

Revised National Ambient Air Quality Standards

The Ministry of Environment and Forest (MoEF), Govt of India, vide gazette notification, G.S.R826 (E), dated 16.11.2009 have notified the National Ambient Air Quality Standards by amending the Environment (Protection) Rules 1986.

The following are the major changes have been effected.

- As against **three** [(i) **Industrial Area** (ii) **Residential, Rural & other areas** (iii) **Sensitive Area**] areas, the new standards is applicable for only two areas viz. (i) Industrial , Residential , Rural, and other areas (ii) Ecologically Sensitive Area (Notified by Central Government)
- The Industrial area, Residential, Rural, and other areas have been clubbed, Ecologically Sensitive area to be notified by Central Government.
- The new parameters included are particulate matter size less than 2.5 μm **OR** PM2.5 $\mu\text{g}/\text{M}^3$, Ozone, ammonia (NH_3), Benzene , Benzo(a)pyrene(BaP) , Arsenic (As) and Nickel (Ni)
- Ambient air quality data generated under National Ambient Air Quality Monitoring Programme (NAMP) has been compared with revised national ambient air quality standards for the year 2010-11

Revised National Ambient Air Quality Standards (MoEF notification G.S.R 826(E), dated 16.11.2009)

Sl. No	Pollutant	Time Weighted Average	New Standards (Schedule VII, Rule 3 (3B) 16 th Nov 2009		Methods of measurement
			Concentration in ambient air		
			Industrial Area Residential, Rural & other Areas	Ecologically sensitive area (Notified by Central Govt)	
1	Sulphur Dioxide(SO ₂)	Annual Avg*	50.0 $\mu\text{g}/\text{m}^3$	20.0 $\mu\text{g}/\text{m}^3$	-Improved West and Gaeke method -Ultraviolet fluorescence
		24 hours**	80.0 $\mu\text{g}/\text{m}^3$	80.0 $\mu\text{g}/\text{m}^3$	
2	Oxides of Nitrogen as NO ₂	Annual Avg*	40.0 $\mu\text{g}/\text{m}^3$	30.0 $\mu\text{g}/\text{m}^3$	-Modified Jacob and Hochheise (Sodium Arsenite) -Chemiluminescence
		24 hours**	80.0 $\mu\text{g}/\text{m}^3$	80.0 $\mu\text{g}/\text{m}^3$	
3	Particulate matter (size less than 10 μm)	Annual Avg*	60.0 $\mu\text{g}/\text{m}^3$	60.0 $\mu\text{g}/\text{m}^3$	-Gravimetric -TOEM -Beta attenuation
		24 hours**	100.0 $\mu\text{g}/\text{m}^3$	100.0 $\mu\text{g}/\text{m}^3$	
4	Particulate matter (size less than 2.5 μm)	Annual Avg*	40.0 $\mu\text{g}/\text{m}^3$	40.0 $\mu\text{g}/\text{m}^3$	-Gravimetric -TOEM -Beta attenuation
		24 hours**	60.0 $\mu\text{g}/\text{m}^3$	60.0 $\mu\text{g}/\text{m}^3$	
5	Lead (Pb)	Annual Avg*	0.50 $\mu\text{g}/\text{m}^3$	0.50 $\mu\text{g}/\text{m}^3$	-AAS/ICP method for sampling on EPM2000 or Equivalent Filter paper -ED-XRF using Teflon filter paper
		24 hours**	1.0 $\mu\text{g}/\text{m}^3$	1.0 $\mu\text{g}/\text{m}^3$	
6	Carbon	8 hours**	2.0 mg/m ³	2.0 mg/m ³	-Non Dispersive Infra Red (NDIR)

	Monoxide (CO)	1 hour	4.0 mg/m ³	4.0 mg/m ³	spectroscopy
7	Ozone	8 hours**	100.0 µg/m ³	100.0 µg/m ³	-Photometric -Chemiluminescence -Chemical method
		1 hour	180.0 µg/m ³	180.0 µg/m ³	
		24 hours**	60.0 µg/m ³	60.0 µg/m ³	
8	Ammonia (NH ₃)	Annual Avg*	100.0 µg/m ³	100.0 µg/m ³	-Chemiluminescence -Indo-Phenol Blue method
		24 hours**	400.0 µg/m ³	400.0 µg/m ³	
9	Benzene	Annual Avg*	5.0 µg/m ³	5.0 µg/m ³	-GC based continuous analyzer -Adsorption/desorption followed by GC analysis
10	Benzo(a) pyrene	Annual Avg*	1.0 ng/m ³	1.0 ng/m ³	-Solvent extraction followed by GC/HPLC extraction
11	Arsenic	Annual Avg*	6.0 ng/m ³	6.0 ng/m ³	AAS/ICP method for sampling on EPM2000 OR Equivalent Filter paper
12	Nickel		20.0 ng/m ³	20.0 ng/m ³	-AAS/ICP method for sampling on EPM2000 OR Equivalent Filter paper

- *Annual Arithmetic mean of minimum 104 measurements in a year taken twice a Week 24 hourly at uniform interval,
- ** 24 hourly / 8 hourly or 1 hourly monitored values as applicable shall be complied with 98 % of the time in a year. However, 2% of the time, they may exceed the limits but not on two consecutive days of monitoring.

Ambient Air Quality Monitoring: National Ambient Air Quality Monitoring Programme (NAAQM), Bangalore City



The Board is monitoring ambient air quality of Bangalore city at 10 locations using manual equipments under National Ambient Air Quality Monitoring Programme (NAMP) covering Industrial Area, Mixed Urban Area and Sensitive Area.

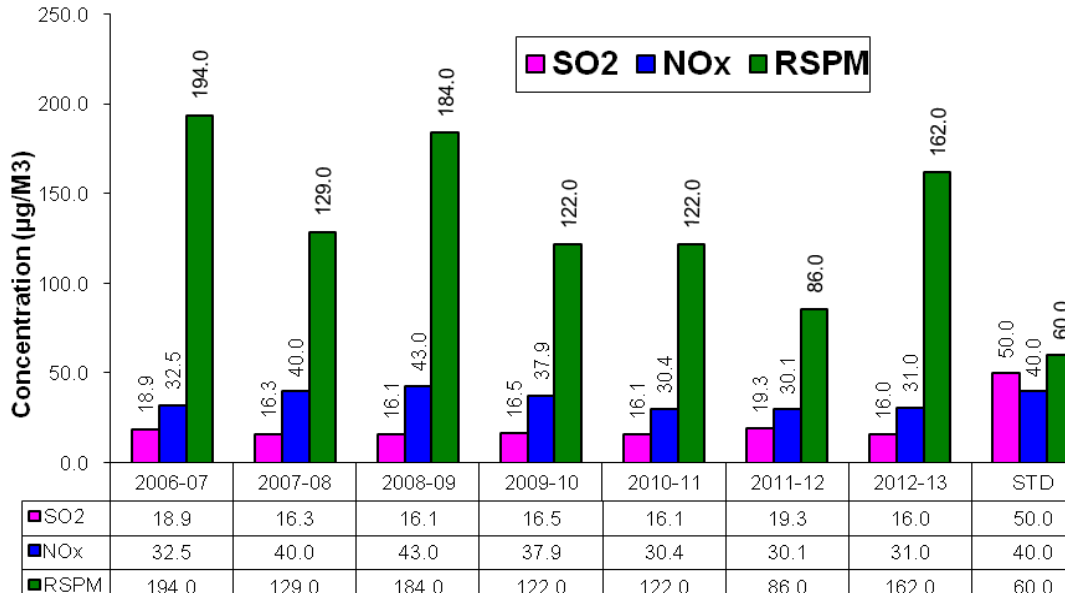
Further, the Board has established two Continuous ambient air quality monitoring stations (CAAQMS) one at City Railway station and other at Regional Office complex at S.G Halli. Monitoring is being carried out on 24 hourly basis for RSPM, SO₂, NO₂ and CO .

