CHAPTER 10 ENVIRONMENTAL CONCERNS

10.1 PLANNED DEVELOPMENT

Having planned development is an important aspect for Bhubaneswar for ensuring tourism and protection of the monuments. Lack of planning, congestion, encroachments and deteriorated environmental conditions are predominantly visible in the city. Even activities/functions with high potential for economy generation have been poorly planned and managed. In spite of its eminent and rich heritage, and growing environmental problems, not much effort has been put in for better planning of the city. The observations relating to the structure of the city, its land use and development are given below.

i. The development in Bhubaneswar even today is based on the Master Plan prepared in 1968. The approach of the master plan lacks inputs on the environmental considerations. The environmental requirements of the city to suit to its functions, as a tourist city and a centre for trade & commerce were not well reflected in the Plan.

ii. Haphazard and unplanned development is evident. A number of congested areas, especially in the core areas where the markets of Rajmahal and Bapuji Nagar, Unit – II market & I.

iii. The tourist areas of Lingraj and Rajarani Temple complex are surrounded by congested areas, even where development is not regulated. Even the hotel areas of Tajganj have a very high congestion and are very badly maintained.

iv. There many other areas with prominent temples as Muketshwar, Dhauli, Khandagiri having high tourism potential but have been neglected. The areas surrounding these monuments are in a very bad condition.

v. The city although has a number of craftsmen with skills in master crafts, silver filigree works, colorful appliqué works, stone images, wood carvings, patta paintings, brassware, horn works, bamboo articles etc. and even entertainers in classical and dance, hardly these activities are organised and emphasized. These activities have tremendous tourism potential and

provide employment opportunity to the local people if are properly organised.

vi. The older city has houses and building with unique architecture, which have touristic value. But, there has been no effort to improve these areas.

vii. A number of slums have come up with housing about 30% of the city's population.

viii. Mixed land uses are seen in most parts of the city. The functions such as trade commerce, open spaces, recreational areas, industries excluding households employment centres, community facilities utilities and services have encroached upon the existing areas meant for residential and other such purposes. Also, it is seen that the tourism areas have wholesale markets in close proximity. The older parts of the city have more such mixed land uses. These changes have lead to spiralling land values and adding density to the already congested areas. The additional activities were not commiserated with the needed additional infrastructure thereby posing a grim picture for the visitor of these areas.

ix. The city although initially evolved in rectangular shape on a grid iron pattern outward from the centre, the city now is more growing towards south west along NH-5 and NH-203 corridor. The road structure of the city has not evolved to cater to the changing pattern o the city and to cater to its functions. The city is growing largely in north, northeast and southwest direction along the main transport routes

x. The open spaces, parks, recreational areas are inadequate and not properly organised in the city. They, especially the green belts/plantation, are to be planned to cater to environmental functions including micro-climate control, pollution control (SPM) and improvement of aesthetics.

xi. Commercial areas in the city are characterised by problems relating to limitation of space, storage, on-street loading/unloading, heterogeneous traffic predominated by slow mode vehicles and idle parking etc.

xii. The city although has a number of craftsmen with skills in stone-inlay, appliqué work, wood carving, brassware, horn work, bamboo articles, silver filigree works, textiles, painting etc. hardly these activities are organised and emphasized. These activities have tremendous tourism potential and provide employment opportunity to the local people if are properly organised.

xiii. A number of slums have come up with housing about 30% of the city's population.

xv. The city was planned built on a gridiron pattern. With the process of time it started developing in a rectangular shape. But due the low lying flood plain of the Daya river, the distributary of Kuakhai in the south and the east and the location of the Bharatpur Reserve Forest in the north and the north west, the structure is now more or less in a dumble shape and the city is growing on Kolkata-Chennai Corridor and Cuttack-Puri corridor al along the national highway.

xvi. The road network and further developmental activities are not properly planned.

xvii. The open spaces, parks, recreational areas are inadequate and not properly organized in the city. They, especially the green belts/plantation, are to be planned to cater to environmental functions including microclimate control, pollution control (SPM) and improvement of aesthetics.

xviii. Commercial areas in the city are characterized by problems relating to limitation of space, storage, on-street loading/unloading, heterogeneous traffic predominated by slow mode vehicles and idle parking etc.

xix. A number of incompatible landuse are found within the city that needs to be relocated.

a. Wholesale vegetable godowns at Ashoknagar–Unit– 2 contributing to the problem of traffic congestion, unhygienic conditions in this residential area.

b. Wholesale warehousing activities are presently continuing at Unit – II, III, Station Road and at Rasulgarh area.

c. The burial ground at Satyanagar.

d. The trenching ground located near Khandagiri. The disposal of garbage are also being carried out on the same ground with the proposal for development of a residential colony at Aiginia.

e. The location of the slaughter House near Kalpana Cinema in Badagada is till operational. Also, the new slaughterhouse at Gadaa Gopinath Prasad needs to be upgraded and proper soild waste and d rainage facility needs to be provided.

f. There are a number of poultry farms, the more important among them being Central Poultry Farm of veterinary College, Siripur, Adivasipadia in Unit-I and at Laxmisagar.

g. Due to the OMFED Milk plan a number of a number of gowalas are functioning on the available vacant space leading to unhealthy and in sanitary conditions. It would be desirable to shift these gowals to some identified location at the outskirts of the city and organized them through OMFED to ensure preservation and marketing of milk.

