



2014-15
CENTRAL POLLUTION CONTROL BOARD
ZONAL OFFICE (SOUTH), BENGALURU – 560079

Project II-Scientific & Technical Activities and R & D

Operation and Maintenance of Networking of CAAQM stations at Bangalore and Chennai.

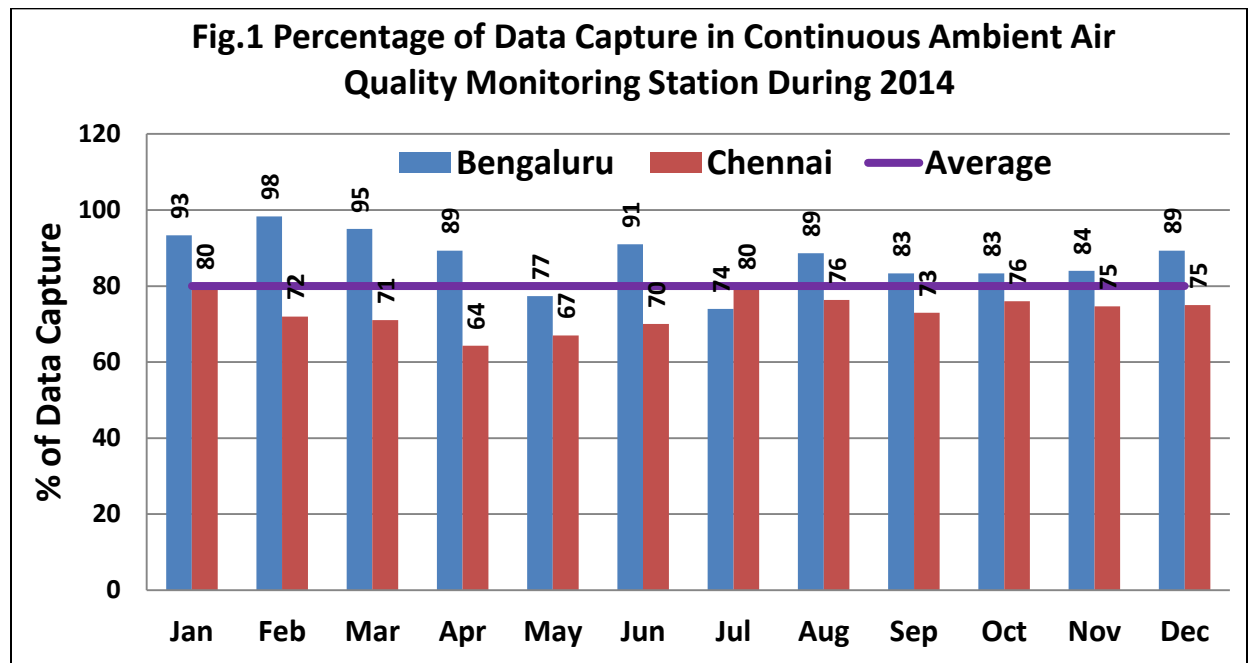
As a part of strengthening of continuous ambient air quality monitoring and its network in the country, 16 continuous ambient air quality monitoring stations and its network were established at various locations of the country under private participation project. Out of which three monitoring locations are being operated at Bengaluru (BTM Layout, Kadabeshnahalli - BWSSB & Peenya industrial area) and three locations are at Chennai (Alandur, IITM, Manali industrial area).

The CAAQM stations at Alandur, IITM Chennai, Tamil Nadu & Kadabeshnahalli - Bangalore made operational during June -2008 whereas as the monitoring station at Peenya put in to operation during September -2008 and BTM Layout during October-2008. The monitoring station at Manali put in operation during July 2009.

Monitoring stations are equipped with various analyzers as to measure about fifteen pollutants namely Ammonia (NH₃), Benzene (C₆H₆), Carbon Monoxide (CO), Ethyl Benzene (C₈H₁₀), M+P+O Xylene: Meta, Para & Ortho Xylene (C₈H₁₀), Methane (CH₄), Nitrogen Dioxide (NO₂), Nitrous Oxide (NO), Oxides of Nitrogen (NO_x), Non Methane Hydro Carbon (NMHC), Ozone (O₃), Respirable Suspended Particulate Matter (RSPM), Sulphur dioxide (SO₂), Toluene (C₆H₅CH₃) & Total Hydro carbon (THC) and seven meteorological parameters namely Barometric Pressure (BP), Relative Humidity (RH), Solar Radiation (SR), Temperature (Temp), Vertical Wind Speed (VWS) & Wind Direction (W DIR) having internationally approved techniques. In addition the monitoring stations are equipped with multipoint calibrators by which each analyzer can be calibrated as and when required on schedule basis.