Under this programme ambient air samples were collected and analyzed during the year **2006-13** and compared to revised national ambient air quality standards (16.11.2009). The air quality in different zones in Bangalore is as under:

- **Industrial Zone:** Three ambient air quality monitoring stations have been set up in the industrial zones of Bangalore city viz.
 - i) Graphite India Limited
 - ii) KHB Industrial Area and
 - iii) Peenya Industrial area

i) Ambient Air Quality at Graphite India Ltd., Bangalore

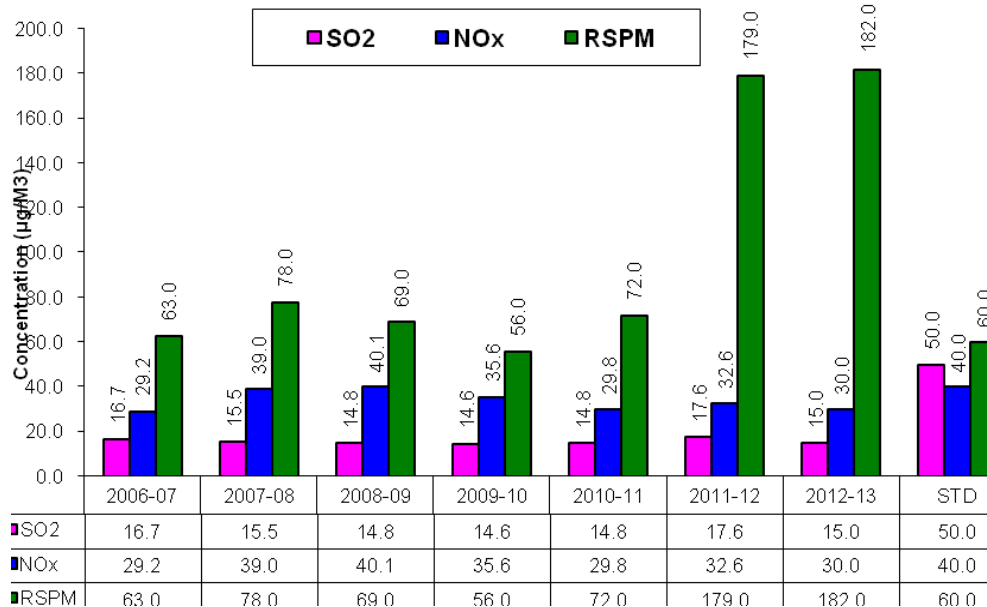
Annual average values of air pollutants at Graphite India , White Field Road, as per the revised standards during the years 2006-13



RSPM values have exceeded the national limit (60.0 µg/M3) in all measured years whereas SO2 and NOx are within the limit during the period 2006-2013. High levels of RSPM may be due to the construction activities and vehicular movement and road dust.

ii) Ambient Air Quality at KHB Industrial Area, Yelahanka, Bangalore

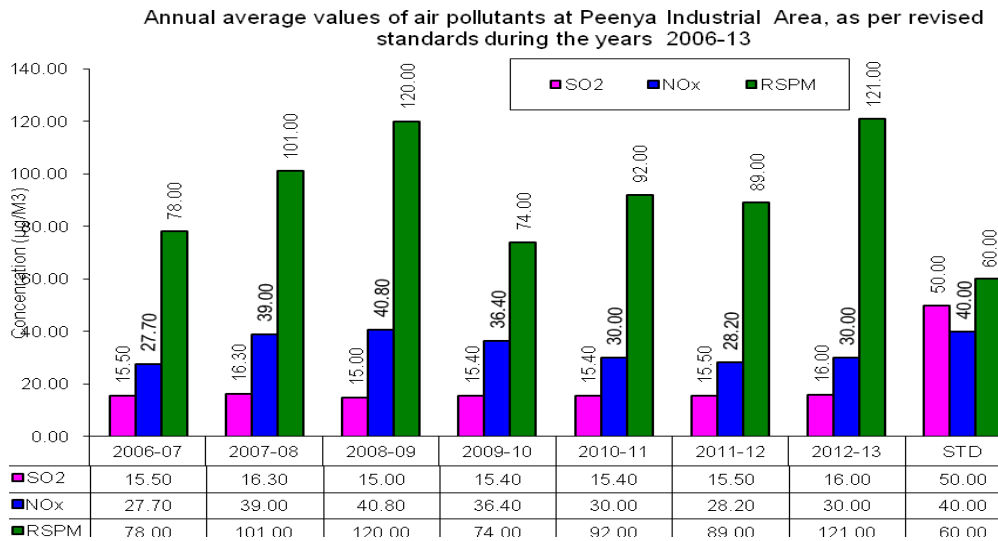
Annual average values of air pollutants at KHB Indl Area, as per revised standards during the years 2006-13



RSPM values are exceeded the national ambient air quality standard (60.0 µg/M3). During 2011-2012 and 2012-2013 RSPM values are around 3 fold higher than national limit, may be

due to construction of International Air Port Road whereas SO₂ and NO₂ are within the limit during the measured years 2006-13.

