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State of ENVIRONMENT Chandigarh - 2014

EXECUTIVE SUMMARY

The first planned city in India, Chandigarh is known internationally for its architecture and urban design. Planned modern city, significant as a symbol of a developing, progressive and free India, Chandigarh is pragmatic mix of the functional and the aesthetic romanticism blended with practicality.Born as a direct result of a violent and black period of Indian history- "the partition", Chandigarh has acquired the unique distinction of being a capital to two states i.e. Haryana & Punjab. The wide tree lined roads, managed gardens, unique architecture, greenery, the Rock Garden, Sukhna lake and its citizens; all together merge to characterize a city of the future, with no baggage of the past.

Famous as "The City Beautiful", Chandigarh was designed by French architect Charles-Édouard Jeanneret, popular as Le Corbusier. The word Chandigarh literally means "The Fort of Chandi". The name comes from the ancient temple called Chandi Mandir, devoted to Hindu goddess Chandi. Located near the foothills of the Shivalik range of the Himalayas in northwest India, Chandigarh covers an area of approximately 114 sq km and shares borders with Haryana and Punjab. As per census 2011, over 10.54686 lakh people reside in Chandigarh with a population density of 9,252 persons/sq.km. In addition to the 114 sq. Km., 26* sq. km. of the hilly area which has been declared as 'Sukhna Wildlife Sanctuary' was acquired for soil conservation works. Total green cover in UT Chandigarh is 53.26 Sq. Km. comprising of Sukhna Wildlife Sanctuary 26 sq. Km.

(*25.42 sq km)

Le Carbusier has conceived the Master Plan of Chandigarh as analogous to the human body with a head (Capitol Complex, Sector 1), heart (The City Centre, Sector 17), lungs (The leisure valley, open spaces and sector parks), intellect (cultural & educational institutions), circulatory system (the road network) and viscera (the industrial area).

Planned for just half a million people, the city now is grooming over a million people in the same defined area of 114 sq. km. with thousands of migrants reaching here in search of better living and opportunities. The number of industries has increased to approx. 2100 small scale units and 7 medium scale units.

Chandigarh architecture is based on neighbourhood concept which allows the access of all facilities within the walking distances, to control the vehicular movement and promote healthy living. Each sector is occupied separately by a school, nursing home, shopping area, parks and gardens for its residents. Moreover the city has also provided with three multi-speciality hospitals including Post Graduate Institute of Medical Education & Research and two Hospitals each in the field of Homeopathy & Ayurveda.

With the promise to keep Chandigarh clean and green, the Administration has initiated a programme to eradicate the slums by rehabilitating the entire slum population. Most of the villages are urbanized and provided with all basic amenities. The Punjab New Capital (Periphery) Control Act, 1952 was promulgated in 1952 to control haphazard growth around Chandigarh.

LAND

As per census 2011, Chandigarh stood second in India, in terms of the urbanized population, among the other cities; with 97.3% population living in urban area. Out of total Area i.e. 28170 acres, 4.75 % is under commercial Area., 5.6% is under Defense, 4.7% is under Industrial Area, 1% is under Public Utilities, 10.5% is under Public/Semi Public, 1.1% is under Railways, 8.6% is under Recreational Use, 37.8% is under Residential Area, 7.3% is under Transport, and 10.9% of total land is vacant. Rest of area is under forest cover. In addition to the 28170 Acres, a total area of 26 sq. km. was acquired by the erstwhile Punjab Government from 1962 to 1964 for soil conservation works that is hilly area declared as 'Sukhna Wildlife Sanctuary'. Total forest and other areas managed by Forest Department in UT Chandigarh is 3436 hectares comprising of Sukhna Wildlife Sanctuary 2598 ha. The total green cover of Chandigarh now is 53.26 sq. Km. and 4.72% of total area is under water bodies. Most of the area of Chandigarh is acquired or urbanized now. As per the Agriculture department Chandigarh, total area under agricultural crops has shrunk to 600 hectares (Ha) in 2013-14. Out of which area under Kharif crops is 45 Ha, Rabi crops 575 Ha and under coarse cereals is 25 Ha. Total cultivated area in Chandigarh including area under fodder, vegetables, and fruits is 1200 Ha. The northeast part of the Union Territory comprises Shivalik rocks constituting conglomerates, friable sand stone, silt stone and clay stone. The matrix consists of medium to coarse grained sandstones. Based on detailed soil survey studies, soils of the Union Territory have been grouped into 9 soil series and mapped accordingly.

Talking about the esthetics of Chandigarh, Sukhna Lake is an important place of natural beauty and peace. The lake requires de-siltation on regular basis, which is being carried out by Engineering Department of the Administration. To check soil erosion, soil conservation efforts have been promoted through construction of silt retention dams across various rivulets (especially upstream Sukhna Lake) as well as plantation of trees & grasses.

The land use pattern has changed in Chandigarh in recent years with the growth in the economy and commercialization; thus several important land acquisitions have happened in the past years. Projects like IT Park and Botanical Garden etc. have been initiated and are under continuous development while many phases have been already completed.

One of the major point of concern for the administration is the change of the land use pattern in the peripheral zone to bring more area under urbanization &, developmental activities; and the generation of high volumes of solid wastes. The Municipal Corporation is, thus, under enormous pressure to upgrade its efficiency of municipal waste disposal.

At present the city produces about 340 tons municipal solid waste per day which is disposed off by MSW Processing Plant attached with specifically designated landfill site spread in an area of 45.11acres at village Dadu Majra.

As per CPCC, out of total industries, 429 industries are having hazardous waste generating units. However the hazardous waste generation has decreased notably from 19868.67 in 2012 to 4201.808 MT in 2013. Out of which approx 159.308 MT used oil & 1719.2 MT acid residue were sold for reprocessing, 2228.453 MT zinc ash sold to zinc sulphate manufacturers and the remaining is disposed off using secure Landfill site at Nimbua, Derabassi (Punjab).

about 2091 kg waste per day. As compared to 685 HCFs in 2012, now the city has total 720 HCFs with a sum of 3791 beds. Out of these, 715 HCFs are utilizing common biomedical waste treatment fascility (CBWTF) in the city. Biomedical waste collection in the city is 100% and, is treated with professionalism with the help of 2 Incinerators installed with proper APCDs (Air Pollution Control Device).

For municipal solid waste management,a demonstration project sponsored by the Central Pollution Control Board and the 'Sahyog Waste Management Project' has been taken up with the help of NGOs & Resident Welfare Associations. This includes establishment of "Sehaj Safai Kendras" & "Khad Banao Kendras" at various locations throughout the city where garbage is systematically collected, segregated and organic waste is converted into compost. Presently 32 Sehaj Safai Kendras are operating in the city. All these waste management facilities work together with the administration leading towards a zero waste city and delivering a total collection and disposal of more than 97% of total waste per day.

LAND USE PATTERN

With the change in the land use pattern, Chandigarh Administration has paid specific attention to the development of vacant spaces for the following environment related activities:

1. Botanical Garden is established with a vision to promote research and education. This may indirectly boost eco-tourism also.
2. During the last session, a target of planting 2,08,477 saplings has been set by the Greening Task Group of Chandigarh and an achievement of more than 100% (2,09,513) was accomplished.
3. Soil conservation measures have been taken up by the administration for the adjoining deteriorating land areas. Exotic weeds like Lantana and Parthenium have been eradicated from the forests including Sukhna Wild Life Sanctuary
4. Rules are strict as nobody can cut or prune trees in Chandigarh without permission from the Administration.

Matka Chowk,Chandigarh

AIR

The ambient air quality of Chandigarh is monitored at the five major places of the city i.e. (1) Punjab Engineering College, (2) Industrial Area (3) Kaimbwala Village, representing village area (4) Sector 17, a commercial place (5) IMTECH, Sec 39. These areas are located in the different parts of the city and are hence, covering almost whole of the city.

Studies have shown that the air quality of Chandigarh is mostly affected by the vehicular pollution of the city. The fleet of vehicles is over 2 per capita household. Chandigarh has the highest density of vehicles in India. The other major contributor of air pollution are activities like industries, burning of dry leaves, litter from trees & gardens in the city, and operation of generator sets in certain areas adjoining the city. Anthropological activities in the neighboring states also contribute to the ambient air quality of Chandigarh.

Respirable Suspended Particulate Matter (RSPM) in the city is crossing its permissible limits. However, the SO_2 & NO_x levels are well within permissible limits. Due to its wider roads and wise traffic sense and regulations, traffic jams are rare in Chandigarh. In a survey, it is found that Chandigarh is the only city which is having the least traffic congestion in India. Whole of the Union Territory of Chandigarh is also declared as Air Pollution Control area in 1988. To abate industrial pollution, the industries are located towards southeast end of the city. The Railway Station is advantageously located bordering the industrial area Chandigarh Pollution Control Committee (CPCC) has made sure that all the air polluting industries have installed proper pollution control devices. To monitor and control vehicular pollution, 'Pollution under control' certificates have been amade compulsory for all the vehicles by the State Transport Authority and Chandigarh Traffic Police. Thirty stations are authorized in the city to issue the same. While lead free petrol was introduced in the Union

territory in early 2000, efforts are being made to promote battery operated vehicles. The Administration has also shifted ISBT from sector 17 to Sector 43 which restricts the buses from outstations to the outskirts of Chandigarh. The Auto Repair Market has also been shifted from Sector 21 market to Sectors 43 & 48 at the periphery. To strengthen the monitoring and control of air pollution further, burning of leaves & operation of unauthorized gensets are strictly discouraged. Chandigarh Administration is actively working to spread awareness among the residents about keeping the environment clean and green, through mass media, camp, eco-clubs and exhibitions etc.

