# CHAPTER 8

# ENVIRONMENTAL CONCERNS

Rapid rise in population and speedy economic development has raised the concern for the environmental degradation in Delhi because of which Delhi is one of the heavily polluted city in India, having for instance one of the country's highest volumes of particulate matter pollution. Unprecedented scale and speed of urbanization in Delhi and consequent pressure on physical and social infrastructure has created damaging stress on living environment and affected the level of pollution adversely. Increase in number of vehicles in Delhi is far faster than construction of roads. Agriculture burning in the NCR and neighbouring states is one of the major contributor of the particulate and other gaseous pollutants in Ambient Air of Delhi. Besides, there is air pollution due to heavy construction activities, water pollution owing to dumping of untreated industrial and municipal wastes in the river and excessive ground water exploration. Recharging of ground water is the need of the hour. The government is emphasizing on rain water harvesting and solar energy in order to reduce pollution from thermal power. Sewage water gets discharged in storm water drain causing serious contamination. Hazardous waste, bio-medical waste and electronic waste are serious threat to environment. These are increasing with urbanization and economic development in the city. Government took various steps to increase the Green cover of the state. Government is also promoting Green buildings for conservation of water and reduction in generation of solid and liquid waste. This chapter dwells upon the various dimension of pollution including sources, past and present status and efforts made to reduce the pollution level in Delhi.

## 2. Ambient Air Quality

2.1 The city of Delhi has a complex urban environment with respect to air pollution and faces severe air pollution of $PM_{10}$, $PM_{2.5}$ and $NO_2$. There are several prominent sources within and outside Delhi contributing to $PM_{10}$, $PM_{2.5}$ and $NO_2$ in ambient air; these pollutants can be taken as surrogate of other pollutants also, as most of the pollutants coexist and have common sources. Year-wise annual mean ambient air quality levels in Delhi during 2001 to 2017 is presented in Statement 8.1.

### Statement 8.1

### AMBIENT AIR QUALITY LEVELS IN DELHI: 2001-2017

| S. No | Years | Ambient Air Quality (µg/m$^3$) | | | |
|---|---|---|---|---|---|
| | | $SO_2$ | $NO_2$ | CO | RSPM ($PM_{10}$) |
| 1 | 2001 | 14.1 | 41.8 | 4183 | 150 |
| 2 | 2002 | 11.3 | 50.8 | 3258 | 192 |
| 3 | 2003 | 9.5 | 55.8 | 2831 | 170 |
| 4 | 2004 | 9.3 | 57.4 | 2581 | 160 |
| 5 | 2005 | 8.8 | 55.9 | 2541 | 168 |
| 6 | 2005 | 8.8 | 55.9 | 2541 | 168 |
| 7 | 2007 | 4 | 38 | 2460 | 161 |

| S. No | Years | Ambient Air Quality (µg/m$^3$) | | | |
|---|---|---|---|---|---|
| | | $SO_2$ | $NO_2$ | CO | RSPM ($PM_{10}$) |
| 8 | 2008 | 5 | 43.1 | 2461 | 201 |
| 9 | 2009 | 5 | 47.3 | 1768 | 248 |
| 10 | 2010 | 5 | 46 | 1937 | 249 |
| 11 | 2011 | 15 | 66 | 2020 | 281 |
| 12 | 2012 | 18.2 | 82.4 | 2020 | 293 |
| 13 | 2013 | 20.1 | 77.5 | 2100 | 282 |
| 14 | 2014 | 16.9 | 79 | 1700 | 318 |
| 15 | 2015 | 17.6 | 73 | 1618 | 268 |
| 16 | 2016 | 19.9 | 70.2 | 2090 | 290 |
| 17 | 2017 | 23.36 | 73.55 | 2130 | 263 |
| | **Standard** | **50** | **40** | **2000** | **60** |

Source: - Department of Environment, GNCTD/CPCB & DPCC

2.2 The values for 2001 to 2010 are of the monitoring stations of CPCB while the values of 2011 to 2017 are of the monitoring station network developed by Delhi Pollution Control Committee. Upto last year, the air quality was being monitored through 6 CAAQMS. However, from 2017-18, 20 new CAAQMS have been installed in 20 new locations, Hence, DPCC presently monitors air quality through 26 online continuous ambient air quality monitoring stations at 26 locations. The six stations can be classified in two categories i.e. residential (R.K. Puram, Mandir Marg & Punjabi Bagh) and hot spots (I.G.I Airport and Anand Vihar). Civil Lines is also influenced by traffic emissions. Statement 8.2 shows the annual average of critical pollutants in Delhi for the Year 2017. Sustained efforts by the Government of Delhi along with the cooperation of all stakeholders, Delhi is showing signs of improvement in reducing / controlling the pollution level since past few years.

## Statement 8.2
## ANNUAL AVERAGE OF CRITICAL POLLUTANTS AT SIX STATIONS IN DELHI (in µg/m$^3$) FOR THE YEAR 2017

| S. No. | Locations | $SO_2$ | $NO_2$ | $PM_{10}$ | $PM_{2.5}$ | $O_3$ | CO (mg/ m$^3$) |
|---|---|---|---|---|---|---|---|
| 1 | R. K. Puram | 30.25 | 62.49 | 256 | 136 | 49.21 | 2.18 |
| 2 | Mandir Marg | 14.03 | 51.85 | 196 | 108 | 24.58 | 1.95 |
| 3 | Punjabi Bagh | 24.25 | 93.09 | 244 | 125 | 51.78 | 1.57 |
| 4 | Civil Lines | 19.90 | 72.17 | 207 | 170 | 42.98 | 2.38 |
| 5 | IGI Airport | 27.17 | 73.12 | N/A | N/A | 56.26 | N/A |
| 6 | Anand Vihar | 24.60 | 88.59 | 410 | 151 | 48.85 | 2.59 |

*Source: - Department of Environment, GNCTD.*

2.3 **Sulphur Dioxide ($SO_2$)**: No significant variation was observed in the annual average value from 2011 to 2017. The values monitored were always within the prescribed limits of 50µg/$m^3$ at all stations. The minimum value was observed at Mandir Marg and maximum was observed at R.K. Puram.

2.4 **Nitrogen Dioxide ($NO_2$)**: Annual average of $NO_2$ concentration has shown the marginal increase from year 2011. In 2017, the average value was 73.55 µg/$m^3$. The minimum value was observed at Mandir Marg and maximum at Anand Vihar. The higher values may be due to high vehicular density in the area. At all the monitoring locations annual average exceeded the prescribed standard of 40 µg/$m^3$.

2.5 **Carbon Monoxide (CO)**: The value of CO in 2017 varied from 1.57 mg/ $m^3$ to 2.59 mg/$m^3$ at different stations. The minimum value was observed at Punjabi Bagh and maximum at Civil lines.

2.6 **Particulate Matter for measuring Pollution**: One way of measuring pollution is by the measure of particulate matter. Particulate matter is basically a mixture of extremely small particles and liquid droplets like acids, chemicals, gas, water, metals, soil dust particles, etc, the measurement of which gives an ideas of the pollution of a city. It is also known as particle pollution or PM.

2.7 **Particulate Matter ($PM_{10}$)**: Concentration of $PM_{10}$ varied from 196 µg/$m^3$ to 410 µg/$m^3$ at different stations. The minimum value was observed at Mandir Marg and maximum at Anand Vihar.

2.8 **Particulate Matter ($PM_{2.5}$):** Concentration of $PM_{2.5}$ varied from 108 µg/$m^3$ to 170 µg/$m^3$ at different stations. The minimum was observed at Mandir Marg and maximum at Civil Lines.

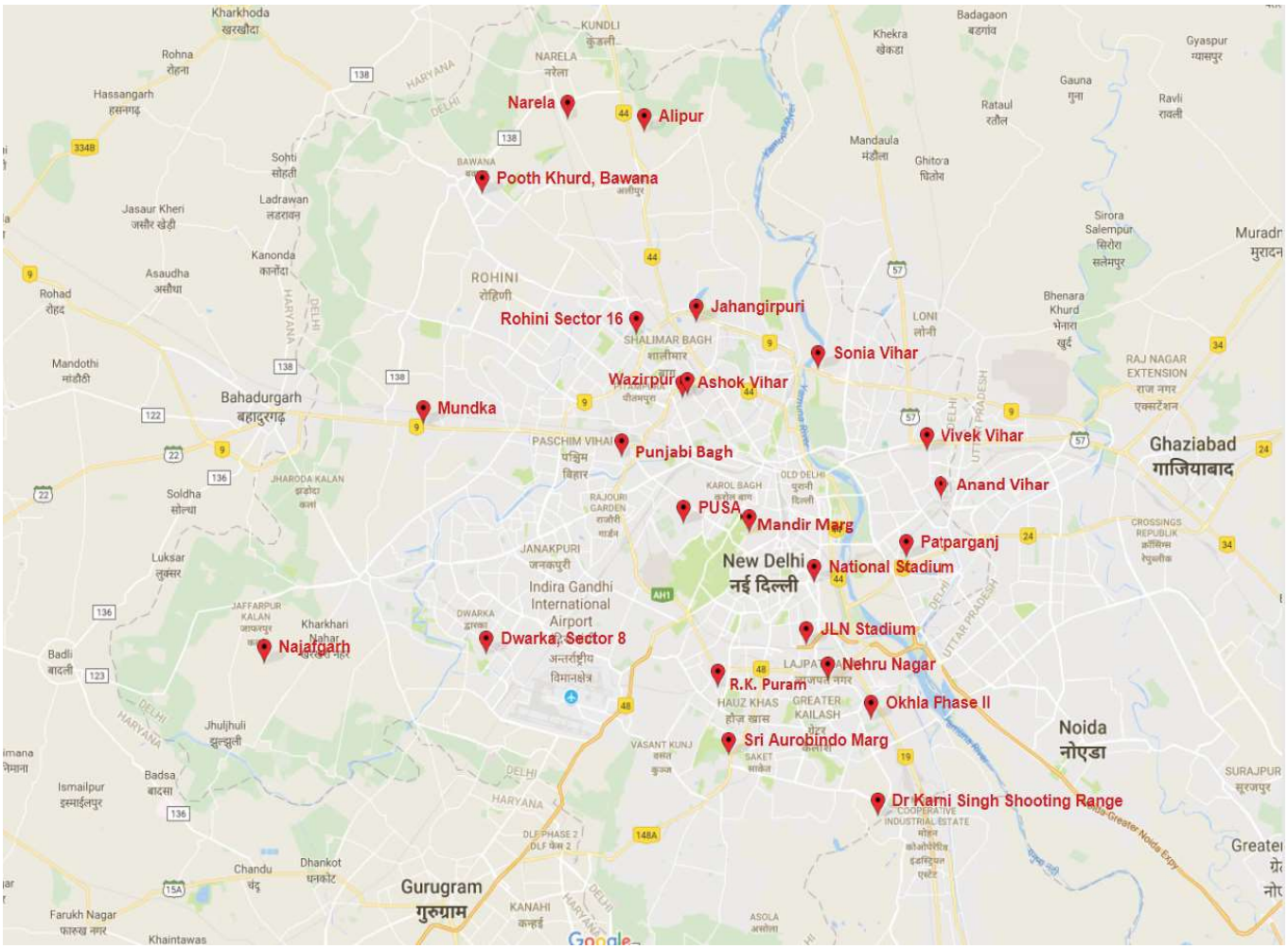
2.9 **Ozone ($O_3$):** The concentration of ozone varied from 24.58 µg/$m^3$ to 56.26 µg/$m^3$ in 2017. The minimum was observed at Mandir Marg and maximum at IGI Airport. The maximum value was observed during the summer months at Civil lines station which exceeds the prescribed limits of 100 µg/$m^3$.