xx. The traffic and transportation system is inadequate.

a. The present transportation network is inadequate to take the load of existing traffic.

b. The access to the monuments is poor.
c. There is 1 bus terminus near Baramunda Bus Stand, which bring in not only the tourists but also the local passengers. This is crating a lot of additional traffic leading to congestion of the area. There is also one old Bus Stand near to Unit-I market where the city town buses used to come for inter city movement.
d. The NH-5 is from Phulnakhra Square to Chennai goes through the City and meets most of the traffic intersection points and NH-203 starts from Rasulgarh and finally leads to Puri.
e. There is proper access road from the railway station to the monuments but there is always traffic congestion during the peak areas.
f. For the intra-city movement, the road network is well defined. Poor land use planning has resulted in mixed traffic and high congestion throughout the city.
g. For intra-city movement the road network is good. The tourist traffic from Delhi has to pass through congested roads to reach the monuments and other facilities in the city. The heavy-duty trucks, passes through the congested internal roads of Bhubaneswar occasionally, mostly on the roads closer to the monuments.
h. Non-availability of required parking facilities pose problems which ultimately leads to traffic congestion.
i. The tourists have poor access to the local shopping/commercial areas

The highly congested intersections are at Rasulgarh sqare (SQ), Vani Vihar SQ, Achrya Vihar SQ, CRP SQ, Khandagiri SQ, Fire Station, SQ, Raj Mahal SQ, Punamagate, Ravi talkies, Kalpana SQ and the Master Canteen.

The highly congested stretches are at Vani Vihar SQ ⇔ Rupali SQ ⇔ Ram Mandir SQ ⇔ Master Canteen SQ ⇔ Rajmahal SQ Acharya Vihar SQ ⇔ HUDCO SQ ⇔ PMG SQ ⇔ AG SQ ⇔ Hospital SQ Rasulgarh SQ ⇔ Bomikhal SQ ⇔ Jharpada SQ ⇔ Kalpana SQ ⇔ Museum SQ

The stretches with high traffic load are at Rasulgarh SQ ⇔ Bomikhal SQ, Bomikhal SQ ⇔ Jharpada SQ, Jharpada SQ ⇔ Kalpana SQ, Kalpana SQ ⇔ Museum SQ , Rasulgarh SQ ⇔ Vani Vihar SQ,

Vanivihar SQ ⇔ Acharya Vihar SQ, Acharyavihar SQ ⇔ Jayadev Vihar SQ, Jayadev Vihar SQ ⇔ CRP SQ, CRP SQ ⇔ Khandagiri SQ, Khandagiri SQ ⇔ Tamando SQ,.

The stretches with medium Vani Vihar SQ ⇔ Master Canteen SQ ⇔ Rajmahal SQ, Achar Vihar SQ ⇔ AG SQ, Jayadev Vihar SQ ⇔ Power House SQ ⇔ Rajbhawan SQ, Baramunda SQ ⇔ Siripur SQ, Khandagiri SQ ⇔ Gandamunda SQ, Rajbhawan SQ ⇔ AG SQ, Siripur SQ ⇔ Rajbhawan SQ, Ravi Talkies SQ ⇔ Garage SQ, Garage SQ ⇔ Uttara SQ.

xxi. The old city of Bhubaneswar had also grown rapidly during last decades. Increase in population in heritage zone has created number of problems. The old town areas which has number of heritage temples and monuments is characterized by number of problems:

- Inadequate road network system, as a result of which there is always traffic congestion in almost all roads of the old city.
- Inadequate parking space for vehicles.
- Lack of drainage and sewerage system due to which the water of the religious tanks are being polluted with inflow of drainage and sewerage system.
- Due to lack of space high-rise construction are being undertaken close the temples which has caused loss of visibility.
- Most of the temples are in the process of deterioration.
- Solid west generated in the area are being dumped along the drains and the boundaries of the ponds posing environmental problem.
- Availability of tourist facilities is negligible. The area needs high standard sanitation for the tourist and the people visiting the temple complexes.
- No organized open space/green areas.

There are a number of departments dealing with urban development/management of Bhubaneswar. The problems have not been systematically identified and also there has not been adequate coordinated effort addressing to the improvement of the environment or living conditions or quality of life or protection of the monuments through a comprehensive urban system.

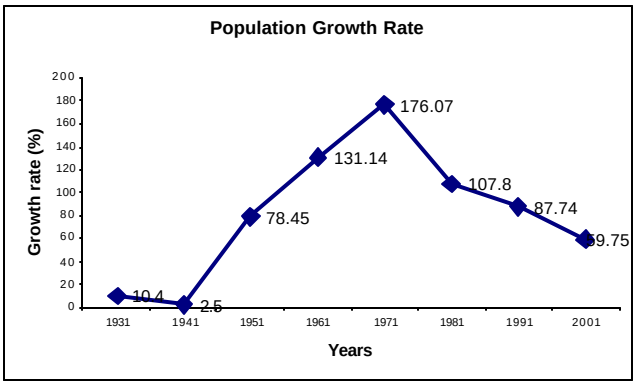
2. POPULATION

Population Growth:

i. There has been steady growth of population in Bhubaneswar city except for the first two decades when there was a drop in the population. This was mainly due to epidemics like cholera, plague etc.