MONITORING OF AIR QUALITY OF CHANDIGARH

Several steps have been taken to check and stop deterioration of the air quality of Chandigarh, such as:-

1. Subsidy on Battery operated vehicles has been given by the Department of Science and Technology. Alternative fuel like LPG driven vehicles have been promoted by the Administration.
2. Chandigarh is all set to become a model solar city over 5 MW rooftop solar power plants have been installed over the govt. buildings, schools, colleges, universities and households.
3. Strict control over industrial pollution is exercised and the installation of air pollution control devices (APCD's) is made mandatory.
4. Hazardous waste is being disposed category wise using recyclers and secure landfilling etc.
4. Traffic lights are synchronized for better traffic flow of vehicles. Small rotaries are closed to ensure grid based movements of the traffic
5. Cycle tracks have been completely developed for slow moving cycle traffic.
6. Due to approachable facilities, tree covered roads and cycle tracks, walking and cycling is promoted . Chandigarh is found as the most walk able city of India in recent survey.
7. CPCC has been monitoring ambient air quality at five places covering different parts of Chandigarh.
8. Many projects including the treatment of biomedical waste, hazardous waste and e-waste etc are successfully operated and CPCC is conducting studies and regular monitoring the respective status in Chandigarh.
9. Massive plantations have been carried out thoroght out city and the total green cover of the city is increased by more than 45% over last decade.
10. Burning of leaves, garden waste and other waste materials has been banned by the Administration.
11. Government of India (GOI) has cleared DPR of metro to pave the way for mass transport system to discourage private vehicles' use.

WATER

Chandigarh is having one of the best water drainage systems in India and whole of the waste water is treated in Sewage Water Treatment Plants within the city premises. The city beautiful is daily generating 57MGD waster water including domestic and industrial sectors, whereas total installed/working capacity of STP's is 53.85 MGD. To make city 100% efficient in terms of waste water treatment, additional 16.7 MGD treatment capacity of STP is at the final stage of completions. 93.7% households are having Treated Tap Water facility, out of total covered 96.7% households. Recently, efforts were made by Municipal Corporation (MC) to elevate the efficiency by enhancement of water supply hours and strengthening of water supply system. Drinking water supply has been given to authorized and rehabilitated colonies and village areas. Special measures have been taken for remote areas. To improve the waste water disposal and to establish the same for newly built areas, up-gradation of sewerage system is ongoing. Polythene was found to be a drainage choker. To solve this problem, the manufacture and use of polythene/plastic carry bags have been completely banned in Chandigarh from 2nd Oct.2008.

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CLIMATE

Geographically, Chandigarh and adjoining regions of Punjab, Haryana, West Utter Pradesh and Himachal Pradesh lie within the sub-tropical zone. The remarkable topography of this region comprising of the flat terrain with the loftiest and the most extensive mountain ranges to its north are mainly responsible for the extreme contrast in climate. Summer temperatures over the parts of this region reaches upto 46°C whereas winter temperatures usually falls to as low as 0°C.The region is affected by western disturbances moving eastwards in winter season, while in summers, the region received heavy rainfalls by monsoon systems moving westwards.

RECOMMENDATIONS:

The present report emphases on the current development and achievements of Chandigarh, related to the different aspects of environmental concern. Adding up to the efficient actions of the Union Territorial administration, the report recommends following initiatives:

- To control the degradation of the land, it is proposed that:
  - The green belt areas including forests should be checked strictly to prevent any biological damage and deteriorating land quality.
  - A coordinated approach in consultation with State Governments of Punjab & Haryana may be adopted to ensure implementation of Punjab New Capital (Periphery) Control Act, 1952 and stop further expansion of satellite towns by PUDA & HUDA. At the same time, it is important to realize that such pressures would continue in future. As such, planning for catering to these pressures be initiated (e.g. development of MRTS, prevention of encroachments, etc.) to promote sustainable development.
  - Land use changes in peri urban areas may be strictly curbed.
- To reuse the solid waste generated, it is proposed that:
  - Solid waste characterization at the generation point level studies may be taken up and the working of Sehaj Safai Kendras and Khad Bnao Kendras should be optimized.
  - Projects for energy generation from the biodegradable municipal waste consisting of fruit & vegetable (mandi waste),house hold kitchen, restaurants, hotel and graden waste should be promoted.
  - Small industries based on the recycling and reuse of solid waste materials in the city should be promoted.
- To control air pollution, it is proposed that:
  - Clean & energy efficient technologies may be promoted in the industries and incentives should be provided for minimization of air emissions and adoption of latest Air Pollution Control Devices.
  - To control vehicular pollution, existing public transport may be improved, alternate fuels (like CNG, Propane) may be promoted with more of subsidies and better facilities like free parking etc.
  - Diesel operated vehicles mainly auto-rikshaw (5,471 registered with city) are observed to be the main source of RSPM in the air of city beautiful, they should be prohibited within the city.
  - Mass Rapid Transport System may be executed in conjunction with satellite towns of Panchkula, Zirakpur, Mohali, Dera Bassi, and Kharar to reduce floating vehicular population in the city. Elevated roads may be planned for long route vehicles.
  - Continuous air monitoring systems should be used to cover the remaining areas of the city for more effective air pollution monitoring and to check the best possible reasons behind it.
  - .The adjoining states of the city should also take strict measures to control over seasonal stubble burning, brick kiln emissions and diesel based public transports entering the city.
- Solar energy utilization throughout the city should be maximized. For this, change in capacity building by law should be included, wherein a minimum capacity of solar Pv plant and solar water heating may be made mendatory.
- Rain water harvesting should be encouraged at small household levels also.
- To understand and quantify the impact of environmental pollution on health, epidemiological studies should be promoted.
- Government agencies, industries, students & residents of the city should be encouraged to protect Environment.

INTRODUCTION

Chandigarh was built up as the new capital of East Punjab after the partition of 'India' in 1947. It is located about 240 km north of New Delhi on a gently sloping terrain in the foothills of the Shivalik Range. Bounded on two sides by two seasonal rivulets, the northern edge of the city is Capital Complex against the panoramic back drop of Shivalik hills.

The geographical location of the city is 30 degree 50' N latitude and 76 degree 48' E longitude and it lies at an altitude varying from 304.8 to 365.76 meters above sea level. The annual rainfall (average) is 1110.7 mm. The temperature in the winter varies from 1^0 C to 16^0C and in summer it ranges from 27^0C to 46^0C.

Chandigarh is a fully grown town of most modern architectural splendour. The city nestles in a picturesque setting in the foothills of the Shivalik hills and enjoys the popular epithet the "City Beautiful". Representative of Modern Architecture & Town Planning, the city is a creation of the French Architect, Le Corbusier. Chandigarh and the area surrounding it was constituted as a Union Territory on 1st November 1966. It also serves as the joint capital of both Punjab and Haryana States. It is bounded on North West by Punjab and on the East and South by Haryana. Its origin was contributed by 'Pandit Jawahar Lal Nehru'.

EDICT OF CHANDIGARH

The Edict of Chandigarh proposes to enlighten the present and future citizens of Chandigarh about the basic concepts of planning of the city so that they become its guardians and save it from the whims of individuals. The Edict highlights that the city is planned to human scale putting its residents in touch with the infinite cosmos and nature. It provides places and buildings for all human activities so that the citizen can live a full and harmonious life.

The central plaza in Sector 17 was designed by Le Corbusier as a "Pedestrian's Paradise". No vehicular traffic is permitted in the plaza.

The edict also specifies that no personal statues shall be erected in the city or in parks of Chandigarh. The city is planned to breathe the new sublimated spirit of art. Commemoration of persons is confined to suitably placed bronze plaques.

The edict proposes that the truthfulness of materials of constructions, concrete, bricks and stone shall be maintained in all buildings constructed or to be constructed.

The seed of Chandigarh is well sown. It is for the citizens to see that the tree flourishes.

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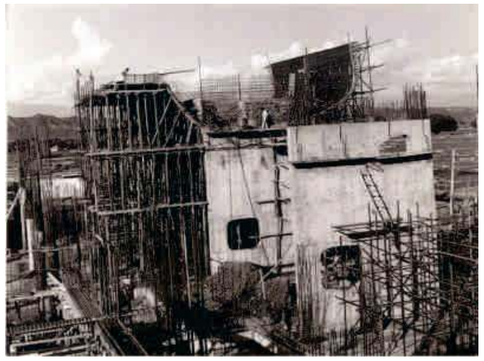
CHANDIGARH: A FACT FILE

- Number one in the country in terms of Human Development Index.
- Awarded as cleanest city of India by Ministry of Urban Development
- Chandigarh will also become the country's first solar city in 2016
- Chandigarh has been rated as the "Wealthiest Town" of India. In terms of family wealth, it was rated as the sixth most prosperous city.
- Good Governance: A compact, efficient Administration having Quick Decision Making System.
- Chandigarh (73.48 points) and Mysore (70.65 points) record the highest household coverage of solid waste collection in the country (MoUD, Government of India).
- Education: Chandigarh has one state level University; i.e. Panjab University and Two deemad Universities; i.e Punjab Engineering College and PGMIER (Post Graduate Institute of Medical Education and Research). Chandigarh host about 45 recognized institutes of higher education and 175 schools to impart knowledge from primary to Sr. Secondary Level.
- Health: There are 3 Hospitals with 500 or more beds,6 (>50<200 beds), 39(<50 beds) out of total 720 Health care units.
- Research Institutes: Institute of Microbial Technology (IMTECH), Central Scientific Instruments Organization (CSIO), National Institute of Pharmaceutical Education and Research (NIPER), and Centre for Research in Rural and Industrial Development (CRRID), all add to the value added Research facilities provided by the city.
- Gross State Domestic Product (GSDP) at Current Prices has shown that Chandigarh has grown by 11.13% in 2013-14 over 2012-13.