2.10 Keeping in view deteriorating ambient air quality in Delhi and need to implement area specific interventions, Government has decided to augment the Ambient Air Quality monitoring infrastructure by installing 20 new state of art Continuous Ambient Air Quality Monitoring Stations in Delhi. The old network has only six stations of DPCC and by this addition Delhi has network of 26 stations operated by DPCC. 20 Continuous Ambient Air Quality Monitoring Stations (CAAQMS) were inaugurated on 09.11.2017 at following locations in Delhi:

## Statement 8.2-A

## New Continuous Ambient Air Quality Monitoring Stations (CAAQMS) established in Delhi on 09.11.2017

| S.No | Name of CAAQMS | S.No | Name of CAAQMS |
|---|---|---|---|
| 1 | Maj. Dhyanchand National Stadium | 11 | DITE Okhla |
| 2 | Jawahar Lal National Stadium. | 12 | Ch. Brahm Prakash Ayurvedic Hospital |
| 3 | Dr. Karni Singh Shooting Range | 13 | Mahrshi Valmiki Hospital,Pooth Khurd |
| 4 | PGDAV College, Sriniwaspuri | 14 | MGICCC, Bakoli |
| 5 | Mother Dairy Plant, Patparganj | 15 | NIT&RD, Mehrauli |
| 6 | Satyawati College | 16 | ITI, Jahangirpuri |
| 7 | Mundka Metro Residential Colony | 17 | IARI, PUSA |
| 8 | S.S.College of Business Studies, Rohini | 18 | NIMR, Sector-8, Dwarka |
| 9 | ITI, Narela | 19 | DITE, Wazirpur |
| 10 | WTP (DJB), Sonia Vihar | 20 | ITI, Shahadra |



2.11 National Ambient Air Quality Standards fixed by the Central Pollution Control Board are presented in Statement 8.3

## Statement 8.3

## NEW NATIONAL AMBIENT AIR QUALITY STANDARDS

| S. No | Pollutant | Residential, Industrial, Rural & Other Areas | | Ecologically Sensitive Areas | |
|---|---|---|---|---|---|
| | | 24 Hourly Standard * (µg/m³) | Annual Standard * (µg/m³) | 24 Hourly Standard* (µg/m³) | Annual Standard* (µg/m³) |
| 1 | $SO_2$ | 80 | 50 | 80 | 20 |
| 2 | $NO_2$ | 80 | 40 | 80 | 30 |
| 3 | $PM_{10}$ | 100 | 60 | 100 | 60 |
| 4 | $PM_{2.5}$ | 60 | 40 | 60 | 40 |
| 5 | Ozone | 180# | 100## | 180# | 100## |
| 6 | Lead | 1.0 | 0.50 | 1.0 | 0.50 |
| 7 | $NH_3$ | 400 | 100 | 400 | 100 |
| 8 | CO | 04# | 02## | 04# | 02## |
| 9 | As | - | 06 | - | 06 |
| 10 | Benzene | - | 05 | - | 05 |
| 11 | BaP Particulate phase only | - | 01 | - | 01 |
| 12 | Ni | - | 20 | - | 20 |

Source: Delhi Pollution Control Committee (DPCC)

* Annual Arithmetic mean of minimum 104 measurements in a year taken twice a week 24 hourly at uniform interval.

** 24 hourly or 08 hourly or 01 hourly monitored values, as applicable, shall be compiled with 98% of the time in a year. 2% of the time, they may exceed the limits but not on two consecutive days of monitoring.

# 1 Hourly, ##8 Hourly.

### 2.12 Comprehensive study on Air Pollution:

A study entitled "Comprehensive study on Air Pollution and Green House Gases in Delhi" was awarded to IIT Kanpur by Department of Environment, GNCTD, & DPCC for studying various measures to improve the quality of air which has been completed and the final GHG report has been submitted by the IIT, Kanpur.

### 2.13 Air Pollution Control:

Delhi faced emergent Smog – Air Pollution situation in November 2016 and also in November 2017 and various immediate directions were issued for controlling Air pollution in the city. Various immediate and regular measures for air pollution control taken include:

- Direction on ban on use of DG Sets in Delhi during winter.
- Direction on stopping of Operation of BTPS during winter.
- Direction issued for ban on bursting of firecrackers/ fireworks..
- Construction and demolition activities were banned temporarily.

- Ban on operation of Electricity Generator sets except essential services.
- Installation of 20 new Continuous Ambient Air Quality Monitoring Stations for better monitoring of air pollution in Delhi.
- Subsidy to Battery Operated vehicle (Two Wheelers & Cars) & e-rickshaws
- Online monitoring and Emission Control System in Thermal Power Plants, Waste-to-energy Plants, Incinerators etc
- Monitoring and Action against persons for burning of waste material/garbage in open and violators of dust control measures. Regular review of penal action taken by MCDs, NDMC, DCB, PWD, Revenue Dept. and DDA against units which are involve in dust pollution. To receive the public complaints in order to stop the burning of Garbage/Waste material/ Leaves and to stop dust pollution, Delhi Pollution Control Committee (DPCC) has opened whatsapp account with mobile number '9717593574' and '9717593501'.
- Penal action against big construction sites by DPCC which were found with inadequate measures to mitigate the air pollution.
- Implementation of Graded Response Action Plan notified by MoEF&CC, GOI with concerned departments.
- 83 Home Guards as Environmental Marshals have been deployed in wards of three municipal corporations covering areas of East Delhi Municipal Corporation, South Delhi Municipal Corporation and North Delhi Municipal Corporation. Standard Operating Procedure (SOP) has also been developed for the working of the scheme.
- Inspection of industries and penal action against the industries which are violating environmental law
- Issuance of draft amended notification for approved fuels in Delhi.
- Regulation through inspection of industries in authorized area against the use of unacceptable fuels in Delhi
- Facilitation to convert industries to use PNG instead of other more polluting fossil fuels.
- Implementation of various directions of Hon'ble Supreme Court, Hon'ble High Court of Delhi and Hon'ble National Green Tribunal.
- Exploring of suitable technological solution through various demonstrations (e.g. anti-smog gun).
- Public Awareness for Air Pollution Control through Workshops / Seminars / Public notices.
- Mechanical sweeping of roads and sprinkling of water by MCDs and PWD.
- Directions under Air Act 1981 have been issued to ban on bursting of fire-crackers on all occasion/ celebration.
- Organized three workshops for areas under Jurisdiction of North MCD, South MCD and East MCD on "Prohibition on open burning of any kind of material - A Small Step Targeting Big Impact" respectively at Delhi Secretariat. Workshops were for public awareness and interaction with implementing authorities. The officials from MCDs i.e. SI/ASI and

horticulture wing participated in the workshops along with RWAs, School/Colleges.

2.14 NCR states related Issues which impact ambient Air Quality of Delhi:

Following issues as mentioned below specifically relate to NCR states which impact ambient air quality of Delhi:

- Completion of Western and Eastern Expressway to be expedited so as to ease City of Delhi from non-destined traffic.

- The feasibility of providing U-Turn and underpass near borders to turn back the non-destined vehicles trying to enter the city needs to be explored.

- Air quality monitoring stations as set up in Delhi to be set up in NCR with online display of data.

- Local bodies and major construction agencies in Delhi have already been directed to use dust suppression methods on the construction sites to reduce the dust emissions. Delhi Police and Department of Transport have been directed to allow transportation of construction material and demolition waste only in closed and properly covered trucks. The neighbouring states must ensure that all the construction sites must undertake the dust suppression methods to control the dust emission from the construction sites. Further, it is also requested that any construction material or construction waste carried to Delhi must be transported in closed or properly covered trucks.

- Open burning of garbage in Delhi's neighbouring areas should be strongly discouraged.