ii. There has been sudden rise since 1941. The sudden rise in population was due to the migration of the people from all over Orissa to Bhubaneswar.

iii. The city experienced the highest growth rate in 1961-1971. This was the highest growth (176.07%) rate experienced by any other capital cities in the country. This was due to expansion of the administrative, liaison, and institutional and industrial activities.



iv. Later on the city experiencing a fall in the population growth rate. The reduced population growth during 1981 to 1991 could be due to closure of industries and restricted industrial development.

v. The increase in population from 1991 to 2001 at the normal rate is the normal urbanization trend as is happening in other cities of the country. From this, it should be noted that the restrictions on the polluting industries are not leading to negative growth.

vi. The expected population of Bhubaneswar by 2011 is 13.13 lakhs. These projections are based on the normal growth rate of population. **However, if any policy decision to boost economy of the area is taken without proper planning, the growth rates will be much higher.**

vii. The central part of the city covering the areas of Unit-28, Unit-7 and Unit-14 areas are having high population density having a population density in the range of 601-750 persons per hectare. The high density in these areas may be attributed to the trade & commerce and industrial activities, which are in existence since the migrant refugees who settled in the central part of the city soon after the independence.

Slums:

i. Slum population in Bhubaneswar is considerably high with 2 lakhs constituting 30% of total population. Slums are distributed throughout the city. Slums are usually devoid of services, have poor living conditions and hence can pose severe environmental problems, including health risks.
ii. Slum Population is 30% of total city population and is distributed throughout the city.
iii. The last decade has shown tremendous growth of the slum population. This is mainly due to the vast devastation caused by the super cyclone in the other parts of Bhubaneswar, which has lead due to huge migration from the rural hinterland, and other parts of the State as well as outside state in search of employment particularly in construction sector.
iv. Most of the slums of the city are located an unutilized Government land/ Railway land. These Government land remained temporarily vacant where development could not be done immediately. This provides favorable opportunities to the lower economic groups specially belonging to the labor classes who came to Bhubaneswar in quest of new opportunities and employment facilities.
v. Slums are usually devoid of services, prone to all types of natural hazards, have poor living conditions and hence can pose severe environmental problems, including health risks. It is observed that the housing conditions in all slum settlements are poor. The over all socio-developmental aspects are extremely poor along with low-level income and productivity.
vi. The increasing trend in slum population from 1991 to 2001 leads to deteriorate living condition due to the absence of planned economic activity and physical infrastructure. In the absence of appropriate economic activity, the ongoing urbanization can lead to economically weaker sections of the migrant population settling in slums, thereby further increasing the existing slum population.

3. ECONOMIC ACTIVITY

Industry:

i. There are not much large scale Industries operating in the city.
ii. Most of the industries are operating mostly inside the four Industrial Estates. (Bhagabanpur IE, Chandaka IE, Rasulgarh IE and Mancheswar IE)
iii. Most of the small-scale industries are operating inside the city. These are specially the small-scale industries that do not have requisite pollution control measures and have pollution impact potential of 2 to 5 km.
iv. Mixed type of land use can be seen in the areas adjoining the industrial estate. The problem becomes more chronic as the city is densely populated.
v. The industrial areas do not have proper infrastructure including green belts, drainage/ sewerage system, Waste disposal facilities, proper roads for transportation of materials/ goods etc.
vi. The location of industries vis-à-vis the other land uses and especially the tourism activity of the city and the likely impacts on the monuments are to be critically viewed.

Tourism:

i. Bhubaneswar today attracts about 1.7 million tourists per year. It has high potential to attract more tourists local, domestic and international.
ii. The areas within and outside the tourists spots need improvement and integration with the city functions and other aspects including socio economic, environmental and the land use.
iii. The quality of environment in Bhubaneswar and other infrastructure for improving sanitary conditions, living conditions of the people, access etc. are to be planned to suit the tourism function of the city.

iv. It is necessary to make the city attractive for tourists with higher income levels and to make the city attractive for longer stays.
v. The traffic situation inside Bhubaneswar is haphazard with some congested areas.
vi. Any plans for increasing tourists and their stay in Bhubaneswar will require analysis of the type of tourist, their income levels and needs and to provide suitable accommodation to them.
vii. It is necessary to make all arrangements to find a suitable eatery closed to the tourists spots. There is a potential for organizing eateries with Indian and continental cuisine but in a hygienic way.
viii. There is high potential to sell a number of handicrafts and goods that locally made or from other parts of the state. However, the spaces for selling them need to be organized. There is a need to properly integrate these areas with the tourists spots.

Trade & Commerce:

i. Several of the commercial activities such as wholesale markets are located too close to the monuments. These activities are not related to tourism and hence activities attract a number of vehicles for transportation of goods/materials thereby adding to congestion and traffic problems.
ii. The land occupied by these activities has higher potential due to tourism being in proximity to the monuments and hence land use conversions can be considered.
iii. A number of wholesale vegetable godowns, a number of vegetable godowns are presently functioning at Ashoknagar – Unit – 2 contributing to the problem of traffic congestion, unhygienic conditions in this residential area.
iv. Wholesale warehousing activities are presently continuing at Unit – II, III, Station Road and at Rasulgarh area.
v. Ribbonated commercial development along Janpath and Cuttack-Puri Road have brought in the problem of congestion, traffic bottleneck and other related problems on these arterial roads. Service roads along Janpath, Cuttack-Puri Road need to be constructed to ensure quick flow of traffic.

