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Indexed in
Scopus Compendex and Geobase Elsevier, Chemical Abstract Services-USA, Geo-Ref Information Services-USA

ISSN 0974-5904, Volume 05, No. 04 (02)

International Journal of Earth Sciences and Engineering

August 2012, P.P. 1096-1099

Air Pollution, Health Implications- An Insight to Urban Governance

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Abstract: Cities have strongly emerged as the prime engines of the Indian economy and generators of national wealth. The National Commission on Urbanization states that, urbanization is the inevitable concomitant of economic change. It is time for us to treat urbanization as a positive, historical force and care for our urban centers. With a total urban population of 285 million in 35 metropolitan cities and metropolises, India's urban issues with all their related challenges and opportunities demand their firm place on the national agenda. In this background a study has been conducted to measure the health impact of increase in urban air pollution in the recent past in Bangalore City. The results reveals that about 54 percent of the people are suffering from air pollution induced diseases like cough, 25 percent are suffering from dust allergy, 7 percent are suffering from asthma and about 1.5 percent are suffering from respiratory infections. Further measurement of Environmental burden of diseases due to urban air pollution has revealed that, mortality of about 334 children (less than 6 years age) can be arrtibuted to urban air pollution induced diseases. About 230 and 305 (people of more than 45 years of age) mortality can be attributed to cardiopulmonary disease and for acute respiratory infections due to increase in urban air pollution when compared to all other risk factors in the city.

Keywords: *Urbanization, Environmental burden of diseases, mortality, Urban Governance*

1.0 Introduction:

The entire developing world is witnessing to an unprecedented shift of human settlements into the cities. The urban population in developing countries is expected to grow from 2 billion in 2000 to 3.9 billion in 2030 (UN, 2006), while total world population may grow from 6 to 8 billion. The United Nations Population Fund predicts that, almost all the world's population in the next 2–3 decade will be in urban areas of developing countries (UNFPA, 2007)

The economic base of the nation through expanding industries, trade, commerce and services has already shifted to urban centers. Cities have strongly emerged as the prime engines of the Indian economy and generators of national wealth. While India's population remains substantially rural, it is also emerging as one of the fastest urbanizing countries in the world. It is the second largest urban system with an urban population of about 340 million in 35 metros. (MoUD, 2011). It is estimated that by the middle of this century, it will become more urban than rural. Projections indicate that by 2030 that India's urban population will be 575 million constituting over 40% of total population. The urban population increased has from 26 million in 1901 to 285 million in 2001 and from 10 per cent to 28 per cent during the same period. The number of urban centers has increased from 3,126 in 1971 to 5,161 by 2001. (MoUD,2011).

There are four components of urban population growth - natural increase or organic growth, rural to urban migration, reclassification, and boundary changes of the existing urban centers. As industrialization progressed, economic activity became increasingly concentrated in urban centers and people began to migrate from rural areas in search of new employment opportunities.

The land occupied by most cities is not sufficient to provide the resources necessary to feed its economy, or the capacity needed to absorb its waste, the environmental impact of urban centers extends beyond city boundaries. The Sustainability of cities depends upon their ability to provide basic environmental sanitation services like potable water, safe wastewater disposal, effective solid waste management and urban air pollution control.

2.0 Urban Planning & Governance:

The Urban planning is a crucial activity for achieving the better environment in the urban center, it is defined as "a self-conscious collective (societal) effort to imagine or re-imagine a urban region and to translate the result into priorities in the areas of investment, conservation measures, pollution control, new and upgraded areas of settlement, strategic infrastructure investments and principles of land-use regulation" (UNCE, 1995). The importance of strategic urban planning system is that, decisions about economic, social and environmental priorities for land use will

have to be made in the interests of sustainable development.

The concept of governance comprises of the mechanisms, processes and institutions, through which citizens and groups articulate their interests, exercise their legal rights, meet their obligations and mediate their differences. The Urban governance has assumed increasing importance as a means to ensure that economic growth is equitable, sustainable and improves the human living conditions. Today, apart from the government, private sector and civil society have a critical role to play in local governance.

The Urban governance is defined as "the sum of the many ways individuals and institutions, public and private, plan and manage the common affairs of the city. It is a continuing process through which conflicting and diverse interests may be accommodated and cooperative action can be taken. It includes formal institutions as well as informal arrangements and social capital of the citizens". Good urban governance is inextricably linked to citizen's welfare and enables the community to access adequate shelter, security of tenure, safe water, sanitation, clean environment, health, education and nutrition, employment and public safety and mobility

3.0 Urban Environment:

3.1 Air Pollution

The Urban environment is under severe threat due to unprecedented increase in the populations, commercial and industrial activity. These have fuelled the generation of waste and non-ecological use of resources. The availability of water and its quality is under severe stress, and discharge of industrial effluents and household sewage into the water bodies has trigged the severity. The proliferation of informal settlements with heavy human concentration and scant urban infrastructure has added to the dangers of disease and epidemics. The solid waste management is pitiable in many cities and sanitary dumping and recycling facilities have not attempted efficiently. In the larger cities, the unbridled rise of vehicles has rendered the air unfit for inhaling and incidences of respiratory diseases are steeply rising.

The urban air pollution is caused due to rapid urbanization of the cities, growing demand for energy, and exponential growth of vehicles. Growth of vehicular population has contributed to 72 percent of the total urban air pollution followed by industrial (20 percent) and domestic activities (8 percent) in India (Navade, 2002). A recent survey by CPCB, has declared that, 23 Indian urban centers are critically polluted in terms of urban air pollution. 12 major metropolitan cities in India produce 352 tonnes of oxides of nitrogen, 1916 tonnes of carbon mono oxides from vehicular emission and 672 tonnes of hydrocarbon (CPCB, 2005).