- The practice of burning of paddy stubs in the agricultural zones adjoining Delhi needs to be stopped. Agriculture burning in the NCR and neighbouring states is other major contributor of the particulate and other gaseous pollutants in Ambient Air of Delhi. It is pertinent to mention here that from October to January are crucial months for Delhi, as with onset of winter, concentration of particulate and gaseous pollutants increase significantly. Agricultural fire in Punjab & Haryana is a major cause, the Aqua satellite of NASA taken the image and shared it in public domain. The images show the cloud of ash spreading almost in the northern belt and especially on Delhi.

2.15 Though, stringent steps have been taken/being taken by Delhi Govt. for reducing air pollution in Delhi, there is an urgent need that NCR states also take similar steps as taken by GNCTD of Delhi. Therefore, a strategy needs to be worked out on similar lines by NCR states.

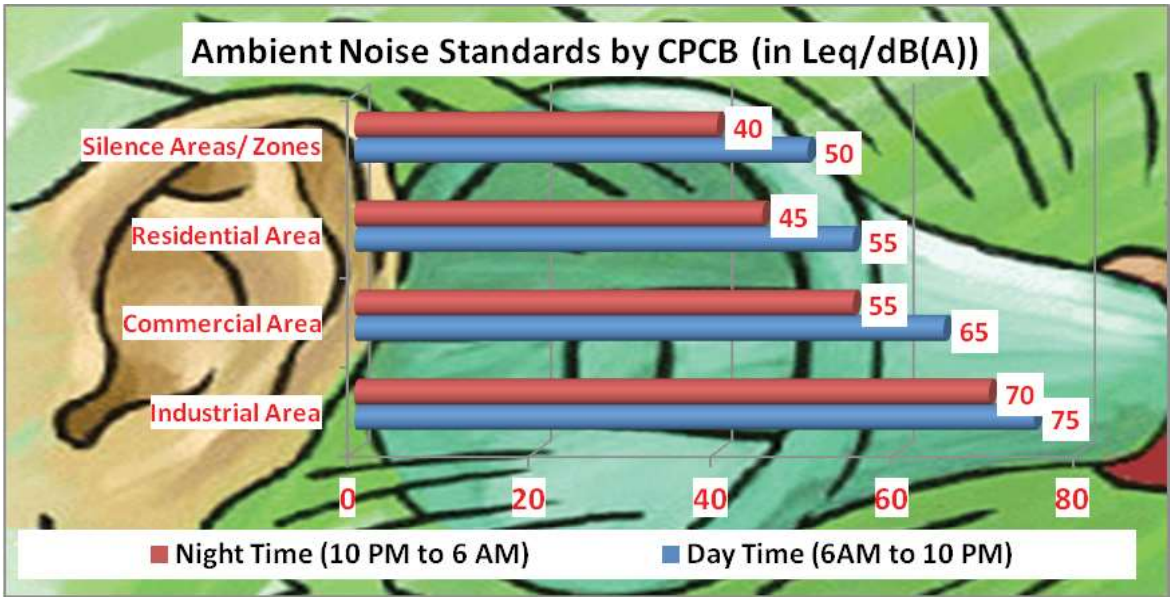
## 3. Noise Pollution

3.1 Delhi witnesses excessive noise on account of large number of vehicle of all sorts

including those who come from other areas where CNG is not the fuel, construction activities, diesel generating sets, etc. Use of high sound loudspeakers during festivals and many social gatherings in public place directly increases the noise pollution in the affected areas. GNCTD has notified an area of 100 metres around the hospitals with 100 beds or more, educational institutions with 1000 students or more, all court complexes, all government complexes as Silence Areas/Zones. The Central Pollution Control Board published the information regarding permitted ambient noise levels in different areas. The prescribed ambient noise levels are presented in Chart 8.1.

**Chart 8.1**

**AMBIENT NOISE STANDARDS BY CPCB (IN LEQ/DB(A))**




Source :- Noise Pollution (Regulation and Control) Rules, 2000, Ministry of Environment, Forests and climate change Government of India.

Notes:- 1. Day Time from 6 AM to 10 PM and Night Time from 10 PM to 6 AM.

2. Silence zone is an area comprising not less than 100 meters around hospitals, educational institutions, courts, religious places or any other areas which is declared as such by the competent authority.

3.2 A Continuous Noise Monitoring is undertaken at R.K. Puram, Mandir Marg, Punjabi Bagh, Civil Lines and Anand Vihar.

**Statement 8.4**

**Monthly Average of Real Time Ambient Noise Levels (Day Time of April-2016 to March-2017**

| Month | Anand Vihar (dB (A)) | Civil Lines (dB (A)) | Mandir Marg (dB (A)) | Punjabi Bagh (db(A)) | R.K. Puram (dB (A)) |
|---|---|---|---|---|---|
| Apr-16 | 67.8 | 61.5 | 56.7 | 59.8 | 60.9 |
| May-16 | 68.1 | 61.6 | 55.8 | 59.4 | 60.3 |
| Jun-16 | 68.6 | 61.9 | 59.8 | 59.6 | 60.6 |
| Jul-16 | 68.1 | 62.4 | 63.8 | 59.2 | 61.2 |

| Month | Anand Vihar (dB (A)) | Civil Lines (dB (A)) | Mandir Marg (dB (A)) | Punjabi Bagh (db(A)) | R.K. Puram (dB (A)) |
|---|---|---|---|---|---|
| Aug-16 | 67.7 | 62.1 | 64.9 | 59.5 | 61.3 |
| Sep-16 | 66.7 | 61.6 | 58.7 | 58.4 | 60.2 |
| Oct-16 | 66.9 | 61.5 | 58.1 | 58.2 | 59.7 |
| Nov-16 | 67.3 | 65.5 | 58.4 | 58.5 | 60.7 |
| Dec-16 | 67.0 | 66.3 | 62.0 | 58.3 | 66.4 |
| Jan-17 | 67.1 | 62.4 | 57.9 | 58.1 | 59.9 |
| Feb-17 | 66.9 | 62.0 | 56.6 | 59.7 | 61.9 |
| Mar-17 | 67.4 | 61.6 | 56.6 | 59.3 | 59.8 |

**Monthly Average of Real Time Ambient Noise Levels (Night Time) of April-2016 to March-2017**

| Month | Anand Vihar (dB (A)) | Civil Lines (dB (A)) | Mandir Marg (dB (A)) | Punjabi Bagh (db(A)) | R.K.Puram (dB (A)) |
|---|---|---|---|---|---|
| Apr-16 | 64.7 | 60.2 | 49.0 | 53.4 | 54.3 |
| May-16 | 65.6 | 60.5 | 52.0 | 54.6 | 55.0 |
| Jun-16 | 67.5 | 62.5 | 59.1 | 59.0 | 61.1 |
| Jul-16 | 65.4 | 60.0 | 51.7 | 52.9 | 54.6 |
| Aug-16 | 65.4 | 59.7 | 49.6 | 52.7 | 54.4 |
| Sep-16 | 67.2 | 62.3 | 58.0 | 58.3 | 60.2 |
| Oct-16 | 67.0 | 62.1 | 57.6 | 58.0 | 59.9 |
| Nov-16 | 66.9 | 62.0 | 57.1 | 57.7 | 59.6 |
| Dec-16 | 67.0 | 62.0 | N.A | 57.7 | 59.6 |
| Jan-17 | 63.8 | 60.6 | 47.9 | 51.7 | 52.0 |
| Feb-17 | 63.2 | 59.6 | 48.8 | 52.6 | 54.0 |
| Mar-17 | 64.4 | 59.1 | 49.0 | 52.0 | 53.4 |

Note:- N.A. : Data Not Available

## 4. Water Pollution

4.1 The river Yamuna, the reason for Delhi's existence, has suffered heavily from pollution. The entire stretch of the Yamuna River in Delhi is highly polluted due to the flow of untreated sewage and also the discharge of inadequate treated industrial effluents.

4.2 DPCC has been conducting monthly water quality monitoring of river Yamuna (at 9 locations) and major drains (24 drains) falling into river Yamuna. Statement 8.5 (at 9 locations) and 8.6 (24 drains) indicates annual average water quality of River Yamuna from April 2016 till March 2017. Recent water quality monitoring reports of river Yamuna indicate that the water quality parameters, BOD & DO, are in the desirable/prescribed norms, with respect to Water Quality criteria of "C" class, at Palla, which is upstream of Wazirabad Barrage.

However, the water quality of River Yamuna at the downstream of Wazirabad barrage after confluence of Najafgarh Drain is not meeting the desirable/ prescribed norms.

4.3 The highest annual average of DO is 8.9 mg/l at Palla. The annual average of BOD has ranged from 2.1 mg/l at Palla to 49.1 mg/l at Khajuri Pantool Pool. The water quality standards for DO and BOD as per CPCB norms are 4mg/l and 3mg/l respectively for class 'C' of river water. The water quality monitoring results in Delhi stretch clearly indicates river water is grossly polluted.

**Statement 8.5**

**ANNUAL AVERAGE WATER QUALITY OF RIVER YAMUNA AT DIFFERENT LOCATIONS: APRIL 2016 TO MARCH 2017**

| S. No. | LOCATIONS | pH (mg/l) | COD (mg/l) | BOD (mg/l) | DO (mg/l) |
|---|---|---|---|---|---|
| | **Water Quality Criteria** | 6.0-9.0 | - | 3mg/l (max) | 4mg/l (min) |
| 1 | PALLA | 7.5 | 9.7 | 2.1 | 8.9 |
| 2 | SURGHAT | 7.4 | 21.7 | 4.4 | 7.7 |
| 3 | KHAJURI PANTOOL POOL | 7.4 | 152.3 | 49.1 | 0.4 |
| 4 | KUDESIA GHAT | 7.4 | 117.0 | 37.3 | 0.6 |
| 5 | ITO BRIDGE | 7.3 | 84.3 | 25.8 | 0.6 |
| 6 | NIZAMUDIN BRIDGE | 7.5 | 74.5 | 24.0 | 1.3 |
| 7 | AGRA CANAL OKHLA | 7.6 | 94.2 | 29.8 | 0.8 |
| 8 | SHAHDARA (DOWN STREAM) | 7.6 | 114.6 | 37.1 | 0.5 |
| 9 | AGRA CANAL JAITPUR | 7.5 | 86.7 | 28.8 | 0.9 |

Source: - Delhi Pollution Control Committee.

