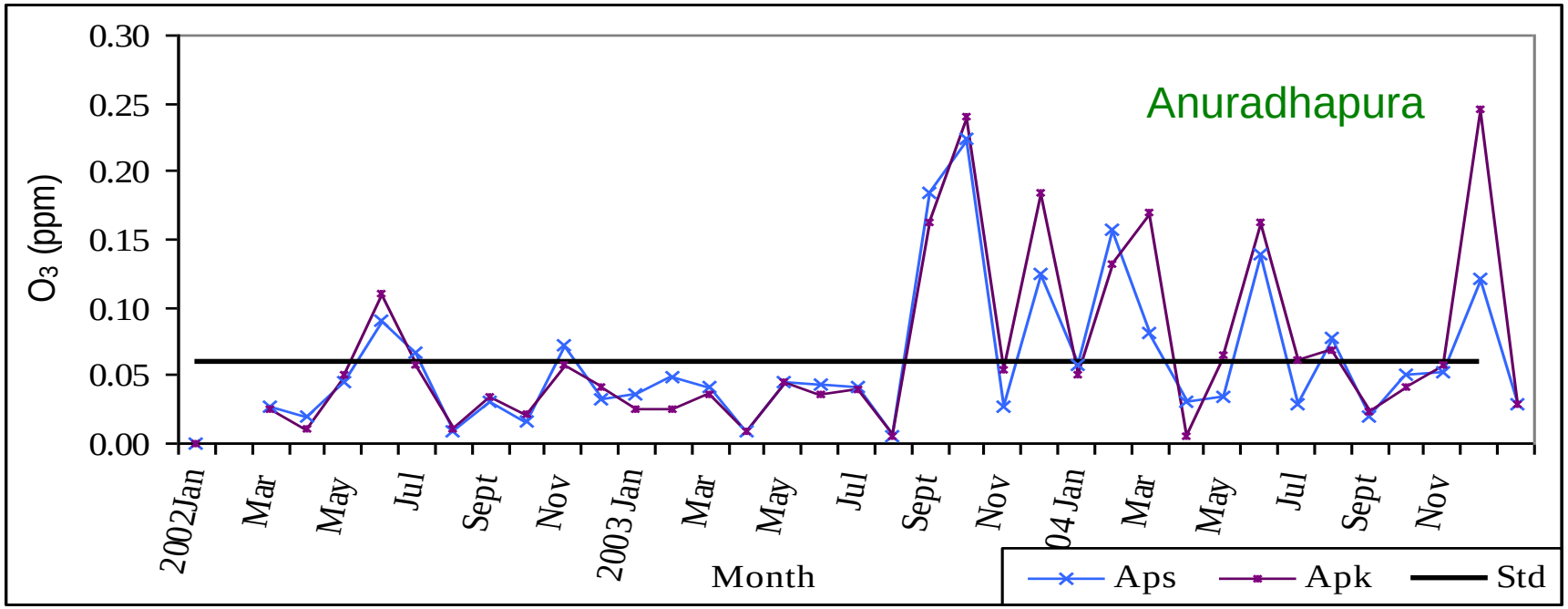


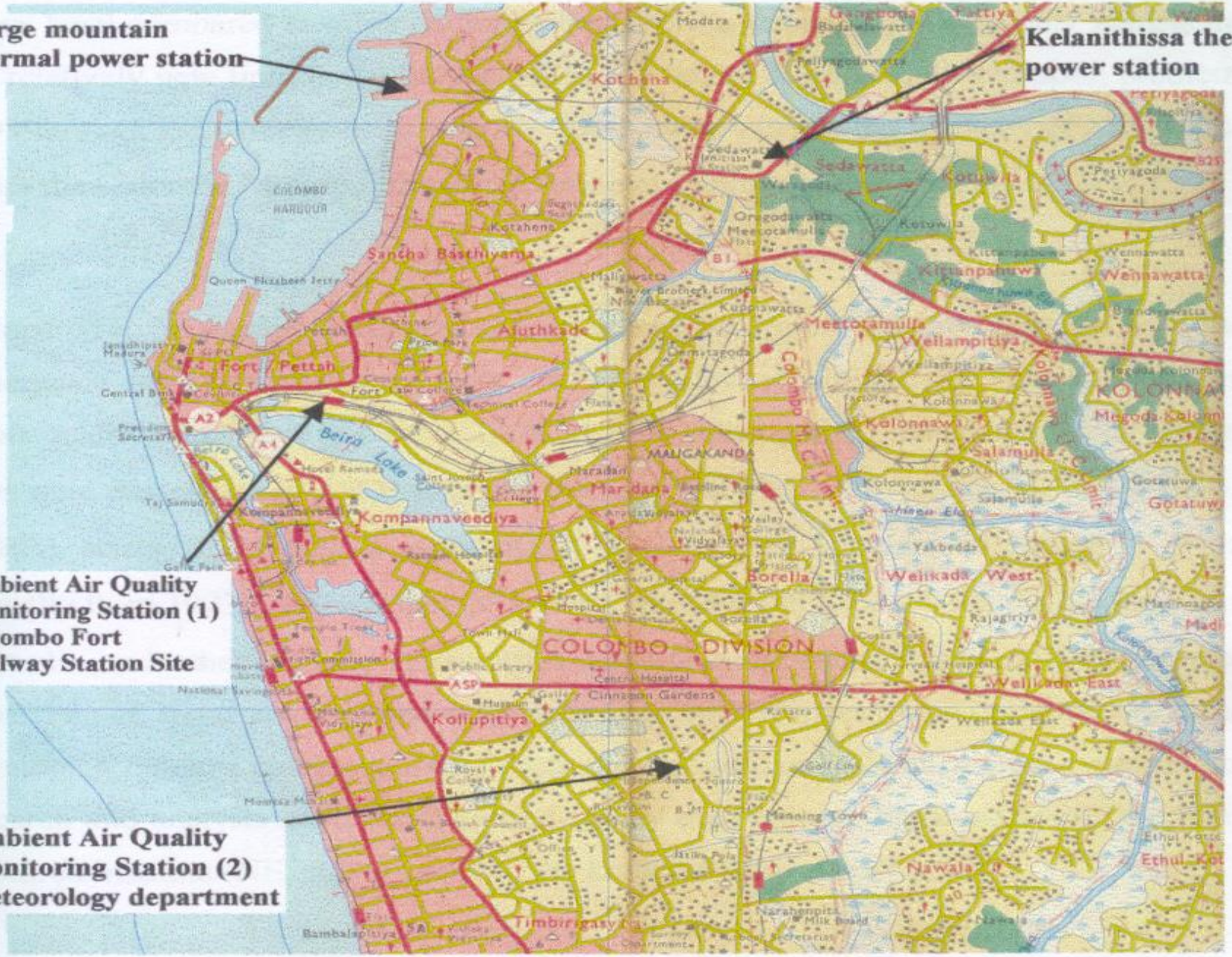
Monthly averages of SO_2

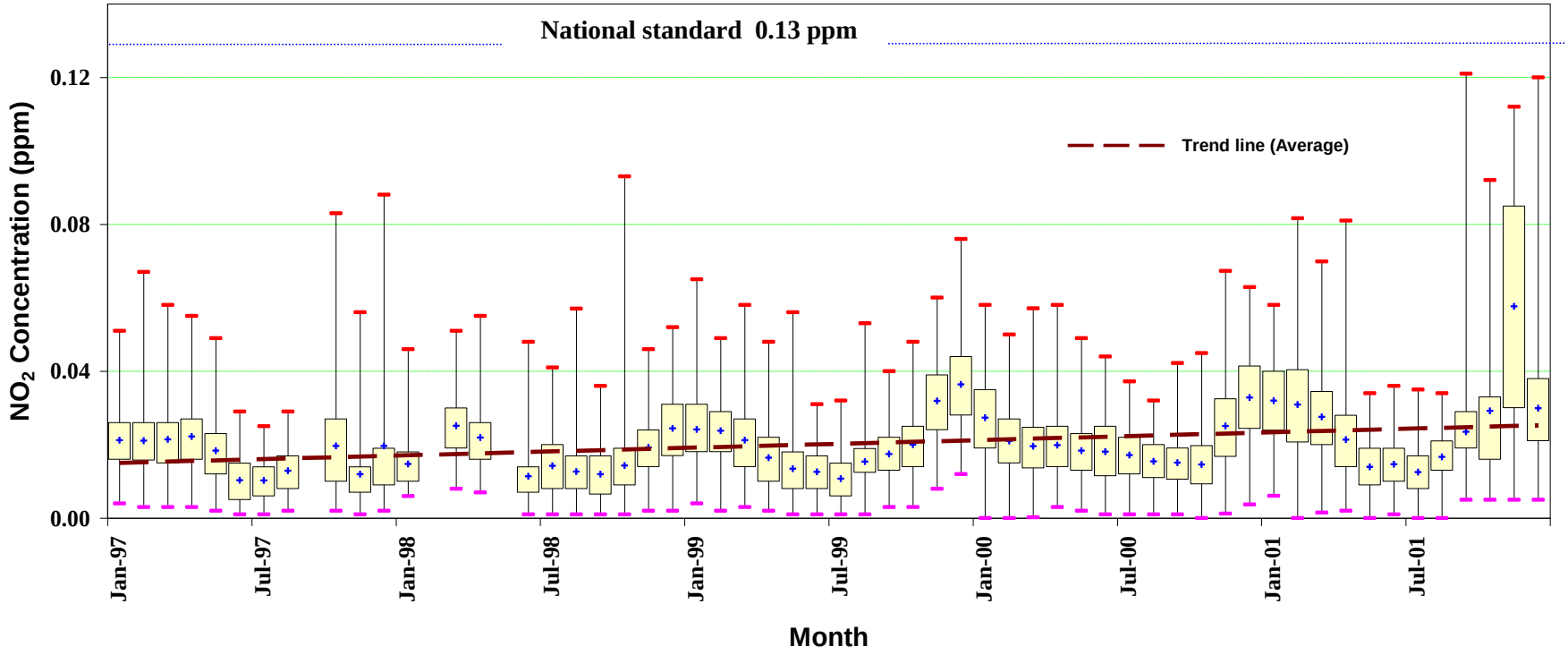




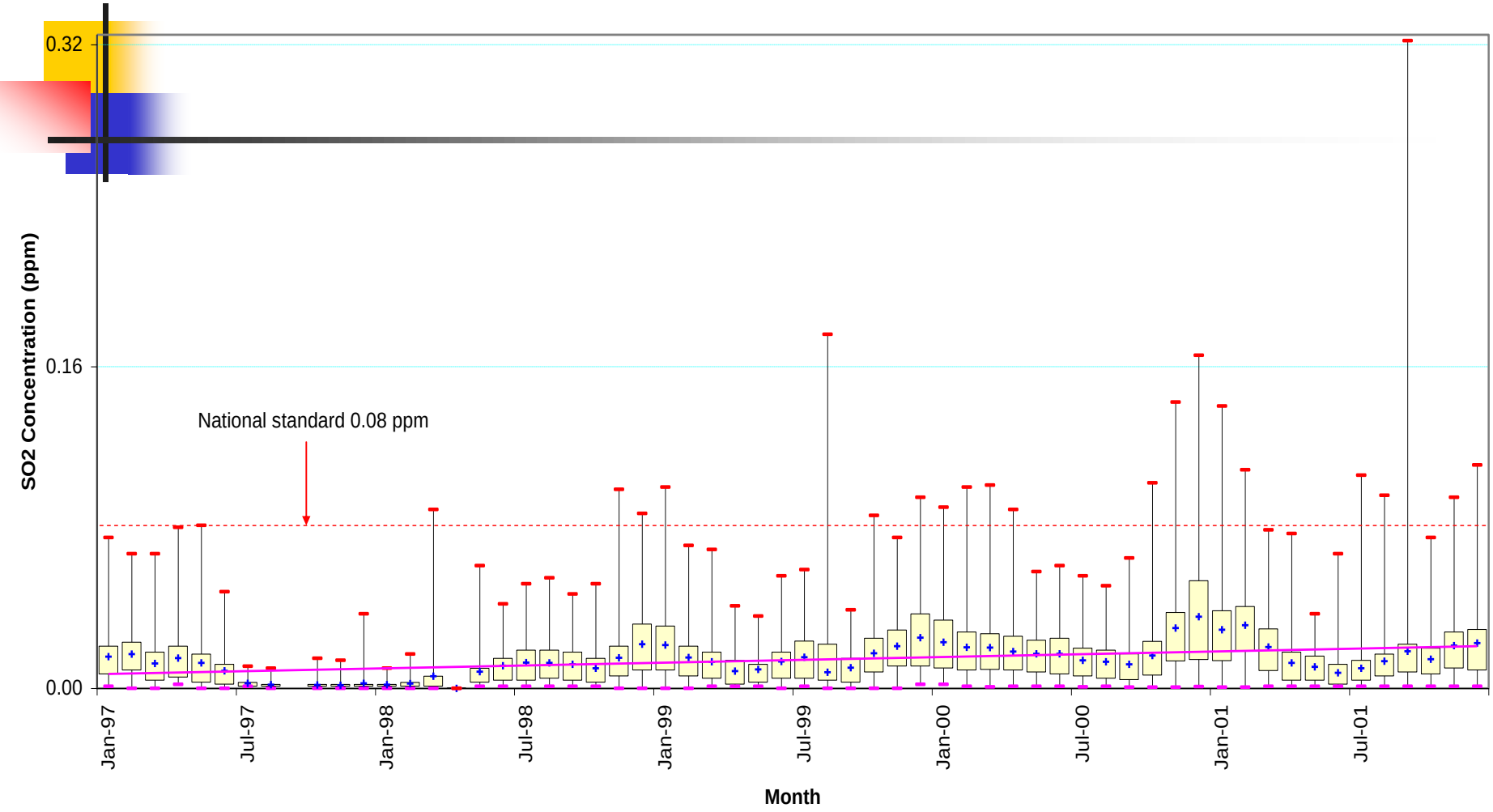
Monthly averages of O_3



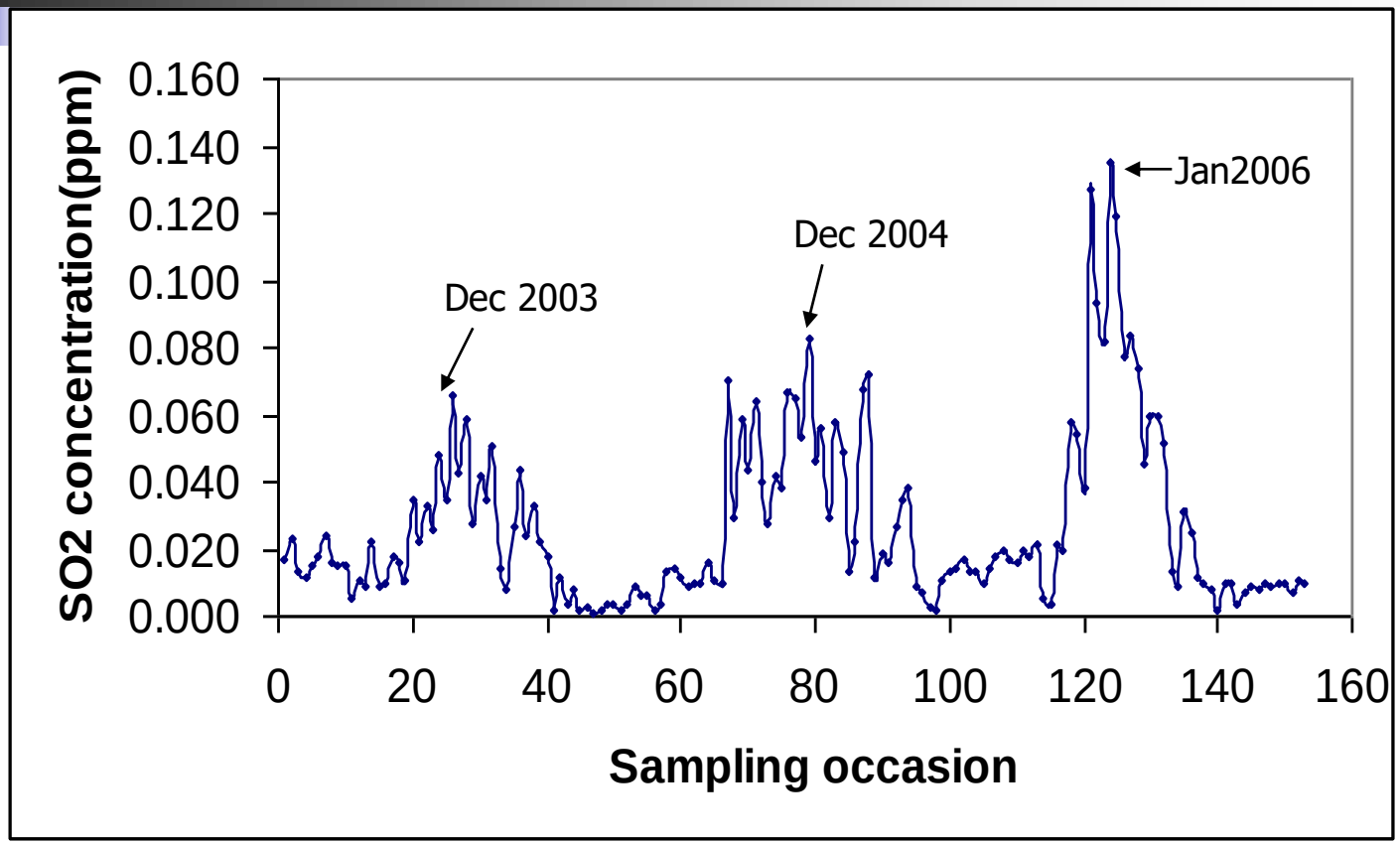

Barge mountain thermal power station
Kelanithissa thermal power station
N
Ambient Air Quality Monitoring Station (1) Colombo Fort Railway Station Site
