INTRODUCTION

Man lives in a biosphere composed of an inter-related atmosphere, hydrosphere and the lithosphere, a few hundred meters below which supports plant and animal life. The biosphere forms an intricate interlocking system containing all that is necessary for life. The ingredients of the ecosphere are constantly recycled and renewed in nature by plants and animals for re-use. The biosphere therefore consists of two inextricable components of a non-living energy source and a world of living plants and animals. The biosphere is composed of several ecosystems, which are made up of populations of organisms existing in an area of the base environment of energy, air, water, soil, and chemicals. Any intrusion or interruption in the balance results in the dislocation and unexpected and undesirable effects within the system.

Environmental pollution by human beings mean the introduction into the biosphere of waste that because of their volume or their composition or both cannot be readily disposed off by natural recycling processes (Getis, et al, 1981). Several types of pollution such as water, solid dumps, air and noise have produced several effects on people. In water pollution, the central idea is that the waste introduced in the biosphere because of its volume and composition cannot be readily disposed off by natural recycling process, when the composition of the water gets modified into something less suitable than its natural state. The discharge of unfavorable substances such as metals or inorganic wastes alter the physical and chemical nature of water and the quality and quantity of organisms living in it. This altered water may be unsuitable for drinking purpose but can be put for other uses such as washing, cleaning, gardening etc.

Pollution may be caused by the fall of dead leaves from trees, animal decay other natural phenomena which may affect the quality of water, but there are natural processes which take care of such pollution. Organisms in water are able to degrade, assimilate, and disperse such substances in which they naturally occur. Rarely do pollutants overwhelm the cleansing abilities of recipient waters, but the pollution discharged by people exceeds the ability by a given body to purify itself. Besides, pollutants introduced by humans such as metals and its compounds or inorganic substances that cannot be broken down by
natural mechanisms or take a very long time to break down. The entire problem in the
would today lies in controlling pollution arising out of technological development,
especially in the fields of agriculture, irrigation, industry and domestic wastes. Each type
of usage alters that water in some way before returning if to the environment (Getis et.al,

Water Pollution

The largest source of water pollution arises from dumping industrial wastes, both
organic and inorganic into water bodies. These are largely acids, highly toxic minerals
such as mercury, lead, arsenic, chromium etc., or in the case of petroleum refineries, toxic
organic compounds. Organisms not adapted to living in polluted water may become
contaminated and die. The water may be unsuitable for domestic and irrigational use, or
may reenter the food chain the deleterious effects on people example: In 1953 the
chemical plant at Minimata Bay Japan, that used Methyl mercury chloride in its
manufacturing process discharged the waste mercury into the bay where if settled in the
mud. Fish that fed on the organism in the mud absorbed the mercury and concentrated it;
the fish in turn was eaten by the people. Over 100 people suffered death, deformity and
permanent disability (Getis et. al., 1981). The 10 million gallons of oil spill from Alaska
in March 1989 spread over 1600 sq.m had affected the marine life of the area. Similar oil
spills off Antarctica, Los Angeles, The North Sea and the Persian Gulf had affected and
endangered marine life in the surrounding areas.

More recently attention is drawn to polychlorinated biphenyle (PCB's)
Compound used in capacitors that increase the efficiency of electric current in a wide
range of products. During the manufacturing process, companies have dumped PCB's in
rivers which have entered food chain e.g: A rock bar containing 335 parts per million of
PCB was caught in the Hudson River. which if the fish had been eaten, the consumer who
would have taken the fish, would have been taken in one third of his life time. Though
the effect of the PCB on human health is not known. Skin eruptions, excessive eye
discharges, and possibly cancer of the liver are believed to be linked to them (Getis, et al,
Herbicides and pesticides used in agriculture such as DDT find their way into water which affects birds, fish and plant life in water. Untreated domestic sewage when let into water sources and reused is known to cause polio hepatitis, spinal meningitis and other diseases.

Eutrophication: Excess nutrients contributed to water bodies from agriculture leads to a situation when nitrates and phosphates used as fertilizers drain into streams, rivers and lakes, eventually drain into ponds and other water bodies. Most of the lakes of Bangalore have been lost by the process of entrophication due to sewage being let into them.