iii) Ambient Air Quality at Peenya Industrial Area, Bangalore

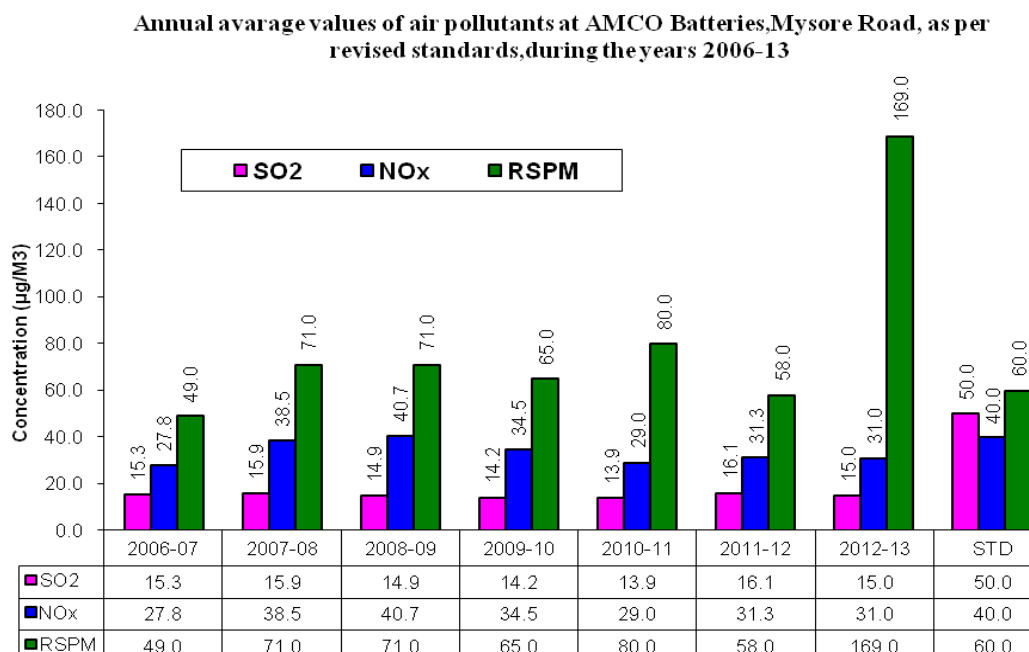


RSPM values are exceeded the national ambient air quality standard (60.0 µg/M³) and SO₂ and NO_x are within the limit during 2006-13

Mixed urban zone: Two ambient air quality monitoring stations have been set up in the mixed zone (Residential, Rural & Other areas) of Bangalore city viz.

- i) AMCO batteries Mysore Road. and ii) Yeshwanthpur Police Station.

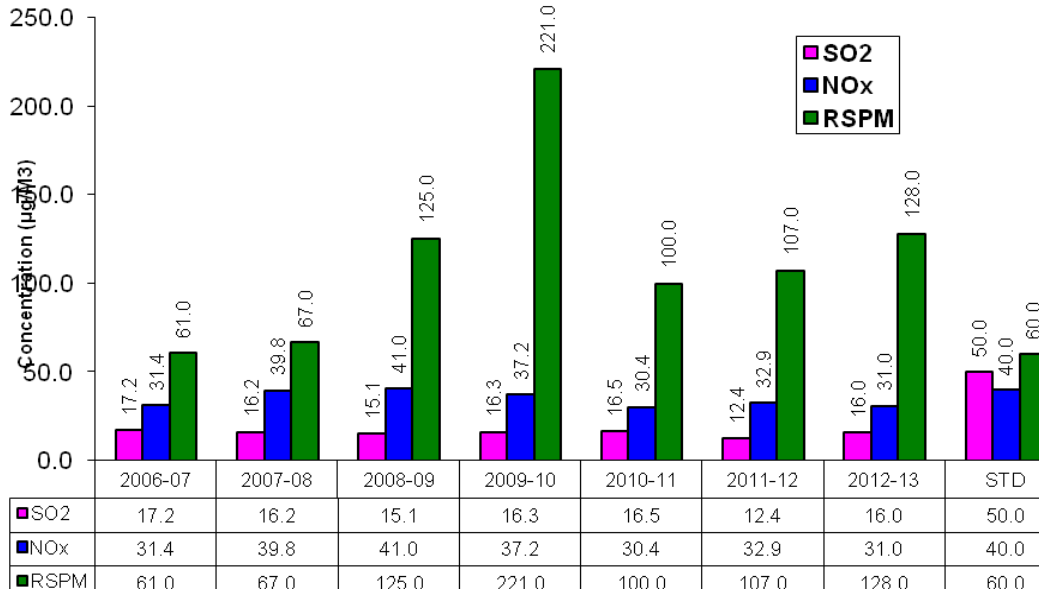
i) Ambient Air Quality at AMCO Batteries, Bangalore



RSPM values have exceeded the national limit (60.0 µg/M³) and SO₂ and NO_x are within the limit during the years 2006-2013

Ambient Air Quality at Yeshwanthapur Police Station, Bangalore

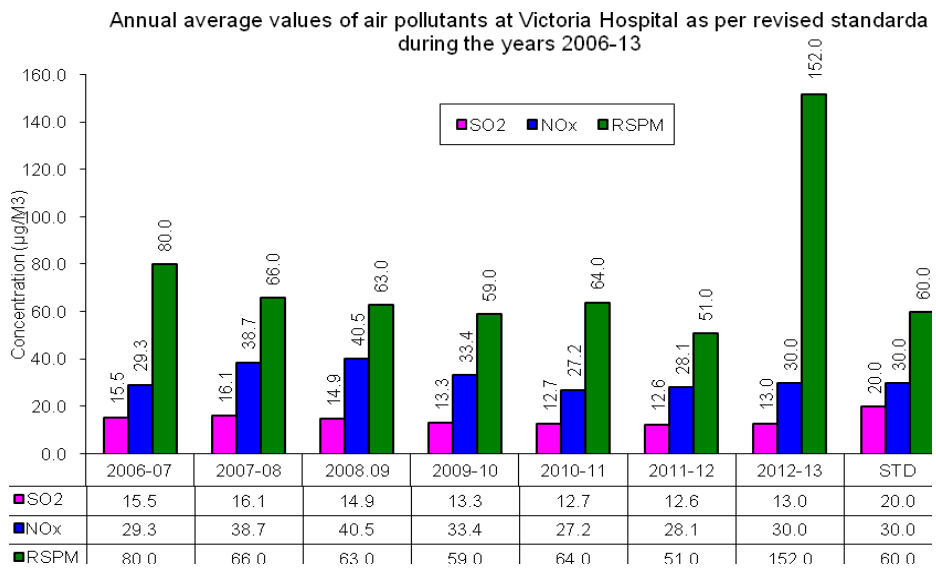
Annual average values of air pollutants at Yeshwanthapur Police Station as per revised standards during the year 2006-13



RSPM values have exceeded the national ambient air quality standard (60.0 $\mu\text{g}/\text{M}^3$) and SO₂ and NO_x are within the limit during 2006-13.