4. INFRASTRUCTURE

Roads

i. The existing road network is inadequate for both intercity as well as intra-city traffic movement. There is smooth flow traffic in four lane and two lane roads with some exception in some single lane roads. There is a need to plan the roads taking into consideration the vehicular pollution and its likely impacts.
ii. The roads in the Old Town are generally narrow and winding. The major corridors of movement in the Old Town are Lewis Road and the Jatni Road. This is a predominantly residential area and traffic is composed mainly of slow moving vehicles and of generally low volumes.
iii. A major limitation of the road system is the absence of service lanes and the provisions of direct access to all properties abutting the arterial roads. This is a serious problem especially during peak hours, when through traffic movement is substantially hampered by vehicles continually slowing down to perform their turning maneuvers. Although there is generally sufficient right of way, provisions of service lanes has been made only at a few sections of Janpath. However, the rest of the arterial streets do not have this facility.
iv. The Cuttack-Puri road has varying road width along its length, from Rasulgarh junction upto Samantrapur, when it assumes the characteristics of a major district road. Within the city limits, its function as a major arterial is severely constrained by heavy commercial landuse abutting the right of way, parking demands and very high volumes of mixed traffic. The road is undivided throughout its length, and apart from the Rasulgarh junction which is literally the entrance to the city and the Kalpana junction all junctions are untreated and uncontrolled.
v. Indiscriminate roadside arboriculture at a few major junctions is a serious hazard to safe traffic operations, as they practically eliminate visibility for turning and inter-section clearing operations.
vi. Improper design of road camber or cross fall results in ponding of rain water along large stretches of major roads, contributing to rapid use of the road surface, in addition to interfering with traffic operations during monsoons. The roadside drainage system also has not been properly designed and maintained, thereby compounding the problem.

Vehicles in Bhubaneswar are growing at an annual average rate of 10.5%. The total number of vehicles in Bhubaneswar will double in less than 20 years. Bhubaneswar is a city of narrow streets and lanes hindering smooth flow of traffic and creating more vehicular pollution. The existing road network is inadequate for both intercity as well as intra-city traffic movement.

More issues related to roads are given in Section 1 above (Planned Development). There is a need to plan the roads properly taking into consideration the vehicular pollution and their likely impacts.

Parking

The areas at Raj Mahal Chawk up to A. G. Crossing, Janpath , Sahidnagar market, the Unit-IV Market and Unit-I market, Pandit Jawaharlal Nehru Marg, Cuttack-Puri Road from Satyanagar Level Crossing to Kalpana Square, Old Town Vegetable market, D.A.V. School, Stewart School, Central School and Rama Devi College, Swasti Hotel, Bapuji Nagar severely facing parking problems.

Electricity

Though the total supply of electricity to the city is 38-mega watt, the actual consumption is only 18 mega watt which is less than 50% of the supply. The rest 20-mega watt is getting lost due to illegal connections and theft. Such high loss of electricity has an adverse impact on the development process and expansion of the new area and new economic activities. Immediate and drastic steps for check on such national loss are a pre-requisite for developing new areas with the same supply.

There is a need to ensure uninterrupted power supply.

Health Care Facilities:

The diseases observed in Bhubaneswar city in the year 2000-2001 include skin diseases, infections of intestine and respiratory tract, anaemia, mental diseases, eye diseases, ear diseases and tuberculosis.

Poor sanitary conditions and bad environmental quality could be the major causes for the spread of these diseases. As is said, prevention is better than cure, it is important to improve living conditions and quality of life in the city.

Water Supply:

i. Presently, water supplied to the city about 182 MLD. The sources of water to this city are Daya, Kuakhai and Naraj. About 40 MLD water is extracted from ground. The supply of drinking water to city is being looked after by the Public Health Engineering Department. However, the entire city has not yet been covered with safe drinking water. The problem becomes more acute during the summer especially in slums and newly developed areas. The urgent need of the hours to provide safe drinking water to all the citizens of the city.

ii. However, most parts of the wards of 1,2,3,4,17,18,19 and 28 are not covered by piped water supply.

iii. Of the water supplied, 40% is said to be the losses in transmission. Hence, the actual water available is about 182 mld, which is 110 lpcd whereas the requirement is 150 lpcd. There is a shortage of about 40 mld. The demand for water supply will grow by additional 20 mld by 2011. The local residents through bore wells and hand pumps currently augment water supply with ground water.

iv. The frequency of water supplied in the city is very low. The water supply is intermittent for only about 1-2 hours in the morning in most of the area. In some areas, the supply is once in two or three days for limited times and that too only in early hours, which is very troublesome for them. They have to store the water in the early morning hours in tanks and drums, sometimes in unhygienic conditions, which they use for consumption throughout the day.

However, since the water supply intake point is 500 m down stream of the Patia drain, the largest contributor of the BOD load (27t/d) there is a need to ensure proper treatment and quality of water and ensure its safe distribution.

v. The drinking water quality, generally, at the treatment plants and pumping stations is satisfactory but the water quality at the receiving end is sometimes found deteriorated. The following observations indicate contamination of drinking water during transit in underground piped network.