The data generated by these monitoring stations are linked with local and central networking stations apart from dissemination of data to public at each monitoring site through digital display board. The hourly data generated are validated and processed

every year. Similarly, the data generated at all 6 monitoring stations for the year 2014 are transferred to Central Networking station and further validated, processed for release of payment. The processed data reveals that the average data capture rate in Bengaluru is 87% and in Chennai, the percentage of data capture rate is 73% during the year 2014. Fig -1 Depicts the pictorial percentage of data, month wise captured in each monitoring stations Bengaluru and Chennai during 2014.



The air quality data generated in the monitoring station are hourly stored in the storage device and transferred to the Central Networking computer. These data were computed statistically for daily, monthly and annual concentrations after thorough scrutiny, plausibility check and validation. The annual concentrations of various pollutants at these six locations in Bengaluru and Chennai are tabulated below.

Table No.1

CAAQMS	NO ($\mu\text{g}/\text{m}^3$)	NO ₂ ($\mu\text{g}/\text{m}^3$)	SO ₂ ($\mu\text{g}/\text{m}^3$)	PM ₁₀ ($\mu\text{g}/\text{m}^3$)	Ozone ($\mu\text{g}/\text{m}^3$)	CO ($\mu\text{g}/\text{m}^3$)	THC ($\mu\text{g}/\text{m}^3$)	Temp (°C)	RH %
Bengaluru									
Peenya	13.6	23.6	11.9	56.5	NA	535.1	1445.0	24.7	68.1
BTM layout	11.2	19.9	12.4	65.0	33.7	959.9	NA	23.9	66.5
BWSSB	13.0	21.3	10.2	72.4	25.3	827.4	NA	24.7	69.9
Average	12.6	21.6	11.5	64.6	29.5	774.1	1445.0	24.4	68.2
Chennai									
Alandur	10.1	15.8	7.7	103.6	25.4	730.1	NA	30.3	61.0

IITM	18.1	18.3	12.4	63.3	34.5	941.6	NA	29.4	59.3
Manali	11.9	29.5	11.1	71.3	NA	1218.8	1171.0	32.2	57.7
Average	13.4	21.2	10.4	79.4	30.0	963.5	1171.0	30.6	59.3

The above table depicts that the annual average concentration of Nitric Oxide (NO) is ranging from 11.2 $\mu\text{g}/\text{m}^3$ to 13.6 $\mu\text{g}/\text{m}^3$ with an average of 12.6 $\mu\text{g}/\text{m}^3$ in Bengaluru whereas in Chennai it is varied from 10.1 $\mu\text{g}/\text{m}^3$ to 18.1 $\mu\text{g}/\text{m}^3$ with an average of 13.4 $\mu\text{g}/\text{m}^3$.

The Nitrogen Dioxide(NO_2) concentration annually computed is ranging from 19.9 $\mu\text{g}/\text{m}^3$ to 23.6 $\mu\text{g}/\text{m}^3$ with an average of 21.6 $\mu\text{g}/\text{m}^3$ in Bengaluru while in Chennai it is found to be ranging from 15.8 $\mu\text{g}/\text{m}^3$ to 29.5 $\mu\text{g}/\text{m}^3$ with an average of 21.2 $\mu\text{g}/\text{m}^3$.

The Sulfur Dioxide(SO_2) concentration annually computed is ranging from 10.2 $\mu\text{g}/\text{m}^3$ to 12.4 $\mu\text{g}/\text{m}^3$ with an average of 11.5 $\mu\text{g}/\text{m}^3$ in Bengaluru while in Chennai it is found to be ranging from 7.7 $\mu\text{g}/\text{m}^3$ to 12.4 $\mu\text{g}/\text{m}^3$ with an average of 10.4 $\mu\text{g}/\text{m}^3$.

The annual average concentration of Respirable Particulate Matter(RSPM₁₀) measured at three locations in Bengaluru is ranging from 56.5 $\mu\text{g}/\text{m}^3$ to 72.4 $\mu\text{g}/\text{m}^3$ with an average concentration of 64.6 $\mu\text{g}/\text{m}^3$ whereas in Chennai measured at three locations is ranging from 63.3 $\mu\text{g}/\text{m}^3$ to 103.6 $\mu\text{g}/\text{m}^3$ with an average of 79.4 $\mu\text{g}/\text{m}^3$.

Out of six monitoring locations, the Ozone(O_3) is measured at two locations in Bengaluru and two locations in Chennai. The annual average concentration of Ozone is varying from 25.3 $\mu\text{g}/\text{m}^3$ to 33.7 $\mu\text{g}/\text{m}^3$ with an average of 29.5 $\mu\text{g}/\text{m}^3$ in Bengaluru whereas in Chennai it is varying from 25.4 $\mu\text{g}/\text{m}^3$ to 34.5 $\mu\text{g}/\text{m}^3$ with an average of 30 $\mu\text{g}/\text{m}^3$.