According to Associated Chambers of Commerce and Industry of India (ASSOCHAM), better civic amenities and law and order situation make Chandigarh figure among the most preferred Tier II cities for a post-retirement life (2010), and it is one of the most preferred destination for tourism (2011).

HISTORICAL BACKGROUND

Chandigarh derives its name from the temple of Goddess 'Chandi' (the goddess of power) located in the area and a fort or 'garh' lying beyond the temple. The city has a pre-historic past. The gently sloping plains, on which modern Chandigarh exists, were, in the ancient past, a wide lake ringed by a marsh. The fossil remains found at the site indicate a large variety of aquatic and amphibian life which was supported by that environment. About 8000 years ago, the area was also known to be a home to the Harappans.



SELECTION OF SITE

The present site was selected in 1948 taking into account various attributes such as its central location in the state, proximity to the national capital & availability of sufficient water supply, fertility of soil, gradient of land for natural drainage, beautiful site with the panorama of blue hills as backdrop & moderate climate.

MASTER PLAN OF CHANDIGARH

The Master Plan was developed by Le Corbusier who also designed the Capital Complex and established the architectural control & design of the main buildings of the city.

In March, 1948, the Government of Punjab, in consultation with the Government of India, approved a 114.59 sq. km. tract of land at the foothills of the Shivaliks as the site for the new capital. The location of the city site was a part of the erstwhile Ambala District as per the 1892-93 gazetteer of District Ambala. The site was selected by Dr. M.S. Randhawa, the then Deputy Commissioner of Ambala. Before the new city came up, the original site had about 59 villages (Singh et.al., 1998). The foundation stone of the city was laid in 1952. Subsequently, at the time of reorganization of the state on 1st November, 1966 into Punjab & Haryana, the city assumed the unique distinction of being the capital city of both, Punjab and Haryana while it was also declared as a Union Territory under the direct control of the Central Government.

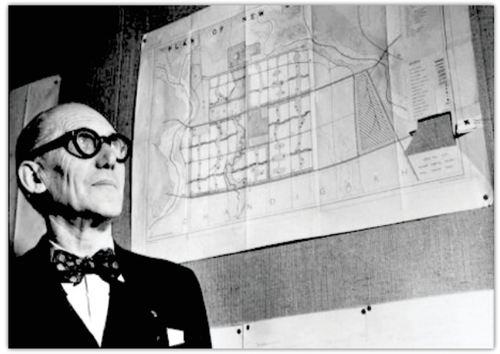
Initiatives by Chandigarh Administration:

Chandigarh Administration is moving on four broad fronts. Firstly, it is its aim to provide, with the help of information technology, an accessible and transparent administration. It is among the earliest to implement the provisions of the Right To Information (RTI) Act. A number of services, for which citizens earlier had to go to government offices, are now available on computer and mobile phones. All rules are being reviewed to see what simplification can be carried out to make them user-friendly. The purpose is to minimize the exercise of discretion, and reduce the leg work of the citizens in dealing with the Administration.

Secondly, the Administration is working towards a higher rate of economic growth by encouraging economic activities which provide greater value addition such as knowledge based industries, high-end commercial activity, etc. Chandigarh already has the highest per capita income in the country.

Thirdly, the Administration is seeking to provide infrastructural services such as electricity supply, water supply, health & educational services and public transport which should compare with those in advanced countries.

Fourthly, the Administration is too conscious of the fact that the benefits of development do not reach everyone equally. Hence there is a special emphasis on reaching out to those whom development has by-passed. To achieve the aforementioned objectives, the Administration has initiated the following actions:



INFORMATION TECHNOLOGY

Ex. Prime Minister, Dr. Manmohan Singh, inaugurated the Rajiv Gandhi Chandigarh Technology Park (CTP) on 25 September 2005. The Administration is also considering the development of Chandigarh as a financial services hub. Projects like the Chandigarh Technology Park, Education City, and Film City will further improve the level of economic activity.

The 250 acre phase-II of the CTP will comprise of 115 acres for Technology Park and 135 acres for integrated support facilities.

POWER

At present, the City is receiving 67% of its power through Mohali (PSEB), about 10 % through Dhulkote (BBMB) and remaining 23 % through Nalagarh. The city has a transmission network which comprises of one No.220 KV Sub Station at Kishangarh Manimajra, 11 Nos. 66 KV Sub Stations and 6 Nos. 33 KV Sub Stations. At present, the city has 2,00,000 consumers as on 31.03.2014 which includes 1,72,653 domestic consumers, 21,428 commercial consumers and about 2300 industrial consumers. The average power requirement is around 32.49. lac units per day. UT has an allocation of 166-236 MW of power from different Central/State Generating Stations during different hours of the day. Per capita consumption is 1168 units per person per annum. Besides this, Chandigarh Administration is maintaining 19437 numbers overhead tube type of street light points within sectors (i.e. V-6) roads. Chandigarh draws power from the central grid and has no power generation of its own. But yet electricity consumption of Chandigarh is increasing by 52 million units every year. Therefore it is imperative that the union territory adapts itself to reduce dependence on the grid electricity and build its own captive generation or switch to renewable power that helps to generate its own power. Chandigarh is moving strongly to adopt Solar City plan to reduce dependence on Conventional Energy.

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Water Treatment and Irrigation

The Chandigarh Administration has initiated action on various projects to meet the objectives of Jawahar Lal Nehru National Urban Renewal Mission so as to have planned development of urban areas with focus on efficiency in urban services delivery system. The Chandigarh Administration has made a provision of tax revenue for the Municipal Corporation.

Conservation of water is given top priority in Chandigarh. The augmentation work of water supply scheme, Phase-IV has already been completed. 25 new deep tube wells have been installed at various parts of the city, and 12 new irrigation tube wells have been installed for supply of water for irrigation. Sewage Treatment Plants of capacity 45 MGD at Diggian, 5 MGD at 3BRD, 5 MGD at Raipur Kalan, 1.25 MGD at Raipur Khurd have been constructed The sewerage and storm water drainage system of the city has further been augmented and strengthened. There is proposal for construction of Sewage Treatment Plants of capacity 10 MGD at 3 BRD, 5 MGD at Maloya, 7.5 MLD at Dhanas.

With the exponentially increasing demand of water resources due to escalating population, the city beautiful "Chandigarh", has also implicated the scheme at the remarkable speed in a very short span of time. The rainwater harvesting potential of Chandigarh, with an area of 114 sq km and the average annual rainfall of 1059.3, is calculated to be 60380.1million litres or 13241gallons or 36.28 MGD.

Conservation of drinking water by harvesting of the tertiary treated sewage for irrigation of green spaces in Chandigarh and Upgradation of water supply infrastructures for proper monitoring and automation with remote computerized surveillance system to 24x7 water supply is under process.

Agriculture

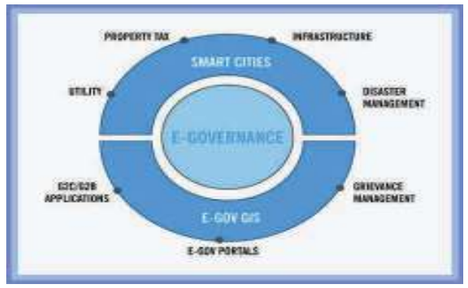
The Union Territory Chandigarh has limited area under Agriculture. The agricultural land is being gradually acquired for the expansion of Chandigarh City, and total crop area has shrunk from 5,441 hectares in 1966 to 1,400 hectares in 2002-03. It has shrunk to as low as 600 hectares in 2013-14. The main sources of irrigation are deep-bore tube-wells installed by the Administration and shallow tube-wells installed by individual farmers. The main crop of foodgrain is wheat and it is sown nearly in 600 hectares of land. The Department is making efforts to promote techniques of harvesting by following measures: (i) Extension and Farmers' Study/Training Tour, (ii) Development of Kitchen Garden, (iii) Soil and Water Conservation.

Housing and Infrastructure

Being a limited and defined city in terms of area with a cover from all the sides by neighboring states, Chandigarh has no margin to expand. Hence, that has put pressure on land use pattern to get changed from open spaces to colonies. Till 2013-14, a total of 28,587 units under Economically Weaker Section (EWS), 8,511 units under Lower Income Group Housing Scheme, 10,675 units by Middle Income Group Housing Scheme and 5,597 units under High Income Group Housing Scheme have been constructed by Chandigarh Housing Board. Total construction units by Chandigarh Housing Board are 60,337.

E-Governance

Chandigarh is one of the few cities of India implementing the e-governance. This not only saves paper but other office stationary also. To make an example out of this, Chandigarh Police has recently launched an SMS information facility. The SMS information facility would enable any person to know the status of public complaints submitted at the public window system and the status of their passport applications. Approx 2501797 transactions were made in 25 Sampark Centres located through out the city.



Transport

Chandigarh Transport Undertaking has the privilege to operate public transport on sub-urban routes, city routes, and on inter-state routes. Chandigarh has a wide roads infrastructure which is maintained by different authorities throughout the year. Transport roads of Chandigarh covered as National Highways 100.00 kms, City roads PWD 485.87 kms, City roads MC 2358.85 kms, and Rural roads 154.67 kms. This makes total roads In kms 3099.39.

