AMBIENT AIR QUALITY STATUS AND TREND OF BHUBANESWAR CITY

STATE POLLUTION CONTROL BOARD, ODISHA

20th AUGUST 2013

AMBIENT AIR QUALITY MONITORING LOCATIONS IN BHUBANESWAR CITY

Locations of AAQ Stations

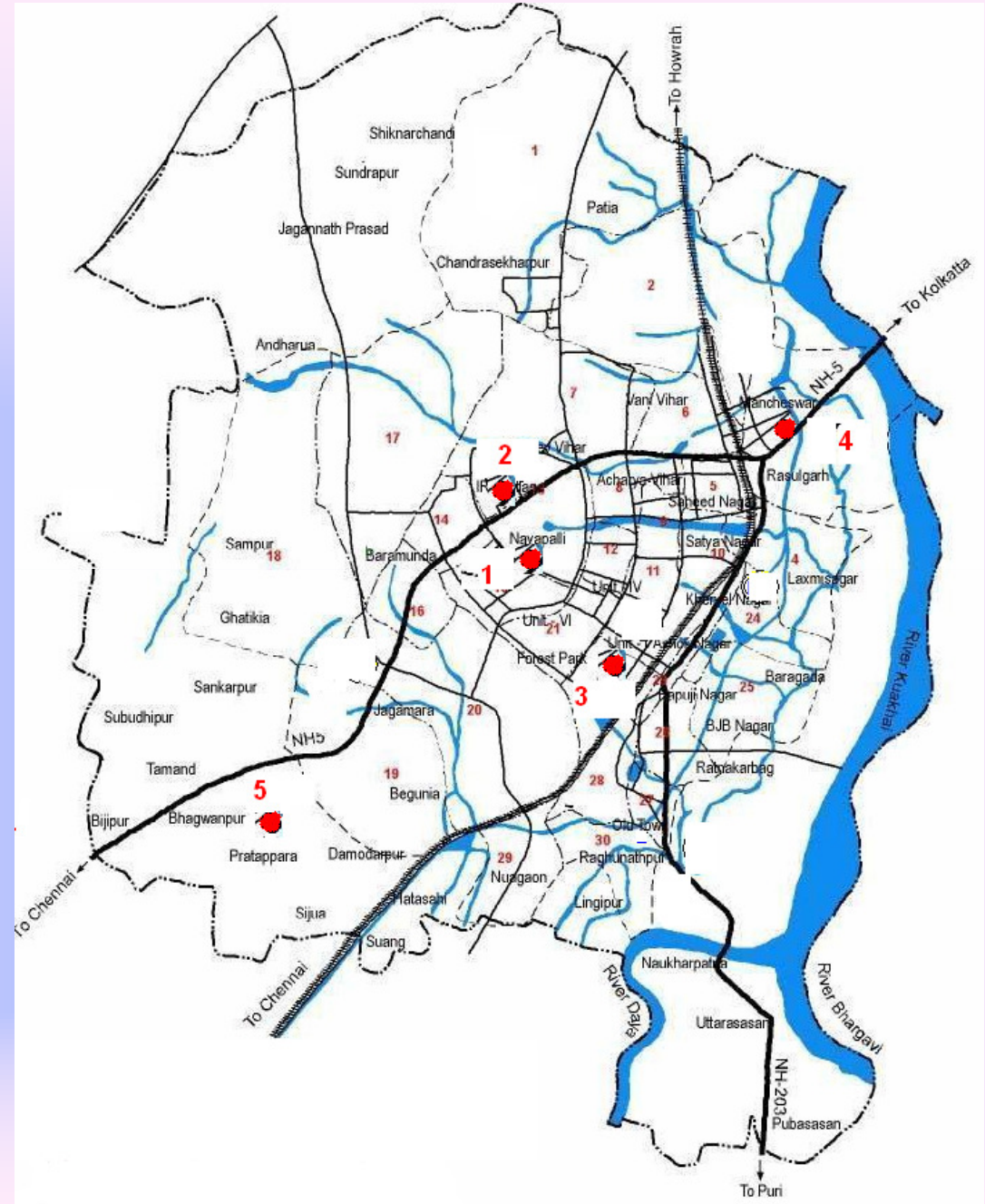
1. SPCB Office Building, H.O. Nayapalli

2. I.R.C. Village

Parameters Monitored

1. Suspended Particulate Matter
2. Respirable Suspended Particulate Matter
3. PM2.5
4. Oxides of Nitrogen
5. Sulphur Dioxide

