

ANALYSIS OF THE UNDERLYING CAUSES OF ENVIRONMENTAL DEGRADATION IN BHUBANESWAR CITY

Dr. Akshaya Kumar Sabat

Associate Professor
 Department of Civil Engineering
 ITER, SOA University, Bhubaneswar-751030, India

ABSTRACT

Bhubaneswar is the capital city of Odisha, situated in the eastern part of India. The environment of the city has been degraded due to different man made activities. This paper critically analyses the effects and causes of environmental degradation in this city, some remedial measures to counteract these effects have also been suggested.

Keywords: Environment, degradation, effects, causes, remedial measures.

I. INTRODUCTION

Environment is the surroundings which include all forms of life plants, animals, human beings, air, water, land, buildings, parks, vehicle etc. Environmental degradation refers to an unfavorable change of surroundings. It is the deterioration of the environment through depletion of resources such as air, water, soil, the destruction of ecosystem and the extinction of wild life [1]. Bhubaneswar is the capital city of Odisha. It covers an area of about 135 Km² and lies at an elevation of 45m above mean sea level. It is situated in 21° 15' north latitude and 85° 15' longitude. The average temperature ranges between a minimum of around 12° C in winter and maximum 45° C in summer [2]. It is famous because i) it is the capital city of Odisha ii) place of tourist interest iii) there are a lot of employment opportunities iii) vast scope for trade and commerce iv) technical education hub of Odisha v) good Medical facilities vi) perfect Law and order situation vii) good climate etc. The present population of the city 8,37,737 according to census 2011 [3], though the city was initially planned for a population of 40 thousands only by the famous architect Otto Konigsberger in 1946 [4]. Since last few years the environment of the city has been degraded due to different man made activities, the original master plan had hardly any provision for counteracting/combating the effects of these environmental degradation.

II. EFFECTS OF ENVIRONMENTAL DEGRADATION

The effects of degradation of environment as have been observed since last few years in Bhubaneswar city are described below.

(i) Excessive heat in summer

It has been found to be excessive heat in summer both during day and night. The temperature in summer is ranging in most of the days around 40° C which not only is affecting the health and comfort of the people but also is increasing the energy consumption by excessive use of air conditioner, refrigerators etc.

(ii) Scarcity of drinking water in summer and artificial flood in rainy season.

The city receives around 1500 mm of rainfall a year, but the number of rainy days has been decreased from 70-82 days to 60 days [5]. Most of the rainfall is due to cyclone than due to monsoon. The ground water level has been depressed by one meter on major areas of the city as shown in the table given below.

Ground water level in major areas of the city

Major areas of the city	Water level below the ground (Open wells) in metres	
	Year -2006	Year -2010
Unit VIII	7.12	8.25
Unit IX	6.90	7.20
Unit IV	4.58	5.25
Nayapalli	7.28	8.10
Tanka Pani Road	3.75	5.50
Ouat	2.66	3.50
BJB Nagar	3.15	4.6
Niladri Bihar	2.88	3.45
Jharapada	4.51	5.20

Source [5]

It has been seen that during summer season scarcity of water has been found in some part of the city those

depend on ground water sources. The opposite things happen in rainy season (even in some other seasons also) if high intensity rainfall occurs for some time flood like situations /artificial flood is seen in different parts of the city like Shastri nagar, Paika nagar, Ravi talkies area etc. Even in month of October artificial flood has been seen in different part of Bhubaneswar. The example is 22nd October 2011 artificial flood in Acharya Vihar. Water get stagnated and does not find path to pass. This type flooding creates traffic jam, traffic diversion, accidents, water bodies gets polluted etc.

(iii) Absence of the feeling of all seasons

The people are not feeling the presence of all six seasons, rather only summer, rain and winter in which the duration of winter is very small.

(iv) Water pollution

The sources of water for Bhubaneswar are both surface and ground water. The surface sources are Kuakhai, Daya, Mahanadi river along with some lakes and ponds in Bhubaneswar. The ground water sources are open and tube well. The total water supply in the city amount to 260.78 Million litres daily (MLD) 18.82% i.e. 49.08 MLD of water supply in Bhubaneswar is from 176 dug well and bore wells, the water loss is 40% due to leakage [6]. From the environmental profile of Bhubaneswar [7] it is found that :

a) The characteristics of surface water as per the classification of central pollution control board fall in category of class - C which demands conventional treatment and disinfection. b) The lake, and ponds water are also unfit for bathing purposes and rituals as it fails to satisfy the status- 'B' category. c) The results of ground water quality analysis state that though the general characteristics of water conform to moderate quality, the coliform count in the case of open wells was found to exceed the normative level in some locations. In case of tube well, the low PH and presence of iron raises concern. d) The river Daya appear to be highly polluted due to discharge from Ganganallah. The presence of faecal - coliform in river water indicates the presence of domestic sewage including human excreta.