4.4 Water quality monitoring results of the drains indicate that most of the drains are not meeting the standards with respect to Bio-chemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD) and Total Suspended Solids (TSS).

**Statement 8.6**

**ANNUAL AVERAGE WATER QUALITY OF DRAINS AT DIFFERENT LOCATIONS IN DELHI: APRIL 2016 TO MARCH 2017**

| S. No. | Measure/Drains | pH | TSS | COD | BOD |
|---|---|---|---|---|---|
| | **Water Quality Criteria** | **5.5-9.0** | **100 (mg/l)** | **250 (mg/l)** | **30 (mg/l)** |
| 1 | Najafgarh Drain | 7.32 | 166.67 | 161.00 | 48.75 |
| 2 | Metcalf House Drain | 7.38 | 80.25 | 90.50 | 29.25 |
| 3 | Khyber Pass Drain | 7.42 | 56.00 | 64.67 | 19.73 |
| 4 | Sweeper Colony Drain | 7.36 | 71.67 | 123.33 | 37.00 |

| S. No. | Measure/Drains | pH | TSS | COD | BOD |
|---|---|---|---|---|---|
| | **Water Quality Criteria** | **5.5-9.0** | **100 (mg/l)** | **250 (mg/l)** | **30 (mg/l)** |
| 5 | Magazine Road Drain | 7.28 | 131.33 | 203.33 | 69.83 |
| 6 | ISBT Drain | 7.53 | 80.50 | 123.67 | 38.83 |
| 7 | Tonga Stand Drain | 7.47 | 137.17 | 257.00 | 86.42 |
| 8 | Moat Drain | No Flow | No Flow | No Flow | No Flow |
| 9 | Civil Mill Drain | 7.36 | 100.67 | 187.43 | 72.25 |
| 10 | Power House Drain | 7.33 | 161.00 | 235.33 | 77.83 |
| 11 | Sen Nursing Home Drain | 7.43 | 149.00 | 247.33 | 85.58 |
| 12 | Drain No. 12A | No Flow | No Flow | No Flow | No Flow |
| 13 | Drain No. 14 | 7.48 | 57.27 | 48.73 | 12.44 |
| 14 | Barapulla Drain | 7.48 | 96.67 | 129.83 | 52.83 |
| 15 | Maharani Bagh Drain | 7.40 | 125.83 | 347.33 | 121.25 |
| 16 | Kalkaji Drain | No Flow | No Flow | No Flow | No Flow |
| 17 | Sarita Vihar Drain (Mathura Road) | 7.61 | 151.17 | 229.00 | 72.33 |
| 18 | Tehkhand Drain | 7.58 | 186.00 | 336.67 | 117.92 |
| 19 | Tuglakabad Drain | 7.62 | 126.50 | 269.00 | 86.25 |
| 20 | Drain Near LPG Bottling Plant | No Flow | No Flow | No Flow | No Flow |
| 21 | Drain Near Sarita Vihar Bridge | 7.54 | 68.50 | 115.00 | 36.67 |
| 22 | Shahdara Drain | 7.60 | 274.67 | 336.67 | 110.83 |
| 23 | Sahibabad Drain | 7.52 | 361.33 | 544.33 | 178.33 |
| 24 | Indrapuri Drain | 7.5 | 285 | 409 | 139.75 |

Source: Delhi Pollution Control Committee.

4.5 As sewerage system is not provided in unplanned habitats, the waste water generated in unplanned area is discharged into drains. Non-utilization of installed capacity of sewage Treatment Plants is another important issue. Delhi Jal Board has prepared a plan to provide sewerage facilities in unauthorized colonies.

4.6 Delhi Jal Board initiated the process of laying of interceptor sewers along 3 major drains (Najafgarh Drain, Supplementary Drain and Shahdara Drain). Sewage generated from the colonies will be trapped before reaching the major drains and the same would be diverted to the existing unutilized STPs/new STPs.

4.7 Delhi Pollution Control Committee, being pollution control statutory agency and regulator, collects samples of treated effluents from all operational STPs on monthly basis. Deficiencies and analysis reports are sent to Delhi Jal Board (DJB) for rectification so as to meet the norms stipulated. Effluent Analysis Report of STPs are also placed on the website of DPCC. Directions have been given to Delhi Jal Board to install online monitoring system on their STPs.

4.8 Mandatory provision of installation of on-site decentralize wastewater treatment system (ETP) by Industries, Hotels, Construction Projects etc with treated wastewater reuse in flushing, cooling, horticulture etc. More than 1800 ETPs have been installed so far. Five/ four Star Hotels and Hospitals having more than 50 beds have been directed to install

Sewage Treatment Plants and most of them have already installed.

4.9 One of the main sources of water pollution is the waste material discharged by industrial units. Waste materials like acids, alkalies, toxic metals, oil, grease, dyes, pesticides and even radioactive materials are poured into the drains by many industrial units. Some other important pollutants include polychlorinated biphenyl (PCB) compounds, lubricants, etc. The pollutants unloaded into the drains usually dissolve or remain suspended in water. Sometimes, they also accumulate on the bottom of the drains. The industrial waste water generated in Delhi is more than 40 MGD. All industrial units located in the Industrial Areas having CETPs have been directed to ensure linkage to conveyance system in Common Effluent Treatment Plants (CETPs). There are 13 functional CETPs for 21 industrial areas in Delhi. Name of CETP along with its capacity is given at statement 8.7.

**Statement 8.7**

**List of Common Effluent Treatment Plants (CETPs) in NCT of Delhi**

| S.No. | Name of CETP | Capacity of CETP (in MLD) |
|---|---|---|
| 1. | Jhilmil & Friends Colony Industrial Area CETP | 16.8 |
| 2 | Badli Industrial Estate CETP | 12 |
| 3 | Mayapuri Industrial Area CETP | 12 |
| 4 | Mangolpuri Industrial Area CETP | 2.4 |
| 5 | Wazirpur Industrial Area CETP | 24 |
| 6 | DSIDC Nangloi & Udyog Nagar Industrial Area CETP | 12 |
| 7 | SMA Industrial Area CETP | 12 |
| 8 | Okhla Industrial Area CETP | 24 |
| 9 | Narela Industrial Area CETP | 22 |
| 10 | Udyog Vihar (Bawana) Industrial Area CETP | 35 |
| 11 | GTK Road Industrial Area, CETP | 6 |
| 12 | Naraina Industrial Area, CETP | 21.6 |
| 13 | Lawrence Road Industrial Area CETP | 12 |
| | **Total** | **211.8 MLD (46.59 MGD)** |

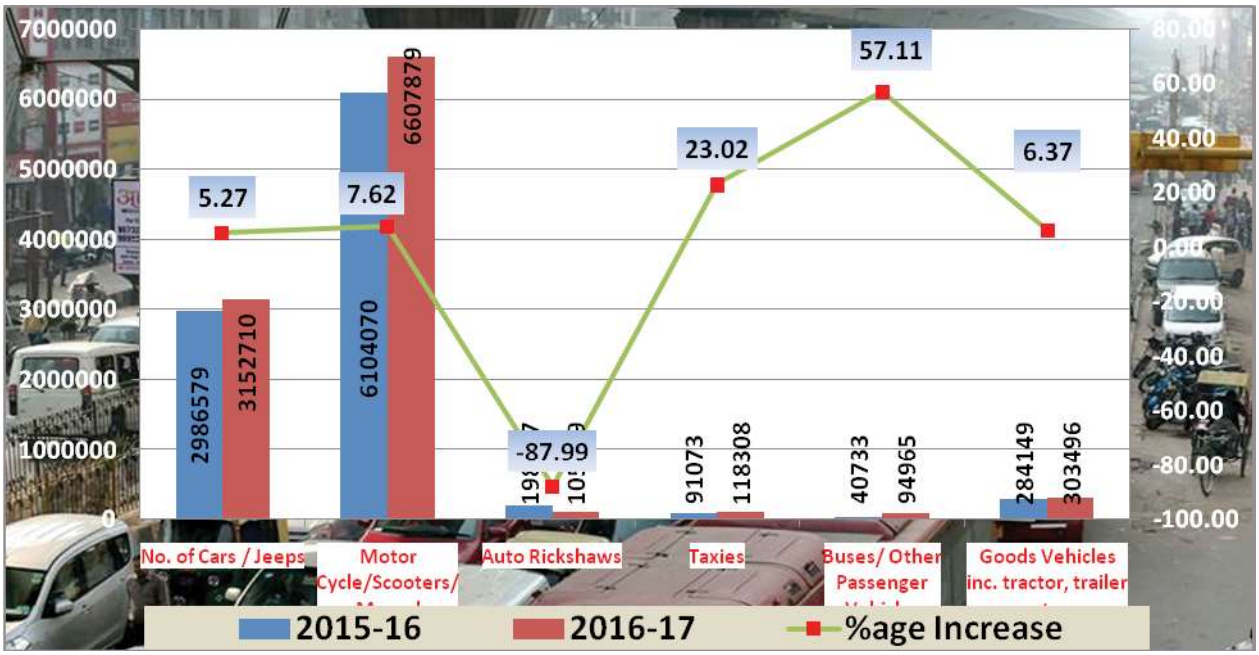
4.10 Delhi Pollution Control Committee collects samples of treated effluents from all 13 CETPs on monthly basis. Deficiencies are communicated to the CETPs Societies for rectification so as to meet the norms stipulated. Effluent Analysis Report of CETPs are also placed on the website of DPCC. Directions have been given to CETP Societies/DSIIDC to install online monitoring system on their CETPs and 6 CETPs have already installed online monitoring system.

