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# AIR POLLUTION BENEFITS DUE TO A SHOPPING MALL IN GURGAON : A NEW PERCEPTION

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## Introduction

Shopping malls in India are a recent phenomenon in cosmopolitan cities and due to their success at the social/ buyer levels; these shopping malls are spreading fast to even small cities and towns. The success of these malls has come due to a mammoth amount of research that has gone in imparting economic and environmental benefits by shopping malls already established in many countries (Hopkins, 1991; White and Sutton, 2001; Voyce, 2006) . The Indian effort has been largely in implementing the benefits of this seller-buyer research and in accepting the very fact that a buyer is only a buyer, irrespective of the nationality one belongs to. However, in developing countries like India, apart from social and economical aspects, one has to be equally concerned with environmental issues (Khillare et al., 2003; Bell et al., 2004; Davidson et al., 2005; Kumar et al., 2007) and in the NCR (National Capital Region) of India, although everybody realizes air-pollution as a nuisance, but an individual shopkeeper does not require any environmental clearance to be taken from the Ministry of Environment and Forests, Government of India. Individual shopkeepers, normally do not have to employ any gadget in reducing or controlling the pollution. However, each and every modern shopping mall has to get clearance of Environmental Impact Assessment and submit an Environmental Management Plan, which is monitored by the At the Perfact Solutions, over the years, we have specialized in carrying out EIA projects of shopping malls, wherein, it has been studied that the present shopping malls in India are a boon to better manage the environmental aspects at the social levels. In a mall, certain advantages are obvious, like wastewater treatment is mandatory and the solid waste generation is almost nil. Rainwater harvesting is also mandatory and is another direct advantage to the society. Similarly, there are some other indirect advantages, like pollution caused by the motor vehicles in a conventional market and in a single parking shopping mall.

At the same time, pollution generated by the generator sets in a mall is far below the total pollution generated by a group of individual shopkeepers in a conventional market. It may be important to note that in many countries, the prevailing environmental conditions and the environmental management practices are so good that the establishment of environmental gadgets may only result into a marginal benefits but in a country like India, wherein all environmental components are at a critical level, establishment of the malls is becoming a big issue of environmental benefits apart from social and economical benefits.

With this objective in mind, this paper presents the study of environmental benefits of JMD Galleria shopping Mall coming up in Sector 18, Gurgaon. It is important to note that although, we study only the benefits of air-pollution due to a mall, but mitigation measures like rainwater harvesting automatically improves the entire ecology of the area [1]

**Data**

In carrying out EIA, we have to deal in assessing the impacts on air, water, soil, noise, flora and fauna, but in this paper, we shall restrict discussion only to aspects related to airpollution. The ambient air quality around the proposed project site and area within 10 km are given in Table 1

**Table 1. Ambient air quality at site and within 10 km area**

| Parameter | Site (Core Zone) | Sector 49 (Buffer Zone) | GHC near Sohna Road (Buffer Zone) | Sector 10 A (Buffer Zone) | Islampur (Buffer Zone) |
|---|---|---|---|---|---|
| SPM $\mu g/m^3$ | 174.15 | 240.49 | 234.27 | 259.16 | 207.33 |
| RSPM $\mu g/m^3$ | 112.25 | 155.05 | 151.01 | 167.04 | 133.64 |
| $SO_2$ $\mu g/m^3$ | 10.91 | 15.26 | 14.86 | 16.44 | 13.15 |
| $NO_X$ $\mu g/m^3$ | 14.8 | 20.67 | 20.14 | 22.28 | 17.82 |

Table 2 presents the soil quality data around the shopping mall. It is important to note that since most of the soil is sandy, if it is not properly managed by implanting trees and other native plants, it will lead to a higher aerosol concentration in the atmosphere.

**3. RESULTS**

Aerosol concentration is minimized by handling the entire solid waste with no generation and

depending upon the number of people visiting, solid waste has been estimated as 435 km/day. The other extremely important role of the mall over conventional shops is that the

**Table 2. Soil Quality Data**

| Parameter | S1 On site | S2 Sector 49 | S3 Tikri | S4 Islampur | S5 Fazilpur Jharsa | S6 Badshahpur Nala |
|---|---|---|---|---|---|---|
| Colour | Dark Brown | Brown | Light Brown | Blackish Brown | Brown | Brown |
| Texture | Sandy Loam | Loam | Loam | Sandy Loam | Sandy Loam | Sandy Loam |
| Bulk density | 1.41 | 1.37 | 1.40 | 1.38 | 1.39 | 1.36 |
| Porosity | 49% | 48% | 54% | 52% | 49% | 51% |
| pH | 7.6 | 7.6 | 7.7 | 7.2 | 7.6 | 7.5 |
| N (kg/ha) | 350.2 | 203.8 | 369.2 | 439.04 | 288.16 | 357.5 |
| P (kg/ha) | 58 | 59 | 54 | 53 | 56 | 60 |
| K (kg/ha) | 86 | 71 | 85 | 88 | 88 | 72 |
| Ca (mg/kg) | 35.2 | 25.6 | 12.8 | 102.2 | 32 | 38.4 |
| Mg (mg/kg) | 1.42 | 1.89 | 0.95 | 1.42 | 0.474 | 1.89 |
| Organic matter (%) | 1.44 | 0.20 | 0.82 | 0.62 | 1.03 | 1.24 |

mall has installed rain water harvesting, thereby improving ecology of the area. The estimated rain harvested water is given in Table 3.

**Table 3. Rainwater harvesting potential in the Gurgaon Mall**

| CALCULATIONS OF RAINWATER HARVESTING POTENTIAL | | | | |
|---|---|---|---|---|
| Description of Area | Area Considered (Sq. M) | Harvesting Factor / Collection Efficiency per area | Average Monsoon Annual Rainfall Considered (mm) | Total Volume of Water Available for Rain Water Harvesting (Cubic Mtr |
| Water Available from Terraces of Apartment buildings/Plots and other roof-top surfaces | 3021 | 0.80 | 520.03 | 1257 |
| Paved Surfaces, Roads & other Built-up Areas | 4699 | 0.65 | 520.03 | 1588 |
| Lawns, Gardens & all other Open Areas | 500 | 0.20 | 520.03 | 52 |
| **GRAND TOTAL** | 8219 | | | **2897** |

In terms of advantage directly to air-pollution, it is basically available on account of two factors: The first is due to the operation of DG sets of installed capacity of 1000 KVA x 2 and 500 KVA x 1. On the basis of the specification of the DG sets (Table 4) and the stack height

**Table 4. Specifications of installed 1000 KVA DG set**

| DG Set capacity | Air flow cu m/sec | **PM** mg/ $Nm^3$ | **Nox** mg/ $Nm^3$ | **HC** Mg/ $Nm^3$ | **CO** mg/ $Nm^3$ |
|---|---|---|---|---|---|
| 1000 KVA | 3.044 | 75 | 887.2 | 100 | 150 |

This data is used to compute concentration at various locations around the mall which has been estimated to be much lower than emitted by smaller DG sets catering to the samenumber of shop, which are put together in this shopping mall. It may be noted that the shopping mall consists of 600 shops spread over ground plus six floors. Moreover, 100 trees were planted and landscaping of 500 sq m area with lawns and ornamental plants has

been undertaken, giving additional advantage to air-pollution at the community level. The details of this study shall be presented in the conference.

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