5. Patrapada

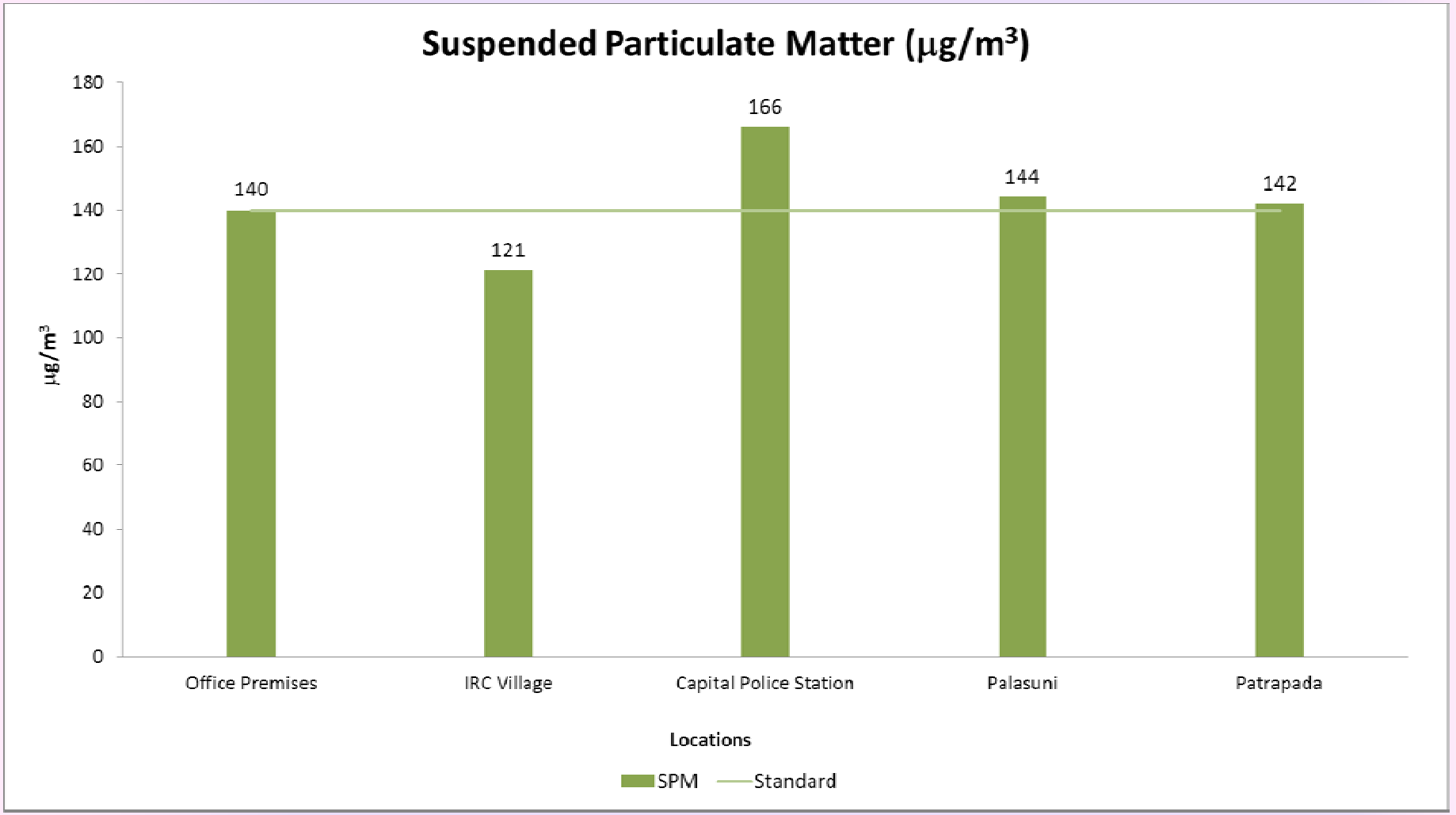


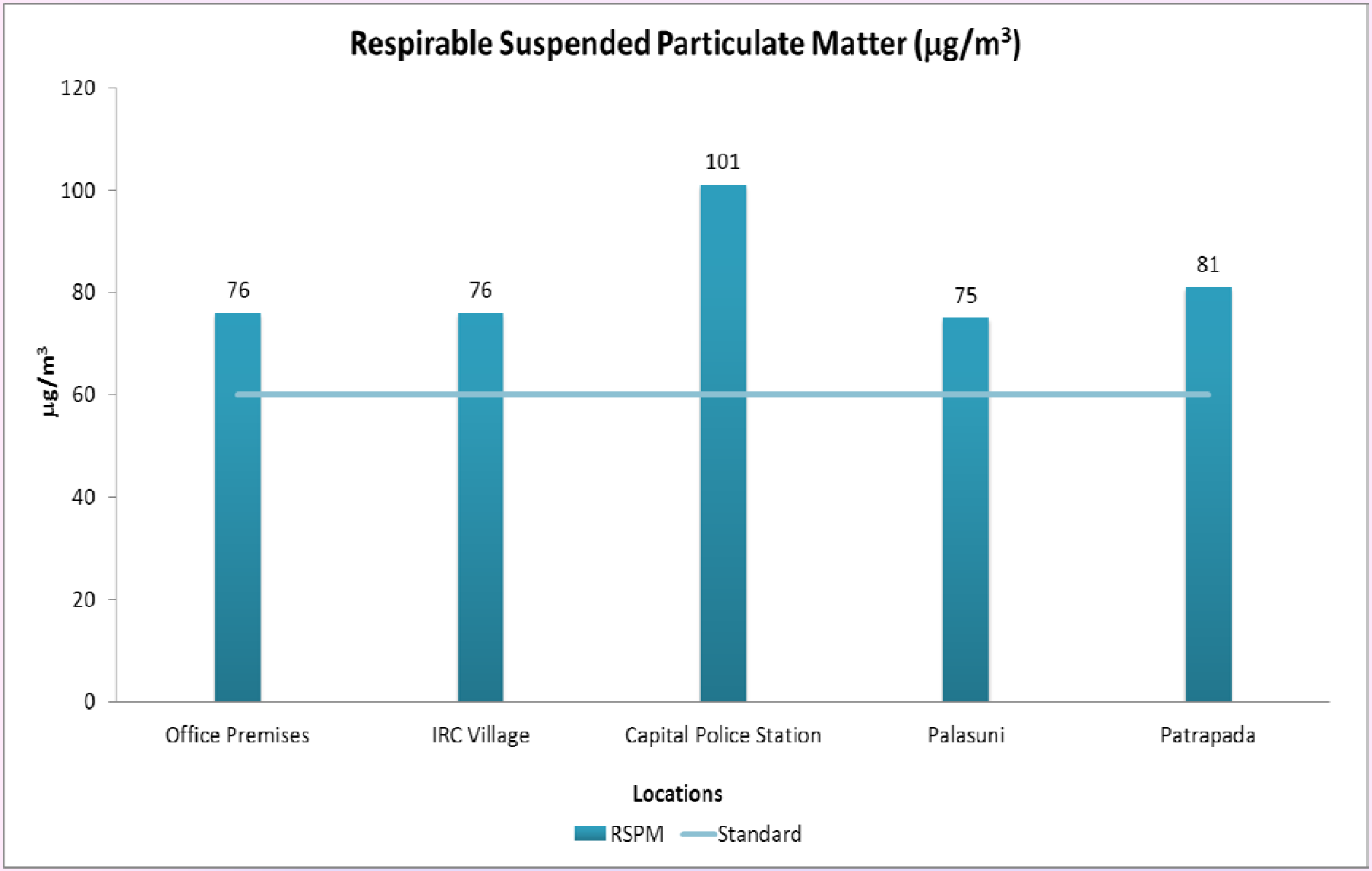
MAJOR AIR POLLUTANTS AND THEIR IMPACT

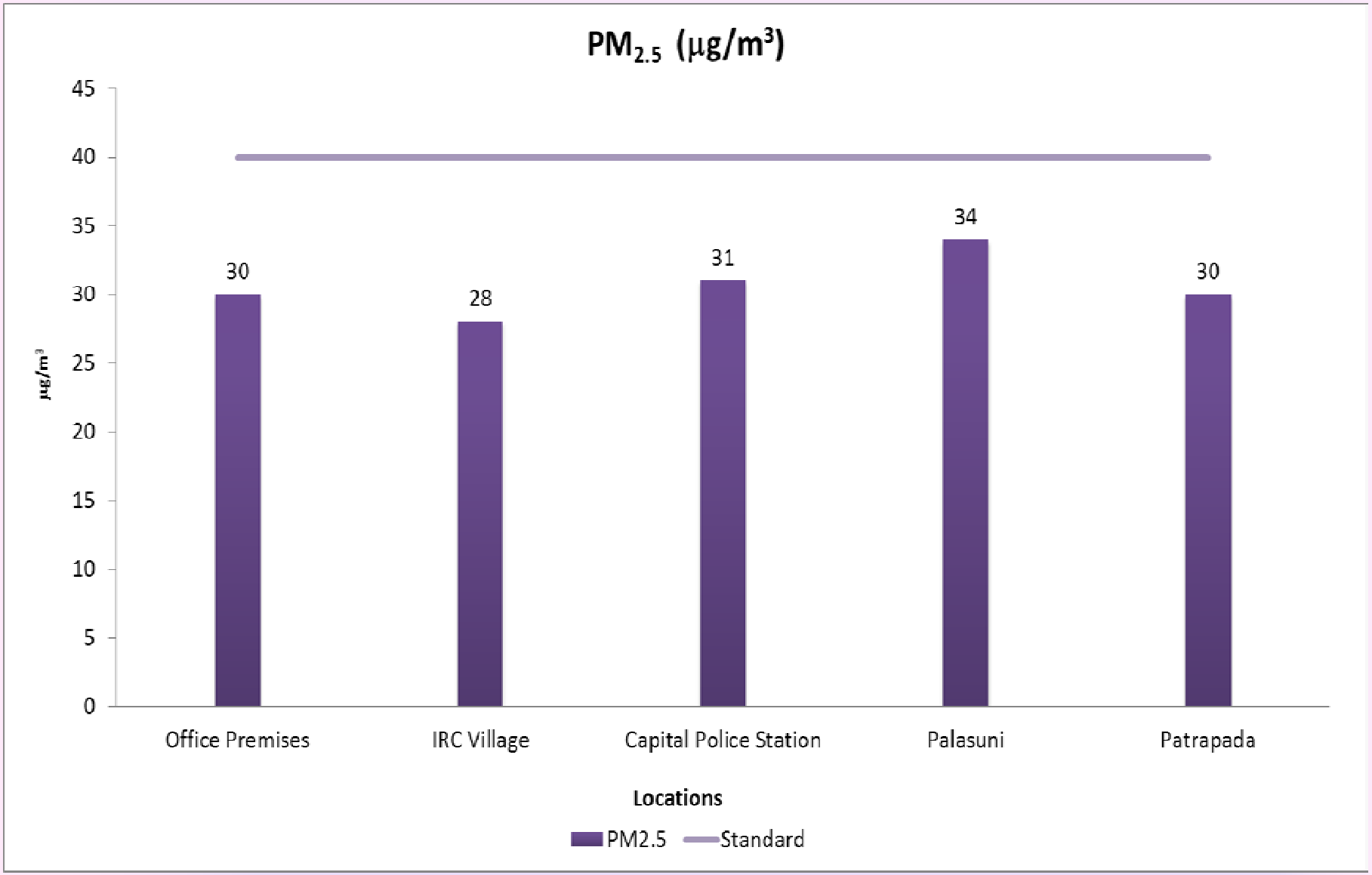
Sl No.	Major Sources	Pollutant	Impact on Human health	Other Effects
(1)	Combustion of fossil fuels, Material handling and processing, Automobiles, Construction of road and buildings.		Particulate Matter Particle size less than 10µ will affect the respiratory tracts and lungs, leads to asthma, bronchitis and pneumonia.	Affect the photosynthetic process of plants.