Greening City Beautiful

Forest cover of the country as per Forests Survey of India (FSI) assessment 2013 is 6,97,898 sq. km (69.79 million ha) and the tree cover of the country is estimated to be 91,266 sq. km (9.13 million ha) comprising 21.23% and 2.78% of the total geographical area respectively. Thus, the total green cover of the country is 789164 km2, which is increased by 5,871 sq. km than that of 2011 assessment.

Chandigarh has wide plan for better life style and clean environment as the city is well known for its beautiful tree covered roads, spatial gardens and surrounding green forests of Shivalik range. The green cover of Chandigarh constitutes the managed gardens; central green belts between the sectors and the open space at community level consist of parks around which clusters of houses are rearranged. In the city, the Horticulture wing of Municipal Corporation and Engineering Department maintains and takes up the plantation on the road side, gardens, parks and other vacant revenue land. The city is enveloped between the Sukhna, Kansal and Nepli reserve forests. The forest and other areas managed by Forest Department in UT Chandigarh is 3436 hectares (ha) comprising of Sukhna Wildlife Sanctuary 2598 ha, Reserved Forest, Un-classed Forest and other areas.

The total geographical area of U.T. Chandigarh is 139.92 sq. km2 which includes 25.42 sq. Km as “Sukhna Wildlife Sanctuary” on 6th March 1998; acquired for soil conservation works. As per the India State of Forests Report -2013 (ISFR) of Forests Survey of India (FSI), the forest cover in UT Chandigarh is 17.26 sq. km and another 10 sq. km area is under tree cover. Thus, the total green cover of Chandigarh as per 'ISFR-2013' is 53.26 km^2, which amounts to 38.04% of the total geographical area.

Major forest type occurring in the Union Territory is Tropical Dry Deciduous. These forests occur in climates that are warm year around and receive several hundred centimetres of rain per year. The canopy of the trees does not normally exceed 25 metres. The common trees are Acacia and bamboo. There is no trace of Chir (Pinus roxburghii) and Sal (Shorea robusta) in the Chandigarh Shivalik Hills; however, some patches of these trees do exist in the Morni Shivalik Hills. The trees are less in number with xerophytes, thorny and spiny species, predominating throughout the range. Scattered trees of the other species grow in small groups except for the closed forests where the tress are in abundance.

Chandigarh Forest Statistics

Name of the Forest	Area in Hectares
Sukhna Wildlife Sanctuary	2598.48
Lake Forests	105.58
Sukhna Choe Forests	350.69
Patiala-ki-Rao Forests	23.29
Parrot Sanctuary	3
Unclassed Forest	183.44
Southern Sector Plantation	100
Botanical Garden	71.23
Total	**3435.71**

Total Forest Area of Chandigarh

VILLAGES

There are 18 villages in Chandigarh. 5 villages have recently been taken over by Municipal Corporation, Chandigarh. There are 13 villages with Rural Development Department with 12 Panchayats. All villages are connected by road and almost all villages have internal metalled roads with piped water supply, sewerage, and drainage system etc .

Industrial Growth in The City

Chandigarh Administration earmarked 1475 acres of land for Industrial Area, Phase-I & II which came into existence during the year 1970. The Administration has also developed Industrial Area, Phase-III in Mauli Jagraon for which an area of 152 acres of land has been earmarked. Chandigarh has nearly 3817 industrial units including 68 large and 59 medium and 1145 small scale units located on the outskirt and separated with a green belt. These units manufacture a wide variety of products with an annual turn over of nearly 2497.59 crores. The highest turnover in Chandigarh is exhibited by the industries based on metal products followed by the paper printing and chemical products.

Chandigarh in Census

Demography

Chandigarh was planned for the population of approximate half a million and present data shows that population has grown double than the planned for. This place the Chandigarh second only to Delhi in terms of Population density.

Field	2001	2011
Total Population	900635	1054686
Males	506938	580282
Females	393697	474404
Population Density Sq Km	7900(Sq KM.)	9252
Percentage Decadal Variation	40.3%	17.10%
Sex Ratio	777	818
%age of Literacy	81.9%	86.43%

Population Growth Rate

Chandigarh had received a heavy population load during the early decades with the highest growth rate of 114.59% during 1961-1971 mainly because of the migrants from Punjab and nearby states. However,population is getting stability in further decades. The lowest growth rate was observed for the recent decade i.e 2001-2011.

Year	Total	Male	Female	Decennial Rate of Growth
1961	119881	72576	47305	-
1971	257251	147080	110171	+114.59
1981	451610	255278	196332	+75.55
1991	642015	358614	283401	+42.16
2001	900635	506938	393697	+40.33
2011	1054686	580282	474404	+17.10

Energy consumption of Petroleum Products

Major part of energy demand of Chandigarh is fulfilled by the petroleum fuels. With the modernization of living style and daily developing technology the city has been issued nearly 3.23 lakh LPG connections in 2012-13. Total consumption of LPG for commercial and domestic purpose in the year 2012-13 was calculated to be 42,255 MT.

Products	2012-13	Unit
Petrol Incl. ULP	116921	Kilo Litres
High Speed Diesel	91267	Kilo Litres
Kerosene	3941	Kilo Litres
Light Diesel Oil	573	Kilo Litres
Furnace Oil	19827	Metric Ton
Low Sulphur heavy Stock	643	Metric Ton
L.P.G Connections	323685	Nos.(Cum.)

State of ENVIRONMENT Chandigarh - 2014

New Initiatives by Chandigarh Administration

Jawaharlal Nehru Chandigarh Education City :- Chandigarh Administration plans to set up a multi institutional Education City at Sarangpur institutional area, Chandigarh, for which 16 sites, measuring 6 acres each on long lease have been set aside. A total area of 130 acres has been made available for the Education City, by the Administration. Chandigarh Administration would also provide common facilities through the Chandigarh Housing Board.

Modern Terminal Market :- The Modern Terminal Market (MTM) project endeavors to integrate farm production with buyers by offering multiple choices to farmers for sale of produce such as electronic auctioning and facility for direct sale to exporter, processor and retail chain network under a single roof. It is envisaged that the MTM shall offer a one-stop solution that provides facility for storage (including warehouse, cold storage, ripening chamber, storage shed), cleaning, grading, sorting, packaging and palletisation of produce including logistics and extension support and advisory to farmers. Each of these services shall be provided in lieu of a User Charge. The MTM shall be built, owned and operated by a Private Enterprise (PE) who may be an individual or a consortium of entrepreneurs from Agri-Business, Cold Chain, Logistics, Warehousing, Agri-Infrastructure and other related background.

The MTM project will be developed on a hub and spoke model. The spokes shall be located at the collection centers from where the Perishable Agricultural Produce shall be brought to a central hub at Chandigarh which shall be located at Agro Zone, Near Sector 39 (W), Chandigarh. The PE shall be required to develop the required market infrastructure for the MTM (including both the hub and spokes) and to provide Market Services and Essential Services to the users of the MTM. A total of 42 acres of land has been earmarked by the Chandigarh Administration for the purpose of development of the hub. Out of the total area earmarked, a maximum of 17 percent of the total land can be utilized for creating Non-Market Assets. The PE shall also be allowed to provide Non-Market Services to the users and to collect User Charges for the same. This may be done only after the commencement of the Market Services. The Administration of the U.T. of Chandigarh, shall provide the basic amenities for facilitating the development of the hub. The selection of Private Enterprise is under process and shall be shortly completed.

State Level Energy Park :- To promote the use of renewable energy resources and spreading awareness among the students, researchers, residents and the tourists; Department of Science and Technology, Chandigarh Administration has setup the State Level Energy Park at Botanical Garden, Village Sarangpur with financial assistance from Ministry of New and Renewable Energy, Government of India. Chandigarh Energy Park will also facilitate creating such awareness throug outdoor and indoor exhibits which will provide platform for understanding the importance of energy conservation.

Entrepreneur Development Centre :-

The Entrepreneur Development Centre (EDC) is a place that is conceived by the Chandigarh Administration in the prospering Rajiv Gandhi Chandigarh Technology Park (RGCTP) to enhance the export of the software export from Chandigarh and to assist young professionals in setting up their entrepreneurship by providing shell space or space with plug n play facilities in a state of the art environment friendly and an intelligent building. The project has been conceived as a transit point for the IT software export companies that are willing to come to the park, but as yet does not have a fully developed building of their own, or their built to suite plot is not yet constructed. This will also have the administrative offices of the IT dept that will be more accessible and approachable for the IT companies in the vicinity.

Soruce: https://www.Chandigarh.gov.in

LAND USE

LAND USE AND ITS DEGRADATION

If air is considered essential for life, land is the platform for the same. Land provides base to all flora- fauna and even under the water, it is the land where flora roots to regulate the life cycle of the fauna. It is an essential resource for one's existence & livelihood. The Union Territory of Chandigarh has an area of 114 sq. km. In addition to this area, Sukhna Wild Life Sanctuary in U.T. Chandigarh spreads across 26* sq. km. City beautiful has population of 10,54,686 (Census 2011) which has already crossed the mark of 1 million. Chandigarh is the capital of two states, Punjab and Haryana and enjoys the status of Union Territory as well. It has emerged as a regional hub for education, health, information and technology, and service sector etc. Chandigarh is ranked highest in Human Development Index and Quality of Life in the country. In Chandigarh, the majority of land is under Urban area (97%). Total area under agricultural crops is shrunk to negligible. Total Green Cover in the city, including Sukhna Wild Life Sanctuary, is 38.26% and area under water bodies is 3.1%, out of which 1.6% area is under Sukhna Wetland. The rest of the area is under vacant land and miscellaneous uses.