Sensitive zone: One ambient air quality monitoring station is at sensitive zone of Bangalore city .ie at Victoria Hospital. .

i) Ambient Air Quality at Victoria Hospital Bangalore



RSPM values have exceeded the national ambient air quality standard (60.0 $\mu\text{g}/\text{M}^3$) and SO₂ and NO_x are within the limit during the years 2006-2013,

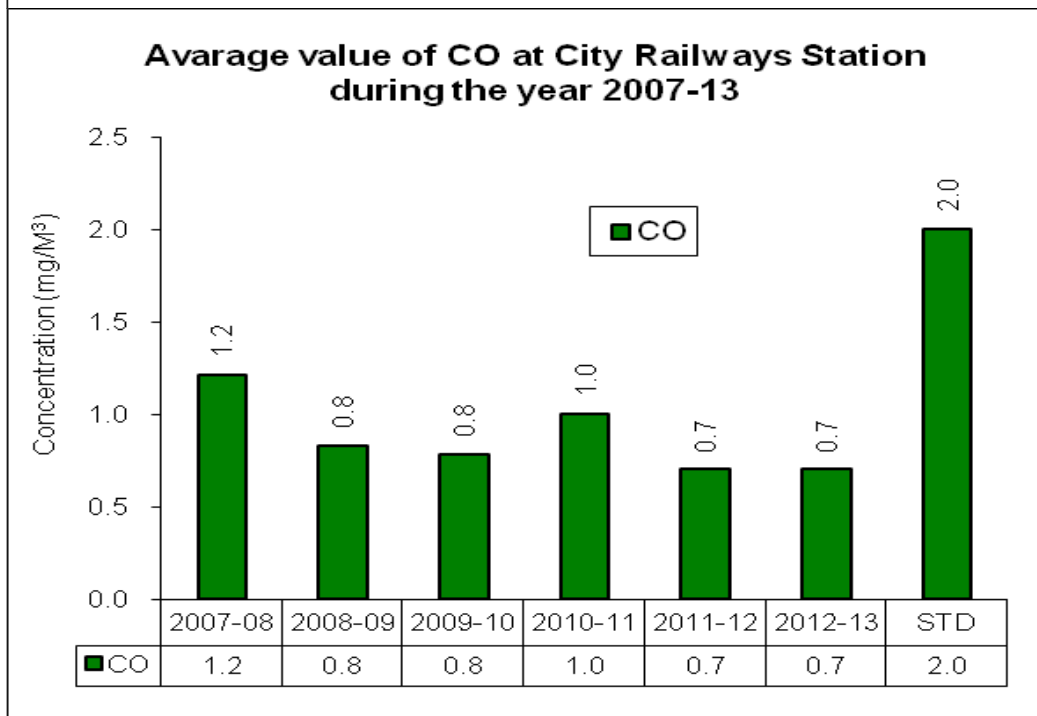
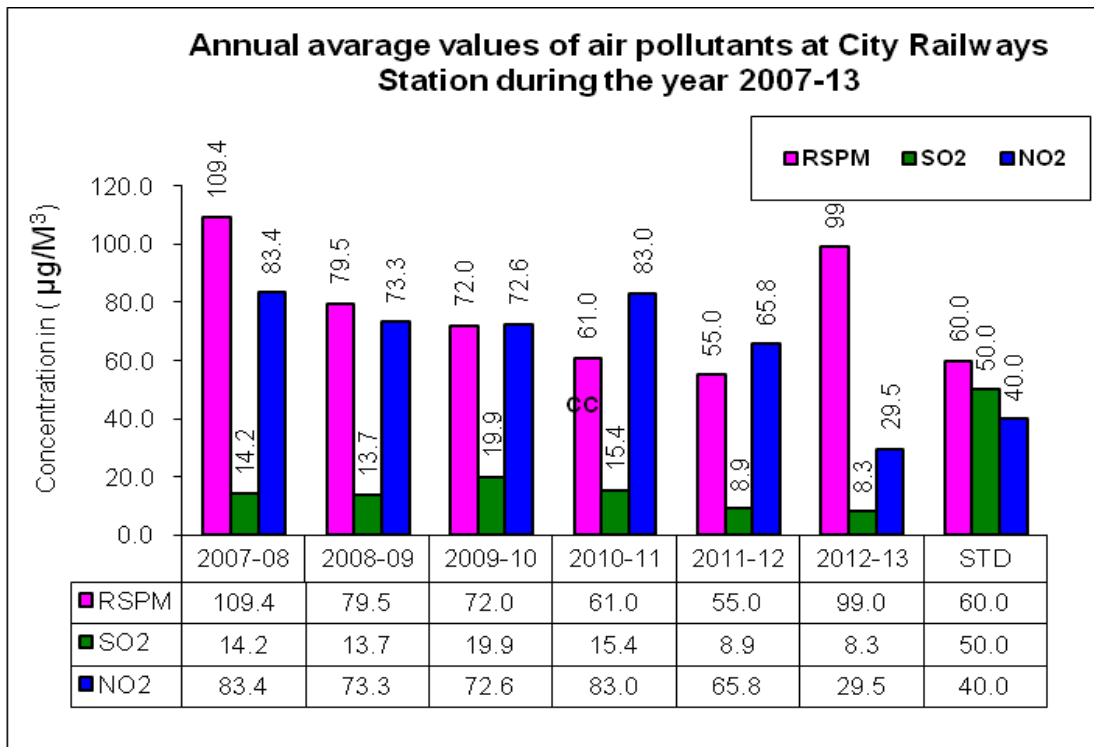
II. Continuous Ambient Air Quality Monitoring (CAAQM) Stations at Bangalore City

Karnataka State Pollution Control Board has installed and commissioned two Continuous Ambient Air Quality Monitoring Stations (CAAQMS) i.e, one at City Railway Station, Bangalore and another at Nisarga Bhavan, Saneguruvanahalli, Bangalore. The stations are operating on 24 hourly basis for 365 days, the generated data is being sent to CPCB.