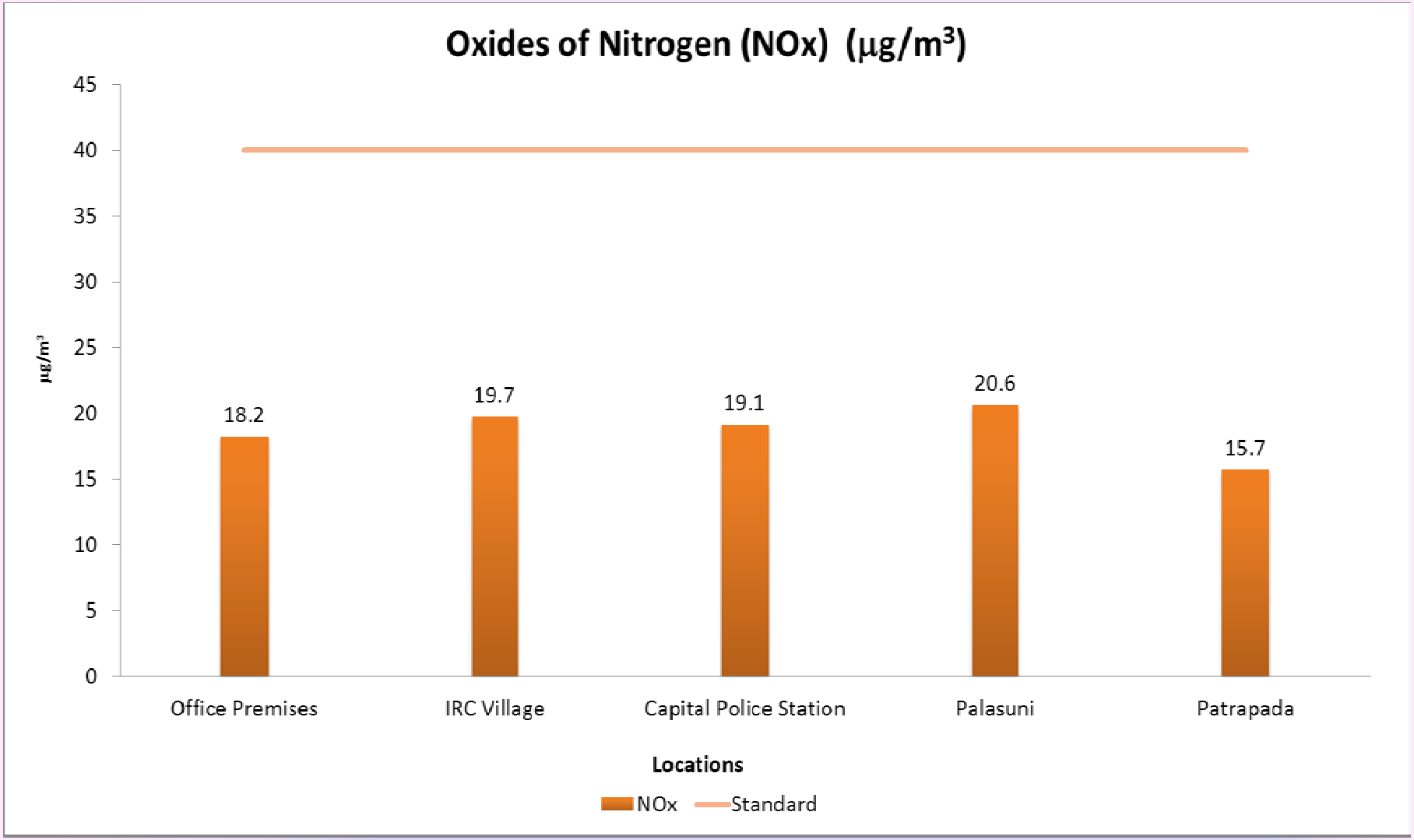
Sl No.	Major Sources	Pollutant	Impact on Human health	Other Effects
(5)	From batteries and paints, burning of fossil fuel	Lead (Pb)	Lead (Pb) Gastrointestinal, liver and kidney damage, abnormality in fertility, mental development of child.	Paralysis of muscles of the larynx and difficult in breathing paralysis of the digestive tract in animals.