(v) Air pollution

The different sources of air pollution in Bhubaneswar are stone crushers/crusher units, small scale industries, motor vehicles etc. It has been found that high to critical levels of SPM in most of the locations, SO₂ within limits and NO_x on moderate levels [7]. However any visible/significant effect of Air pollution has not been felt or reported anywhere.

III. UNDERLYING CAUSES OF ENVIRONMENTAL DEGRADATION

The underlying causes of environmental degradation may be as follows

1) Improper Management of Solid Wastes

The city generates around 480 Metric Tonne of solid wastes presently [8]. From the physical and chemical characteristics of waste it is known that the waste have high organic content [9]. After collection of wastes from different wards they are transported to open dumping yards situated at different places in and around the city. No processing of solid waste are done before disposal hence degrade the environment in the following manner.

- Air pollution due to bad odour of wastes, fugitive dust, wind blown litter etc.
- Surface and ground water contamination by the leachates coming out from the dumping yards.
- Anaerobic decomposition of solid wastes occur inside the dumping yards which results in the emission of CH₄, CO₂ and other trace gases. These gases contribute to global warming and is one of the main reasons of high temperature in summer in Bhubaneswar.

2) Poor Drainage System

There are 10 major natural drains running west to east of the city. Some of which finally joins the Ganganallah. Ganganallah finally meets the river Daya. The entire city has not been covered with storm water drains. The drain length is about 363 km though there is a requirement of 1000 km length of drain [10]. Bhubaneswar is a complete hilly terrain, it is expected that within few minutes of rain, water should pass through the drains which ultimately will reach Ganganallah. However such thing does not happens due to the following reasons

- (i) Encroachment of natural drains by construction (ii) Dumping of waste material by the people making the storm water drains a dumping yard which results in blocking and choking of drains. (iii) Lack of regular, maintenance of the drains i.e. desilting, emptying/clearing of solid wastes from the drains, repair of drains etc.

These are the reasons of artificial floods in Bhubaneswar.

3) Poor Sanitation System

As the entire area has not been covered with sewerage system. Mostly people use septic tanks for

disposal of domestic solid wastes, the slum people use open spaces as their toilet. When minimum distance is not kept between ground water sources and septic tanks the ground water sources are polluted. Similarly the discharge of septic tank effluents to the natural drains without giving any treatments also pollute the surface water. Defecation of slum people in open space also pollutes the surface and ground water sources.

This is one of the reasons of water pollution in Bhubaneswar city.

4) Loss of Wet lands and Water bodies

There were large areas of wetlands around Bhubaneswar city. For large scale construction of apartments, slums etc. wetlands and water bodies like lakes, ponds etc. were filled up. Water bodies i) increase the natural recharge of ground water (ii) make the local climate cool. Destruction of water bodies is one of the reasons of excessive heat in Bhubaneswar.

5) Deforestation/Cutting of Trees

In Bhubaneswar since some years back for widening of NH₅ and widening of different stretches of roads hundreds of huge trees were cut. Deforestation of Chandaka forest by supercyclone and also by local people for their livehood contributed to the degradation of the environment. Cutting of trees /deforestation degrades environment in the following manner:

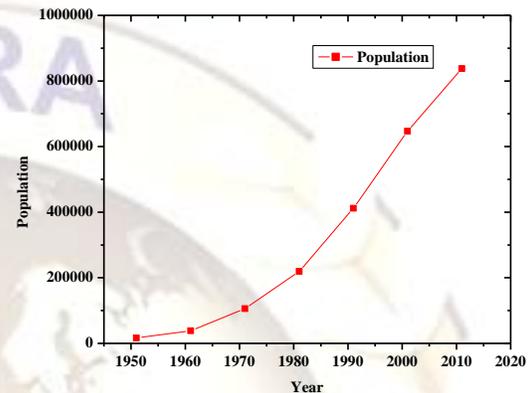
i) Trees absorb pollutants, NO₂, SO₂, O₃, CO through the pores of leaf surfaces. ii) Through their leaves and branches small particulate matter such as pollen, dust, smoke, and ash are trapped and filtered. iii) For Photo synthesis trees absorb CO₂ from atmosphere, oxygen is the by product of photo synthesis which is released by tree into the atmosphere. iv) The roots of the trees increase soil permeability which results in reduced surface run off of water from storms, reduces soil erosion and increase ground water recharge. v) The air temperature also lowers through shade of the trees.