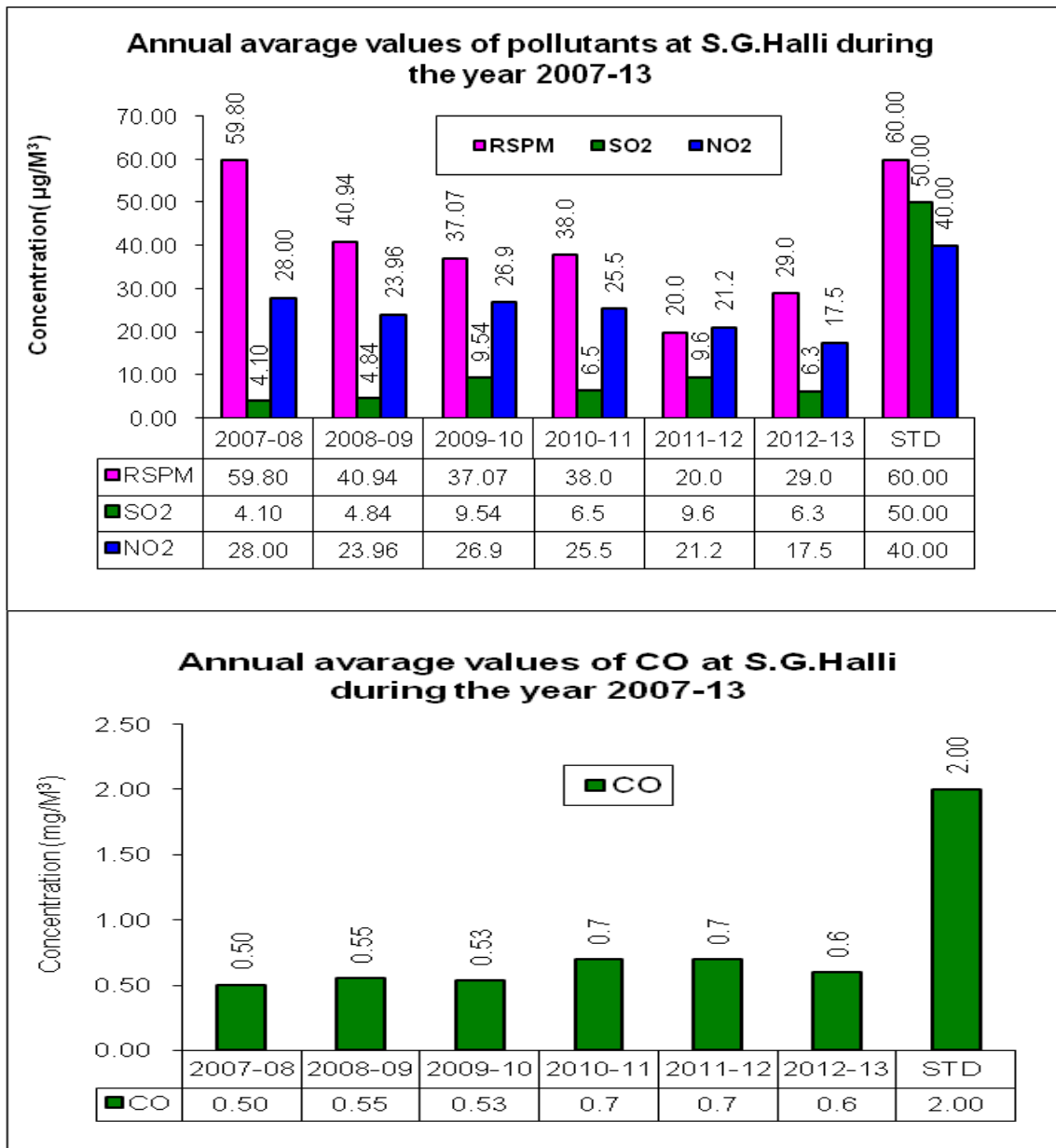
The annual average data (2007-13) generated by CAAQM Stations at City Railway Station and Regional Office Complex S.G Halli are as follows.



Continuous ambient air quality monitoring stations, one at City Railway station and other at S.G.Halli, Shivanagar



RSPM and NO_x values are exceeded to the national limit of (60.0 and 40.0 µg/M³) respectively for the period of 2007 -12, During the year 2012-13 , RSPM has exceeded the limit and SO₂, NO_x, and CO values are within the national limit . At City Railway Station Metro work is under progress, hence only RSPM has exceeded and traffic has decreased meanwhile pollutants like SO₂, NO₂ and CO are showing decreasing trend.



The station is located at Residential Area ie at Regional Office Complex, Nisarga Bhavan, Saneguruvanahalli, Bangalore, all measured values are within the national limit during 2007- 13.

Figure 1 Monthly average values of air pollutants City Railway Station (Concentration of pollutants in microgram per cubic meter)

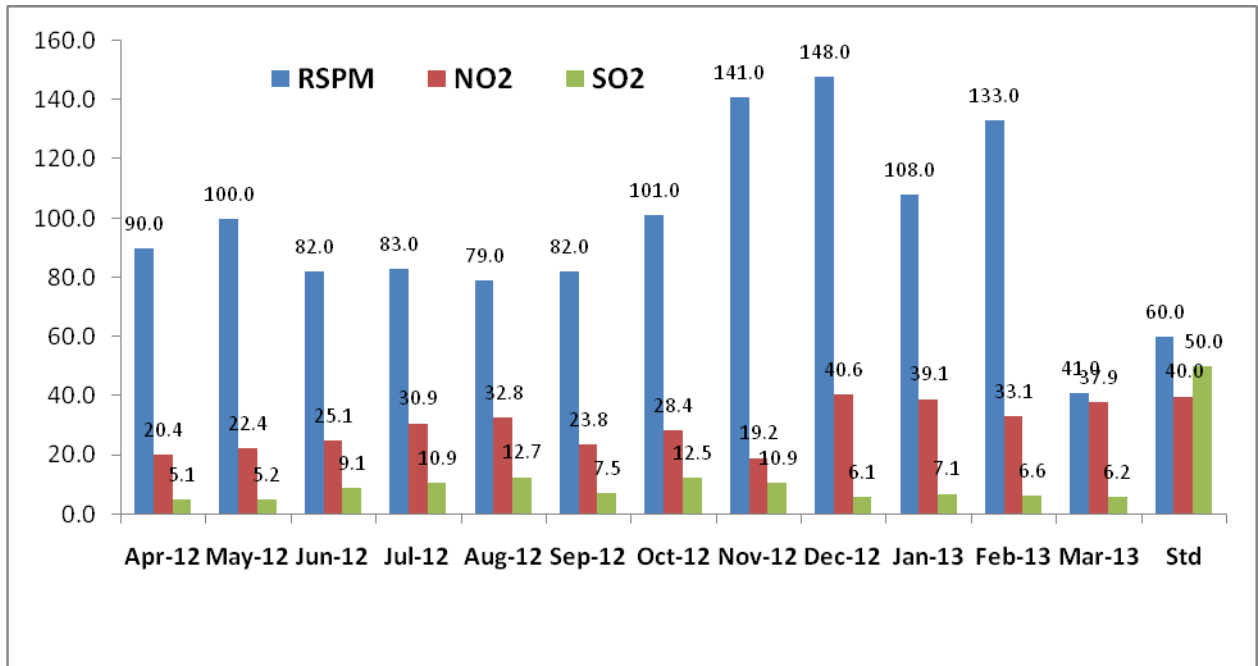
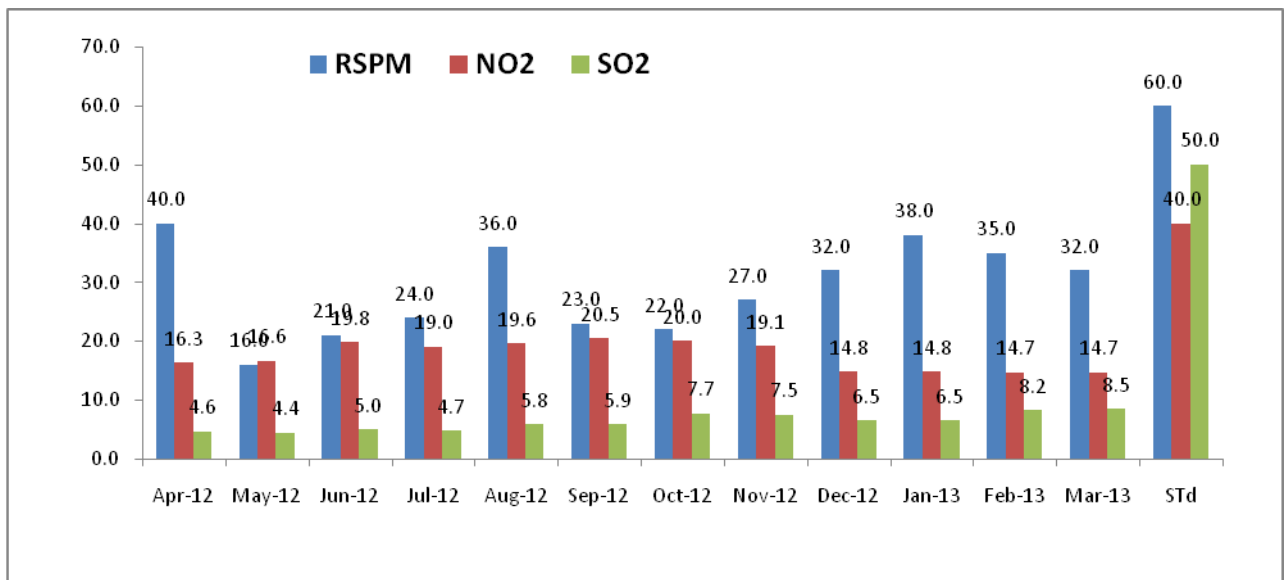