## 5. Vehicular Pollution

5.1 The vehicle emission and their contribution to ambient air concentration is the significant to $PM_{10}$ and $PM_{2.5}$ both in winter and summer. The number of vehicles registered in Delhi has increased from 31.64 lakh in 1999-2000 to 103.83 lakh in 2016-17. The highest %age increase observed in Taxis from 1999-2000 to 2016-17. During the same period, the percentage of increase was observed in all categories of vehicles i.e. cars & jeeps; motor cycles & scooters, auto rickshaws, buses and goods vehicles. This has automatically enhanced the pollution levels of Delhi by the emission of pollutants by these vehicles. There were 97.05 lakh registered vehicles in Delhi in 2015-16 which increased to 103.83 lakh in 2016-17. The increase in various Vehicles in Delhi in 2016-17 as compared to 2015-16 is shown in chart 8.2

**Chart 8.2**

**REGISTERED VEHICLES IN DELHI 2015-16 AND 2016-17**




5.2 Govt. of NCT of Delhi through Delhi Pollution Control Committee provides following financial subsidy on newly purchased Battery Operated Four Wheelers and Two wheelers due to which e-Rickshaws were introduced in 2016-17:

| S.No. | Type of Vehicles | Cost of Vehicles (base price) | Subsidy given by Govt. of Delhi (in ₹) |
|---|---|---|---|
| 1. | 4 Wheeler | Upto 5 lakhs | 30,000/- |
| 2. | 4 Wheeler | More than 5 lakhs | 1,50,000/- |
| 3. | 2 Wheeler | Upto 20,000/- | 1,000/- |
| 4. | 2 Wheeler | More than 20,000/- but less than 25,000/- | 2,000/- |
| 5. | 2 Wheeler | More than 25,000/- | 5,500/- |

5.3 Financial subsidy is provided from the Air Ambient fund, created by levying 25 paisa per litre of Diesel (Diesel Case) with the objective of utilizing the collect amount towards clean environment movement including promotion of environment friendly vehicles/non polluting vehicles in Delhi. One time fixed subsidy of ₹ 30,000/- is also provided to battery operated e-rickshaw owners, authorized by Transport Department and registered in NCT of Delhi w.e.f. 01.04.2016. Initially the subsidy amount w.e.f. 01.04.2015 was ₹ 15,000/-. An individual can claim subsidy only on one e-rickshaw. On subsequent purchase by the same individual no subsidy is allowed. The subsidy is given by DPCC from Air Ambience Fund.

## 6. Waste Management

### 6.1 Municipal Solid Waste

6.1.1 In Delhi, 5 Municipal Authorities are responsible for Municipal solid Waste Generation and Management.

6.1.2 There are 4 landfill sites namely Bhalaswa land fill site (since 1993), Ghazipur land fill site (since 1984), Okhla land fill site (1994) and Bawana land fill site (Developed as Engineering Landfill Site and operating since 2011). In the absence of availability of landfill sites, all the 5 Municipal Bodies are also using the first 3 sites for disposal of Municipal Solid Waste though these are not Engineering Landfill Site.

6.1.3 Integrated MSW management plant of 4000 TPD capacity has been developed at Narela-Bawana and the plant is operational for 2000 TPD.

6.1.4 There are 2 Compost Plants in Delhi one at Okhla (operated by M/s IL & FS, Capacity 200 Tonns per day) and another one at Bawana (operated by M/s Delhi MSW Solutions Ltd., Capacity 1500 Tonns per day)

6.1.5 In addition there are 3 Waste to Energy Plants in Delhi as per the details:

| S. No. | Name | Plant Capacity ( MTD ) | Electricity Generated (MW) | Status |
|---|---|---|---|---|
| 1. | Timarpur - Okhla Waste to Energy Plant | 2950 (1950 + 1000) | 16 | Operational |
| 2. | Ghazipur Waste to Energy Plant | 1300 | 12 | Operational |
| 3. | Narela Waste to Energy Plant | 2000 | 24 | Operational |

6.1.6 Ministry of Environment, Forests and Climate Change, GOI has notified the revised Solid Waste Management Rules 2016 on 08.04.2016. The responsibility of management of Municipal Solid Waste has been entrusted with Urban Development Department and Urban Local Bodies. All Municipal Corporations have been directed to prepare Solid Waste Management Plan with activity timelines ranging from 8-16 months.

## 6.2 Biomedical Waste

6.2.1 Ministry of Environment, Forests and Climate Change, Govt of India has notified Bio-Medical Waste Management Rules, 2016 on 28.03.2016. The prescribed authority for implementation of the provisions of these rules is Delhi Pollution Control Committee. About 25 Tons per day of Bio-Medical Waste is generated and treated in Delhi. There are following two Common Bio-Medical Waste Treatment Facilities (CBWTF) in Delhi for the treatment of the Bio-Medical Waste generated from the Health Care Establishments in Delhi :

(i) M/s Biotic Waste Solutions Pvt. Ltd at SMA Industrial Area, GTK Road, Delhi

(ii) M/s SMS Water Grace BMW Pvt. Ltd., near Nilothi STP of DJB.

6.2.2 These CBWTFs have total capacity of 63 Tons/ Day and having Incinerators, Autoclave and Shredders for the treatment and disposal of the Bio-Medical Waste and have installed Online Monitoring System.

## 6.3 Electronic Waste

Ministry of Environment, Forests and Climate Change, Govt of India has notified E-Waste (Management) Rules, 2016 on 23.03.2016 which have come into force from 1st October 2016. List of Authorities and corresponding duties are mentioned in Schedule IV of the said Rules.

## 6.4. Plactic Waste

6.4.1 Plastic waste especially carry bags has been creating nuisance in Delhi despite over 12 years of massive awareness campaign “Say No To Plastic Bags”. Hon’ble High Court of Delhi had passed a judgment in August 2008 for imposing ban on plastic carry bags in main markets, local shopping centers, etc. subsequent to which Government of Delhi had issued a notification on 07.01.2009, but the situation continued to worsen even after three years of issue of this notification. In light of this, Government of Delhi has imposed ban on manufacture, sale, storage, usage, import and transport of plastic carry bags in NCT of Delhi vide Notification dated 23.10.2012.

6.4.2 This notification has been challenged in the Hon'ble High Court of Delhi by All India Plastic Industries Association and on 05-12-2016; Hon'ble High Court of Delhi has transferred this matter to the Hon'ble NGT for further decision. Besides, Ministry of Environment, Forests and Climate Change, GOI has notified revised Plastic Waste Management Rules 2016 on 18-03-2016. These rules entrust the responsibility of plastic waste management with Urban Development Department and the Urban Local Bodies

## 6.5 Construction and Demolition Waste

6.5.1 There are following two operational Construction and Demolition Waste Processing Plants of M/s IL & FS in Delhi

(i) Construction and Demolition Waste Processing Plant at Jahangirpuri (Capacity – 2000 Tons/Day).

(ii) Construction and Demolition Waste Processing Plant at Shastri Park (Capacity – 500 Tons/Day).

6.5.2 Processed construction and demolition material is used for making tiles/ pavement blocks and also for ready mix concrete, aggregates etc.

6.5.3 Ministry of Environment, Forests and Climate Change, GOI has notified the Construction and Demolition Waste Management Rules, 2016 on 29.03.2016. As per these Rules, the Secretary in-charge of Urban Development shall prepare their policy document with respect to management of construction and demolition of waste in accordance with the provisions of these rules within one year from date of final notification of these rules.

## 6.6 Hazardous Waste

6.6.1 There are about 1100 units (Excluding S.S. Pickling Units) generating Hazardous waste in Delhi as per the report submitted by M/s Aecadics India Pvt. Ltd., i.e. consultant engaged by DSIIDC for development of TSDF at Bawana. An estimated amount of 4197.76 T/Annum of Hazardous waste is generated from these units alongwith 13 CETPs.

6.6.2 A site for setting up of TSDF for disposal of hazardous waste of Delhi has been identified in Bawana Area and its development is under process by DSIIDC.

# 7. Climate Change Mitigation Measures

7.1 On the issue of Combating Climate Change, Delhi is the first city in the country to set a mandate and brought out a detailed Climate Change Agenda for 2009-2012, on the lines of National Action Plan for Climate Change released by the Government of India.

7.2 65 important point climate change agenda have been identified for the city of Delhi under following sectors:

a) Enhanced Energy Efficiency
b) Sustainable Habitat
c) Green India
d) Water Mission
e) Strategic Knowledge
f) Solar Mission

7.3 Delhi State Action Plan on Climate Change (SAPCC) is being prepared on the lines of National Action Plan on Climate Change (NAPCC).

## 8. Rain-Water Harvesting Structure

8.1 The demand of water in Delhi is increasing day by day with the rapid urbanization and the availability of potable water is not adequate to meet the growing requirements of Delhi. Main water source in the city is the water share from neighbouring basin states like Haryana, Himachal Pradesh, Uttar Pradesh etc. Thus, there is a limitation to augment the water supply. Due to this, the burden on ground water extraction is, increasing and unexpected withdrawal of ground water has resulted in depletion in water level and deterioration in quality of ground water. Rainwater harvesting is an ideal solution to areas where there is insufficient ground water or surface water resources are lacking. It helps in using the ground water and furthermore keeps the overflow from going into sewer or storm water drains.

8.2 Installation of Rain-Water Harvesting System has been made mandatory for plots having area of 100 Sq. Meters and above. The financial assistance of the 50 per cent of the project cost or 1 lakh whichever is less, is provided by Delhi Government / Delhi Jal Board to the Resident Welfare Associations or Schools for this purpose.

8.3 For Hotels / Malls / Construction Projects etc, installation of Rain Water Harvesting System has been made mandatory through contract mechanism.