- The data shows that the water quality at receiving end at VSS Nagar, Baramunda Bus Stand, Sailashree Vihar, Niladri Vihar have high coliform count indicating that there is breakage in the pipes.
- Iron content is exceptionally high at most of the sampling locations. This may be due to the rusting of the pipes, which cause encrustation in water supply structure having adverse effect on water for domestic uses and increasing the iron bacteria.
- Residual chlorine at most of the locations was also observed to be high. This may be due to the treatment method applied at Bhubaneswar.

vi. The ground water is generally saline with high TDS, however people have been resorting to ground water to augment piped supply.

Sewerage:

i. Sewer lines exist only in the some part of the City (especially in the Unit 1,11,111,1V,V, VI, VII, VIII) . All the other wards do not have sewer lines. The disposal of the city sewage is mainly governed by the undulating land that divides the main city into 4 drainage valleys. The open drains in the valley find their way to the Gangua Nallah which finally meets the River Daya. In other areas the discharge is through septic tanks and oxidation ponds. Most of the sewage gets collected through the septic tanks and oxidation ponds, which finds their way to the nearby open drains.

ii. The total sewage generated in the city is 140.6 mld. The city has no sewage treatment Plant.

iii. The Bhubaneswar city has a severe sewage problem. Most of the city does not have sewerage system. The sewage is found flowing along the roads into the open drains. Some of the areas are even not drained and hence leading to stagnation of sewage. This is a major cause for pathetic sanitary and living conditions in the city. There is a need to take up this issue on a priority.

Housing:

i. The central city area has housing areas in a very poor condition, although these areas have some very architecturally appealing buildings. The city has nearly 40 % population in slums. Inadequate housing areas for the economically weaker sections and inadequate employment opportunities are of major concern for preventing slums.

ii. Areas with private dairies within households, semi-operational/non-functional sewerage system regular problems with water stagnation on roads, improper garbage collection, poor state of interior roads include Saheed Nagar, Forest park, IRC Village, Unit-1, 2,3,4,6,7,9, BJB Nagar, Bapuji Nagar.

iii. Very old and congested residential areas where most of the houses are in the state of dilapidation, congested roads, poor ventilation, mixed use with commercial activity etc. and very new housing localities with no basic infrastructure, the developing areas around the village settlements within the city boundary include IRC Village, N2, N3, Bargarh Brit, Nageswar Tangi, VSS Nagar, Bargarh, Laxmisagar, Old Town, Bomikhal, Rasulgarh, Cuttack Road.

iv. Slum areas/village settlements lacking roads, water supply network and drainage and with majority of population below poverty line include Sikharachandi, Patia Hadi Sahi, Patia Bhoi Sahi,

Radhakrushna Lane (Near Patia), Rasulgarh Bhoi Sahi, Sabarsahi, Sameigadia, Chakeisiani Tangi Sahi, Pandara, Brahmeswar Patna Bhoi Sahi, Jambeswar Patna (Behera Sahi and Bharati Matha Bhoi Sahi), Kapilaprasad Bhoi Sahi, Nuagaon Khuruda Sahi, Nuagaon Jena Sahi, Kapileswar Bhoi Sahi, Nuagaon Upper Sahi, Pokhariput Bhoi Sahi, Jadupur (A & B), Jadupur Begunia, Puruna Sahi, Odia Sahi, Aiginia Bhoi Sahi, Dumuduma Raghunath Nagar and Bhoi Sahi

5. ENVIRONMENTAL RESOURCE/PROTECTION AREAS

i. The existing **reserved forests** within the city are to be protected from land use conversion. Also, the adjoining areas should be planned so as not to affect these areas.

ii. The green belts and open spaces in the city are not adequate. Extensive **plantation** is required to be carried out covering the entire city for providing the functions of aesthetics/landscaping, micro-climate control, control of pollution, buffer to sensitive areas such as monuments and sources of pollution including industrial areas and transportation corridors and recreation.

iii. Several areas in Bhubaneswar having potential for developing plantation, especially those along the banks of Kuakhai & Daya River, in the industrial areas, along the major roads, bypass roads that are under construction, and railway lines, along drains, within and around monuments and in the institutional areas.

iv. There is a need to look at the possibilities of upgrading the existing **parks and gardens** and creating more parks and gardens, especially within the residential areas and in their close proximity so as to provide accessibility to nature to the residents. Also, **recreational areas** are to be created for both residents as well as tourists. The recreational areas for tourists are to be properly planned and provided.

v. The **monuments & temples** form an important source of heritage and have a very high tourism potential. However, the spaces within the monuments and outside are to be properly planned so as to ensure their protection and to put to tourism use.

vi. Because of changing agricultural pattern, the **agricultural lands** remain fallow for most of the time. This leads to addition of particulate matter into the ambient air. The areas behind Taj Mahal are not under intensive use and these areas can be developed into **horticulture**.

vii. **The numerous ponds and lakes** have excellent potential to be integrated with tourism, as many important monuments are located along the banks of the river.

viii. Several areas in Bhubaneswar having potential for developing plantation especially those along the river banks, in the industrial area, along the major roads, bypass roads, railway lines, along drains, within and around monuments and in the institutional areas. The areas that are lying vacant and can be changes to organized parks are: Saheednagar, Rasulgarh Jayadev Nagar, Behind Kalpana Cinema Hall Junction, In front of B.J.B College. (Arts Block), Neelakantha Nagar, Saheednagar Opposite Plot No.303 & 308, Bargarh Housing Scheme and near over bridge at Jaydev Nagar.