Air Pollution

Truly, truly clear air never existed. Dust from volcanic eruption, marsh gases, smoke from forest fires and wind blown dust from natural sources, fossil fuels discharged into the air led to pollutants being let into the atmosphere accounting to three fourths the pollutants from all sources. Industrial processes, incineration and evaporation of solvents account for the rest of the pollutant.

The most well-known air pollutant is sulfur oxide, which arises from burning fossil fuels. They cause industrial smog which are associated with respiratory ailments. When weather conditions enable smog to remain in an area for several days, disasters occur e.g.: the Donora Pennsylvania for from October 26 to 30, 1948 involved 6000 people being ill, and 20 deaths, besides 130 law suits. The 1941 smog of Los Angeles gave rise to damage to vegetation and eye irritation for the smog period. The London smog of December 5 to 9, 1952 resulted in 4000 deaths (Ehrlich and Ehrlich, 1970). Sulfur oxides are also responsible for acid rain, which forms weak sulfuric acid when absorbed by the water vapour. This when washed out by rain or snow, damages vegetation, corrodes marble and lime stone sculptures and buildings. Acid rain has affected forests and crop patterns in Europe and North America. Increasing concern by the general public about the possible health consequences of smog episodes has led to demands for appropriate action by the authorities (World Health Organization, 1992).
Most of the fuel burning process discharge solid particles of soot and dust, sulfate and fluorides, asbestos and metallic particles emitted during combustion. Large and medium particles discharged are heavy and tend to wash out of the air discoloring buildings, clothing and cars. The very fine particles remain suspended in the air tend to affect human health. They also have long-term effects on the climate. Radioactive pollutants from nuclear power plants are problems of similar concern, as isotopes take a long time to decay.

The burning of fossil fuel also adds carbon dioxide to the atmosphere. Carbon dioxide has a far-reaching effect on the climatic changes especially in industrial areas. They are known to cause damages to lungs, and respiratory ailments.

Industrial disasters like the Bhopal gas tragedy of December 2, 1984 was one of the worst industrial disasters which methyl isocyanide from union carbide to manufacture pesticides vapourized into the air and killed about 2500 people and affected 50,000 people with permanent health problems (Khardkar and Dubey, 1984).

Noise Pollution

Noise is a sound without value and of an unwanted obnoxious and disturbing nature. Noise is important to environmental quality and aesthetic sense, and medical research reveals that noise presents serious health hazards such as deafness, illness and even death. Hearing loss is the most significant health problem caused by excessive noise exposure and is considered as a hazard in certain work environments. It is possible that exposure to excessive noise, characterizes life in a modern technological society and can cause varying degrees of hearing loss. Noise besides is annoying and disturbing and can cause temporary or permanent damage to the eardrums.

Increasing evidence points to physical and mental illness from noise pollution. Excessive noise can constrict blood vessels and can in turn lead to high blood pressure and cardiac illness. It may also be a factor in many stress-related diseases such as septic ulcer and hypertension. High level noise may disturb and cause permanent harm to unborn children, whose mothers are exposed to excessive sound. Noise can affect the automatic nervous system and produce emotional distress, neurosis and mental illness. It
can affect normal sleep and produce irritable unproductive social behaviour. Shock waves can actually cause physical and structural damage to buildings and homes (Henning D. H. 1974).

Motorized equipment such as motor cycles, cars, trucks, slow mobiles, scramblers etc., produce sound to affect wild life. Urban sound centers around transport, which if planned can be muffled. One of the most serious problem centers is around aircraft noise particularly around airports. A low flying jet may blast people in areas surrounding air ports with about 115 decibels (90 decibels can cause permanent hearing loss). A study indicated that people living around Heathrow Air port had a much higher rate of mental hospital admission than those in nearby quieter areas. About 140 major airports are involved with noise-related suits, complaints or political disputes. Supersonic transport illustrates growing concern by public. Social surveying on noise reveal an increasing percentage of people who are annoyed by noise pollution in metropolitan areas (Henning, 1974).