## 9. Measures taken to Tackle the Pollution in Delhi

9.1 There is a policy for afforestation, atmospheric pollution, bio-medical waste, domestic refuse, and water and sewage treatment. Additionally, there are action plans to encourage public participation in environmental problems. Given the continued growth of the city and its population, problems are tackled only with difficulty—for instance,

9.2 **Odd-Even Traffic Scheme**: To tackle rising air pollution in Delhi, the Government of Delhi has come up with odd-even traffic scheme. The first phase was in January 2016 for the first 15 days in the month. The second phase was from April 15 to April 30, 2016. According to the notification issued by the Government, from 8 am to 8 pm, vehicles with odd registration numbers were allowed to ply on odd dates and those with even registration numbers were plying on even dates. There was no restriction on any vehicle on Sundays.

9.3 **Supreme Court Ban on sale of fireworks**: Since air pollution spikes in Delhi during festivities for Diwali, on 9 October 2017 the Supreme Court of India banned the sale of fireworks - a main source of the spike - in the city.

## 10. Other Measures to Control Pollution and Improve the Environment

10.1 Some of the important measures adopted by the Government / DPCC to control pollution and improve the environment are as follows;

- More than 15 year old commercial / transport vehicles have been phased out.
- Entire public transport has been switch over to CNG fuel mode (approx. 1,60,000).

- Implementation of Bharat Stage IV/Euro-IV emission norms.
- Sulphur content in Diesel has been reduced upto 50 PPM since April 2010.
- PUCs being linked on the net so that daily reports can be downloaded & monitoring can be done.
- Air Ambience Fund has been created by levying fee on the sale of diesel at the rate of ₹ 0.25 per liter in the NCT of Delhi. The Air Ambience Fund is utilized for promoting clean technologies.
- Levy of Environment Compensation Charge on commercial vehicles.
- Gas based Power Plants are being promoted.
- Whole of Delhi declared as air pollution control area under Air Act.
- Stringent emission norms for industries and thermal power stations
- Installation of Emission Control System in air polluting industries
- Burning of leaves/plastics is prohibited
- Use of 5 KVA or more capacity of DG set is prohibited from 10 PM to 6 AM except in group housing societies. Also, acoustic enclosure has been made mandatory in DG sets.
- Re-use of treated waste water for gardening and cooling purposes.
- Making use of Bio-degradable kitchen solid waste for Vermi Composting at community level and utilizing compost for gardening purpose.
- Environment Department has supported Schools for putting up paper re-cycling equipments/ plants.
- Development and Protection of the Ridge Area.
- Development of Wild Life Sanctuary at Bhatti, Asola.
- Development and Preservation of lakes and water bodies.
- For ground water regulations and management in the city, a notification containing directions under section 5 of Environment Protection Act has been issued on 12th July 2010.
- Massive plantation drive is being organised each year with the involvement of some Government Departments, Municipal bodies, NGO, Civil Society Organisations, Citizens, RWAs, Schools & Colleges, etc.
- Anti-Fire cracker companies is conducted every year during Diwali Festival.
- Improvement of parks and gardens and their maintenance is being taken care of by providing adequate funds to local bodies and RWAs.
- Providing Sewerage System in unplanned habitats i.e. unauthorised colonies and rural villages.

## 11. How can the citizens of Delhi help in reducing pollution?

11.1 Pollution in Delhi is a perpetual problem which needs to be looked upon as a serious issue not only by the Government but also by the citizens of Delhi:

- One of the easiest ways is that there should be an efficient involvement of Resident Welfare Associations in various localities in collection, segregation of garbage from houses and the societies.
- Citizens can take steps to cover the garbage into compost in their localities.
- More and more trees must be planted in every locality.
- Stop open burning.
- Stop bursting fire crackers.
- Control dust pollution at construction sites.
- Every individual should keep a proper check on the pollution level of their vehicles.
- Making more use of CNG.

- One of the best ways to control pollution is to manage wastes of all types in a proper manner.
- Each and every citizen should use buses and metro instead of cars and scooters, as they can carry a lot more people in one journey. Car pool is also a good option.
- Controlling the use of energy and making use of electricity in an efficient manner.
- One can also reduce water pollution by reducing the use of chemicals, cleaning agents, pesticides, herbicides, fertilizers etc.
- Install rain water harvesting structures.

11.2 It is the duty of every citizen to think in a broader perspective to control pollution. We really don't want our future generations to live in an unhealthy environment in Delhi.

## 12. DELHI PARKS AND GARDENS SOCIETY (DPGS)

12.1 Delhi Parks and Gardens Society (DPGS) maintain parks and gardens of Delhi. DPGS involves RWAs/NGOs, in maintaining and developing parks of Delhi, with the objective to increase the greenery in Delhi. It provides financial assistance to RWAs/NGOs for maintenance and development of parks and gardens in Delhi based on NOC from the concerned Land Owning Agency.

### 12.2 Performance of DPGS during 2016-17 and 2017-18

- During year 2016-17, DPGS implemented the Joint Park Management Scheme of DPGS under Department of Environment, Govt. of NCT of Delhi, including new areas measuring almost 431.91 Acres with the participation of 289 RWA/NGO, covering 1394 Nos. of parks. During, 2017-18, financial assistance for maintenance of parks and gardens provided for areas measuring almost 327.62 acres with the participation of 233 RWAs/NGOs, covering 1043 number of parks till 15th Jan. 2018. Till March 2018, DPGS intends to provide assistance to around 330 RWAs for 1400 parks with an area of 400 acres.

- The Society is motivating RWA's/NGO's in the greening activities, by organizing meetings, distribution of plants to RWAs' for plantation in parks, technical advices and coordinating with other agencies. During 2016-17, 1.52 Lakhs plants raised & maintained in DPGS Nursery, were distributed to RWAs'/NGOs', greening agencies, corporation etc. and got the same planted. During 2017-18, till 15th Jan, 2018, 1.60 Lakh plants procured/raised and maintained in DPGS Nursery were distributed to RWAs/NGOs, greening agencies, corporates etc., for plantation.

- DPGS carried out monitoring of parks under various civic agencies like MCD, NDMC, DDA, CPWD for inventroization and categorization of status leased on its development status, i.e., well maintained, satisfactory and poor parks and effectively coordinated greenery maintenance amongst greening agencies in NCT Delhi.
- DPGS is taking up greening projects in poorly maintained parks, semi vacant spaces and also in open spaces.
- DPGS is providing advice to other agencies in the greening activities. Thereby motivating greening by various agencies in Delhi.

## 12.3 Achievements 2016-17 & 2017-18

| Financial Year | No. of RWAs/ NGOs | No. of Parks | Covering Area (in Acres) |
|---|---|---|---|
| 2016-17 | 289 | 1370 | 431.91 |
| 2017-18 (upto 15th Jan,2018) | 233 | 1043 | 327.62 |

## 13. FOREST IN DELHI

13.1 The Delhi government is committed to increase green cover of the city. Activities carried, out by the State Government, Forest Department and greening agencies have helped a lot in striking a balance between ecology and development. The vegetation of Delhi is thorny scrub, which is found in arid and semi-arid zone.

13.2 The National Forest Policy, 1988 provides that a minimum of 1/3rd of the total land area of the country should be under forest or tree cover. Taking the above in view, the Govt. of NCT of Delhi is making all endeavors to meet the national goal as set by the Central Govt. and is constantly adding to the green cover of the State which is reflected in the change in forest and tree cover given as follows:

**Statement 8.8**

**FOREST AND TREE COVER AREA OF DELHI 1993-2017**

(Sq. Km)

| S. No. | Year | Forest and Tree Cover | Absolute Increase In Area | % of Total Area |
|---|---|---|---|---|
| 1. | 1993 | 22 | -- | 1.48 |
| 2. | 1995 | 26 | 4 | 1.75 |
| 3. | 1997 | 26 | -- | 1.75 |
| 4. | 1999 | 88 | 62 | 5.93 |
| 5. | 2001 | 151 | 63 | 10.2 |
| 6. | 2003 | 268 | 117 | 18.07 |
| 7. | 2005 | 283 | 15 | 19.09 |
| 8. | 2009 | 299.58 | 16.58 | 20.20 |
| 9. | 2011 | 296.20 | -3.38 | 19.97 |
| 10. | 2013 | 297.81 | 1.61 | 20.08 |
| 11. | 2015 | 299.77 | 1.96 | 20.22 |
| 12. | 2017 | 305.41 | 5.64 | 20.59 |

Source: State Forest Report, 2017

13.3 Government of NCT of Delhi has taken initiatives to increase forests and tree cover area to keep the environment green in Delhi. As a result of the initiatives taken by Government of NCT of Delhi, forest and tree cover area has been increasing steadily since 1993. The forest and tree cover area increased to 305.41 sq km in 2017 increasing thereby the share of forests in the total area to 20.59 per cent. The growth of forests and tree cover has particularly been monumental post 1999. Of the total 305.41 sq km of forest area in NCT of Delhi, nearly 279 sq km has been added during the period 1997 to 2017.

**Statement 8.9**

**CHANGE IN FOREST AND TREE COVER IN DELHI BETWEEN 2015 AND 2017**

***(Area in Sq Km)***

| ***Change in Forest Cover in Delhi*** | | | |
|---|---|---|---|
| | ***2015 Assessment*** | ***2017 Assessment*** | ***Change*** |
| Geographical Area | 1483 | | |
| Very Dense Forest | 6.94 | 6.72 | -0.22 |
| Moderate Dense Forest | 57.15 | 56.24 | -0.91 |
| Open Forest | 124.68 | 129.45 | 4.77 |
| Total Forest | **188.77** | **192.41** | **3.64** |
| **Percent of Geographical Area** | **12.72** | **12.97** | **0.25** |
| ***Change in Tree Cover in Delhi*** | | | |
| | ***2015 Assessment*** | ***2017 Assessment*** | ***Change*** |
| **Total Tree cover** | **111** | **113** | **2** |
| **Percent of Geographical Area** | **7.48** | **7.62** | **0.14** |

Source: State Forest Report, 2017

13.4 It may be observed from Statement 8.8 that the growth of forest and tree cover area of Delhi increased from 22 Sq. Km in 1993 to 305.41 Sq. Km in 2017. The percentage of forest and tree cover area to the total area of Delhi has increased manifold from a mere level of 1.48 per cent in 1993 to 20.59 per cent in 2017. Delhi's forest cover has increased by 0.25% or 3.64 sq km, compared to the assessments conducted in 2015, according to the State of the Forest report 2017.