ix. Unorganized development is more on agricultural land than the formal development and rate of growth of unorganized development is very high than planned/project based development. The fertile tracts of Daya and Kuakhai river is rapidly being put to brick kiln and construction use.

x. The lakes and the drains are being used as dhobighats, vehicle washing, fishing and open defecations. This is leading to growth algal bloom and eutrophication. . Also, indiscriminate dumping of garbage, other solid waste materials and construction rubbles have added to the pollution and siltation problems in the lakes.

xi. Most of the lakes and the water bodies are located adjacent to the valley areas and the drainage area. The wastewater from the residential areas are reaching to the lakes and the ponds and polluting the water bodies. Also, due to the lack of sewerage system, the sewage is allowed to the roadside drains which ultimately reaches the water bodies.

xii. The wetlands and the natural drains are facing maximum conversion and encroachments. Large-scale construction (especially for housing, roads and slums). is being carried on the drainage area. These natural drains and the wetlands are natural recharge zones.

xiii. The large-scale encroachments of the lakes and ponds are affecting the lakes and the flora fauna thereby, affecting the ecology.

xiv. Thus, it is clearly demonstrated that there has been a large development in locations which are flood prone and thereby marginally suitable for settlements. The development is going on a fast rate without any proper attention to green zones creation, sewage networking and natural drainage pattern.

6. AIR POLLUTION

Considering the stone crushers and the brick kilns other than the domestic, commercial , vehicular and the DG sets, the total pollution load including SPM, SO_2, CO, NO_x and HC is 2.32 Mt/day of which 98 % is contributed by stone crushers, followed by brick kilns. However, if the stone crushers are shifted out from the city, brick kilns will turn out to be the major contributors of pollution in Bhubaneswar with about 99 % contribution.

Stone crushers are the single largest contributor of SPM with an emission of 1.87 Mt/day followed by brick kilns sources with 0.4 Mt/day. However, about 2.23 Mt/day of PM can be avoided if the stone crushers and the brick kilns are shifted out from the city. It they are shifted out from city then industries using coal is the major contributor (3.75 t/d) for high SPM followed by the domestic (0.61 t/d) and the vehicular (0.41 t/d).

Presently, Brick kiln is the highest contributor of $S0_2$ with an emission of 19.95 t/day followed by vehicles with 0.35 t/day. However, if the brick kilns are supplied with natural gas and stop using coal, vehicles will be the highest contributors of $S0_2$ (0.35 t/day). Vehicles also are the highest contributors interms of CO and HC. The high load of CO (4.75 t/day) is attributed to two & three wheelers (1.37 t/day) followed by trucks (0.6 t/day) and buses (0.5 t/day).

Industrial

Bhubaneswar city has 88 no's Industries operating identified by the State Pollution Control Board, Orissa, out of which 16 are Air Polluting and 34 are Water polluting. The details on the location and type of industries in the industrial areas of the city are given in Annexure V. Details of industries operating in different industrial estates (Mancheswar IE, Rasulgarh IE, Chandaka IE and Bhagabanpur IE)

The major pollutants from industrial sector are SPM & NOx. The quantity of SPM generated is about 3.73 T/Day and NOx of 0.18 T/Day because of coal and coke by the industries. By stopping the uses of coal and adopting natural gas can bring down the industrial air pollution load considerable.

The impact areas due to air pollution from industries is given below:

Level of Impact	Impact Distance	Prominent Locations
Impact Area I	2 km from industries	Chandrasekharpur, Patharagadia, Patia, Damana, Sikhrachandi, Gadakana, Sainik School Area, Mancheswar, Pandara, Bhagabanpur, Patrapada, Bijipur, Tamando, Subudhipur, Kalinga Nagar, Sankarpur and Dumuduma area.
Impact Area II	2-5 km from industries	Bharatpur, Sundarpur, Andharua, Malipada, Sampur, Ghatikia and Core area of the City

Domestic sources:

a. Considerable amount of population (30% of total city population) of Bhubaneswar is mostly living in slums. People living in slums mostly live in *bastis, juggis and jhopris* and they use kerosene, coal and wood for cooking purposes. However, most of the other population is dependent on LPG (Liquefied Petroleum Gas).

b. The total fuel consumed by the domestic sector is Coal (13.69 T/Day), Wood (13.69 T/Day), Cow dung (06.84T/Day), LPG (57.0 T/Day) and Kerosene (47.14 KL/Day).

c. The major air pollution impact areas due domestic sources from usage of coal, wood and cow dung are given below:

Level of Impact	Distance	Prominent Locations
Impact Area I (High)	200 m to the population using wood and cow dung	Sikharachandi, Patia Hadi Sahi, Patia Bhoi Sahi, Radhakrushna Lane (Near Patia), Rasulgarh Bhoi Sahi, Sabarsahi, Sameigadia, Chakeisiani Tangi Sahi, Pandara, Brahmeswar Patna Bhoi Sahi, Jambeswar Patna (Behera Sahi and Bharati Matha Bhoi Sahi), Kapilaprasad Bhoi Sahi, Nuagaon Khuruda Sahi, Nuagaon Jena Sahi, Kapileswar Bhoi Sahi, Nuagaon Upper Sahi, Pokhariput Bhoi Sahi, Jadupur (A & B), Jadupur Begunia, Puruna Sahi, Odia Sahi, Aiginia Bhoi Sahi, Dumuduma Raghunath Nagar and Bhoi Sahi
Impact Area II (Medium)	Distributed according to the concentration of non slum population	Other areas under residential and commercial use zones using LPG as fuel.