Ambient Air Quality Monitoring Station (2) Meteorology department
COLOMBO HARBOUR
Kotahena
Sedawatta
Kotuwila
Kirulapone
Wennawatta
Meetotamulla
Weilampitiya
KOLONNAWA
Kolonnawa
Sancha Bastiyana
Aluthkade
Fort
Pettah
Beira Lake
MALIGAKANDA
Maradana
Kompannaveediya
Borella
Wellikada West
Wellikada East
COLOMBO DIVISION
Kollupitiya
Cinnamon Gardens
Timbirigasyaya
Nawala
Rajagiriya
Yakbedda
Gothatuwa
Manning Town
Ethul Kotte
Narahenpita
Bambalapitiya
A2
A4
B1
A5



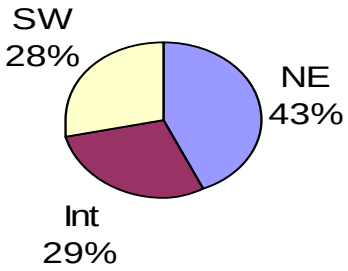
NO_2 variation Jan 1997-Dec 2001



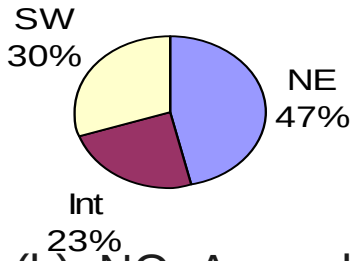
SO_2 concentrations Jan 1997-December 2001


SO2 concentration(ppm)
0.160
0.140
0.120
0.100
0.080
0.060
0.040
0.020
0.000
Dec 2003
Dec 2004
Jan2006
0
20
40
60
80
100
120
140
160
Sampling occasion

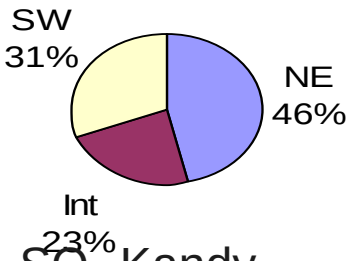