Cutting of trees is one of reasons of excessive heat in summer and depletion of ground water reserve in Bhubaneswar.

6) Uncontrolled Growth of Population and their Life Style

The population of Bhubaneswar city has been increased from 16,512 in 1951 to population of 8,37,737 in 2011[3] as shown in figure given below. Housing has been a great problem in

Bhubaneswar. To accommodate the people the open space, low land, wet lands, lake, ponds etc. has been filled up for construction of apartments, by encroachment of natural drains and by destroying the open space, parks and gardens. In and around Bhubaneswar it has been identified that, there are around 459 illegal apartments [11].



Growth of Population in Bhubaneswar City from 1951 to 2011

Similarly a lot of black top roads have also been constructed. The maximum extraction of ground water has also been done. For modern life style the people use Air conditioner, Television, Refrigerator, Computers etc. All these activities affect the environment in following manner.

Black top roads absorb heat from sun as a result of which the temperature during the day time increases, and release heat into the atmosphere in the night time, which increases temperature in night.

High rise buildings accompanying narrow roads, obstructs the free circulation of air. It also reduces the wind speed which reduces the natural cooling effects.

Excess use of air conditioner, refrigerator, computers, mobile phones, digital music recorder, washing machine, television etc. result in the production of huge quantities of E-wastes. Contaminants like lead, zinc, mercury, cadmium, copper, chromium, silver, etc. are generated from these wastes which degrade the environment and affect the health of the people.

The release of CFC/HCFC the refrigerant in air conditioner and refrigerator if released into the atmosphere deplete the ozone layer. Even HFC, a

new refrigerant that do not deplete the ozone layer, contributes to global warming.

These activities of the rich people degrade the environment resulting excessive heat in summer. depression of ground water table, creation of artificial flood, water pollution etc.

Around 30 % of total population live in slum areas [12]. Some of the slum area are also very near to the waste dumping yard. Living standard of the slum is very unhygienic. In some patches the milkmen along with cows and buffalows live. Slum people have less accessibility for use of electricity they use kerosene, wood, cow dung cake, coal etc. for cooking, use public place/ open space as toilet. Use storm water drains as dumping yards, use lake and ponds for bathing etc. It has also been found that because they live near to dumping yards they are suffered by a number of diseases frequently. Some of these diseases are diarrhea, fever and cold, skin infection etc. [13]. In these manners the slum people degrade the environment reflected as excessive heat in summer, air pollution, water pollution and artificial flood etc.

6) Weak Public Transportation System

The public city transportation system is very weak. Peoples use their own vehicles mostly two wheeler and depend on auto rickshaw to travel to different parts of the city. Most of the accidents inside Bhubaneswar is not only due to the poor driving of auto rickshaw drivers but also weak repair, maintenance and high volume of around 18000 [14] of autorickshaws. A bus stand at Baramunda is also within the city. NH₅ passes through the city. All these vehicles emit the pollutants like carbon monoxide (CO), sulphur dioxide (SO₂) and nitrogen oxides (NO_x), particulate emissions in the form of dust into atmosphere which impact air quality and degrades the environment. It is one of the reason of air pollution in Bhubaneswar.

IV. REMEDIAL MEASURES

The following remedial measures are proposed to prevent the degradation of environment in Bhubaneswar.

(1) Increase in vegetation cover

Sufficient number of trees and other plants should be planted along the roads, along the drains, inside office building, inside residential buildings, in College and School campuses etc. People should be encouraged to establish horticulture garden around

their buildings. Creation of new parks in each wards and maintenance of old parks should be done. Further destruction Chandaka forest should be prevented.

(2) Introduction of Vibrant Public Transportation system

Mass Transportation system should be introduced which will reduce the fuel consumption and traffic congestion. The number of auto rickshaw should also be reduced. Old vehicles should be checked regularly. Frequent training to autorickshaw drivers regarding traffic rules and driving should be organized. People should be encouraged to use alternative sources of energy such as solar, wind, bio-gas and bio-mass power etc. Dependencies on fossil fuels should be reduced. People should be encouraged to use bicycles, and bicycle tracks should be constructed.

(3) Proper management of Municipal solid wastes

The collection efficiency of municipal solid wastes should be increased by engaging more number of persons, vehicles and equipments. There should not be any dumping yard inside the city. The waste should be disposed properly in sanitary landfill, constructed outside the city which should also be utilized to generate energy.