13.5 The State Forest Report 2017 reveals that both 'Very dense forest' cover and 'Medium dense forest' cover in Delhi has declined over the past two years. The very dense forest cover has declined from 6.94 sq.km in 2015 to 6.72 sq. km in 2017, the medium dense forest cover has dropped from 57.1 sq. km to 56.2 sq. km during the same time. Very dense forest cover has more than 70% canopy, medium dense forest cover has a canopy of 40% to 70%. These are the actual carbon sinks. Losing out such dense forests is not a good sign as it reduces a city's capacity to sequester carbon. It is the open forests with a canopy cover of 10% to 40% which has increased from 124 sq. km to 129 sq. km in Delhi, leading to an overall increase in forest cover.

13.6 Some trees had to be felled because of construction projects such as the Metro and road widening. But at the same time, afforestation drives were also undertaken. The new plants

have not been accounted for as they are too small. They would only come under the medium dense forest or very dense forest after a period of five to 10 years at least.

13.7 The report says that Delhi's addition of 3.64 sq km of forest, mostly through open forest cover, is because of plantation and conservation activities. The decrease in forest cover has been attributed to civil construction.

13.8 As far as tree cover is concerned - sparse vegetation along roads or small- scale plantations - Delhi has the second-highest tree cover as a percentage of the total geographical area among states. The overall increase in Delhi's green cover is a good sign. Delhi's green cover has increased from around 20.2% during 2015 to 20.6% during 2017.

**Chart 8.3**

**Tree Cover as % of Total Area; 2017**

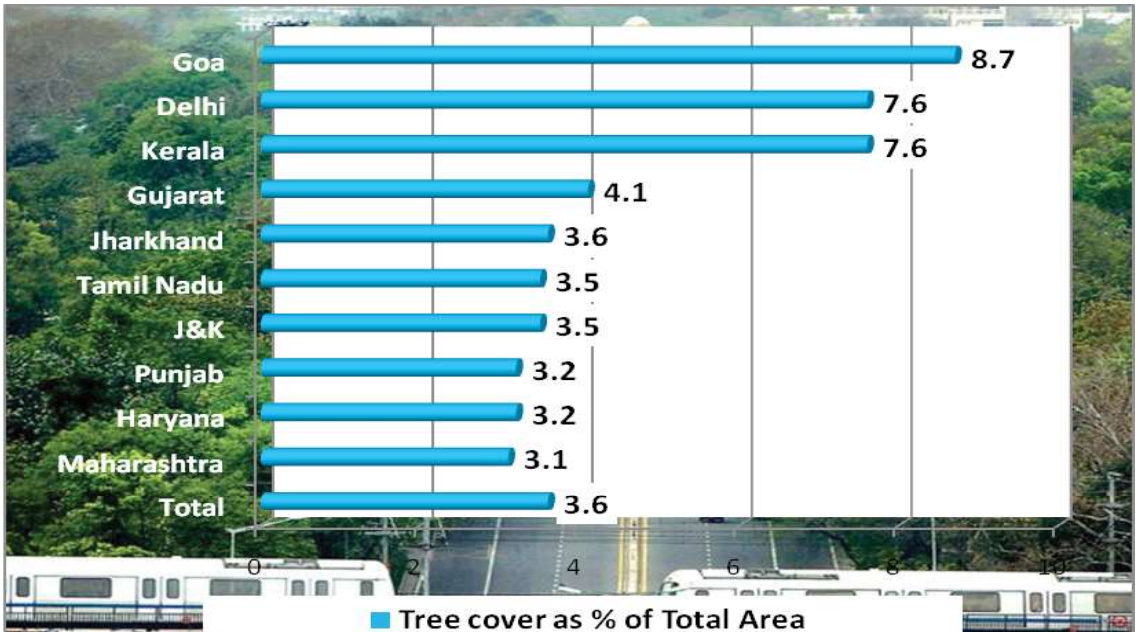
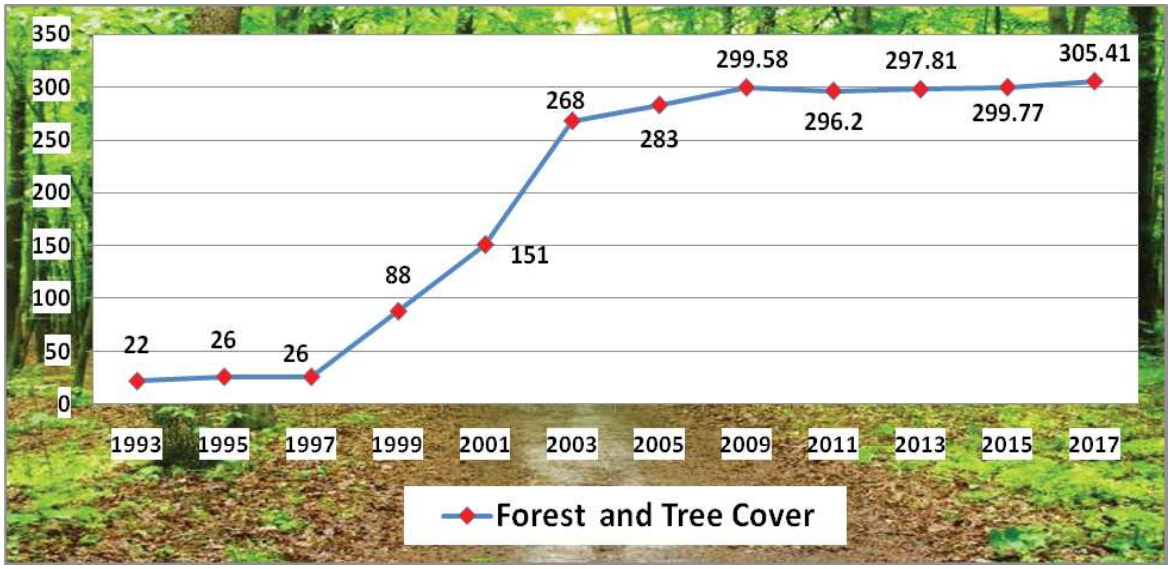



**Chart 8.4**

**FOREST AND TREE COVER AREA OF DELHI 1993-2017**



13.9 The information regarding the district-wise forest cover area and total geographical area of Delhi is presented in Statement 8.10.

## Statement 8.10

## DISTRICT-WISE FOREST COVER IN DELHI - 2017

(Sq. Km)

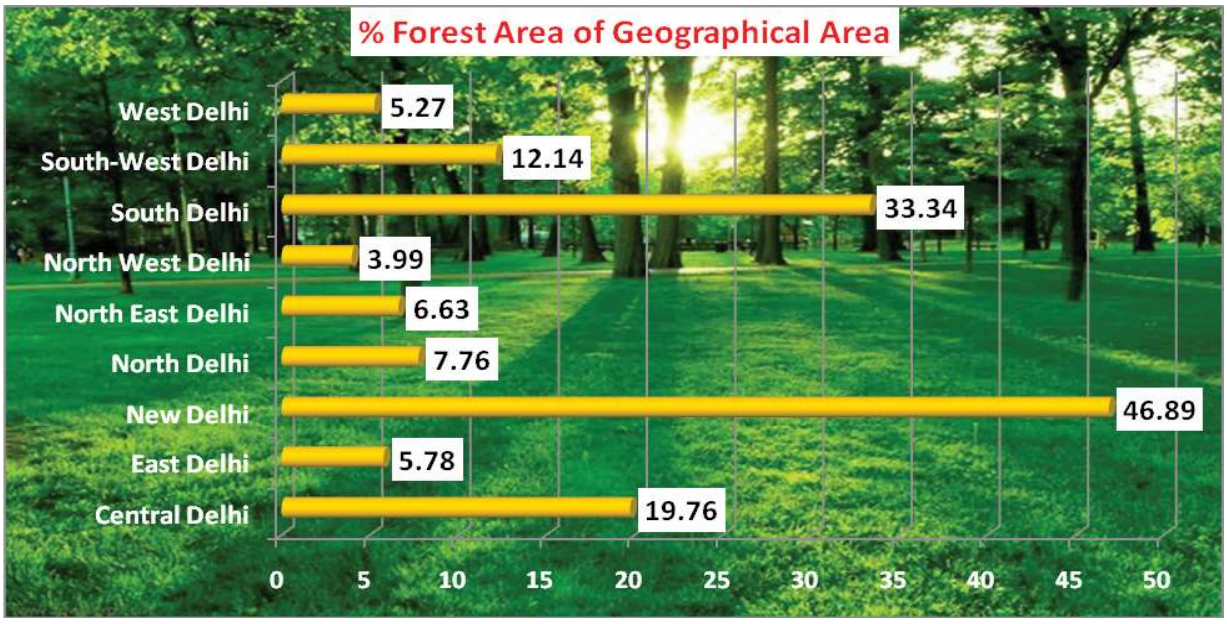
| S. No. | Districts | Geographical Area | Forest Cover Area | % of Geographical Area |
|---|---|---|---|---|
| 1. | Central Delhi | 25 | 4.94 | 19.76 |
| 2. | East Delhi | 64 | 3.70 | 5.78 |
| 3. | New Delhi | 35 | 16.41 | 46.89 |
| 4. | North Delhi | 59 | 4.58 | 7.76 |
| 5. | North East Delhi | 60 | 3.98 | 6.63 |
| 6. | North West Delhi | 440 | 17.55 | 3.99 |
| 7. | South Delhi | 250 | 83.35 | 33.34 |
| 8. | South-West Delhi | 421 | 51.10 | 12.14 |
| 9. | West Delhi | 129 | 6.80 | 5.27 |
| | **Total** | **1483** | **192.41** | **12.97** |

Source: State Forest Report, 2017

13.10 It may be inferred from Statement 8.10 that the forest cover area of Delhi is 192.41 sq. km i.e. 12.97 per cent of the total area of Delhi. South Delhi constitutes the highest forest cover area at 83.35 sq. km, South West Delhi at 51.10 sq. km, North West Delhi at 17.55 sq. km, New Delhi at 16.41 sq. km, respectively. On the contrary the lowest forest cover observed in East Delhi at 3.70 sq. Km. The information regarding district-wise forest cover in Delhi is also depicted in Chart 8.5.