DG Sets:

Due to power break downs of 1hour daily; a number of DG Sets are used in Bhubaneswar City. Based on a detailed survey carried out, it is estimated that about 8,946 DG Sets operate in the city. As per primary survey, the fuel consumed by the DG Sets by different sectors and the average consumption of diesel varies as per the capacity of the generators.

Level of Impact	Impact Distance	Area
Impact Area I	150 m to the commercial establishments, hospitals, institutions and very densely populated	Nayapalli, Chandrasekharpur, Sahid Nagar, Bapujee Nagar, Old Town, Unit – IX, CRP Square, Ashok Nagar, Vani Vihar, PMG Square, Power House Junction
Impact Area II	Distributed according to the concentration of residential areas (non slum population)	Residential areas in Unit 1, Nalco Nagar, Arjun Nagar,

Vehicular

The issues regarding the road network had already discussed under 'Infrastructure' section. The total number of vehicles in Bhubaneswar District has grown at a tremendous rate of 57.7% during 1994 to 2000. The goods HCVs have grown alarmingly by 405%. At the current trend, vehicles will double in about 20 years. The city today has about 2.4 lakhs Vehicles.

The pollution load from vehicles in Bhubaneswar includes 0.63 t/d of PM, 0.35 t/d of SO2, 3.67 t/d of NOx, 4.35 t/d of HC and 7.21 t/d of CO. The CO emission from vehicles is very high. The major contributors are three wheelers followed by two wheelers and trucks.

The roads/stretches with high air pollution loads from vehicles include the congested stretches and the stretches with high vehicle loads, as given below.

The highly congested intersections are at Rasulgarh sqare (SQ), vani Vihar SQ, Achrya Vihar SQ, CRP SQ, Khandagiri SQ, Fire Station, SQ, Raj Mahal SQ, Punamagate, Ravi talkies, Kalpana SQ and the Master Canteen.

The highly congested stretches are at Vani Vihar SQ ⇔ Rupali SQ ⇔ Ram Mandir SQ ⇔ Master Canteen SQ ⇔ Rajmahal SQ Acharya Vihar SQ ⇔ HUDCO SQ ⇔ PMG SQ ⇔ AG SQ ⇔ Hospital SQ Rasulgarh SQ ⇔ Bomikhal SQ ⇔ Jharpada SQ ⇔ Kalpana SQ⇔ Museum SQ

The stretches with high traffic load are at Rasulgarh SQ ⇔ Bomikhal SQ, Bomikhal SQ ⇔ Jharpada SQ, Jharpada SQ ⇔ Kalpana SQ, Kalpana SQ ⇔ Museum SQ , Rasulgarh SQ ⇔ Vani Vihar SQ, Vanivihar SQ ⇔ Acharya Vihar SQ, Acharyavihar SQ ⇔ Jayadev Vihar SQ, Jayadev Vihar SQ ⇔ CRP SQ, CRP SQ ⇔ Khandagiri SQ, Khandagiri SQ ⇔ Tamando SQ,.

The stretches with medium Vani Vihar SQ ⇔ Master Canteen SQ ⇔ Rajmahal SQ, Achar Vihar SQ ⇔ AG SQ, Jayadev Vihar SQ ⇔ Power House SQ ⇔ Rajbhawan SQ, Baramunda SQ ⇔ Siripur SQ, Khandagiri SQ ⇔ Gandamunda SQ, Rajbhawan SQ ⇔ AG SQ, Siripur SQ ⇔ Rajbhawan SQ, Ravi Talkies SQ⇔ Garage SQ, Garage SQ ⇔ Uttara SQ.

For through traffic, the (number) load of vehicles is highest on Kolkatta- Chennai Road (NH-5) followed by Cuttack-Puri Road (NH-203) towards Puri.

DG Sets

The impact of air pollution due to DG Sets emissions have been categorized into two areas and are shown in Map 11.

Level of Impact	Impact Distance	Area
Impact Area I	150 m to the commercial establishments, hospitals, institutions and very densely populated	Nayapalli, Chandrasekharpur, Sahid Nagar, Bapujee Nagar, Old Town, Unit – IX, CRP Square, Ashok Nagar, Vani Vihar, PMG Square, Power House Junction
Impact Area II	Distributed according to the concentration of residential areas (non slum population)	Residential areas in Unit 1, Nalco Nagar, Arjun Nagar,

BRICK KILNS

Apart from the above sources number of Brick Kilns are established mainly in the low line areas of the Kuakhai River and Daya. They are catering to the requirements of Bhubaneswar City. Presently about 45 of them are operating within th e city having no pollution control device

The major pollutants from this sector are SPM & NOx. The quantity of SPM generated is about 398 T/Day and NOx of 19 T/Day. By stopping the uses of coal and adopting natural gas can bring down the industrial air pollution load considerable.

Level of Impact	Impact Distance	Prominent Locations
Impact Area I	500 m from brick kilns	Banks of Kuakhai River, Uttarasasan, Pupasasan,
Impact Area II	1 km from brick kilns	Mancheswar, Gada Gopi Prasad, Rasulgargh, Lakshmi sagai, Baragada.