Transboundary pollution from the South Asian countries during NE monsoon period and Industrial pollution of the western region of the country during southwest monsoon period may get transported due to winds to the central highlands. This must be another reason of having high pollutant concentrations in the city of Kandy during these periods.



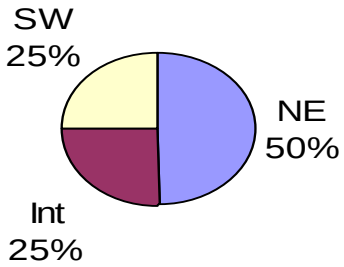
(a) NO_2 Kandy



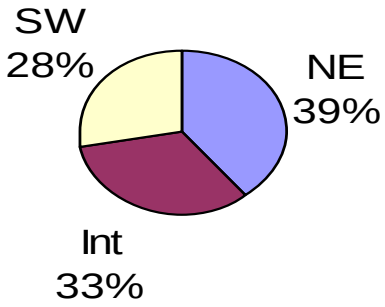
(b) NO_2 Anuradhapura



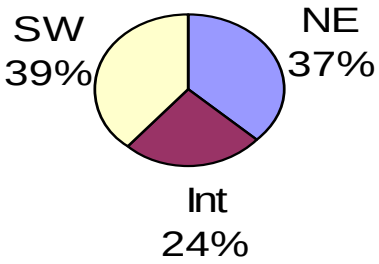
(c) SO_2 Kandy



(d) SO_2 Anuradhapura



(e) O_3 Kandy



(f) O_3 Anuradhapura

Monsoonal variation of pollutant concentration

NE = Northeast, Int = Inter monsoon, SW = Southwest

RAINS-Asia Model

- The Regional Air Pollution Information & Simulation (RAINS-Asia) model is a tool to analyze cost-effective strategies for reducing environmental impacts of SO_2 emissions in Asia.