The annual average concentration of Carbon Monoxide(CO) measured at three locations in Bengaluru is ranging from 535 $\mu\text{g}/\text{m}^3$ to 960 $\mu\text{g}/\text{m}^3$ with an average concentration of 774 $\mu\text{g}/\text{m}^3$ whereas in Chennai, measured at three locations is ranging from 730 $\mu\text{g}/\text{m}^3$ to 1129 $\mu\text{g}/\text{m}^3$ with an average of 964 $\mu\text{g}/\text{m}^3$.

The metrological parameters in respect of Temperature and Relative Humidity are computed annually. The temperature is varying from 23.9($^{\circ}\text{C}$) to 24.7($^{\circ}\text{C}$) with an average of 24.4($^{\circ}\text{C}$) in Bengaluru while 29.4($^{\circ}\text{C}$) to 32.2($^{\circ}\text{C}$) is varied with an average of 30.6($^{\circ}\text{C}$) in Chennai. The annual average level of Relative Humidity (RH) measured at three locations in Bengaluru is ranging from 66.5% to 69.9% with an average concentration of 68% whereas in Chennai, measured at three locations is ranging from 57.7% to 61% with an average of 59.3%.

The annual average concentration of various pollutants measured at different locations in Bengaluru and Chennai are depicted pictorial as follows.

Fig.No.2 Ambient Air Quality Status at Various locations in Bengaluru and Chennai (Annual Average)

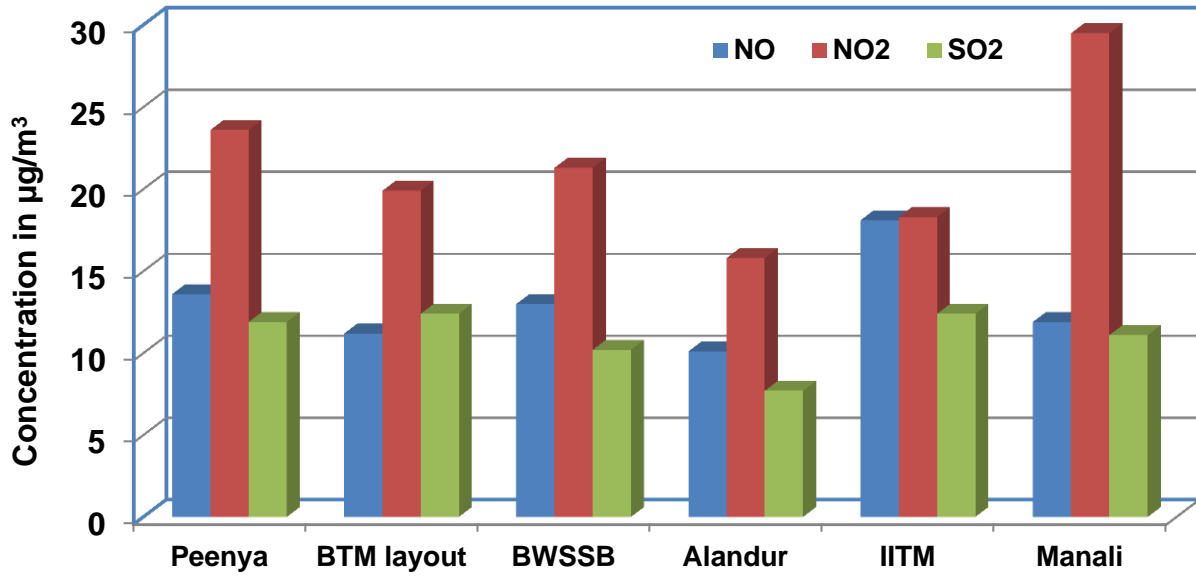


Fig. No. 3 Ambient Air Quality Status at Various locations in Bengaluru and Chennai (Annual Average)