Figure 2 Monthly average values of air pollutants S.G .Halli (Concentration of pollutants in microgram per cubic meter)

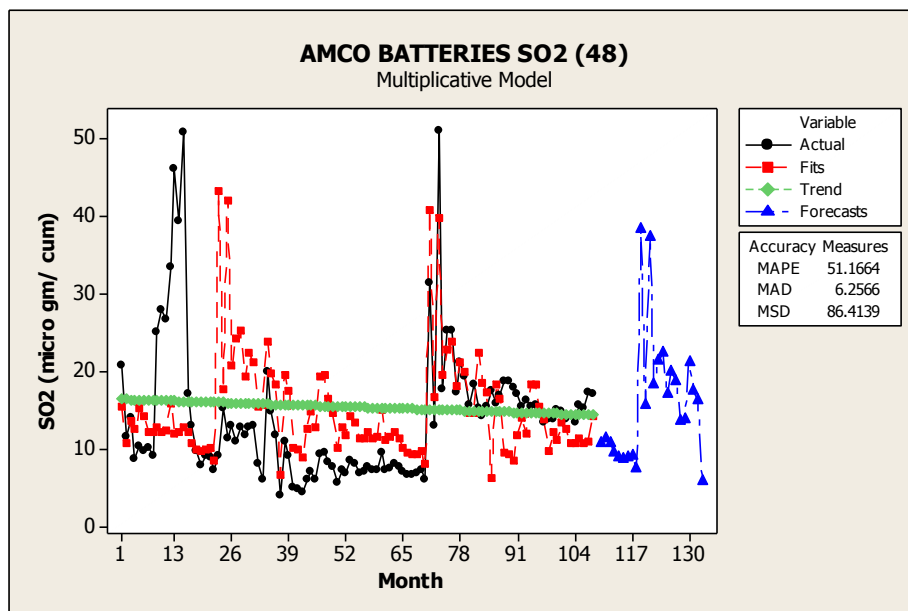


Status & Trends of Ambient Air Quality: Bangalore City

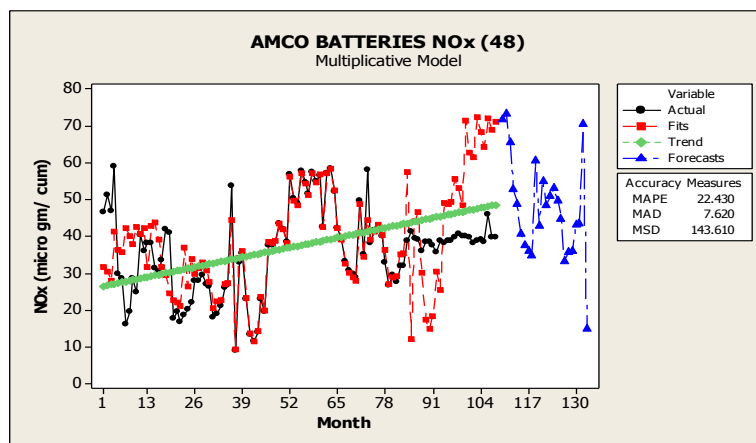
In recent decades, air pollution has become one of the most important problems of megacities. Initially, the main air pollutants of concern were sulphur compounds, which were generated mostly by burning coal. Today, photochemical smog, Oxides of nitrogen, Carbon monoxide, heavy metals, particulate matter-induced primarily from traffic, but also from industrial activities, power generation, and solvents-has become the main source of concern for air quality. It is reported that air pollutants are still a major problem in many cities of the developing world. Air pollution has serious impacts on public health.

Time Series Trends

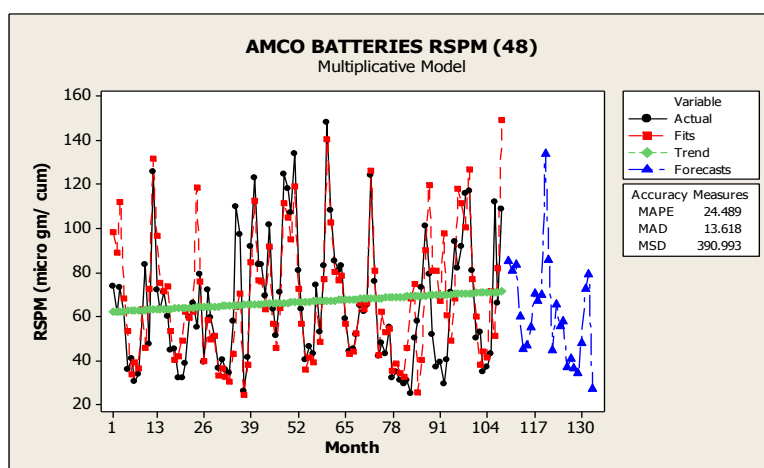
The analysis of time series data for ascertaining ambient air quality Trends carried out at residential areas & Forecast was carried out at two Continuous Ambient air quality monitoring stations (CAAQMS) data using statistical software- Minitab 15. The graphical output from the Minitab15 for the four pollutants is presented below. The figures show the trends of SO₂, NO_x, and RSPM for Moving Averages (MA) of 12, 24, 36 and 48 respectively at AMCO Batteries Mysore Road Bangalore..



It is observed that the concentration of SO₂ showing decreasing trend by 15 -20 % over 10 years. The reason is Sulphur reduction programme of Govt of India (Green Fuel 0.005 % in 11 cities and 0.035 % entire country)



It is observed that the concentration of NO_x is showing an increasing trend by 100 % over 10 years. The reason may be an increase in vehicular population by 258 %



It is also observed that the concentration of RSPM for this site is showing a moderate by 16-20% increase in trend over 10 years. The reason might be re-suspension of road dust, vehicular traffic and construction activities etc.