Chandigarh has witnessed rapid population growth from 1961 to 2011i.e. From 1,19,881 to 1054986. This pressure has driven change in land use pattern over the period of time.

State of ENVIRONMENT Chandigarh - 2014

Institutional Framework

Land use in Chandigarh and factors which cause its degradation are controlled by different departments as mentioned in the table :

Preservation of land quality & prevention of erosion	Department of Forests & Wildlife Department of Environment
Determining Land use pattern	Department of Architecture Department of Urban Planning
Control of land degradation due to municipal waste & hazardous waste pollution	Chandigarh Pollution Control Committee Municipal Corporation

EXISTING LAND USE

Important components of major land use of Chandigarh are discussed below:

Urban Area:

Maximum land use of Chandigarh is in urban category .Census 2011 reveals that 97.3% households are in urban area and 2.7% in rural area. Categorization of total area is given below :

Out of total Area i.e. 28170 Acres 4.75 % is under commercial Area., 5.6% is under Defense, 7.5% is under Forest, 4.7% is under Industrial Area, 1% is under Public Utilities, 10.5% is under Public/Semi Public, 1.1% is under Railways, 8.6% is under Recreational Use, 37.8% is under Residential Area, and 7.3% is under Transport. Rest of the 10.9% of total land is vacant. An additional area of 25.42 sq. km. was acquired by the erstwhile Punjab Government from 1962 to 1964 for soil conservation works.

Source: Sr. Town Planner, Chandigarh

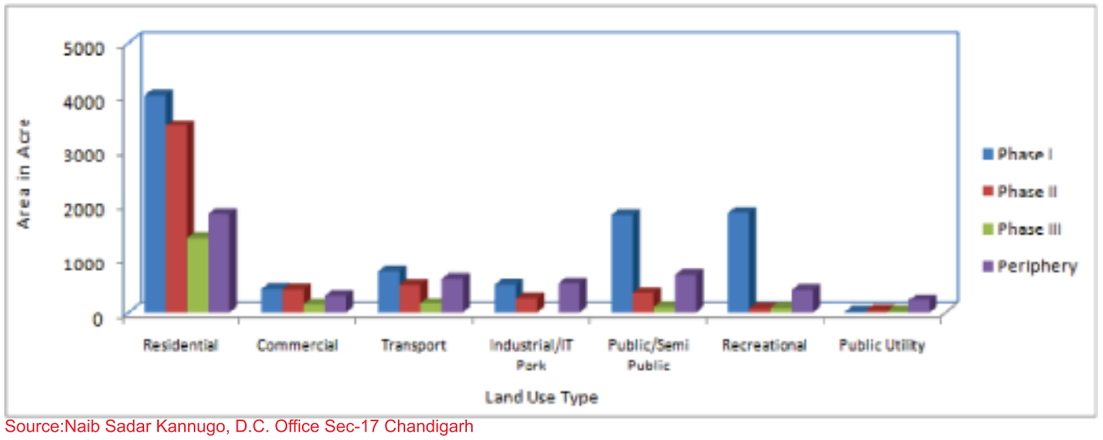
Land Use pattern of Chandigarh

Land use pattern in Chandigarh is driven by anthropogenic activities. Nature has made indirect impact by attracting so many people from the neighboring states i.e. Punjab, Haryana, and Himachal Pardesh. A lot of commercial activities have come up in the form of industrial area and shopping complexes. Agricultural land is affected the most with increase in commercialization in Chandigarh. More population means more of transportation and traffic which triggers change in land use pattern for locomotion. Also, waste generated from industrial activities, encroachment, and urbanization impacts the land use pattern.

Available land area of Chandigarh is divided in to different categories depending upon the land use type. The development of the city was well planed in three phases(Phase I, Phase II, Phase III) with total distributed area of 28.170 acre. Phase wise distribution of the total land area of Chandigarh among different categories is described by the graph below .Out of the total area nearly 3082 acre is still lying vacant.

Land Use Type	Total Area (Acre)
Phase I	9398.82
Phase II	5158.75
Phase III	1870.53
Periphery	11741.86
Residential	10672.15
Commercial	1339.72
Transport	2046.9
Industrial/IT Park	1346.39
Public/Semi Public	2968.78
Recreational	2428.46
Public Utility	302.32
Railway Land	316.29
Total Defence	1573
Total Forest	2113.97

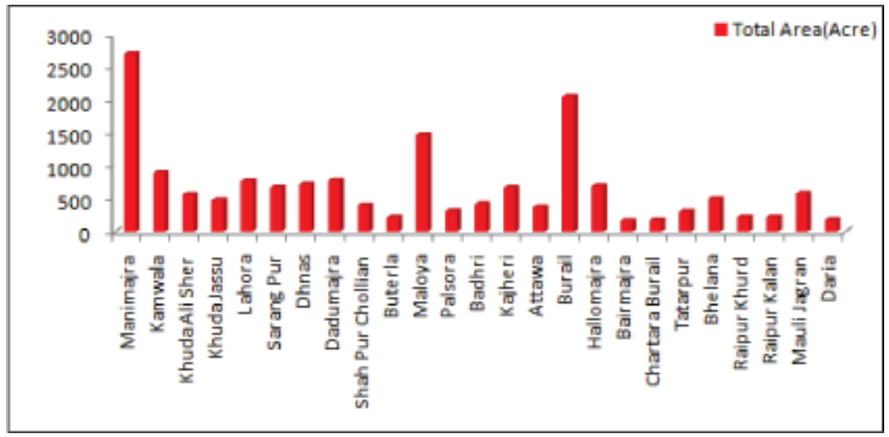
Land Use Characterization of Chandigarh:



Source:Naib Sadar Kannugo, D.C. Office Sec-17 Chandigarh

Land Area Under Existing Villages (YEAR 2013)

Under the territory of UT Chandigarh, about 25 villages are existing with a total area of 16,597 acre. Out of which 378 acre are covered under red line area, 264.70 acre under extended abadi, 13249.05 acre is already acquired; thus the balance area is just 2,705 acre. Out of the total 25 villages, 23 villages are inhabited, 2 villages are uninhabited and 10 villages came under municipal corporation Chandigarh.



Source:Naib Sadar Kannugo, D.C. Office Sec-17 Chandigarh

After, 2004, the acquisitions have taken place as under:

Total land acquired	635 acres
For Housing	26% (165. 2 acres)
For Industry, Commercial	42.83%(272 acres)
For Environment related Purpose	3.78% (24 acres)
For other developmental purpose	54% (343.67 acres)

Green cover of Chandigarh has increased to 38.04% of its total land mass. It covers now 53.26 Sq. Km. of total land of UT, Chandigarh. For details please refer to Chapter on Forests. Chandigarh is the greenest city of India. The credit goes to Chandigarh Administration as well as to the informed residents of the city.

Land Classification (2010 - 2013)

Year	2010	2011	2012	2013
Total Area According To Village Papers	17361	17361	17361	17361
Forests	525	525	525	525
Not Available for Cultivation	13531	13531	13531	13531
Other Uncultivated Land Excluding Fallow Lands	362	362	362	362
Current Fallow Lands	70	70	70	70
Fallow Land Other Than Current Fallow	123	123	123	123
Net Area Sown	2750	2750	2750	2750
Total Cropped Area	4268	4231	4328	4328
Area Sown More Than Once	1518	1481	1518	1518
Net Irrigated Area	2750	2750	2750	2750
Gross Irrigated Area	2750	2750	2750	2750
Unit	**Acre**	**Acre**	**Acre**	**Acre**

Source: Land Acquisition Officer, Chandigarh

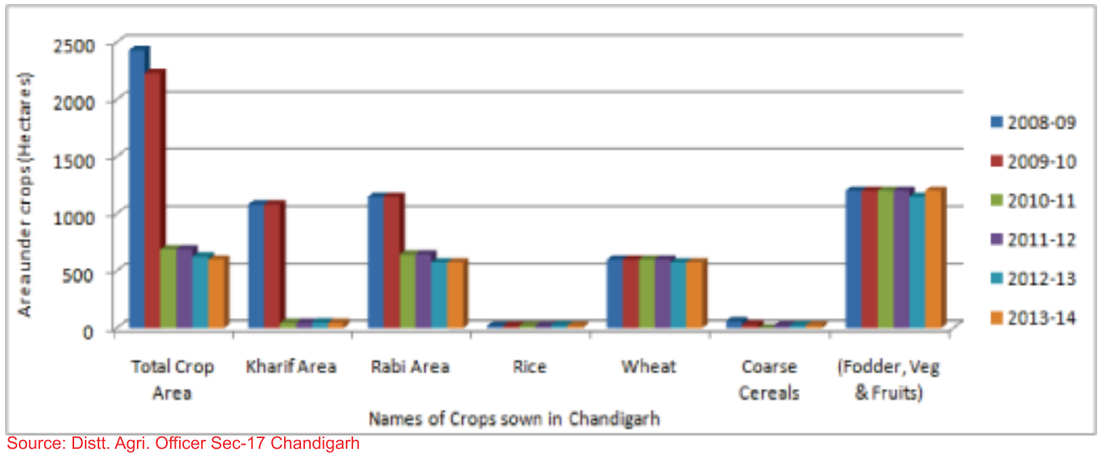
Agricultural Land Use:-

Chandigarh was planned in phases. In the first phase, 25 sectors were planned which are now increased to 56 (excluding sector 13) sectors and sector 61 and 63. Due to such fast development and urbanization, agricultural area is decreasing and simultaneously, residential area/urban population and industrial area are increasing. For Phase-III of industrial area, the vacant land has been acquired near Raipur Kalan. For IT park, land has been acquired near village Kishangarh and for Institutional/recreational sites, land has been acquired in Sarangpur. Due to expansion of Chandigarh, the cultivated area is decreasing with time. Change in land use pattern has exerted a great impact on the land of Chandigarh. Various types of houses and other commercial & recreational foundations are built up to match the needs of overgrowing population. As per record of Chandigarh Housing Board, there are 28,587 units of houses constructed since the board came into existence in 1976, under Economically Weaker Section (EWS), 10,675 under Middle Income Group (MIG), 8,511 under Lower Income Group (LIG), and 5,597 High Income Group (HIG) schemes. Therefore, construction of houses in total of all categories is 60,337 units.