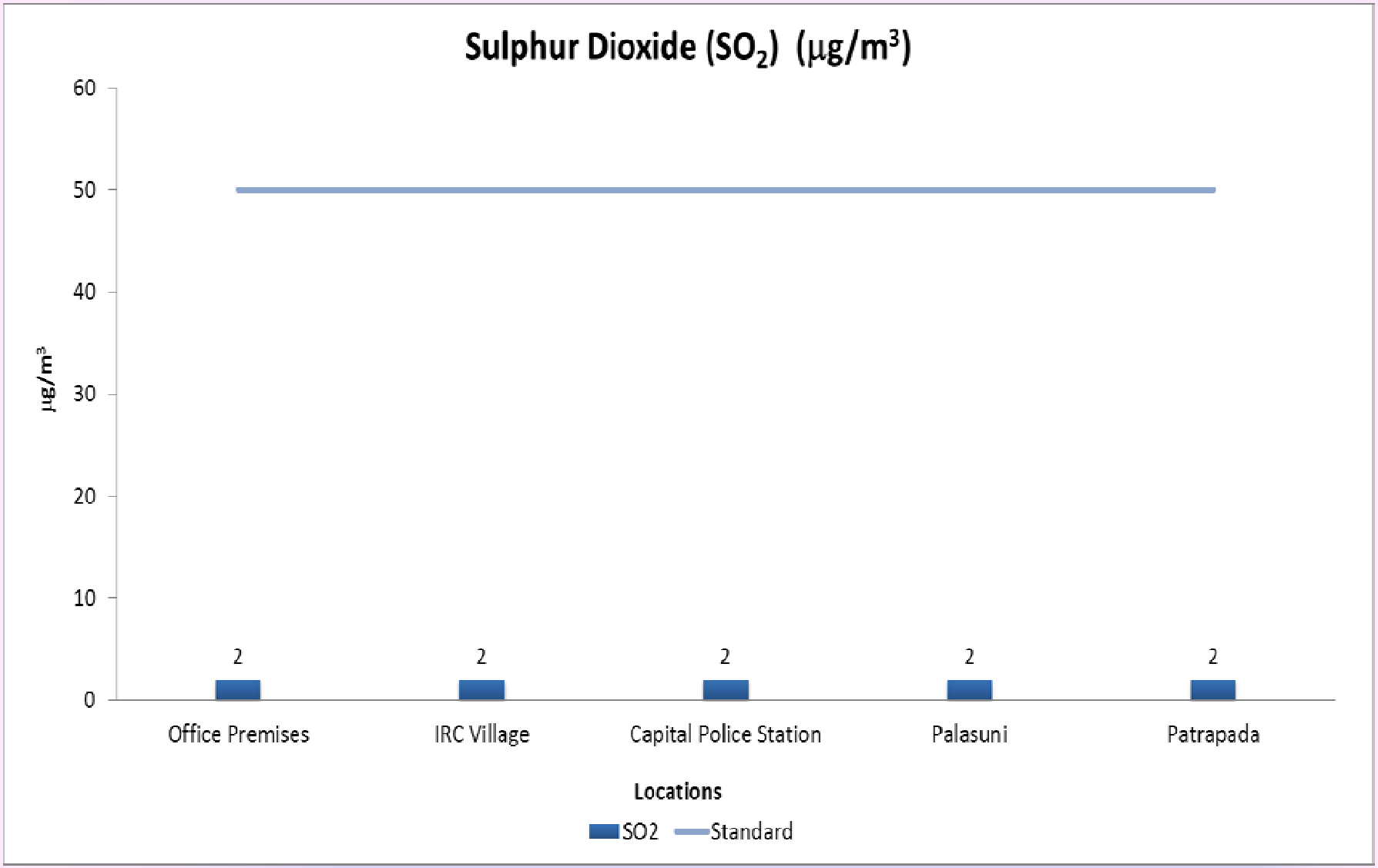
AMBIENT AIR QUALITY STATUS AT DIFFERENT LOCATIONS OF BHUBANESWAR CITY – 2012



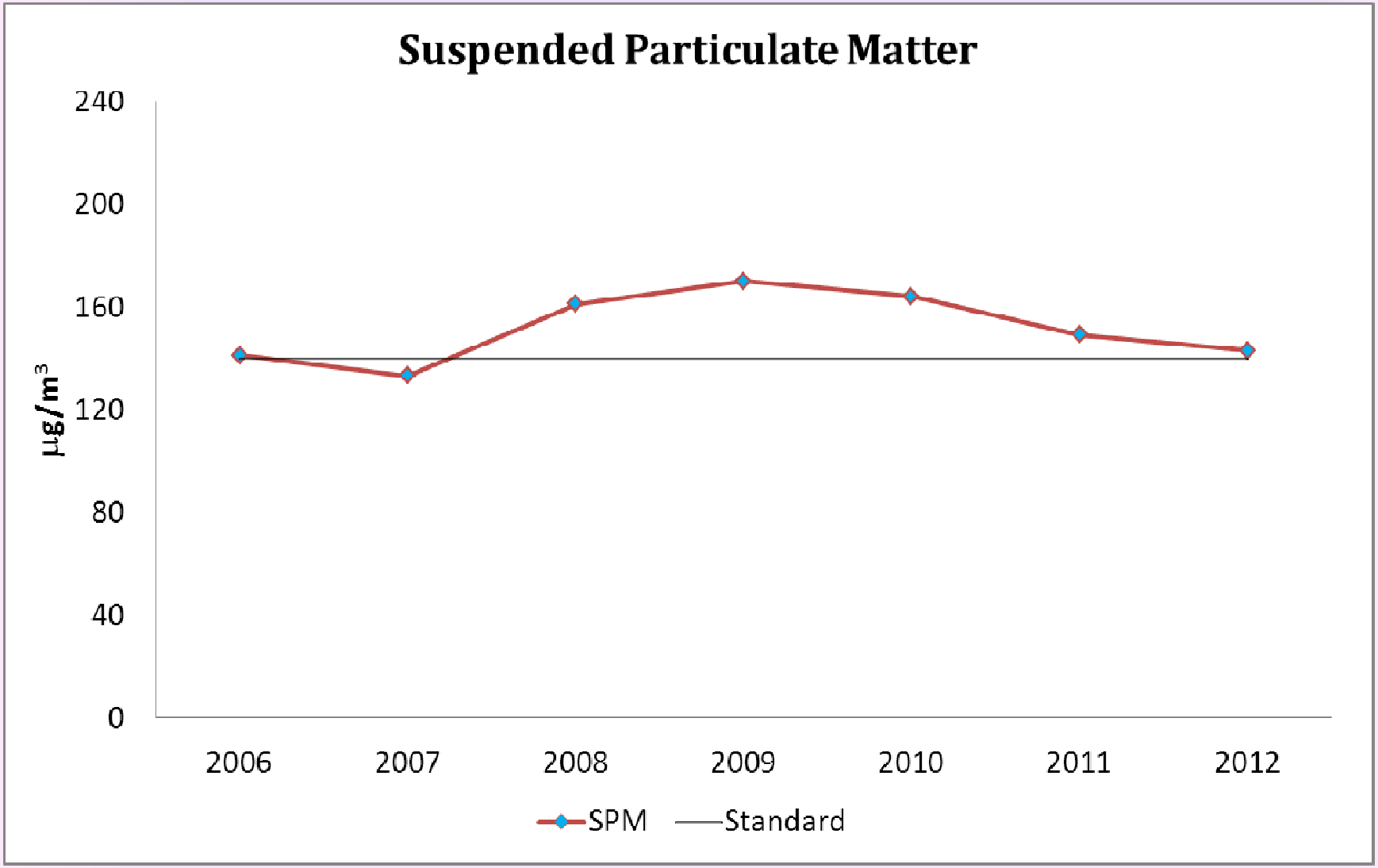

Respirable Suspended Particulate Matter (µg/m³)
120
100
80
60
40
20
0
µg/m³
76
76
101
75
81
Office Premises
IRC Village
Capital Police Station
Palasuni
Patrapada
Locations
RSPM
Standard