(4) Construction and maintenance of efficient drainage and sewerage system

The whole area should be covered with storm water drains and sewers. The existing storm water drains should be cleaned regularly. Encroachment of natural drains should also be cleared. Septic tank effluents should not be directly discharged to the natural drains, it should be discharged by giving some treatment. Septic tanks and soak pits should be constructed and maintained properly, keeping minimum 15-20 m distance from ground water sources, so that they will not pollute it.

(5) Restoration /Preservation of Wet lands and Water bodies

Wet lands and water bodies like lakes, ponds should not be encroached and they should be protected properly.

(6) Improvement of Living conditions in Slum Areas

The living conditions should be improved in slum area. The slum area peoples should use electricity for lighting, should use LPG for cooking instead of cow dung cake, kerosene, etc. They should be

advised to use toilets and not for disposal of solid waste here and there.

(7) Construction of Satellite Cities

To reduce the population density satellite city should be constructed with all modern facilities. More number of large markets, shops should be made in different places of Bhubaneswar to avoid traffic congestions in some particular areas. Area of Bhubaneswar Municipal Corporation (BMC) should be increased and work should progress speedily. Planning should be done such that housing, commercial areas, and offices should be located close to each other.

(8) Encouragement for Rain water harvesting and Artificial recharge of Ground water

As far as possible ground water recharge should be done by both Government and public. Roof water harvesting should be encouraged to increase the level of ground water table and increase in ground water reserve.

(9) Construction of Green roofs and Cool pavements

Peoples should be advised to construct green roof or roof top garden. A roof top garden is a vegetative layer grown on a roof top. Green roof provide shade and remove heat from the air through evapotranspiration reducing the temperature of roof surface and surrounding air.

Cool pavements should be constructed by using pavement materials that reflect maximum solar energy, increases water absorption and remains cooler than the conventional pavements.

(10). Creation of Awareness and Strict Enforcement of Environmental laws and Government regulations

Creation of awareness in public through T.V., newspapers, short films etc. regarding causes, effects and remedial/preventive measures of environmental degradation should be done. Strict enforcement of different environmental laws and different Government rules/regulations should also be done honestly and violation of these should be punished.

V. CONCLUSIONS

Environmental degradation is one of most serious problems faced by any nation. The degradation of environment of Bhubaneswar, has not so far being alarming like metro cities of India but still it is a

matter of concern particularly the heat in summer. The effects and causes of environmental degradation of Bhubaneswar city has been discussed in this paper. Some remedial measures have also been suggested. Government of Odisha has started to take some initiative though in late, to control the environmental degradation like plantation of trees in different wards, introduction of City bus service under JnNURM schemes, construction fly over in some important crossings, widening of different important crowded stretches, ban on entry of heavy vehicles during rush time, adding more number of revenue villages under BMC for construction of mass housing, construction of vending zones by removing the encroachment of roads by small vendors and cabin, desilting of storm water drains etc. It is the duty of not only the government but all citizens to be involved in different activities which will prevent the degradation of the environment of Bhubaneswar city and improve its quality.

REFERENCES

- 1) http://en.wikipedia.org/wiki/Environment_degradation.
- 2) <http://en.wikipedia.org/wiki/Bhubaneswar>.
- 3) www.census2011.co.in/census/city/270-bhubaneswar.html.
- 4) <http://bmc.gov.in/>
- 5) *The Telegraph*, 30th June, 2011.
- 6) *The pioneer*, 23rd March, 2011.
- 7) "Environmental profile of Bhubaneswar" available in the website http://www.orissalinks.com/bigfiles/Draft%20Proposal_CDP%20BDPA-2008/Chapters/Chap12,Environment%20&%20Disaster.pdf.
- 8) *The Telegraph*, 17th August, 2010.
- 9) A.K.Sabat, S.Nayak, N.C.Moharana, T.Mohanty, "Management of Municipal solid waste-A case study" *E-Planet*. 6(2), 2008, pp.52-56.
- 10) *The Sambad*, 1st September, 2011.
- 11) *The Business standard*, 9th April, 2011.
- 12) N.R. Rout, "Slum Growth in Bhubaneswar: A Problem or Solution?" *ITPI Journal* 5 (4), 2008, pp. 59 – 64.
- 13) B.Sarangi, M.Mohapatra, S.Sha, "Waste disposal in Urban areas-an acute problem –A case study in Bhubaneswar city" *Proceedings of National conference on Advances in Environmental Engineering*, held at N.I.T.Rourkela, 2009, pp.372-376.
- 14) *The Telegraph*, 13th October, 2011.