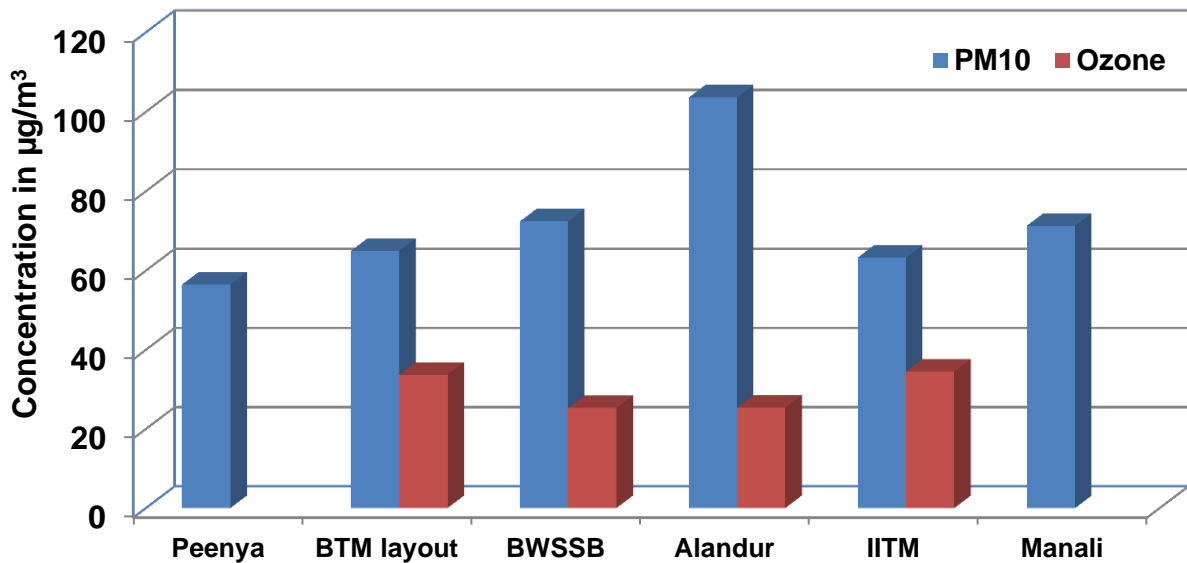


Fig.No.4 Ambient Air Quality Status at Various locations in Bengaluru and Chennai (Annual Average)

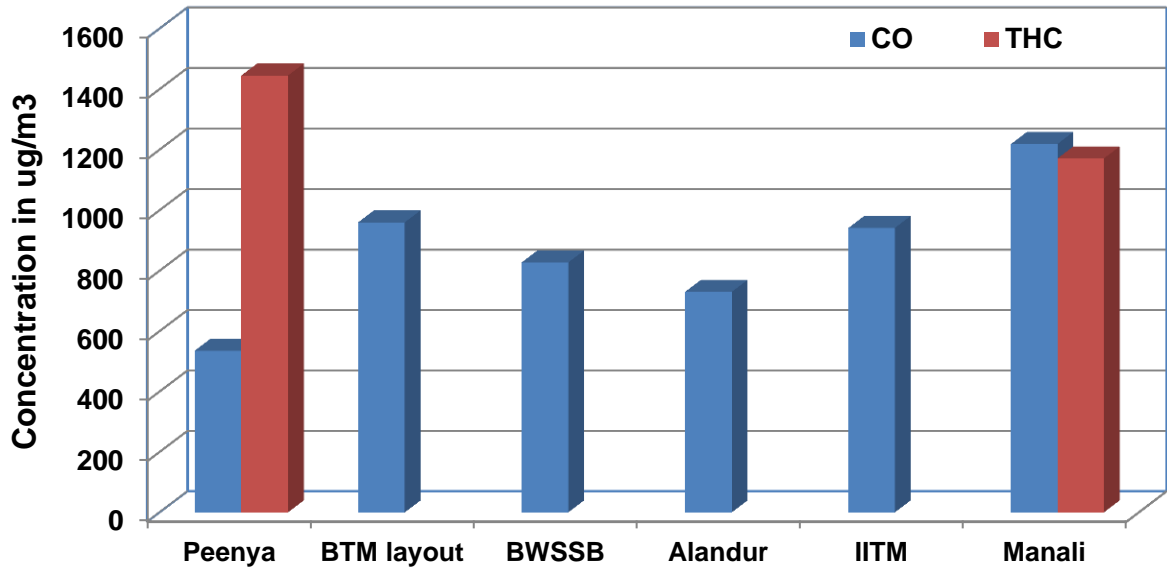


Fig.No.5 Ambient Air Quality Status at Various locations in Bengaluru and Chennai (Annual Average)