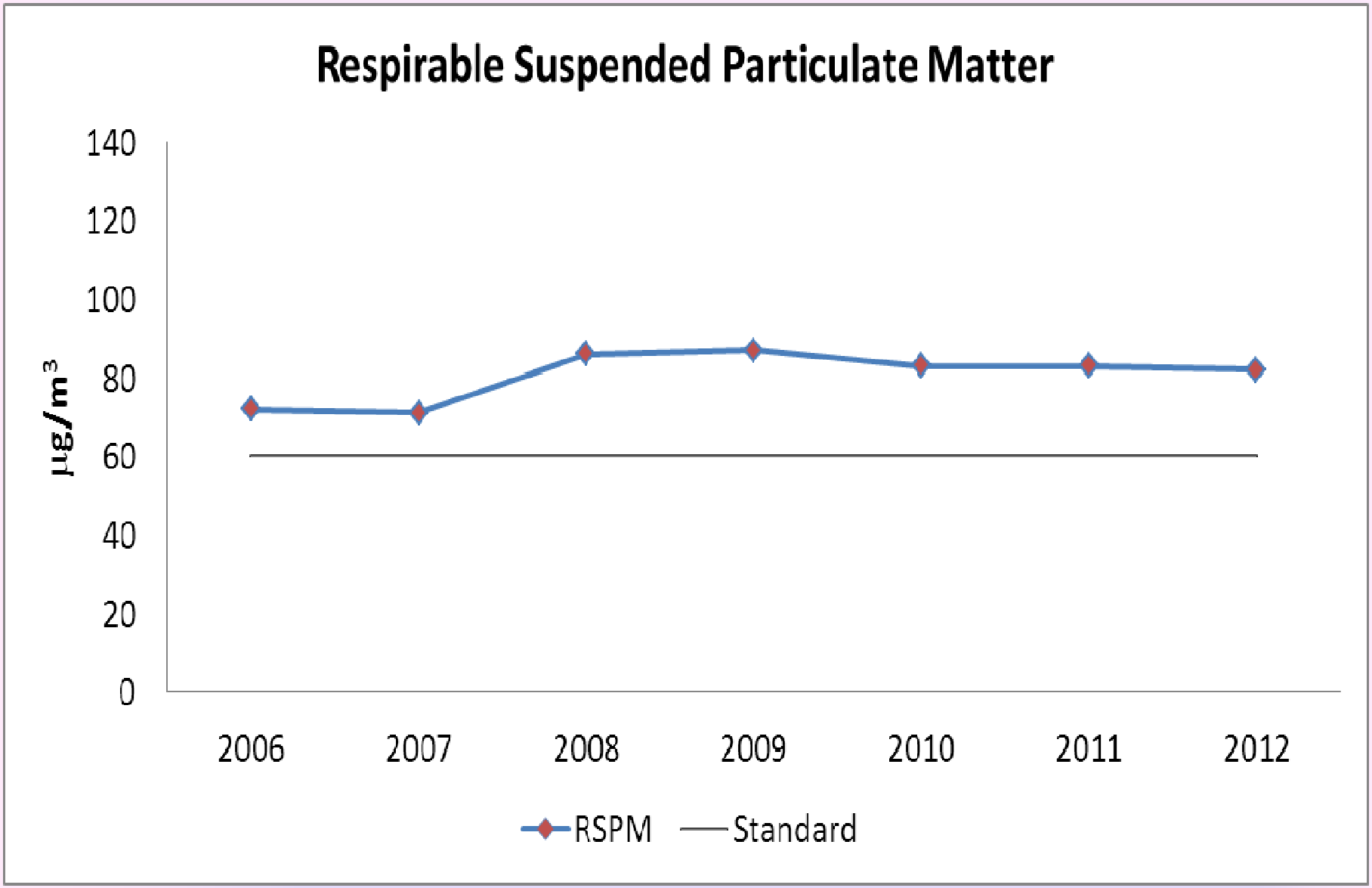

PM2.5 (µg/m3)
45
40
35
30
25
20
15
10
5
0
µg/m3
30
28
31
34
30
Office Premises
IRC Village
Capital Police Station
Palasuni
Patrapada
Locations
PM2.5
Standard

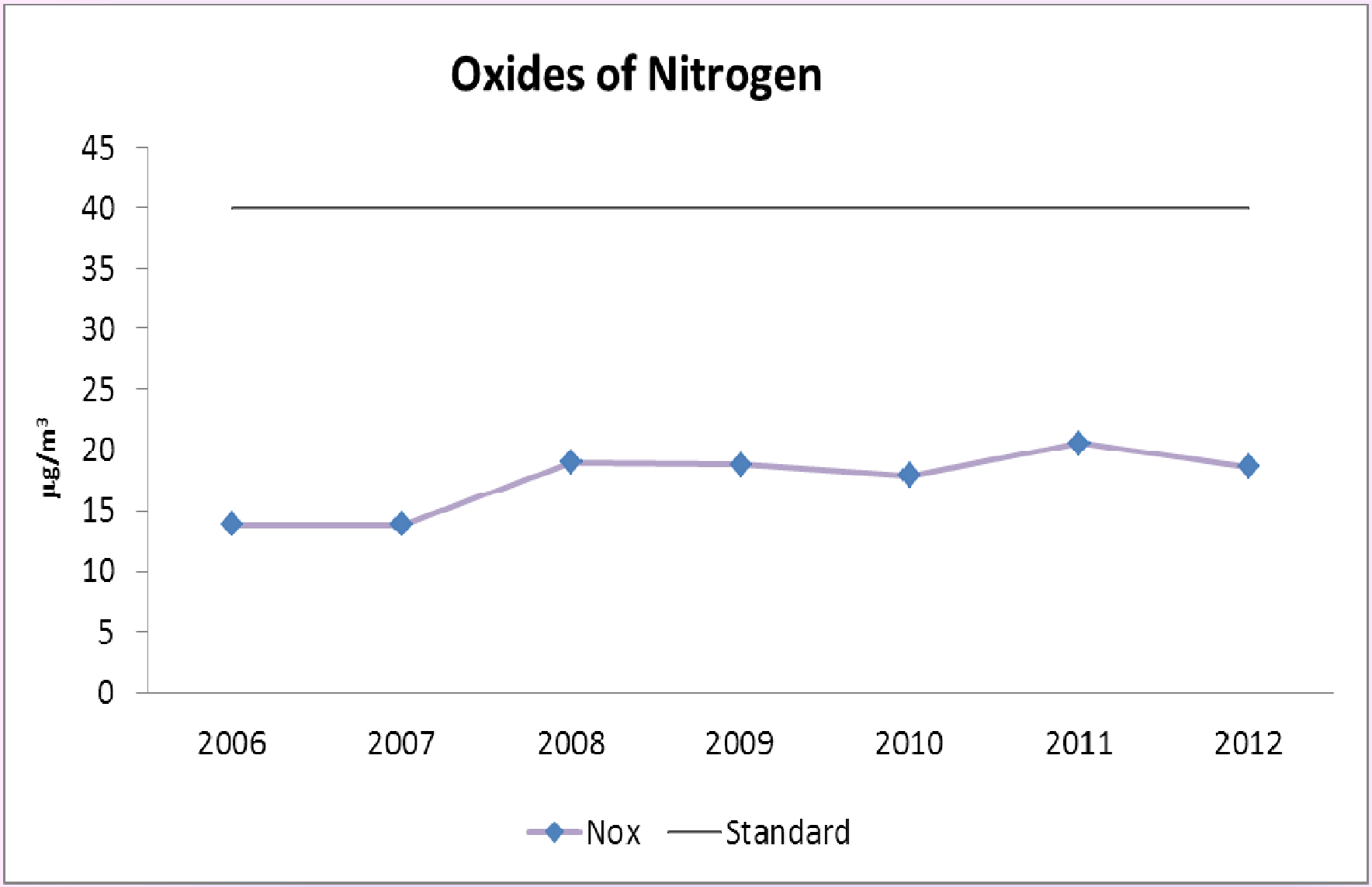

Oxides of Nitrogen (NOx) (µg/m³)
45
40
35
30
25
20
15
10
5
0
µg/m³
18.2
19.7
19.1
20.6
15.7
Office Premises
IRC Village
Capital Police Station
Palasuni
Patrapada
Locations
NOx
Standard