- The RAINS Model provides data ,stored in dBase format , on energy scenarios ,emission control technologies & abatement costs, atmospheric transport and critical loads .

- This module consists of three modules.

I. Regional Energy Scenario (RESGEN)

II. ENergy Emission Module (ENEM)

III. DEPosition & critical loads Assessment module (DEP)

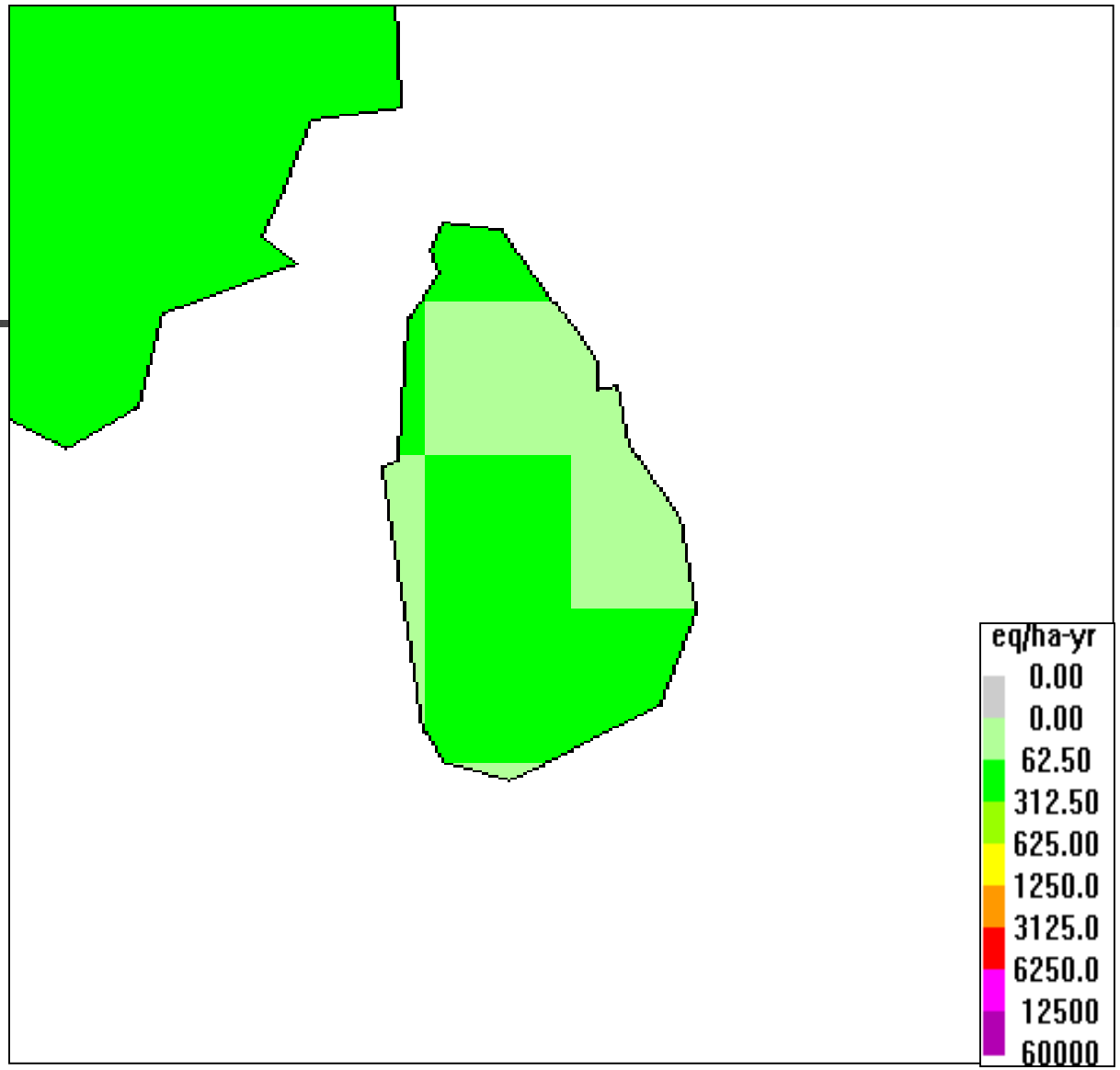


Figure 01:Map of the SO_2 deposition for Sri Lanka in 1990