## Chart 8.5

## DISTRICT-WISE FOREST COVER IN DELHI - 2017



**Forest Cover within Green Wash:**

| | |
|---|---|
| Very Dense Forest | 1.40 sq. km |
| Moderately Dense Forest | 6.85 sq. km |
| Open Forest | 1.94 sq. km |
| Sub Total | 10.19 sq. km |

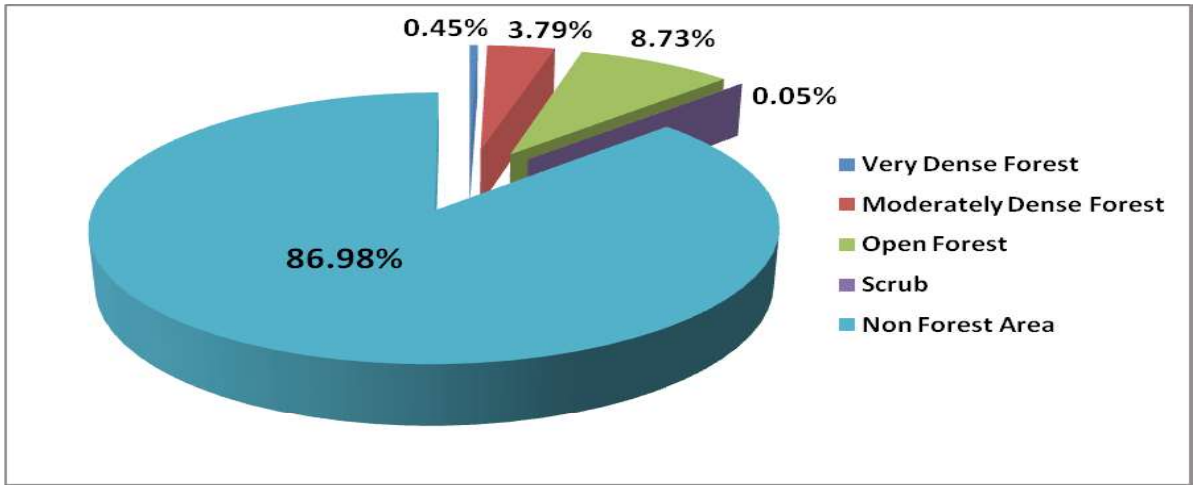
**Forest Cover outside Green Wash:**

| | |
|---|---|
| Very Dense Forest | 5.32 sq. km |
| Moderately Dense Forest | 49.39 sq. km |
| Open Forest | 127.51 sq. km |
| Sub Total | 182.22 sq. km |
| Total Forest Cover | 192.41 sq. km |
| Tree Cover | 113 sq. km |
| Total Forest & Tree Cover | 305.41 sq. km |
| Of State's Geographical Area | 20.59% |
| Of India's Forest & Tree Cover | 0.04% |
| Per Capita Forest & Tree Cover | 0.002 ha |

13.11 Composition of forests in terms of its density is shown in Chart 8.6. Out of the total geographical area of NCT of Delhi, very dense forest is spread over 0.45 per cent, moderately dense forest is spread over 3.79 percent, open forest is spread over 8.73 per cent and scrub is spread over 0.05 per cent, which is almost negligible.

**Chart 8.6**

**COMPOSITION OF FOREST COVER (%AGE) IN NCT OF DELHI IN 2017**




Source: State Forest Report, 2017

## 14 Decadal Change in Water Bodies within Forest

14.1 An increase of 0.55 sq. km has been observed year 2015 in the water body coverage within Forests compared to the year 2005.

14.2 Water Bodies within Forest for the years 2005 and 2015

| Area/ Coverage | 2005 | 2015 |
|---|---|---|
| Extent of Water Bodies (sq. km.) within Forest | 3.77 | 4.32 |
| %age of Water Bodies to Forest Cover | 2.13 | 2.25 |

## 15. Asola Bhatti Wild Life Sanctuary

15.1 Asola Bhatti Wildlife Sanctuary spread over 4845.57 acres is situated near Tughlakabad Fort in South Delhi. The Wildlife Sanctuary is considered the breathing lung of the cosmopolitan city of Delhi. It was established in 1992 with the aim to protect the wildlife in the area between Delhi and Surajkund (Delhi-Haryana border). The Asola Bhatti wildlife sanctuary actually lies in South Delhi District, all along Delhi Haryana Border along Faridabad and Gurgaon.

15.2 The sanctuary is located on the Southern Ridge which is part of the northern terminal of Aravalli Hills (Aravallis are one of the oldest mountain system of the world). The reason for the biodiversity significance of the Ridge lies in its merger with Indo-Gangetic Plains. The legal Status of the Southern Ridge was considered uncertain till 1986 when the community land of villages Asola, Sahurpur and Maidangari (2679.29 Acre) were notified and land of Bhatti village area (2166.28 Acre) was notified in 1991 as Sanctuary. Few Check dams have been constructed at Asola Wild Life Sanctuary as conservation measure for soil and water. These check dams have proved to be very effective for ground water recharge and creation of water bodies for the sustenance of Wild Life in the Sanctuary.

### 15.3 Reclamation of Bhatti area of Asola Bhatti Wild Life Sanctuary through ECO Task Force (ETF)

15.3.1 Forest Department, Government of NCT of Delhi is implementing the project of rehabilitation of about 2100 acres of Bhatti Mines area since October 2000 through ETF, which is a part of Asola-Bhatti Wild Life Sanctuary. Project period for five years was approved in 2000 at a cost of ₹ 8.23 crore, was extended further for a period of 3 years up to 8.10.2008 with an additional cost of ₹ 4.93 crore. The project was extended for a period of two years from 2008-2010 at an estimated cost of ₹ 13.04 crores. Further the project was extended till 31st March 2012 with the total revised estimated cost of ₹ 40.89 crore of the project. The project period for Rehabilitation of degraded forest land in Asola Bhatti Wildlife Sanctuary and Dera Mandi area through Eco-Task Force was again extended for the period 01.04.2012 to 31.03.2017 with the cost of ₹ 44.82 crore (₹ 31.39 crore for Establishment cost of ETF and ₹ 13.43 crore for Project Stores cost which includes plantation work & its maintenance for five years). In all, total project cost of ₹ 85.71 crore already approved by the EFC for the period w.e.f. 09.10.2000 to 31.03.2017.

15.3.2 EFC has approved the extension of the project period for rehabilitation of degraded forest land in the Southern Ridge area of Asola Bhatti, Dera Mandi, Maidangarhi, Ghittorni and Rajokri through Eco Task Force from 01.01.2017 to 31.03.2022 at an estimated cost of ₹ 90.25 crore (₹ 48.75 crore for Establishment cost of ETF and ₹ 41.50 crore for Project cost which includes plantation work & its maintenance for five years) for improving and sustaining the wildlife habitat through plantation. Project cost includes expenditure for creation of plantation of 2 lakh saplings per year for a period of five years

## 16. Major Achievements Made during 2016-17 & 2017-18

a) The department of Forests and Wildlife regulates the removal of trees as per provisions under Delhi (Preservation) of Trees Act, 1994. Online solution e-forest has been introduced for tree felling permission to User Agency and individuals with the provision of e-payment gateway. This will facilitate time bound permission of tree felling by Forest department in a transparent manner.

b) The Government is committed to provide soothing and green environment to the citizen of Delhi. Massive tree plantation drive was launched during July-September, 2016 involving 19 other greening agencies, eco-clubs and RWAs for plantation of 10 lakh tree saplings and 5 lakh shrubs as middle canopy. During 2016-17 a total of 8.72 Lakh sapling and 12.31 Lakh shrubs had been planted by the Forest Department alongwith other greening agencies.

c) During 2017-18, about 5.5 lakh saplings and 7.93 lakh shrubs have already been planted till December, 2017. The shrubs had been planted by the civic agencies during 2017-18 as per suitability of land especially on divider and road barns.

d) More than 3.5 lakh saplings were distributed in 2017-18 free of cost to the citizens from forest nurseries for planting in their own backyard. Such effort has paid dividends and the green cover of Delhi has increased substantially.

e) Long term plan for replacement of vilyati kikkar in central ridge area had been launched. Initially the stretch at S.P. Marg is being developed where canopy manipulation and gap opening is being done in the existing vilyati kikkar trees which are gradually being replaced by planting local indigenous species.

f) City forests at Mitraon, Nasirpur, Garhi Mandu, Taj Enclave, Shastri Park, Mukhmelpur were developed/ improved to increase the awareness for green area among local residents as large numbers of people residing in the area go to these forests for recreation in clean and green environment. Butterfly park at Tughlakabad is also developed.

g) Nurseries have been developed to raise around 8 lakh saplings/ seedlings for tree plantation.

h) Eco-restoration of habitat through Eco Task Force in Asola Bhatti Wildlife Sanctuary has been done by carrying out plantation of 1.5 lakh saplings and low cost engineering structures to improve the soil moisture regime.

## Chart 8.7

## FOREST COVER MAP OF DELHI