STONE CRUSHERS

Apart from these sources of air pollution there are about 19 stone crushers operating within the city. Detail list of the Stone Crushers are given at Annexure -------. Stone crushers are concentrated around the National Highway no 05, which traverses the city. The major pollutants from industrial sector are SPM. The quantity of SPM generated is about 1869 T/Day .

The impact of air pollution due to emissions from stone crushers has been categorized into two areas.

Level of Impact	Impact Distance	Prominent Locations
Impact Area I	200 m from brick kilns	Bhagwanpur, Tamand, Pratappara, Sankarpur, Subhudhipur, Bijipur, Damodarpur
Impact Area II	2km from brick kilns	Sijua, Begunia, Jagmar, Ghatika, Sampur, Baramanuda, Khnadagiri & Udaigiri, Naypalli, IRC villagr

The topsoil of Bhubaneswar consists of hard laterite in the North and Western part. Its origin seems to be influenced by the topography and the bedrock characteristics of the origin. But the Eastern and Southern part consist of alluvial soil formed by the deposition of rivers like Daya, Kuakhai and Bhargavi. The soil dust becomes air borne easily. Dust storms are very common during May-June. The major natural sources of air pollution contributing to SPM are:

1. Open areas not covered with grass of vegetation
2. Fallow agriculture fields – due to changed agricultural practices, fields remain fallow for substantial period from March/April to the next 4 months.
3. Sand from the bed of river Daya, Kuakhai and Bhargavi.

7. WATER POLLUTION

i. At present only the main city district is sewered. Several areas in the city are not covered by sewerage system and these areas are severely affected due to stagnation of sewage on the roads and open plots adjoining the building blocks. Open drains carrying sewage across the city pose severe threat to health in addition to causing nuisance of bad odour and over flow during monsoon period.

ii. In absence of sewerage system, people are using septic tanks and soak pits. In most of the places sewage is discharged in to open drains without any treatment, which ultimately discharge to Gangua Nallah. Gangua nallah in its course of 12 km in the city of Bhubaneswar receives wastewater discharges at 9 drains. River Kuakhai receives about 27.22 mld of wastewater from Patia drain.

iii. Also, the old sewerage system is prone to frequent choking of sewerage lines leading to overflow of sewage into roads and creating bad sanitary conditions. Lack of periodic maintenance and renovation of old sewerage system is yet another problem.

iv. The total organic load (BOD) discharged through these drains is 100.64 t/day and that of solids is 127 t/day. The major contributor to the water pollution for BOD Load is Patia drain followed by Sainik

School These drains discharge both domestic and industrial wastewater from densely populated old city areas. These drains discharge both domestic and industrial wastewater from densely populated old city areas.

v. The existing water quality in river Kuakhai is 'acceptable'. Over the year the trends shows that the water quality has deteriorated from the 'excellent' category to the 'desirable' category at the upstream of Bhubaneswar. But due the discharges from the city the water quality has deteriorated although not alarming. The present water quality in River Kuakhai can be categorized under ' C ' class and falls under the 'Acceptable' category of the Water Quality Criteria.

vi. The water quality in all most all the lakes and ponds is not suitable for bathing. The high levels of BOD, chloride, nitrate, TC and FC counts recorded in all these water bodies indicate their polluted nature. However, in view of the socio-economic considerations added with religious sentiments, bathing in these public ponds is likely to continue for time to come.

vii. The ground water quality suggests that the water quality of both dug wells and tube wells are not much polluted excepting the lower pH recorded at Baramunda, Khandagiri, Kalpana and Unit – IV market and high iron content in almost all tube wells..

viii. The existing water pollution levels, poor sanitation, lack of sewerage system, polluted drains and river, overflowing sewage are highly deterrent to the tourism activity and for the health of the local people.

8. SOLID WASTE

i. The municipal solid waste generated is about 350 t/day. The Bhubaneswar Municipal Corporation is facing serious shortage of waste transportation vehicles and facilities such as garages and workshops needed to maintain and repair the vehicles. The Municipal Corporation has only 44 vehicles including tractors, tippers, loaders and refuse collectors of which only 20 are in working condition. As a result, only 35 % of the city waste is being transported and disposed by the Municipal Corporation daily. Due to the shortage of vehicles, many wards are not attended for days together, leading to the accumulation of the waste.

ii. The Bhubaneswar Municipal Corporation is collecting 112 T waste per day out of the total 345 MT per day waste generation in the city.

iii. The estimated quantity of hazardous waste from the city is about 31.7 t/year from the battery, paints and chemical industries. These wastes are generated from the industries at Mancheswar Industrial area and the effluent treatment sludge from the chemical industries at Chandaka Industrial Estate. .

iv. The total estimated biomedical waste from the major hospitals of the city is about 475 kg/day. The biomedical wastes are currently dumped along with municipal solid waste. This poses high health risks to the city.

v. Bhubaneswar has five waste disposal sites within the BMC area namely Jharpada, Mancheswar, near Womens' Polytechnic, behind Khandagiri and Udaygiri and Baragada area. The solid waste is also being dumped irregularly in many areas, even in residential colonies, along the highways or even in parks. There is no system of monitoring the dumping activities. Sweepers are also resorting to open burning due to shortage of handcarts and inadequate capacity of the bins.