Families practicing Agriculture:

Due to increasing population, development and the land value, the agricultural land is shrinking at a faster rate since last decade. In total, merely about 680 families in Chandigarh are indulged in agriculture. However, most of them (468) are small farmers with the land holding up to ½ - 2 acres only. Farmers up to 5 acres land are 187 only, whereas the number of big farm owners are just 25.

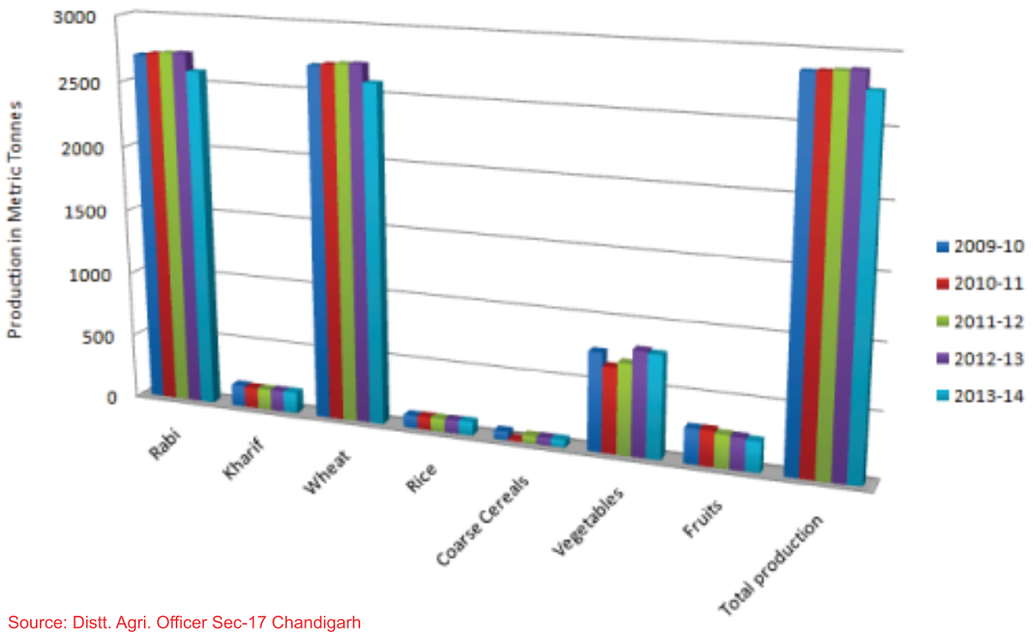
Distribution of cropped area:



Source: Distt. Agri. Officer Sec-17 Chandigarh

With the increasing urbanization, the total area available for agriculture has decreased from 2,430 hectare (2008-09) to 625 hectare in 2012-13. The crop wise distribution of the available area is described in the figure above, which shows that the main crops of the area are wheat and vegetables. Area under fodder crops is also notable because of the farm animals and dairy business.

Total Crop Production Pattern of Chandigarh:



Source: Distt. Agri. Officer Sec-17 Chandigarh

Annual Fruit Production in Chandigarh:

Year	Kinnow	Mango	Guava	Bair	Peach	Unit
2009-10	9	155	75	15	16	M.T
2010-11	8	165	70	14	15	M.T
2011-12	8	140	75	14	15	M.T
2012-13	8	135	75	14	15	M.T
2013-14	8	130	70	12	13	M.T

Source: Distt. Agri. Officer Sec-17 Chandigarh

Consumption of Pesticides in Agriculture:

Year	Insecticide	Fungicide	Weedicides	Rodenticide	Unit
2004-05		0.05	0.14	Negligible	M.T
2005-06	0.59	0.05	0.11	Negligible	M.T
2006-07	0.55	0.05	0.1	Negligible	M.T
2007-08	0.35	0.2	0.3	Negligible	M.T
2008-09	0.3	0.01	0.01	0.03	M.T
2009-10	0.3	0.01	0.01	0.03	M.T
2010-11	0.22	0.01	0.01	0.03	M.T
2011-12	0.22	0.01	0.01	0.03	M.T
2012-13	0.21	0.01	0.01	0.02	M.T
2013-14	0.21	0.01	0.01	0.02	M.T

Source: Distt. Agri. Officer Sec-17 Chandigarh

Use of pesticides in agriculture is obvious for the prevention of crop damaging pests, fungus, unwanted plants (weeds) and a number of crop eating animals like rodents etc. Consumption of pesticides in India is quite higher than the other developing countries. The agricultural states like Punjab and Haryana are the toppers in pesticide consumption in India. Due to smaller agricultural area, Chandigarh has very low consumption of pesticides. Use of insecticides is highest among all pesticides in Chandigarh which are sprayed in almost all food grain crops and vegetable cultivation.The Demand of Fertilizer is being met from the neighboring Villages of Punjab & Haryana states due to their negligible demand & decreasing trend of Agriculture Land. Also the availability of Farm Yard Manure in plenty around city beautiful. As there is no fertilizer Production unit exists in Union Territory, Chandigarh. About 40 to 45 MT fertilizer in terms of materials is being brought by the farmers from neighboring villages of Punjab & Haryana States (2014).

Commercialization and modernization:

Chandigarh, due to its natural beauty and planned architecture, has been a diamond in merchant's eye. It has witnessed a big leap taken in commercialization and urbanization in a short span of a few decades. Villages along with their agricultural land are turned into urban area or a center for education and research like Botanical garden in village Sarangpur. Agricultural land is acquired for various purposes like IT Park and Theme Park, etc. And the commercial activities are prohibited in residential area.

RESPONSES:

A. Legislative and Policy Responses:

1. The Capital of Punjab (Development and Regulation) Act, 1952 and the Punjab New Capital Periphery (Control) Act, 1952 are the two specific laws passed to guarantee the development of Chandigarh as per the 'edict'. However, violations of the provisions of the above acts are witnessed in the city. As of today, the Chandimandir Cantonment, satellite towns of Mohali, Zirakpur, and Panchkula adversely affect the Chandigarh region in violation of the Punjab New Capital Periphery (Control) Act, 1952.
   With a view to identify the potential impact of large scale development in the close vicinity of Chandigarh, a high powered coordination committee was appointed to review and evolve strategies for planned development of the areas surrounding the Union Territory (to ensure minimal impacts on the city environs). The co-ordination committee approved, in 1984, the adoption of Regional approach (as envisaged in the Chandigarh Inter State Capital Region Plan 2001) to achieve the objective. The strategy suggested:
   i) Development of small and medium towns in the influence zone of Chandigarh and dispersal of population and economic activities over a wider area.
   ii) Adoption of spatial development strategy providing effective linkage between cities, medium and small sized towns and rural land in order to sustain urban agglomeration of Chandigarh city and to hold back excessive urban migration to Chandigarh besides ensuring equitable distribution of population and resources for orderly growth and development in the area.
   iii) The regional plan identified some immediate actions to be taken which included:
      a) Preparation of sub-regional plans by respective State Governments, of the area falling under their jurisdiction.
      b) Preparation of development plans for all regional and sub regional towns and all future developments to be taken up in accordance with these plans.
      c) Unauthorized structures near Zirakpur, Chandimandir on Kalka road, and on other major road crossings to be removed.
      d) Regional transport systems for Chandigarh urban complex and inter city movement be prepared and developed.
      e) Strict control on environmental protection and pollution be observed.
      f) Industries should be dispersed in the regional and sub regional towns by developing necessary infrastructure.
      g) Features like Shivalik hills, lake, choes and rivers must be retained green to promote natural environment and eco system. It should be further augmented by development of city forest, bird sanctuaries and deer parks, etc.
   However, despite the Committee's recommendations, expansion of the new Urban Centers of Panchkula, SAS Nagar, Naya Gram, Kharar and Zirakpur has continued.

2. The Chandigarh Pollution Control Committee is implementing the Hazardous Waste (Management Handling & Transboundry Movement) Rules, 2008 and The Biomedical Wastes (Management & Handling) Rules, 1998.

3. With a view to control the menace of plastic containers & polythene carry bags, the Municipal Corporation has framed by laws known as Chandigarh Municipal Corporation (Ban on Manufacture and usage of Polythene Bags & containers) Bye laws,2000. The said bye laws are implemented by the Inspectorate Staff of the Corporation. Besides, Recycled Plastic Manufacture & Usage Rules, 1999 as amended are also being implemented in Chandigarh. Earlier, the Chandigarh Administration vide notification no. ED/2003/543 dated 16th September 2003 has prohibited the manufacture, sale & use of polythene/plastic carry bags of thickness less than 30 microns and of size less than 8"X12". Now, Chandigarh Administration Vide its notification dated 30.07.2008, has put complete ban on the manufacturing & use of polythene/plastic carry bags in Chandigarh from 2.10.2008.