**Solid Waste**

Modern technologies have produced enormous solid wastes. The problem of advanced society has been one of disposal of variety and amount of refuse produced by residential, commercial and industrial processes. Open dumps and landfill harbour disease carrying rats and insects. Glass, chemicals and televisions are also found in dumped garbage. Industrial wastes can turn lethal when corrosive acids, organic materials and discarded metals reach out of land fill to drinking water sources. Hong Kong with 5.7 million people and 49,000 factories within its 400 sq.miles dumps 1000 tonnes of plastics per day – triple the amount thrown away in London (Time, 1989). The pelican, a voyager freighter had dumped 14000 tonnes of toxic incinerator ash in an unknown destination in 1986. (Time. 1989). The United States throw away society disposes 16 billion disposable diapers, 1.6 billion pens and 2 billion razors and blades and 220 million tires per year. They discard enough aluminum to rebuild the entire US commercial airline fleet every three months. The country is still struggling to clear up the mess created by the indiscriminate dumping of toxic waste (Time. 1989). Recycling seems to be the best way to reduce waste. Japan recycles more than 50 % of its waste and Western Europe
around 30% while US 10% of its garbage of 16 million tonnes a year. Only 16 states in US have mandatory recycling laws.

Slums and squatters due to their congestion, poor service facilities and drainage tend to pollute the surrounding areas causing a terrible stench. These areas are a source of infectious diseases such as Malaria, Tuberculosis Dengue etc.

A Profile of slums is considered as a major source of pollution in urban areas, especially in areas, which have a rapid urban growth, and an unplanned or poor plan of development. Major health impacts start from these sources of settlement.

Study Area

Bangalore City is taken up as an area to study “Environmental Pollution and its Impacts”. Bangalore City witnessed a rapid growth of population that led to unplanned growth and congestion. The growth of service was not able to keep pace with the population growth and urban spread leading to a sprawl and a haphazard growth of industries. Uneven topography, poor public transport, unplanned narrow roads have tended to give rise to a spurt of privately owned vehicles especially two wheelers since the last 1980’s. Hence pollutants in the air from industries and vehicles defoliate air quality with severe health impacts in the city. An indepth study of Environmental Pollution in Bangalore has been attempted from all aspects in its underlying geographical prospective.

Objectives

The Main Objectives of the Study are:

1. To study the nature and trend of ambient air quality of Bangalore City and analyze the factors that give rise to high levels of air pollution especially in certain areas such as traffic junctions, industrial, commercial and residential areas.

2. As a complementary to patterns of air pollution as the underlying factor is automobile a detail into types and the alarming growth of automobiles as a major sources of air pollution is assessed.
3. Consequent upon the city growth and industrialization, the quality of water is affected. The third objective takes on insight into the sources of water supply, waste water treatment, alternative sources and a decline into existing surface tank water supply due to pollution and encroachment. Pollution with the chemical quality is made at one stream namely the Vrishabhavathi as a sample case study.

4. The fourth objective looks into pollution from noise as a source of hazard. Noise levels are measured at traffic junction, residential, commercial, and industrial area to assess how far above the standard levels noise rises in the city, and what actually causes this unwanted noise. To understand its impact on people sample study is made on a hundred respondents to see how they perceive noise pollution.

5. The fifth objective examines environmental degradation from industries as a major source of pollution. Dealing broadly with nature and distribution of Small, Medium and Large Scale Industries and the impact of pollution on health and environment is examined. A detail study of two case studies one small scale industry - Electroplating and one large scale industry namely the textiles industries with reference to Binny Mills is made in detail.

6. The sixth objective is studying the nature of solid wastes, their generation, collection and disposal spatially for a 10-year period to understand its composition. This gives an insight into recycling solid waste - both in the formal and informal system. An EIA is attempted at three of the nine new sights identified by BDA in terms of health, and aesthetic.

7. The Seventh objective tries to assess the human factor, namely poorer localities i.e., slums as areas that generate a poor environmental habitat, and its impact on human health. Cases study of 12 slums substantial this aspect.
8. An attempt has been made to broadly study pollution from quarries, obscene posters etc., as smaller, but nevertheless important aspects of pollution. The study also tries to assess how far a decline in the green belt has added to pollution problem.

As the study deals with over all environmental pollution of Bangalore, the objective do not form an inter link of one objective over the other but would describe each aspect of pollution and its impact on man and the environment.