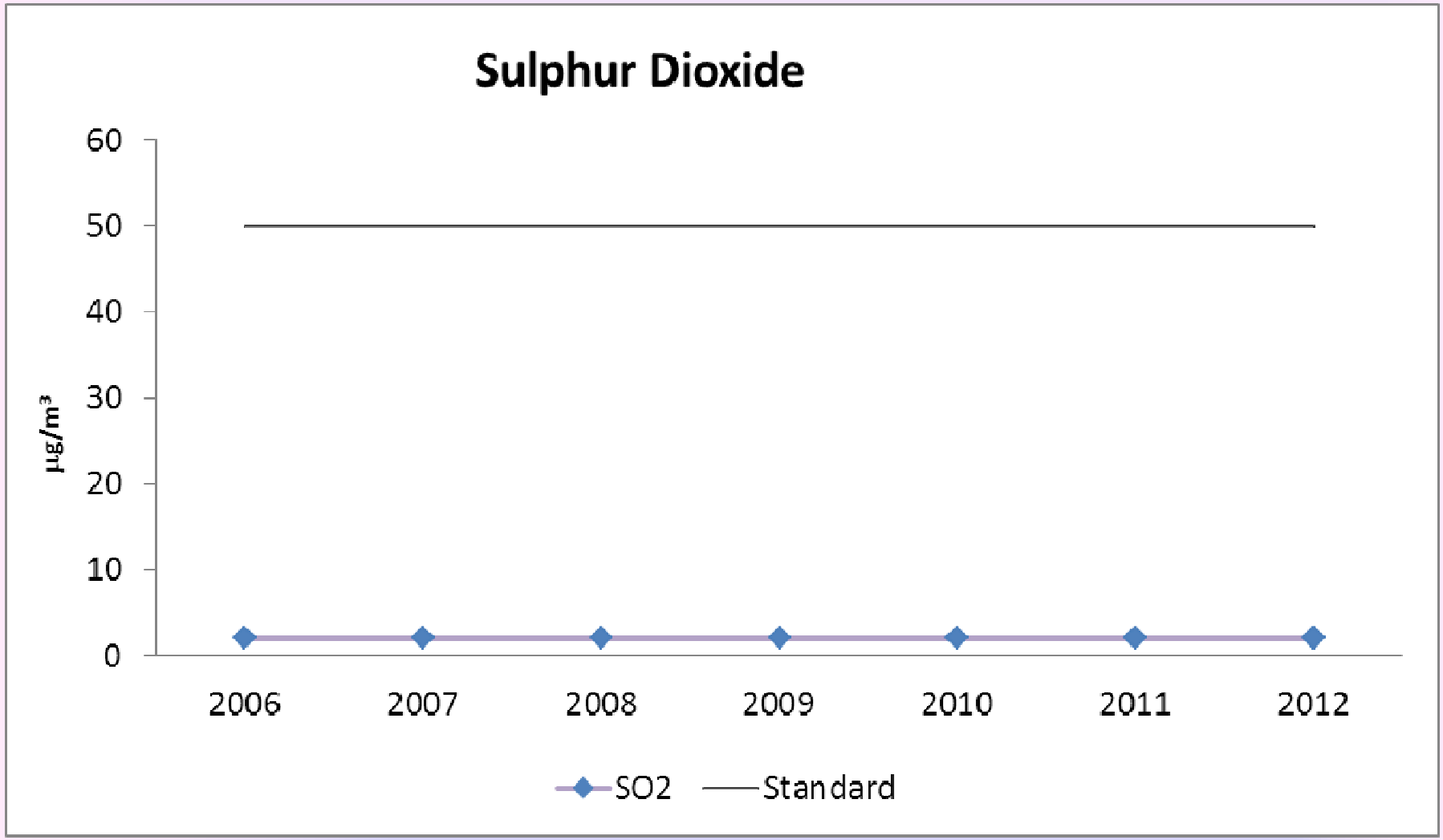

Sulphur Dioxide (SO_2) ($\mu g/m^3$)
60
50
40
30
20
10
0
$\mu g/m^3$
2
2
2
2
2
Office Premises
IRC Village
Capital Police Station
Palasuni
Patrapada
Locations
SO2
Standard

Trend in Annual Average Concentration of air pollutant of Bhubaneswar City (2006-2012)