National Ambient Noise Monitoring Programme (NANMP) :

As per section 5.2.8 (IV) of National Environmental Policy (NEP)-2006, CPCB is in the process of developing Noise Monitoring Network in India. It has decided to include ambient noise as a regular parameter for monitoring in specified urban areas.

The Hon'ble Minister for Environment and Forests, Govt of India has announced the road map for systematic monitoring of ambient noise national noise monitoring network covering 25 cities by 2012 to make Indian cities less noisy. Karnataka is one among the State and in

Bangalore it is proposed to establish 10 continuous monitoring stations. For every continuous monitoring station CPCB will provide 100% capital cost and 50% of operation and maintenance cost. It was proposed to establish five monitoring stations during the reporting year 2010-11 and the remaining five stations is planned for the year 2011-12.

In the 1st phase the State Board has received five monitoring equipments from CPCB and installed at the following locations. The proposed locations for 2nd phase is also indicated below:



Noise monitoring stations installed and working

Sl No.	Station Name	Type of Area	Location	Concerned RO's
1	KSPCB, Parisara bhavan, # 49 Church Street, Bangalore. (City Railway Station)	Commercial area	KSPCB head Office	City-II
2.	KSPCB office Building, Nisarga Bhavan, Sanegravannahalli, Bangalore.	Residential area	CAAQM station of KSPCB	City-III
3.	CAAQM at 29 th main Madival lake, BTM II nd stage, Bangalore	Residential area	CAAQM station of CPCB	City-I
4.	Ace Manufacturing System, Peenya Industrial Area, Bangalore-58.	Industrial Area,	CAAQM station of CPCB	Peenya
5.	BWSSB site No. 137. Kadubidnahalli, Bangalore	Commercial Area	CAAQM station of CPCB	East -II

Noise Levels Other than continuous noise monitoring stations:

The Board during 2012 has monitored ambient noise at different locations other than regular monitoring carried out through continuous noise monitoring stations. The details are as below:

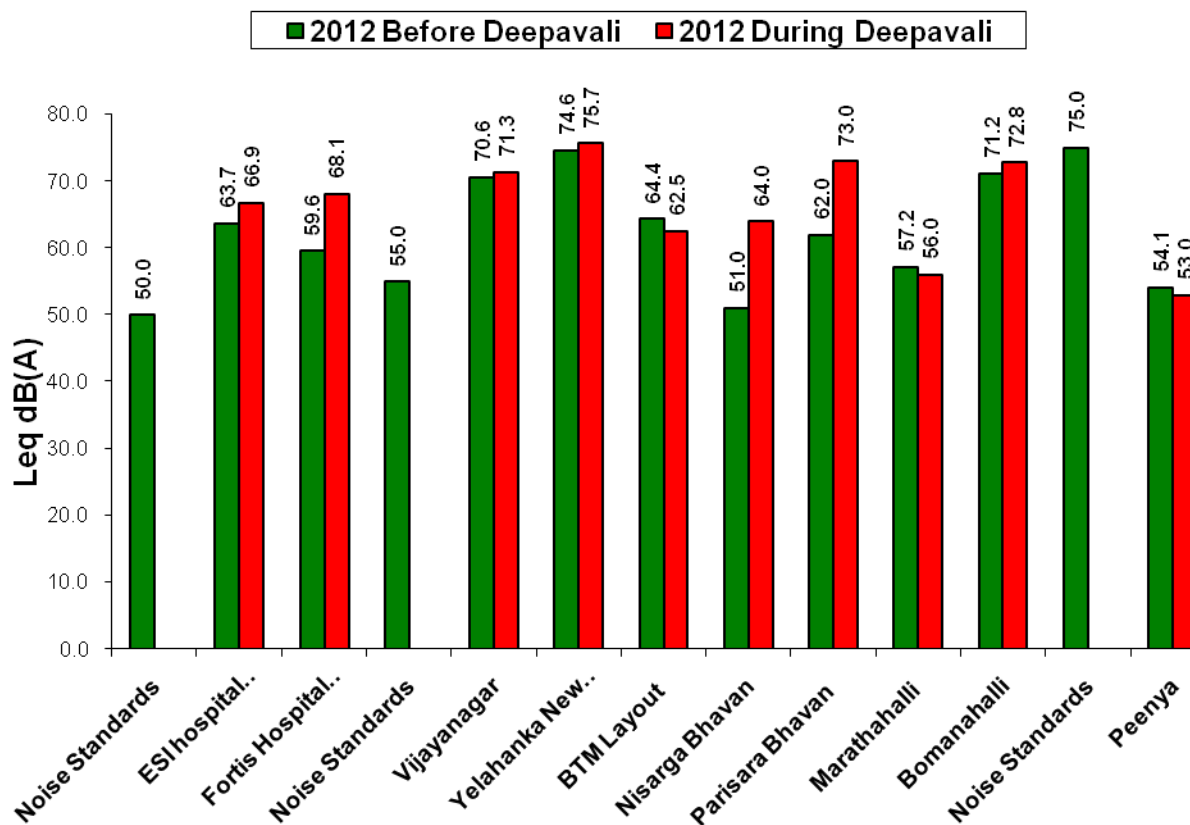
Place of Monitoring	Area	Limit dB(A)	Leq	Status
ITPL, White Field	I	75	74.4	Within the limit
Bommasandra .I.Area	I	75	62.6	Within the limit
Yelahanka I.Area	I	75	71.7	Within the limit
Kormangala	C	65	72.9	Exceeded by 12%
Jallahalli Cross	C	65	86.6	Exceeded by 33 %
Yeshwanthpur	C	65	78.7	Exceeded by 21 %
Ulsoor Near SS Temple	R	55	73.3	Exceeded by 33 %
Kengeri upanagara	R	55	69.2	Exceeded by 25 %
Vijaynagar	R	55	63.3	Exceeded by 15%
ESI Rajainagar	S	50	79.5	Exceeded by 59%
ESI Indiranagar	S	50	85.5	Exceeded by 71 %
Victoria Hospital	S	50	79.0	Exceeded by 58%
Vijaynagar {Night Time (9.00PM to 6.00AM)}	R	45	54.9	Exceeded by 22%
Hanumanthnagar	R	45	54.0	Exceeded by 20%
Hebbal Resid'l Area	R	45	74.8	Exceeded by 66%

Ambient Noise Monitoring during - Deepavali 2012:

Fire crackers generate instantaneous impulsive noise, which when measured in free field condition in impulsive mode, gives peak sound pressure level. It is quite obvious that a number of crackers when bursting serially can easily form a band of continuous noise in the presence of reflecting surfaces. The reverberation of soundwave due to repeated reflection in the surfaces prolongs the time interval of prevailing sound intensity. The continuous band of noise, thus formed, definitely affects the ambient level in close proximity.