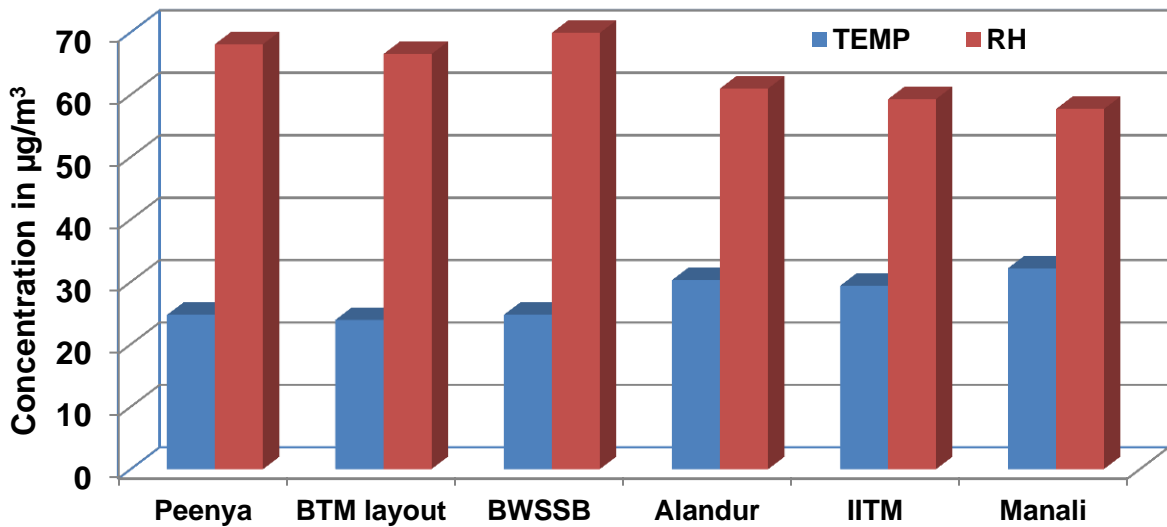


Table:2 Ambient Air Quality status in Peenya Industrial Area, Bengaluru during 2014 (Monthly Average)

Year-2014	NO	NO ₂	NO _x	NH ₃	SO ₂	CO	PM ₁₀	CH ₄	NMHC	THC
Units	µ/m ³	µ/m ³	µ/m ³	µ/m ³	µ/m ³	µ/m ³	µ/m ³	µ/m ³	µ/m ³	µ/m ³
Jan	31.5	33.0	36.8	15.7	28.2	442.1	79.0	553.1	832.8	1268.7
Feb	32.8	36.8	39.7	14.7	30.7	640.0	94.8	694.7	1039.5	1521.7
Mar	45.1	45.6	51.2	13.0	23.1	727.5	86.5	606.4	951.5	1534.9
Apr	6.5	13.7	15.8	18.7	6.1	573.4	NV	529.0	802.2	1331.1
May	6.2	17.3	18.5	18.7	4.8	374.4	NV	527.6	725.9	1253.5
Jun	5.9	32.0	25.8	18.9	6.2	433.0	NV	530.2	742.6	1275.6
Jul	5.7	33.3	26.3	20.4	6.7	368.0	8.7	528.5	770.4	1293.1
Aug	6.4	15.2	20.7	17.8	7.6	335.2	27.3	528.6	757.2	1285.8
Sep	ND	ND	ND	ND	9.1	650.0	32.5	1215.1	866.8	2081.9
Oct	3.3	12.4	9.0	21.4	5.8	695.6	42.4	1230.2	933.2	2303.2
Nov	2.7	7.8	5.3	19.7	5.0	652.4	64.0	650.4	694.4	1534.3
Dec	3.2	12.3	8.3	26.5	9.0	529.3	73.6	295.6	426.6	662.1
Average	13.6	23.6	23.4	18.7	11.9	535.1	56.5	657.4	795.2	1445.5
Minimum	2.7	7.8	5.3	13.0	4.8	335.2	8.7	295.6	426.6	662.1
Maximum	45.1	45.6	51.2	26.5	30.7	727.5	94.8	1230.2	1039.5	2303.2

Table:3. Meteorological Parameters in Peenya Industrial Area, Bengaluru during 2014 (Monthly Average)

Year-2014	TEMP	RH	W S	W Dir	V W S	B P	S R
Units	°C	%	m/s	Deg	m/s	mb	W/m ²
Jan	22.0	64.3	2.3	SE	0.0	1013.3	190.6
Feb	23.9	52.7	2.9	SE	0.1	1010.0	216.0
Mar	25.2	43.7	2.2	SE	0.0	1009.0	243.4
Apr	27.5	45.2	2.0	132.0	1.1	993.2	263.8
May	26.1	64.8	2.0	170.3	1.1	989.5	202.5
Jun	24.6	74.2	2.0	209.0	1.1	984.6	167.4
Jul	23.2	82.9	2.0	214.2	1.1	934.7	138.8
Aug	23.3	83.9	2.0	203.1	1.1	947.6	145.9
Sep	27.5	71.3	3.3	187.6	0.3	1010.8	178.8
Oct	25.3	79.6	2.0	162.9	0.0	1012.9	173.8
Nov	22.5	76.0	2.4	154.5	0.2	993.1	175.2

Dec	25.5	79.0	3.9	141.0	0.1	910.7	150.5
Average	24.7	68.1	2.4	175.0	0.5	984.1	187.2
Minimum	22.0	43.7	2.0	132.0	0.0	910.7	138.8
Maximum	27.5	83.9	3.9	214.2	1.1	1013.3	263.8

Table:4. Ambient Air Quality status in BTM Layout Area, Bengaluru during 2014 (Monthly Average)