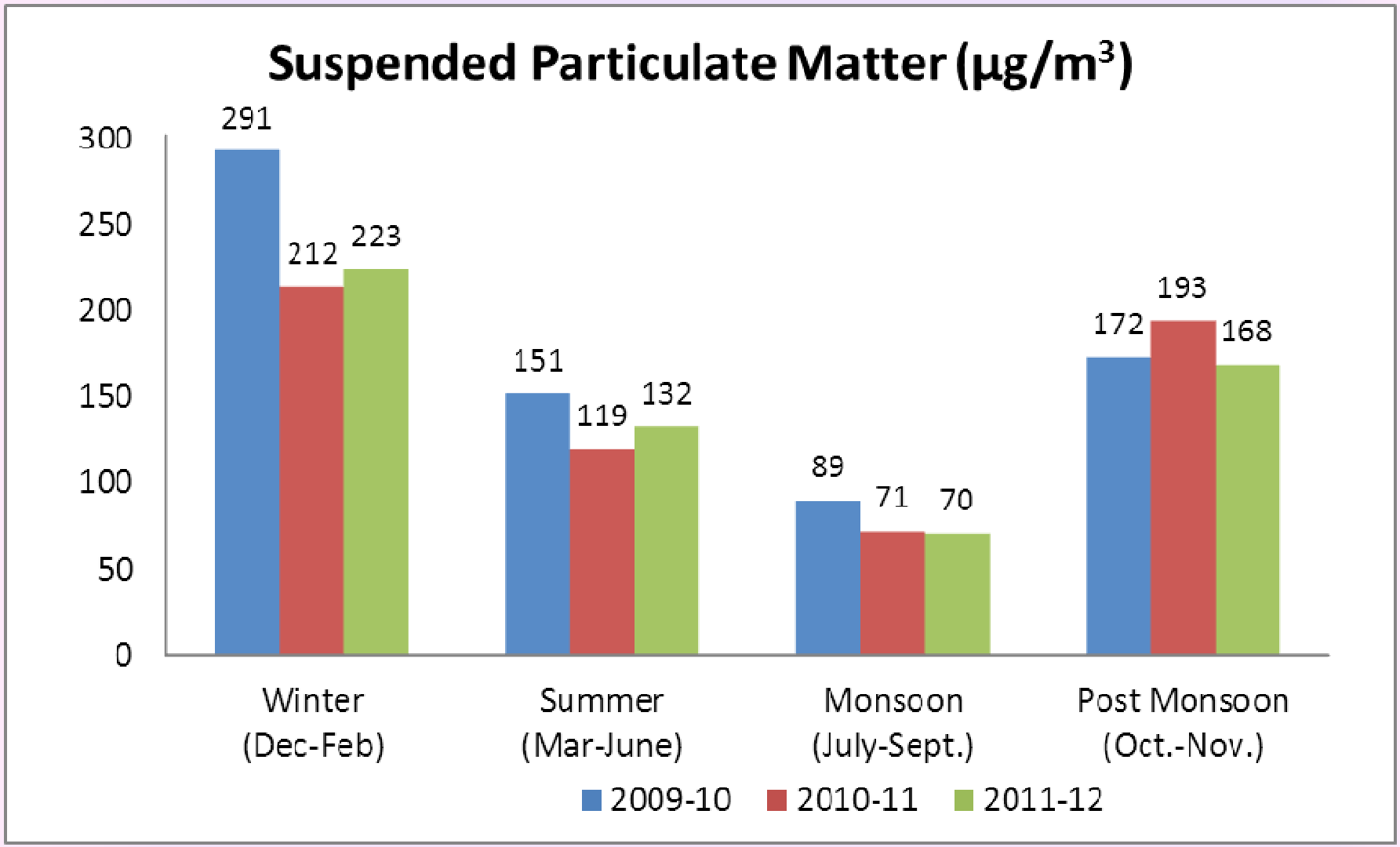


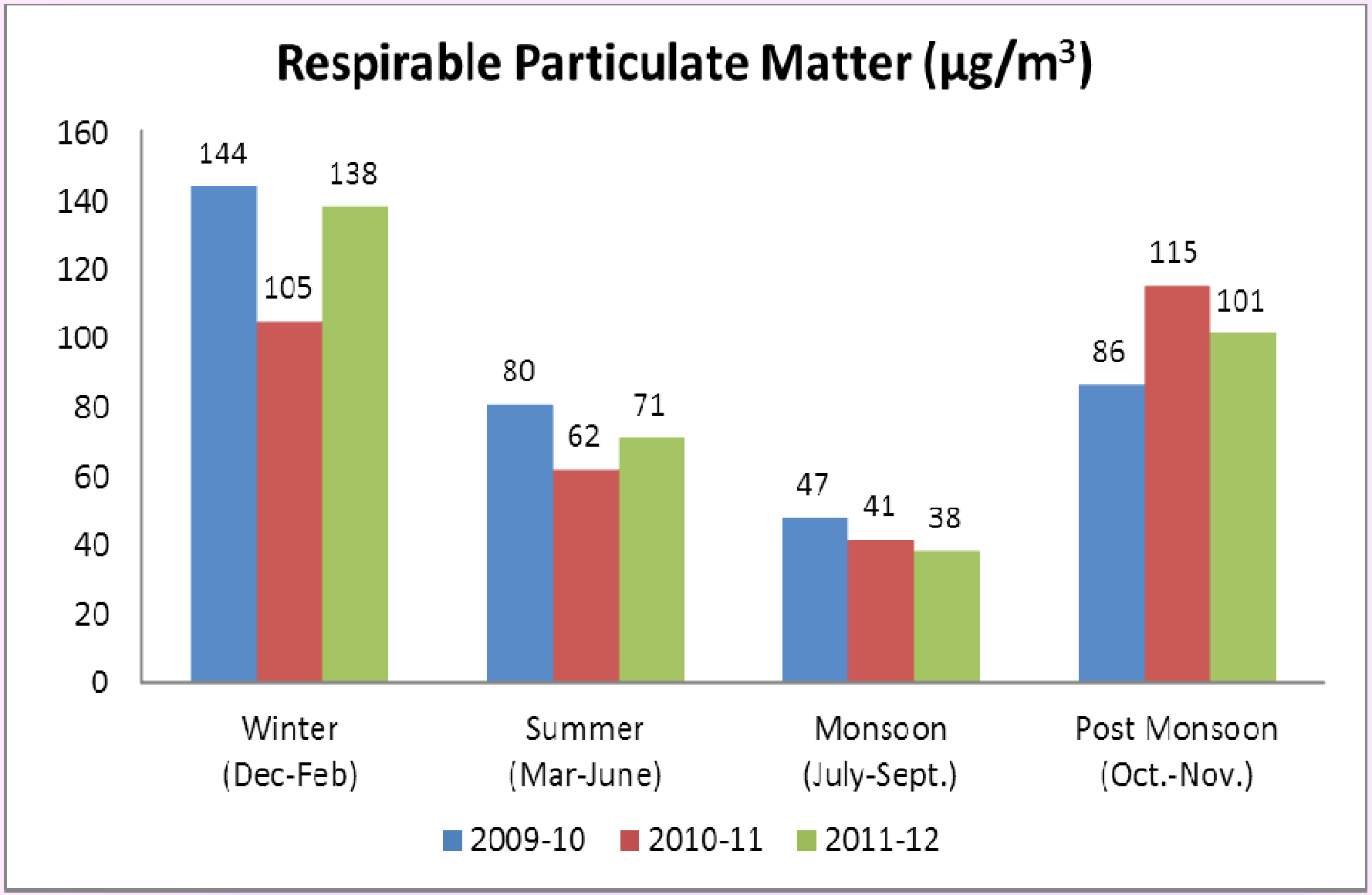

Respirable Suspended Particulate Matter
140
120
100
80
60
40
20
0
µg/m3
2006
2007
2008
2009
2010
2011
2012
RSPM
Standard

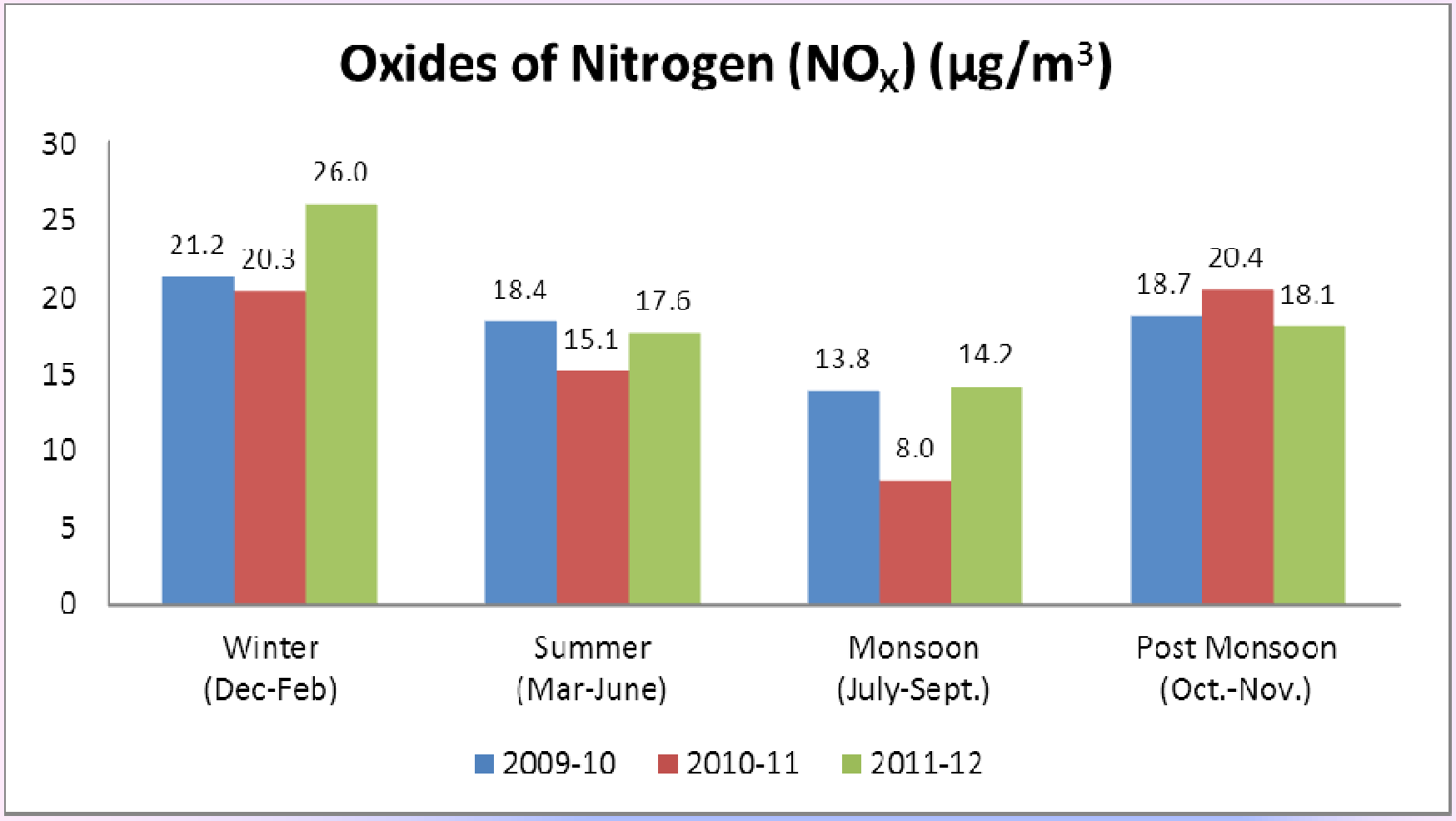

Oxides of Nitrogen
45
40
35
30
25
20
15
10
5
0
µg/m³
2006
2007
2008
2009
2010
2011
2012
Nox
Standard


Sulphur Dioxide
60
50
40
30
20
10
0
µg/m³
2006
2007
2008
2009
2010
2011
2012
SO2
Standard

Seasonal Variation of air pollutant of Bhubaneswar City (2009-2012)




Respirable Particulate Matter (µg/m3)
160
140
120
100
80
60
40
20
0
144
105
138
80
62
71
47
41
38
86
115
101
Winter (Dec-Feb)
Summer (Mar-June)
Monsoon (July-Sept.)
Post Monsoon (Oct.-Nov.)
2009-10
2010-11
2011-12


Oxides of Nitrogen (NO_x) (µg/m^3)
30
25
20
15
10
5
0
21.2
20.3
26.0
18.4
15.1
17.6
13.8
8.0
14.2
18.7
20.4
18.1
Winter (Dec-Feb)
Summer (Mar-June)
Monsoon (July-Sept.)
Post Monsoon (Oct.-Nov.)
2009-10
2010-11
2011-12