3.2 Health Threats:

The Urbanization has major public health challenge for the 21st century, as urban populations are rapidly increasing, basic infrastructure is insufficient, and social and economic inequities in urban areas result in significant health inequalities (Vlahov et al., 2006, 2007). The environmental burden of diseases is 15 times higher in developing countries than in developed countries, due to differences in exposure to environmental risks and access to healthcare (WHO, 2004).

A study of urban health status reveals that, mortality rates per 10000 people, the circulatory system diseases (heart failure, hypertensive heart disease, cardiovascular disease) has increased in the polluted areas from 7.0 to 16.4 percent, the infectious and parasitic diseases mortality rate (cholera, tuberculosis, malaria and hepatitis) due to water pollution, has increased from 4.7 to 9.0 percent, and the respiratory diseases due to urban air pollution (acute respiratory infections, pneumonias and chronic respiratory conditions) has increased from 4.0 to 7.6 percent. In India one in every ten children in urban slums do not live to see their fifth birthday (MoHFW, 2010).

The number of deaths attributable to urban air pollution ranges from 2 to 3 million, and many of these deaths are caused by acute respiratory infections and other cardiovascular diseases (WHO, 1999). A study on automobile air emission of major Indian cities and annual episodes of illness and pre-mature deaths due to the presence of suspended particulate matter (SPM) in the ambient air of 4 metro cities have shown an increasing trend from 1991-92 to 1995.

Metro Cities	*Annual Episodes of Illness*		*Annual Pre-Mature Deaths*		
	1991-92	1995	1991-92	1995	Remarks
Calcutta	30,22,786	54,46,225	5,726	10,647	Increase
Chennai	4,62,966	6,80,241	863	1291	Increase
Delhi	39,90,012	51,97,018	7,491	9,859	Increase
Mumbai	25,79,210	40,05,538	4,477	7,023	Increase

Source: *Dewaram (1997)*

According to a study by Paramesh for Bangalore City, has revealed that, there is a steady increase in prevalence of asthma from 9 per cent to 29.5 per cent from 1979 to 1999. Further, it was observed that the persistent asthma has increased from 20 per cent in 1994 to 36.6 per cent in 2004. In this back ground a study was conducted to measure the extent of air pollution and its health impact in the city of Bangalore.

4.0 Study Area:

The Bangalore is rapidly developing mega-city, located in the South of India. The city has experienced rapid population growth in the recent past and the city boundary has also expanded (JNNURM, 2006). The existing urban infrastructure is insufficient for the efficient promotion of such growth and poses a need for immediate and consistent urban environmental management (Sudhira *et al.*, 2007). The Bangalore urban public transport system is not sufficient for foster economic development. Traffic problems are acute, and local authorities are developing many improvement plans like construction highways and improvement of road network. Even then, the speed of the vehicle is low and results in long travel time (the average speed in the city area is as low as 10-13 km/hr, which is bad when compared to many other growing Asian cities).

5.0 Methodology & Data Source:

The environmental burden of diseases has been measured based on the standard method as proposed by WHO and economic quantification of the burden was measured by Cost of Illness (COI) method. The data on air quality of the city was obtained from Karnataka State Pollution Control Board, Central Pollution Control Board and Tata Energy Research Institute. The Secondary health data was collected from major hospitals to establish the association between increase in air pollution with respiratory related diseases. Primary data was collected by conducting contingent valuation (CV) survey using structured questionnaire covering 100 households around 500 m radius of each air quality monitoring stations.

6.0 Results & Discussions:

The rapid growth of the city in the last two decades has polluted the ambient air. The PM_{10} (called SPM) levels are almost three times that of the Standards, exposing people to unhealthy levels for the last several years, which has raised the concern over growing pollution and health risk. The ambient air quality in with respect to RSPM and SPM in the industrial zones is moderate to highly polluting, in the mixed zones (Residential, Rural & other areas) with respect NO_x it is moderate, while with respect to RSPM and SPM, it is moderate to highly polluting. The ambient air quality with respect to SO_2 & RSPM in the Sensitive zone is highly polluting, while with respect to NO_x & SPM it is critically polluting. (Nagappa, 2010).

By considering the average concentration of PM 10 as 211.62 µg/m^{3}and that of PM 2.5 as 80.69 µg/m^3, the quantification of environmental burden of disease (extrapolated value for total Bangalore Population) indicates that, mortality of about 334 children (less than 6 years age) can be arrtibuted to urban air pollution induced diseases. About 230 and 305 (people of more than 45 years of age) mortality can be attributed to cardiopulmonary disease and for acute respiratory infections due to increase in urban air pollution when compared to all other risk factors in the city.

The study indicates high incidences of cough, dust allergy and asthma. About 55 percent of the respondents are affected by cough, 26 percent are affected by dust allergy and 8 percent are affected by asthma in the study area. The study has also revealed that, about 49 percent of respondents have visited the doctor more than 2 times (maximum of 3 visits) for various respiratory related diseases and about 27 percent of respondents have visited 4- 6 times, and about 17 percent of respondents have regular habit of visiting to the doctors.
Finally the economic quantification indicates that, the average additional total economic cost incurred by the respondents due to increased air pollution induced diseases is Rs 5650/year, which is very high when compared to the respondents from the controlled area.

7.0 Conclusions:

Hence it is necessary to formulate strategy through consultation to identify problems, solutions and implementation. It is also necessary to create community awareness and to enforce & support for cost effective technologies in the Urban Governance. The integrated waste management systems, waste recycling, clean technologies and non conventional sources of energy to be promoted and supported at all levels. The monitoring mechanisms for the control of various facets of pollution should be strengthened in cooperation with research institution, govt. agencies & NGOs so that the people are not affected.

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