Year 2014	NO	NO ₂	NO _x	NH ₃	SO ₂	Ozone	PM ₁₀
Units	μ/m ³	μ/m ³	μ/m ³	μ/m ³	μ/m ³	μ/m ³	μ/m ³
Jan	17.8	17.4	20.1	12.2	1145.5	30.9	96.7
Feb	17.2	18.2	20.2	11.1	1120.1	50.2	94.4
Mar	17.6	17.3	19.9	10.3	1014.0	44.8	85.3
Apr	5.6	14.7	15.8	29.3	762.3	25.7	49.5
May	3.5	14.7	13.7	9.9	1091.8	26.4	33.2
Jun	3.1	15.9	13.6	4.2	1115.3	15.4	34.8
Jul	3.3	15.8	14.1	16.8	803.0	10.0	66.1
Aug	3.5	15.5	14.2	43.5	564.2	12.1	76.6
Sep	8.4	23.9	17.0	3.1	1264.2	28.3	59.5
Oct	10.1	33.6	22.4	3.1	940.3	55.5	59.1
Nov	9.7	15.2	13.7	2.6	750.5	53.3	69.7
Dec	34.3	34.6	36.6	2.8	947.2	52.1	55.1
Average	11.2	19.7	18.4	12.4	959.9	33.7	65.0
Minimum	3.1	14.7	13.6	2.6	564.2	10.0	33.2
Maximum	34.3	34.6	36.6	43.5	1264.2	55.5	96.7

Table:5. Meteorological Parameters in BTM Layout Area, Bengaluru during 2014 (Monthly Average)

Year 2014	TEMP	RH	W S	W DIR	V W S	B P
Units	°C	%	m/s	Deg	m/s	mb
Jan	20.7	65.5	1.9	SE	0.0	1010.1
Feb	23.3	54.1	2.0	SE	0.0	1009.7
Mar	25.2	46.8	1.9	SE	0.0	1008.9

Apr	27.5	48.9	1.4	169.1	1.3	1002.1
May	26.5	63.6	1.8	201.5	1.2	998.6
Jun	25.0	71.0	ND	218.9	1.3	996.5
Jul	22.9	79.0	1.3	242.5	1.3	998.6
Aug	23.0	79.9	1.4	229.6	1.3	999.0
Sep	23.2	74.9	1.6	220.4	0.5	1000.4
Oct	22.6	80.0	1.3	166.2	0.2	1003.6
Nov	23.2	65.1	4.9	158.3	0.2	917.4
Dec	23.8	69.3	4.1	165.7	0.3	907.8
Average	23.9	66.5	2.2	196.9	0.6	987.7
Minimum	20.7	46.8	1.3	158.3	0.0	907.8
Maximum	27.5	80.0	4.9	242.5	1.3	1010.1

Table:6 Ambient Air Quality status in Kadabeshnahalli (BWSSB) Area, Bengaluru during 2014 (Monthly Average)

Year-2014	NO	NO₂	NO_x	SO₂	CO	Ozone	PM₁₀
Units	µ/m³	µ/m³	µ/m³	µ/m³	µ/m³	µ/m³	µ/m³
Jan	26.4	26.1	30.0	22.7	1620.1	29.7	98.1
Feb	30.7	30.2	34.0	23.5	1502.5	21.4	97.7
Mar	16.4	18.8	20.1	14.6	1219.4	38.6	84.5
Apr	4.4	14.8	14.5	3.6	1128.7	15.5	47.3
May	5.6	16.8	14.5	4.7	823.3	20.9	59.8
Jun	11.5	20.7	18.7	4.8	682.7	21.7	49.1
Jul	9.3	18.8	18.0	18.8	381.4	17.0	NV
Aug	10.6	20.3	16.4	16.3	305.2	17.3	23.2
Sep	7.5	11.6	10.2	4.8	735.9	21.5	53.0
Oct	12.4	30.2	23.7	3.9	381.3	24.0	71.1
Nov	12.8	28.3	25.2	2.8	567.1	31.2	119.9
Dec	8.7	25.7	18.9	2.3	581.7	44.5	92.7
Average	13.0	21.8	20.3	10.2	827.4	25.3	72.4
Minimum	4.4	11.6	10.2	2.3	305.2	15.5	23.2
Maximum	30.7	30.2	34.0	23.5	1620.1	44.5	119.9

Table:7. Meteorological Parameters in Kadabeshnahalli (BWSSB) Area, Bengaluru during 2014 (Monthly Average)

Year 2014	TEMP	RH	W S	W Dir	V W S	B P	S R
Units	°C	%	m/s	Deg	m/s	mb	W/m ²
Jan	20.4	73.9	1.1	NE	0.0	1010.7	164.1
Feb	22.4	64.5	0.8	NE	0.0	1010.9	160.7
Mar	24.6	54.3	0.7	NE	0.1	1011.3	176.5
Apr	27.3	55.0	0.7	79.3	1.8	999.4	189.9
May	26.3	66.5	1.3	84.2	1.6	981.9	267.7
Jun	25.1	67.8	1.8	146.3	1.2	987.3	217.1
Jul	23.5	88.8	0.8	112.9	1.8	996.9	252.7
Aug	NV	NV	0.9	108.2	0.7	1003.9	143.5
Sep	24.6	74.5	2.2	247.7	0.7	979.7	199.4
Oct	25.2	75.7	1.1	181.6	0.6	1010.7	201.7
Nov	24.5	64.5	1.2	162.4	0.6	1011.6	227.9
Dec	27.9	82.8	0.9	139.0	0.2	968.4	172.6
Average	24.7	69.9	1.1	140.2	0.8	997.7	197.8
Minimum	20.4	54.3	0.7	79.3	0.0	968.4	143.5
Maximum	27.9	88.8	2.2	247.7	1.8	1011.6	267.7