Review of Literature

Studies on pollution at global, national and regional levels have been widely made. A large number of independent studies have also made on various aspects of pollution- water, air, noise, solid waste etc., for various cities. A collective study on all aspect of pollution for a single city has been limited to a few cities especially in India. Aggregate problems for most cities are almost similar especially in developing countries. In India typical land use pattern with a central business area, crowding, large scale growth of migrant population, unplanned urban growth, haphazard growth of industries, proliferation of slums have all led to improper planning to the degradation of the urban environment. Marcus and Detwyler’s (1972) compilation of the urban environment describes physical setting, climatic aspects of urban areas, water, noise and air as components of pollution. They have also described the positive impacts of urban vegetation and wild life in improving the environment. Works of different authors in this book has thrown light on urban environmental problems and their impacts on human beings, the environment and health. Stevenson’s (1972) approach to noise hazard with reference to large cities such as Tokyo, Chicago, New York, etc., brings out all aspects of pollution from noise – source, distribution, spread, effects, remedial measures etc., Bach’s (1972) approach to air pollution- pollutants, factors and impacts for various cities are expressed. Detwyler’s (1972) approach to green areas and green belts in cities form buffer zones against pollution. Other aspects of pollution such as water in cities, storm water flooding etc. are discussed in this book. Studies on solid waste management for
Indian cities such as Madras by Gunasekaran (1989), Bangalore by Eshwarappa and Patil (1986), and Naseeba (1997) have detailed patterns of waste generation, collection and recycling. Ramachandran (1991) has tried to analyzed the impact of the declining green belt and tanks for Bangalore City. Policy implication on the issues of green belt in relation to ecological questions are described. Swaminathan (1997) has described spatial patterns and noise levels of Madurai City. Patil and Gagil (1988) describes and quantify heavy metals and carbonmonoxide in dust samples from automobile emission for Pune City. These and many such studies reflect a single aspects of pollution for one urban area. But a comprehensive over all aspect of pollution for a single city has been limited to Kumra’s work on Kanpur City and Bhatnagar’s work on Chandigarh City. An attempt have been made to study a comprehensive approach to pollution for Bangalore City. A study of this type would involve the collection of a wide range of literature and database. The inadequate records of database by the Pollution Control Board and other such bodies have brought in certain limitation in the study. Nevertheless an attempt has been made to depict a comprehensive approach to bring out the over all picture of pollution and its impact on the environments and health for a rapidly growing urban city like Bangalore.

Limitation of the Study

As the study of Pollution of Bangalore City is vast covering all aspects of degradation, the study suffer from a detail study of each of the aspects of pollution. The largest limitations were time and the vastness of both the study area and nature of the problem. Nevertheless the study provides a clear picture of environmental pollution of a rapidly growing Metropolitan City, and its impact on the environment and on man.

Methodology

The present study is based on primary and secondary sources of data and field survey. As the study has included almost all aspects of environmental pollution, it is difficult to conduct an intensive field survey. Thus while analysing the environmental issues often case studies were made. Here primary data was collected to assess trends and patterns.
Secondary data is collected from the records of various offices like, Census Operations, District Gazetteer of Bangalore, Karnataka State Pollution control Board (KSPCB), Indian Institute of Science (IISc), Regional Transport Office (RTO) Bangalore, Water Supply and Sewerage Board (BWSSB), Directorate of Industries and Commerce, Bangalore City Corporation (BCC), Karnataka State Slum Clearance Board (KSSCB), Center for Environment Education, South (CEE), Bureau of Indian Standard etc.

Data is also generated from maps such as Survey of India map, the TTK map of Bangalore City NATMO etc. These maps are used to understand the location and spatial distribution of roads, railways, industries, water bodies, garbage dumping yards, slums etc.

Primary data is collected by using various methods. To study the effects of air pollution, perception survey was conducted among traffic policemen in various parts of the city using a random sampling technique. Questionnaires were used and traffic policemen were asked questions pertaining to air pollution.

Water samples from Vrishabhavathi Valley have been collected and analysed in the laboratory to know the concentration of various parameters and level of pollution.