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B. Soil Conservation Measures:

Department of Forests & Wildlife is undertaking multifarious activities related to Soil and Moisture Conservation, Restoration of Biodiversity, Wildlife Management, establishment of Botanical Garden and Afforestation on massive scale.

In addition to Sukhna Lake, around 150 water bodies/ rain water harvesting structures have been established by the department so far, in sukhna wild life sanctuary & other forests. This has reduced soil erosion drastically from the catchment area of sukhna lake. Choe banks have been stabilized by planting 'Nara' along the banks.

The soil & moisture conservation works supplemented by massive afforestation, carried out in the Wildlife Sanctuary, which is also the catchment part of the Sukhna Lake, has reduced silt inflow into the lake drastically.

Lake rejuvenation and soil conservation works:

Sukhna lake of Chandigarh was formed by constructing a 12.8 meter high earthen embankment which harvested run off from 4207 ha of denuded catchment of Shivalik hills drained by Kansal and Nepli Choe. Due to natural rainwater resource and large catchment area of 42.07 km^2, the problem of siltation was raised in due course of time. Intensive soil and water conservation measures were taken up in the 2540 ha forest catchment of the lake by the administration, which included effective closure, large scale plantation, and construction of more than 190 silt measures. In a period of almost 3 decades, the siltation rates of the lake were reduced from 140 to 5 tonnes per hectare per year. As a result of various soil and moistutre conservation works and aforestation most part of catchment is stabilized and is now covered under thick vegetation cover. The overall tree density improved from160 to 450 trees per hectare and bush density from 5977 to 8994.

C. Actions for control of land degradation due to municipal solid waste

1. Sahyog - Waste Management Project:

To control the increasing quantity of waste and its disposal, Chandigarh Administration and Municipal Corporation with active involvement & participation of Resident Welfare Associations, NGO's like CAWEDS (Chandigarh Animal Welfare and Eco Development Society) & Yuvsatta, Institutions like hospitals, colleges, hotels and the university, have initiated a project 'SAHYOG' for the effective and meaningful disposal of waste.

The household waste is taken to Sehaj Safai Kendras (S.S.K.) and Khad Banao Kendras (K.B.K.), which are established at various locations in the sectors (refer to chapter Waste Management). The Municipal Corporation initiated the (SSK) scheme in 2002 from Sector 15 for ensuring proper collection and transportation of Municipal Solid Waste in the city. So far, the Corporation has identified about 100 sites for the construction of above mentioned Kendras. Under the scheme all Garbage Containers from these Sectors are removed and 2 sites per sector are designated for disposal of garbage, horticulture and other waste material collected from house to house by the Sector Welfare Associations on cost recovery basis. The collected waste is then segregated into recyclable material, organic and inorganic waste. The organic material is converted into compost (including vermincompost with the help of earthworms). Hence, the waste is converted into excellent manure produced most economically. The project 'SAHYOG' has been implemented in the institutions and various sectors.

Disposal of Fallen Tree Leaves

At present, the garden waste and waste of fallen tree leaves is being disposed of with the domestic and other waste at the existing landfill site. Instructions have been issued to the field workers not to burn any type of garbage or dry leaves. The corporation has invited 'expression of interest' from various agencies promoting different technologies for the setting up of a garbage processing unit. A proposal for the setting up of a separate unit for the disposal of Horticulture Waste and fallen dry leaves etc. is under consideration.

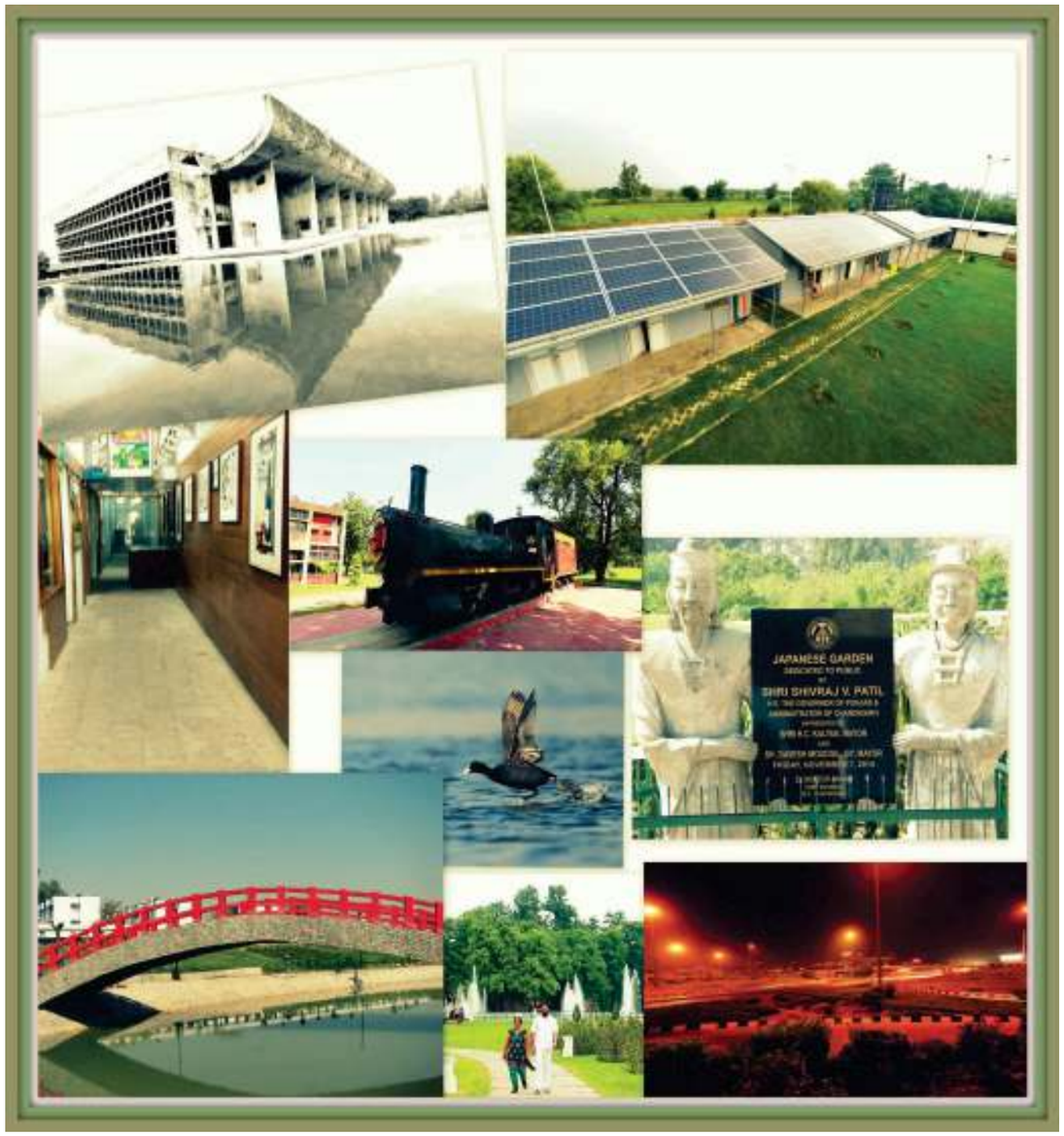
Recommendations

Despite the commendable actions taken by the Union Territory Administration for protection of its land resources from degradation and pollution, the following initiatives are suggested:

1. A coordinated approach in consultation with the State Governments of Punjab and Haryana may be adopted to ensure implementation of the Punjab New Capital Periphery (Control) Act, 1952. Discussions may be taken up with PUDA and HUDA to stop further expansion of satellite towns. However, it is important to realize that such pressures will continue in future. Hence, planning (like, MRTS, prevention of encroachment, etc.) for catering to these pressures may be taken up.
2. A strategy for integration of urban villages with adjoining planned sectors needs to be devised. Also, strategy for tackling problems of residential & commercial slums may be defined.
3. Commercial areas may be augmented with concept of multi level shopping.
4. Studies on characterization of solid waste need to be conducted and waste segregation at household level needs to be promoted. The citizens of Chandigarh are literate and environmentally conscious and aware, hence, this activity can be successfully initiated here.

5. For disposal of construction waste, the Administration may provide low lying area which can be filled up by Municipal authorities conveniently.
6. Land use changes in peri urban areas should be strictly curbed to retain/freeze existing land use pattern.

Capacity of Incinerators	
P.G.I	2 x 200 kg/h
GMSH-16	100 kg/h



IT IS YOUR DUTY TO KEEP AIR CLEAN FOR MY FURTURE USE

With the increase in population and the industrialization of the city, the problem of air pollution has also been arising. Due to high per capita income, the city beautiful is among the highest vehicular density areas of the country. Due to daily inflow of commuters from the three adjoining states (Haryana, Punjab & Himachal Pradesh), and the visitors load for centrally located PGIMER (Post Graduate Institute of Medical Education & Research); Chandigarh experiences very heavy traffic load daily. Also as the name indicates, city beautiful is densely occupied with a variety of seasonal, flowering, ornamental and fruit yielding trees. All these factors contribute through their own way towards the gaseous pollutants and suspended particulate loads in the air by means of releasing SO_2, NO_2, smoke, carbon particles and pollens.

Due to the well managed traffic system, strictly followed speed limits, dense tree cover around all roads, high green area, and regular industrial check-ups; the air quality of Chandigarh is much healthier than most of the growing cities of India. The SO_2 & NO_2 levels of the city always lie below the permissible limits given by the "National Ambient Air Quality Standards 2009" of India (MPL SO_2-50 $\mu g/m^3$ & NO_2-50 $\mu g/m^3$). However, the RSPM (PM_{10}) level has been observed above permissible limits in the city. The average RSPM level observed for the last year i.e. 2014 was 105 $\mu g/m^3$, which is quite higher than the desired limit of 60 $\mu g/m^3$. Therefore, there is a need to find out the culprit facts and to plan out strategy for their effective eradication.