Table:8 Ambient Air Quality status in Alandur, Chennai during 2014 (Monthly Average)

Year 2014	NO	NO ₂	NO _x	SO ₂	CO	Ozone	PM ₁₀
Units	µ/m ³	µ/m ³	µ/m ³	µ/m ³	µ/m ³	µ/m ³	µ/m ³
Jan	13.8	22.3	20.5	15.4	824.1	32.7	88.2
Feb	14.3	23.8	23.1	12.4	834.2	29.6	94.9
Mar	13.5	19.1	22.2	11.3	801.8	24.3	93.3
Apr	11.4	21.4	26.4	6.2	1032.2	16.4	202.2
May	9.5	18.5	23.5	4.7	197.2	52.6	177.1
Jun	6.6	12.8	13.5	4.8	211.7	34.0	126.0
Jul	5.2	9.1	8.1	4.3	138.0	21.1	90.6
Aug	6.1	8.7	8.2	2.5	485.5	20.3	42.2
Sep	ND	ND	ND	5.8	ND	ND	29.6
Oct	11.9	12.5	19.3	7.6	758.5	13.2	66.5

Nov	10.4	13.7	18.8	9.5	1413.5	10.2	114.3
Dec	8.8	12.6	20.6	7.6	1334.7	NV	117.8
Average	10.1	15.8	18.6	7.7	730.1	25.4	103.6
Minimum	5.2	8.7	8.1	2.5	138.0	10.2	29.6
Maximum	14.3	23.8	26.4	15.4	1413.5	52.6	202.2

Table:9. Meteorological Parameters at Alandur, Chennai during 2014 (Monthly Average)

Year 2014	Temp	RH	W S	W Dir	V W S	B P	S R
Units	°C	%	m/s	Deg	m/s	mb	W/m ²
Jan	28.2	65.0	NW	SE	0.2	1014.2	87.0
Feb	28.5	65.1	NW	SE	0.1	1013.6	74.8
Mar	30.0	61.3	ND	SE	-0.1	1014.2	90.6
Apr	31.2	67.6	ND	SW	0.1	1011.4	111.8
May	32.1	61.6	ND	SW	0.1	1007.9	146.2
Jun	32.5	53.4	ND	SW	0.1	1004.9	131.4
Jul	31.7	53.1	ND		0.1	1006.3	97.2
Aug	31.1	62.9	ND	SW	0.2	1006.9	84.7
Sep	30.6	70.2	ND	SW	0.0	1008.5	82.8
Oct	29.9	62.6	0.4	SW	NV	1009.6	69.1
Nov	29.1	54.0	1.0	SE	0.1	1011.5	95.6
Dec	28.5	55.7	1.1	SE	0.1	1008.0	57.5
Average	30.3	61.0	0.8	SE& SW	0.1	1009.7	94.1
Minimum	28.2	53.1	0.4		-0.1	1004.9	57.5
Maximum	32.5	70.2	1.1		0.2	1014.2	146.2

Table:10. Ambient Air Quality status in IITM, Chennai during 2014 (Monthly Average)

Year 2014	NO	NO ₂	NO _x	SO ₂	CO	Ozone	PM ₁₀
Units	µ/m ³	µ/m ³	µ/m ³	µ/m ³	µ/m ³	µ/m ³	µ/m ³
Jan	18.5	18.9	21.3	14.0	1031.8	47.1	NW
Feb	17.5	18.1	20.1	13.8	898.5	69.4	NW
Mar	17.6	18.2	20.3	10.2	1192.3	37.6	NW
Apr	22.0	22.6	25.5	14.0	1354.6	46.8	ND

May	16.2	16.1	18.4	15.4	1589.1	44.8	ND
Jun	15.7	14.6	17.2	16.4	1403.9	37.6	114.0
Jul	6.9	9.7	8.6	2.1	1323.4	45.6	70.5
Aug	7.4	8.3	7.4	5.4	1081.9	29.9	54.1
Sep	10.1	14.9	22.3	5.0	242.6	5.6	35.3
Oct	11.5	12.7	21.8	8.0	404.4	9.7	37.1
Nov	40.5	38.5	48.0	32.8	561.5	21.4	76.2
Dec	33.3	27.3	41.3	12.0	214.7	18.3	56.1
Average	18.1	18.3	22.7	12.4	941.6	34.5	63.3
Minimum	6.9	8.3	7.4	2.1	214.7	5.6	35.3
Maximum	40.5	38.5	48.0	32.8	1589.1	69.4	114.0