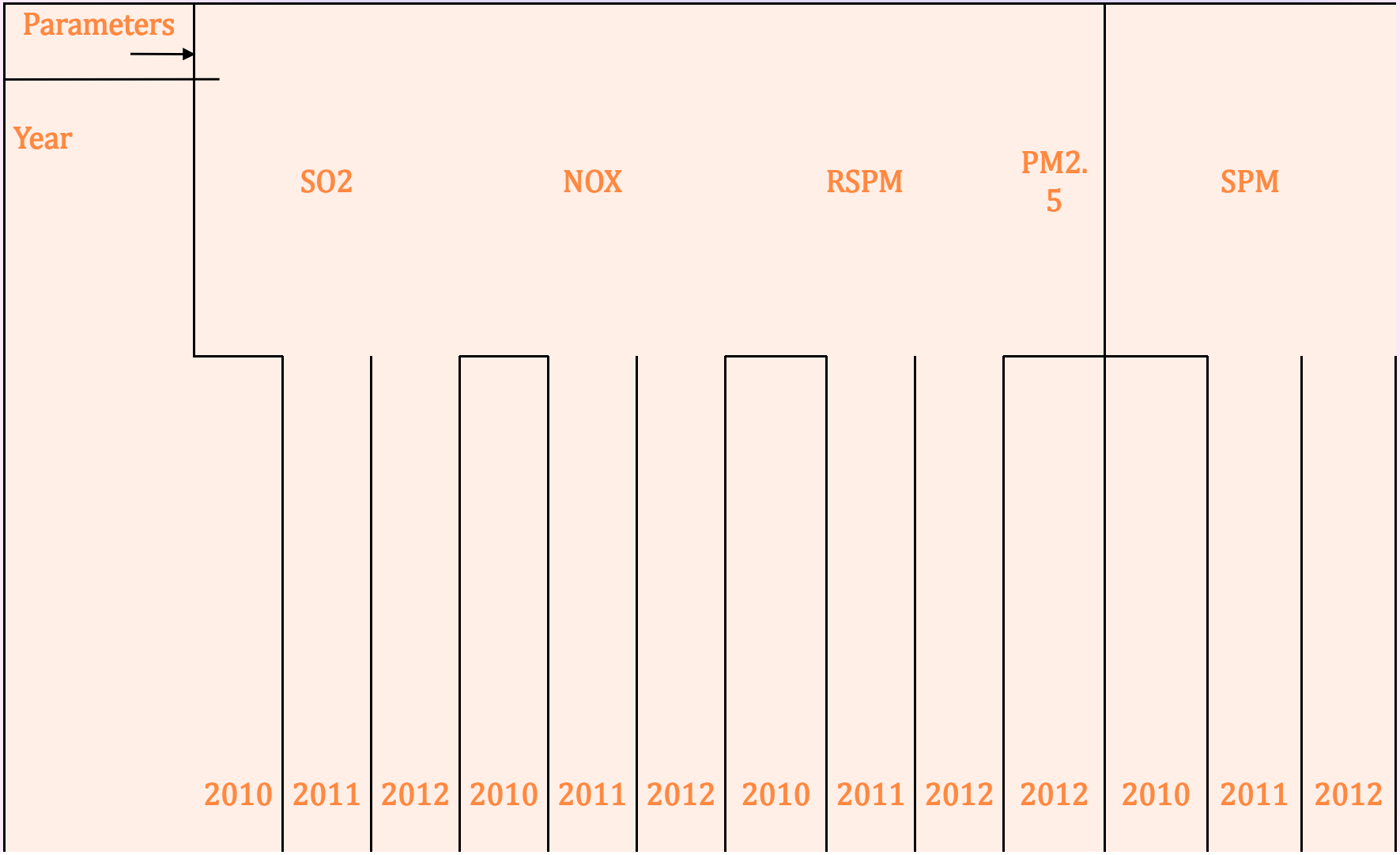
Categorisation of Air Quality as per Exceedence Factor

$$\text{Exceedence factor (E F)} = \frac{\text{Observed annual mean concentration of criteria pollutant}}{\text{Annual Standard for the respective pollutant of the area class}}$$

The four air quality categories are,

Critical pollution (C)	:	when EF is more than 1.5
High pollution (H)	:	when EF is between 1.0 and 1.5
Moderate pollution (M)	:	when EF is between 0.5 and 1.0
Low pollution (L)	:	when EF is less than 0.5

Air Quality on the basis of EF values (2010-2012)



IMPORTANT METEOROLOGICAL FACTORS AFFECTING AIR POLLUTION

Concentration of air pollutants depend not only on the quantity of pollutants emitted from the sources but also on the ability of the atmosphere to either absorb or to disperse these emission. The important factors are -

- Wind direction and Speed
- Atmospheric Stability and Temperature Inversions
- Precipitation
- Humidity

SOURCES OF EMISSION AND ESTIMATION OF POLLUTION LOAD

Domestic

Emission Factor for Different Fuels Used in Domestic Sector

Type of Fuel	Emission Factor (Kg/T)				
	SPM	SO2	NOx	HC	CO
Wood/Cow Dung Cake	13.7	0.5	5	1	1
Coal	10	19(s)	1.5	10	45
Kerosene	3	17(s)	2.3	0.4	0.25
LPG	0.42	0.02(s)	1.8	0.17	0.44

Source: WHO Publication (No.62)

Industrial

Emission Factor for Different Fuels Used in Industrial Sector

Type of Fuel	Emission Factor (Kg/T)				
	SPM	SO2	NOx	HC	CO
Coal	6.5(A)	19 (S)	7.5	0.5	1
Fuel Oil Residual (Furnace Oil)	2.87	19 (S)	7.5	0.37	0.52
Oil distillate (HSD/Kerosene)	2.13	20.1 (S)	7.5	0.41	0.59
LPG	0.38	0.02 (S)	2.6	0.065	0.35
Natural Gas	0.34	20(S)	3.6	0.058	0.32

Source: WHO publication (No.62)

Vehicular

Emission & Deterioration Factor of Different Type of Vehicles

Name of the Vehicle	Deterioration factor (0 – 5 years)				Emission factor (g/Km)			
	SPM	NOx	HC	CO	SPM	NOx	HC	CO
2 Wheeler	1.3	1.3	1.3	1.3	0.05	0.3	0.7	2.2
3 Wheeler	1.7	1.7	1.7	1.7	0.08	0.11	2.05	4.3
Car/Taxi (PCD)	1.28	1	1	1.14	0.07	0.5	0.13	0.9
Busses	1.355	1	1	1.18	0.56	12	0.87	3.6
Trucks / Tractors	1.595	1	1	1.33	0.28	6.30	0.87	3.6

Source: CPCB Publication (Transport Fuel Quality for Year 2005)

SUGGESTIVE MEASURES FOR IMPROVEMENT OF AMBIENT AIR QUALITY

- Improvement of road conditions
- Effective traffic planning and management to relieve congestion, particularly at the traffic intersections on peak hours
- Vehicles in use beyond the certain number of years and with old technology should not be permitted on the roads
- Condition of the vehicle should be strictly checked
- Use of LPG /clean fuel should be promoted for domestic / vehicular use
- Fuel efficient kerosene stoves and improved chullas should be encouraged
- Adulteration of automobile fuel and lubricants should be regulated
- Improvement of fuel quality – reduction in sulphur / lead etc.
- Improvement in Engine efficiency – Bharat stages IV
- Prohibition on open burning of dry leaves, old tyres, rags, plastic, paper and other wastes
- Increase in green cover in the cities and towns

Thank You

HEIGHT AND SURFACE INFLUENCE ON WIND SPEED

HEIGHT ABOVE GROUND LEVEL(m.)	RELATIVE WIND SPEED OVER DIFFERENT SURFACES IN PERCENT OF WIND SPEED		
	TOWN CENTERS,TALL BUILDINGS	SUB URBAN DISTRICTS ,FOREST AREAS	FLAT LAND, SEA
500	100	100	100
300	82	92	100
100	53	68	86
30	32	48	71
10	21	36	60
3	13	25	49

- SOURCE: IS 13736(PART 2/SEC2): 1993,IEC PUB 721-2-2(1988)