Karnataka State Pollution Control Board has conducted ambient noise level monitoring at ten selected locations such ESI hospital Indranagar, Fortis Hospital Nagarbhavi, Vijayanagar, Yelahanka New Town, BTM Layout, Nisarga Bhavan S.G.Halli, Parisara Bhavan Church street, Marathahalli, Bomanahalli and Peenya covering sensitive area, residential areas and Industrial area as per the C.P.C.B guidelines on a normal and festival days (Before Deepavali 2012 and during Deepavali 2012) between 6:00 p.m. and 10:00 p.m. The microphone of the Sound Level Meter fitted with windscreen was placed 1.5m above the ground, and at least 1 m from the façade of the building at each location. Data recorded at each location were used to compute the one-hour equivalent continuous noise level L_{eq} for 6 hour duration. The graph below indicates the noise level at the above monitoring locations.

Ambient noise levels measured in Bangalore city during Deepavali -



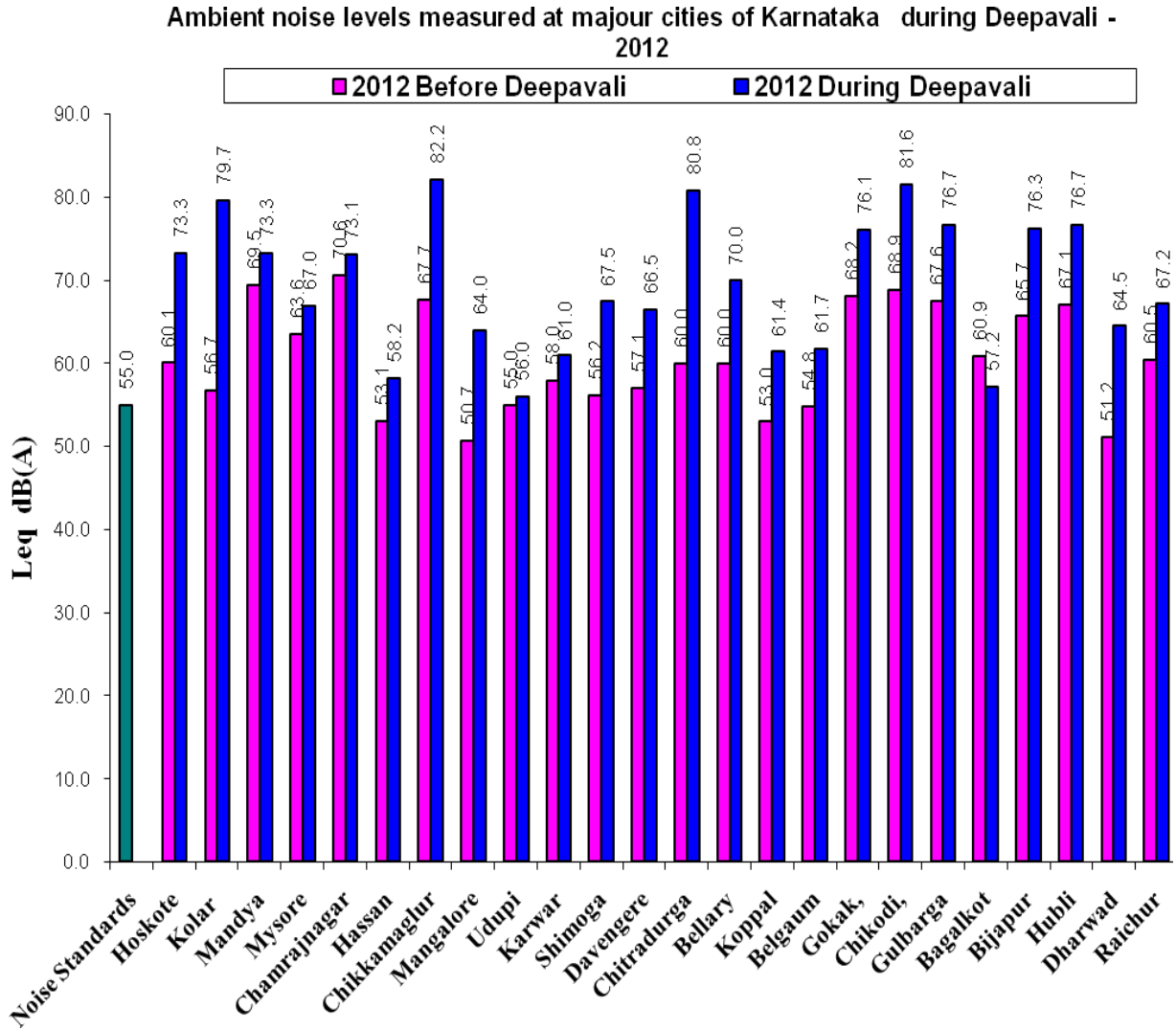
Comparison of Ambient Noise Level on Deepavali days during the year 2011 & 2012 (All the average values are in dB (A))

Sl No	Place of Monitoring	National Noise Limits	Zone	Deepavali 2011	Deepavali 2012	D/I, compared to 2011 Deepavali
1	Vijayanagar Club	55	R	72.5	71.5	1.3 % decrease
2	Indiranagar ESIH	50	S	66.5	66.8	0.5 % decrease
3	Peenya	75	I	57.5	53.0	7.8 % decrease
4	NisargaBhavan	55	R	56.0	64.0	14 % Increase
5	BTM Layout	55	R	54.5	62.5	14.6 % increase
6	ParisaraBhavan	65	C	57.5	73.0	26 % increase
7	Marathahalli	55	R	53.5	56.0	4.6 % increase
8	Yelahanka New-Towm	75	I	88.0	75.7	14 % decrease

Note : Industrial Area , R – Residential Area, C – Commercial Area, S – Sensitive Area

The Board also conducted ambient noise level monitoring during Deepavali 2012 at other 21 cities at residential areas as per the CPCB guidelines in the State viz, Hoskote, Kolar, Mandya, Mysore, Chamrajnagar, Hassan, Chikkamagalur, Mangalore, Udipi, Karwar

,Shimoga, Davengere, Chitradurga,Bellary, Koppal, Belgaum, Gokak, Chikodi, Gulbarga, Bagalkot, Bijapur, Hubli, Dharwad and Raichur. The graph below indicates the noise level at the above monitoring locations.



The Board is organizing “**No honking Mondays**” from November 2012 in association with Residence Association and Police Department in Bangalore city, to create awareness on impact of noise on environment to public. During campaign noise level measurement also being carried out at selected locations, the measured data is reveals that there is a reduction of 4-5 % noise level during campaign.

No Honking Monday’s – Noise level measured at different locations of Bangalore city

Name of the places	Normal days Noise values	No Horn Monday’s Noise values	Average % Reduction	Limits in dB(A) Leq
BDA Complex Koramangala	81.2	79.3	2.3 %	65.0
Sony Circle , Koramangala	83. 2	78.8	5.4 %	
Aishwarya Junction, Koramangala	84.8	79.1	6.7 %	
Wipro Junction Koramangala	81.9	78.75	3.8 %	
Overall reduction of Noise level during campaign			4.5 %	