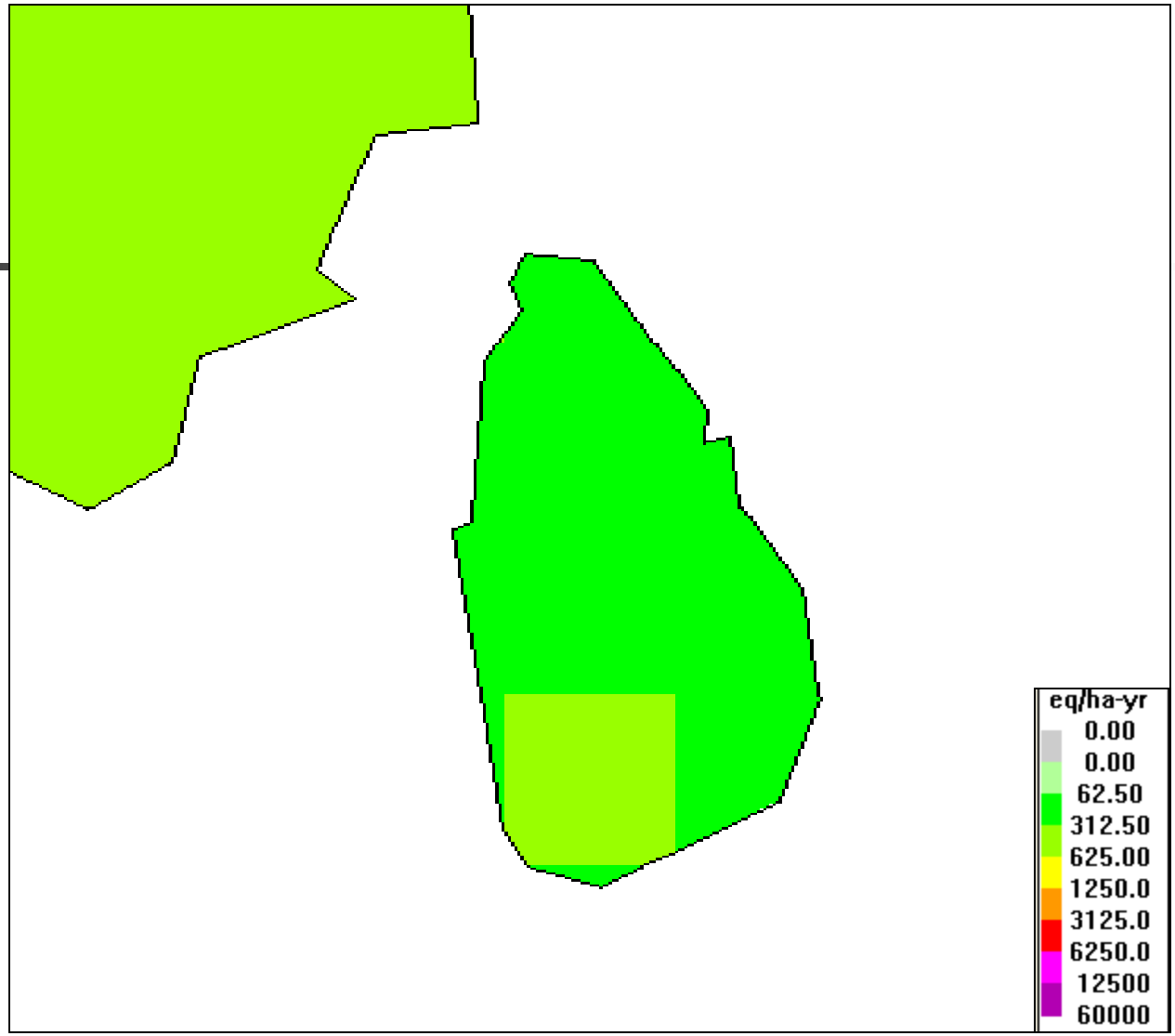
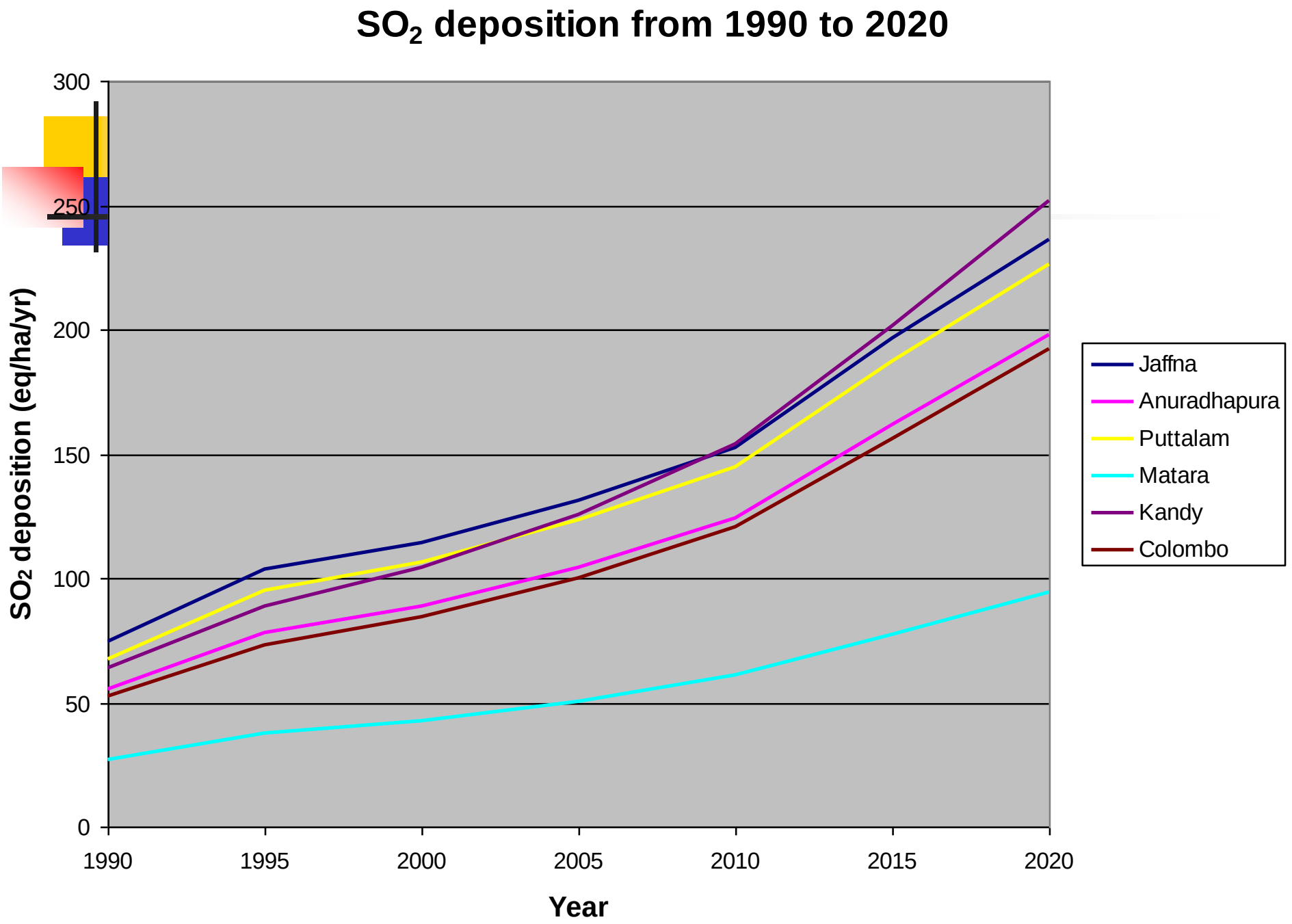
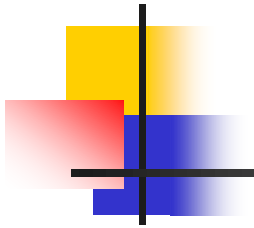


Figure 02:Map of the SO_2 deposition for Sri Lanka in 2020

Table 01:SO2 deposition of some districts in Sri Lanka

Deposition (SO_2 eq/ha y)							
	YEAR						
District	1990	1995	2000	2005	2010	2015	2020
Jaffna	74.15	103.40	114.46	131.52	152.51	196.31	236.28
Anuradhapura	55.63	78.09	88.88	104.44	124.36	161.6	198.07
Puttalam	67.46	95.39	106.62	123.69	144.65	186.99	226.02
Matara	27.26	37.29	42.88	50.51	60.80	77.00	94.64
Kandy	64.12	88.77	104.31	125.33	154.12	201.18	251.53
Colombo	52.50	73.40	84.52	100.09	120.44	156.09	192.54


SO2 deposition from 1990 to 2020
300
250
200
150
100
50
0
SO2 deposition (eq/ha/yr)
1990
1995
2000
2005
2010
2015
2020
Year
Jaffna
Anuradhapura
Puttalam
Matara
Kandy
Colombo



- Thank you!