Measurement of noise levels is made by using noise level meter. Sampling stations have selected mostly on busy road crossing. Traffic count along these crossing was also made. Questionnaire surveys have been conducted to analyse people perception towards noise pollution.

Personal survey has been conducted to find out slum localities and questionnaires have been administered to study the environmental problem arising out of slum location. For this work help of KSSCB has also been taken.
Organisation of the Thesis

The study of environmental pollution in Bangalore City has been evaluated under eleven chapters including physico cultural settings on the study area. In the physico – cultural settings – relief, drainage, geology and soils, climate and meteorological features, land use pattern, population structure and its distribution have been discussed in detail.

In the second chapter, major air pollutants, their effects on human health and sources of air pollution in Bangalore are studied. To know the ambient air quality of Bangalore, temporal and seasonal patterns of pollutant mainly suspended particulate matter (SPM), sulfur dioxide (SO₂) and oxide of nitrogen (NOₓ) have been analyzed for the period of 14 years. Concentration of lead in ambient air has been discussed. In addition to this air pollution – perception survey among traffic policemen is conducted to observe its impact on human health.

The third chapter is devoted to study the unchecked growth of vehicles in India in general and Bangalore in particular and the pollutants emitted from these automobiles. In this chapter concentration of some pollutants for both diesel and petrol driven vehicles and their effects have been discussed. A Profile on the automobile structure of Bangalore City, role of traffic density in causing air pollution and hazards have been evaluated.

The fourth chapter deals with sources of water supply, spatial distribution, consumption and problem of water pollution in Bangalore City. In this chapter three major valleys i.e., Vrishabhavathi, K. & C and Hebbal waste water treatment plants were studied. In addition to this case study of Vrishabhavathi Valley Stream has been evaluated. Case studies of Ulsoor Lake, Habbal Lake Dorekere Lake and Medievala Lake have been carried out and finally preservative measures against pollution of water bodies have been suggested.

The fifth chapter seeks to analyse the sources and intensity of noise pollution in various parts of the city. Noise levels during the daytime have been measured and traffic counts at various crossings of the city have been carried out to correlate the increase in noise level with increasing vehicular traffic. In addition to this, survey on public response
to noise has been conducted and this has been analysed, finally suggestions are made to minimize the noise levels in the city.

In the sixth chapter, growth of industries in Bangalore since independence, distribution of small, medium and large-scale industries have been discussed. To study the problems of pollution from industrial establishment and its impact on the health and environment of the city is studied. Case studies of Electroplating units in Bangalore and textile mills (Binny Mills Ltd.) have been carried out.

The seventh chapter deals with sources, generation collection and disposal of urban solid wastes, in Bangalore City. Comparative study of range wise solid waste generation and infrastructure services for the years 1984 – 85 and 1994 – 95 has been analysed. Problems of hospital wastes and its impact on human are also discussed in detail – management of solid wastes in Bangalore – Formal and Informal system and role of NGO’s and CBO’s in waste management have been discussed. EIA for solid waste management has presented. On the basis of the study, recommendations have been made to solve the increasing level of solid waste.

In Chapter eight, some social and environmental problems of slums have been examined. Spatial distribution and range wise characteristic of slum and their problems have been discussed in detail. In addition to this sample study of 12 slums have been carried out and collected data have been analysed. Environmental impacts – Congestion, Air Pollution, Water Pollution, Noise Pollution, Solid Waste and Residential Health faced by slum dwellers have been studied in detail. Further problems of crimes, its occurrence and growth in Bangalore have been studied in brief. On the basis of the study, recommendations have been made to solve the problems.

The ninth chapter briefly describes three minor sources of pollution arising from declining green cover in the city, mining granite or quarrying for building purposes and visual pollution that has caught the attention of those intended to place importance on aesthetics. The last factor has in recent years made the people to remove hoarding from public places as it marred the beauty of Bangalore City.
The tenth chapter in summary describes sources of major hazards of health as a result of pollution from various sources. The hazards are described in relation to a cross section of the population such as slum dwellers, policemen etc. Other aspects of health are dealt in the respective chapter on air pollution, industrial pollution and with solid wastes.

The eleventh chapter draws conclusion on various aspects of pollution studied for Bangalore City along with suggestion.

Reference