Table:11. Meteorological Parameters at IITM, Chennai during 2014 (Monthly Average)

Year 2014	Temp	RH	W S	W Dir	V W S	B P	S R
Units	°C	%	m/s	Deg	m/s	mb	W/m²
Jan	26.2	59.4	1.9	SE	0.0	1012.3	141.1
Feb	26.6	57.1	1.9	SE	0.0	1009.0	185.0
Mar	28.5	55.6	1.9	SE	NW	1012.5	219.6
Apr	31.1	60.6	2.0	NW	0.1	1013.5	203.6
May	31.8	56.8	2.0	SW	0.0	1015.7	133.3
Jun	32.9	46.4	2.0	SE	0.1	1012.5	159.4
Jul	32.0	44.7	2.0	SE	0.1	1019.0	174.3
Aug	30.8	54.8	1.9	SE	0.1	1014.7	164.2
Sep	30.0	60.5	1.9	SE	0.1	1015.9	135.6
Oct	28.9	67.4	1.9	SE	0.1	1017.1	89.5
Nov	27.0	72.0	1.9	SW	-0.1	1009.8	231.6
Dec	26.7	76.0	1.9	SE	ND	1009.1	309.1
Average	29.4	59.3	1.9	SE	0.0	1013.4	178.9
Minimum	26.2	44.7	1.9		-0.1	1009.0	89.5
Maximum	32.9	76.0	2.0		0.1	1019.0	309.1

Table:12. Ambient Air Quality status in Manali, Chennai during 2014 (Monthly Average)

Year 2014	NO	NO ₂	NO _x	NH ₃	SO ₂	CO	PM ₁₀	THC
Units	μ/m ³	μ/m ³	μ/m ³	μ/m ³	μ/m ³	μ/m ³	μ/m ³	μ/m ³
Jan	8.4	28.2	16.1	40.9	16.1	829.6	64.5	742.0
Feb	22.7	34.7	38.8	55.2	18.3	1712.5	ND	608.1
Mar	17.6	33.4	33.3	10.4	12.5	1849.5	ND	849.7
Apr	15.7	48.1	45.6	7.8	11.6	609.9	ND	759.3
May	19.1	44.1	46.0	7.6	12.6	1197.1	NV	797.1
Jun	7.2	46.1	35.1	9.4	13.1	645.4	ND	377.2
Jul	11.5	39.8	36.1	7.8	4.8	1019.7	ND	389.9
Aug	7.7	41.8	33.4	7.0	12.6	665.7	ND	444.5
Sep	8.3	13.4	19.0	12.5	6.6	1323.3	91.3	1661.7
Oct	11.1	8.6	10.9	9.0	8.5	1587.6	51.3	2379.6
Nov	7.3	9.3	9.4	4.8	8.5	1681.5	60.5	2573.0
Dec	6.3	6.7	7.8	4.1	7.7	1503.7	88.7	2480.1
Average	11.9	29.5	27.6	14.7	11.1	1218.8	71.3	1171.8
Min	6.3	6.7	7.8	4.1	4.8	609.9	51.3	377.2
Max	22.7	48.1	46.0	55.2	18.3	1849.5	91.3	2573.0

Table:13. Meteorological Parameters at Manali, Chennai during 2014 (Monthly Average)

Year 2014	Temp	RH	W S	W Dir	V W S	B P	S R
Units	°C	%	m/s	Deg	m/s	mb	W/m ²
Jan	30.4	ND	1.8	SE	0.3	1010.3	225.3
Feb	31.9	ND	1.7	SE	0.3	1008.9	277.1
Mar	33.1	ND	1.7	SE	0.3	1008.7	258.2
Apr	31.8	50.3	1.7	SE	0.3	1007.2	212.7
May	34.8	50.2	1.7	SW	0.3	1004.2	173.5
Jun	36.8	51.5	1.8	SW	0.3	1002.2	163.2
Jul	37.6	50.2	1.8	SW	0.3	1003.2	175.9
Aug	29.7	56.0	1.7	SW	0.3	1003.7	220.7
Sep	30.7	67.2	1.7	SW	-0.3	1004.6	185.4
Oct	32.3	63.6	1.6	SW	-0.2	1006.5	153.1
Nov	30.9	66.1	1.7	SW	0.2	1007.5	141.2
Dec	27.1	64.2	1.7	SW	0.2	1008.3	141.4
Average	32.2	57.7	1.7	SW	0.2	1006.3	194.0
Minimum	27.1	50.2	1.6		-0.3	1002.2	141.2
Maximum	37.6	67.2	1.8		0.3	1010.3	277.1

June 8, 2015