National Ambient Air Quality Standards

Pollutant	Time Weighted average	Concentration in ambient air		Method of measurement
		Industrial Area	Sensitive Area	
Sulphur Dioxide (SO_2)	Annual Average*	50 µg/m³	20 µg/m³	Improved West and Gacke method Ultraviolet fluorescence
	24 hours **	80 µg/m³	80µg/m³	
Oxides of Nitrogen as NO_2	Annual Average*	40 µg/m³	30 µg/m³	Modified Jacob & Hochheiser modified (Na-Arsenite) Chemiluminescence
	24 hours **	80 µg/m³	80 µg/m³	
Particulate Matter (size less than 10 µg/m)	Annual Average*	60 µg/m³	60 µg/m³	Gravimetric TOEM Beta Attenuation
	24 hours **	100 µg/m³	100 µg/m³	
Particulate Matter (size less than 2.5 µg/m)	Annual Average*	40 µg/m³	40 µg/m³	Gravimetric TOEM Beta Attenuation
	24 hours **	60 µg/m ³	60 µg/m³	
Lead (Pb)	Annual Average*	0.50 µg/m ³	0.50 µg/m³	AAS Method after Sampling using EPM 2000 or equivalent filter paper
	24 hours **	1.0 µg/m ³	1.0 µg/m³	
Carbon Monoxide (CO)	8 hours	02 µg/m ³	02 µg/m³	Non dispersive infrared spectroscopy
	I hour	04 µg/m ³	04 µg/m³	

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

**24 boudy/8 hourly or 01 hourly monitored values, as applicable, shall be complied 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.

NOTE:

Whenever and wherever two consecutive values exceeds the limit specified above for the respective category, it shall be considered adequate reason to institute regular or continuous monitoring and further investigations.

Major Institutions, working towards air quality monitoring and preservation in Chandigarh are:-

Policy and regular Monitoring

- Chandigarh Pollution Control Committee (CPCC)
- Department of Environment
- State Transport Authority

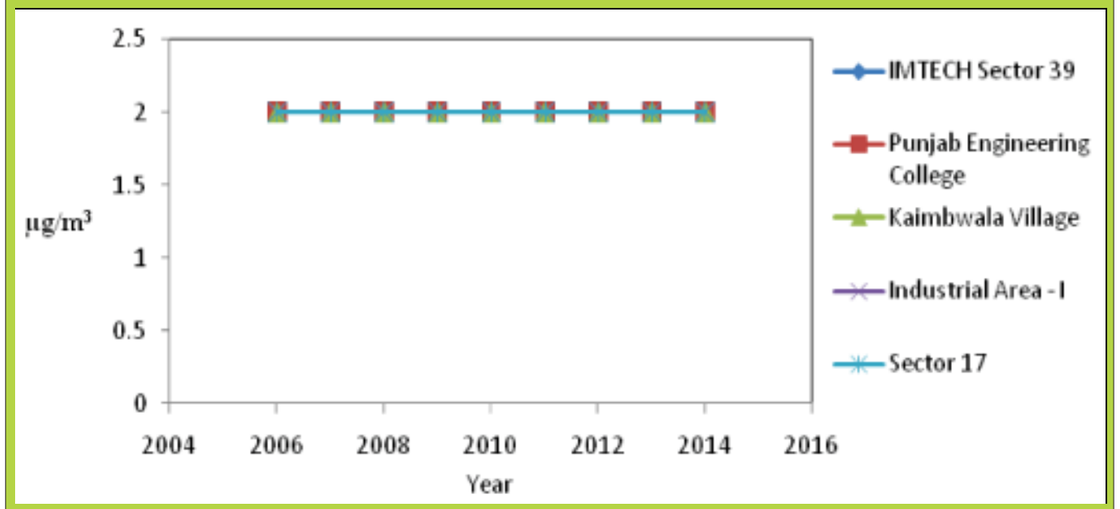
Research and Development

- Central Scientific Instruments Organization
- Punjab Engineering College
- Panjab University

Air sample analysis at CPCC laboratory

In addition to the above, the State Transport Authority and Chandigarh Police are responsible for taking action for the control of vehicular pollution whereas the Municipal Corporation is responsible for the control of pollution from municipal waste.

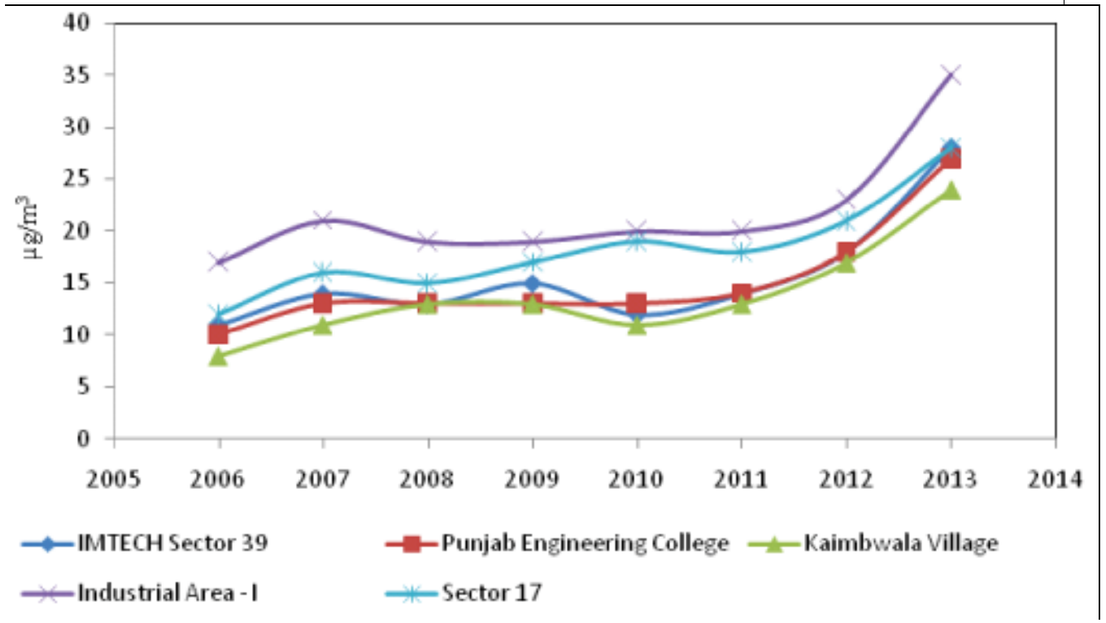
Trends of SO_x in Chandigarh:



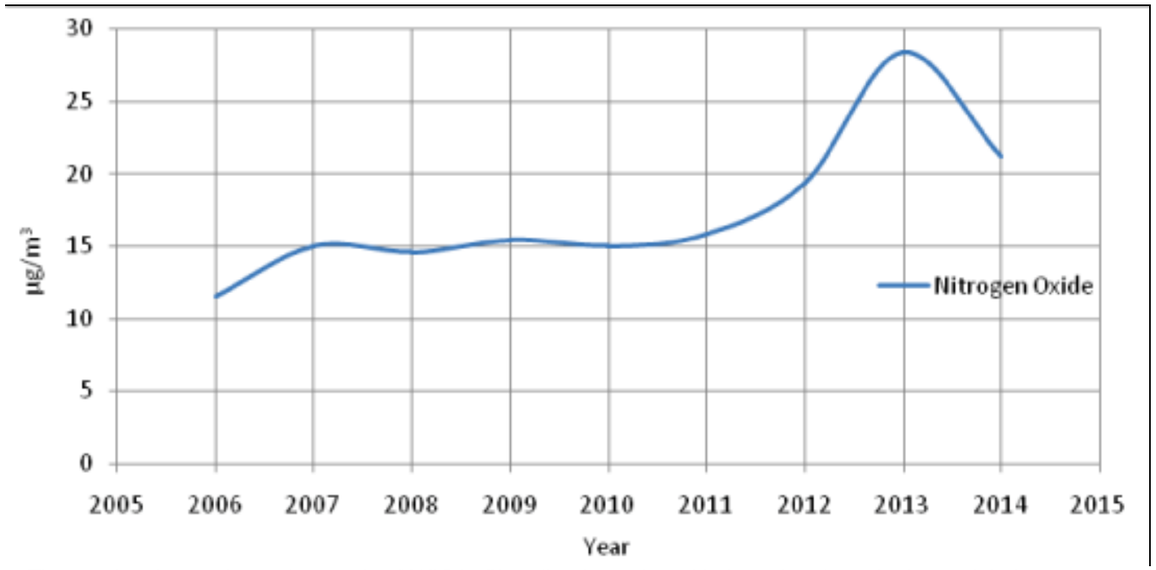
The atmosphere of city beautiful is very clear as far as the concentration of SO_2 is concerned. The SO_2 levels in the air of Chandigarh are observed to lie below the detectable limits (BDL) therefore assigned a constant value "2" for the ease of data management. The above graph shows the controlled level SO_2 in the city since year 2006.

Trends of NO_2 in Chandigarh:

➢Monthly average of NO_2 in Chandigarh:



➢Yearly average of NO_2 in Chandigarh:



The graphs above, shows the trends of NO2 in Chandigarh varying with the point of monitoring and their average values per year since 2006. The NO2 level is also very much controlled in the city as lies much below the permissible limits (MPL for NO2 40 µg/m3) decided under national ambient air quality standards of India 2009. The average value