

PREVALENCE OF MOTOR VEHICLE EMISSIONS AT SELECTED PLACES OF FAISALABAD CITY

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The estimated contribution of the motor vehicle emissions to the concentration and distribution of nitrogen oxides, carbon monoxide and hydrocarbons over Faisalabad city was calculated by using emission factors and vehicle kilometers travelled to assess the level of air pollutants. It was found that the environmental pollution due to motorcycles was maximum and percentage contribution from motorcycles and rickshaws was similar for all pollutants.

Key words: Faisalabad, motor vehicle emissions

INTRODUCTION

Environmental pollution such as due to noise, water, chemicals etc. has largely affected the quality of human life. Khan (1987) reported that about 2.8 million tonnes of various types of pollutants from mobile sources are being added to the atmosphere of Pakistan every year. Gazdar (1989) reported that about 700,000 tonnes of pollutants are being released into the atmosphere every year in Pakistan. This quantity is increasing annually by about 10%. Such an alarming situation led the authors to investigate and estimate the pollutants present in local environment.

Faisalabad is the third largest city of Pakistan. The fifth population and housing census of the country held in 1998 showed that population of Faisalabad is 5.3 million (Anonymous, 1998). Heavy traffic flows on roads for most part of the day which significantly adds to the air pollution sources of the city. Common air pollutant sources in Faisalabad city included respirable particulate matter from smoky diesel vehicles, two-stroke motorcycles, rickshaws, road dust and industry. Lead aerosol originates from combustion of leaded gasoline and carbon monoxide is emitted by gasoline vehicles and burning of waste and

firewood. Similarly, sulphur oxides are produced from combustion of sulphur containing fuels and industrial processes. Motor vehicle emissions may be a major source of nitrogen oxides and volatile organic compounds. The present study aimed at determining the contribution of the motor vehicles to the concentration and distribution of nitrogen and sulphur oxide, carbon monoxide and lead over Faisalabad city.

MATERIALS AND METHODS

1. Emission of pollutants was calculated by using "emission factors" on a 3km x 3km grid cell as proposed by Carnovale et al. (1991). Following this method, Faisalabad city was divided into six grids.

2. The total vehicle kilometers travelled (YKT) was determined by the formula:

$$(YKT)_3 = \sum_n (C_n \times h_n)$$

Where, I, J, n, C, and h, are grid cell numbers, road category, label for individual road, traffic count on road, and length of road within grid cell respectively.

3. The value of YKT was multiplied by the standards given in Table I. The results thus obtained gave the total emission of different pollutants.

Table I. Exhaust emission standards from motor vehicles in Pakistan

Type	Particulate	Emission (g/km)			
		Carbon monoxide	Hydroxides	Nitrogen oxides	Sulphur oxides
Motorcycles and rickshaws (petrol)	0.21	17.0	10.12	0.10	0.34
Private cars, jeeps, UN vans, mini buses and taxis (petrol)	0.33	22.9	1.88	2.83	0.08
Mini buses (diesel)	0.48	1.1	0.29	0.99	0.34
Inter-city buses, private trucks, carrier trucks and tractors (diesel)	1.01	13.2	2.50	13.40	1.70

Source: (Tariq et al., 1983)

- The data regarding the number of motor vehicles passing through any grid cell were collected from 6.00 a.m. to 8.00 p.m. for one day on each road of the grid.
- The statistical data about standard emission from motor vehicles were collected from various organizations such as EPA, Punjab, registration office, bureau of

statistics, traffic police, control centres of Municipal Corporation, Faisalabad etc.

- The data were analyzed using descriptive statistics and coefficients of variation were worked out.
- Of the (3km x 3km) grid cells in Faisalabad, each consisted of city roads for one inter-city highway. Emission data were

recorded for the automobiles running on roads. From the data, the motor vehicle emissions per hour were calculated. The pollutants were calculated in kilograms per day.

RESULTS AND DISCUSSION

Overall the environmental pollution due to motorcycles was maximum (Table 2). It was interesting to find that percent contribution from motorcycles and rickshaws was similar for all the pollutants. According to Tariq et al. (1983), the standard values of exhaust from motorcycles and rickshaws included carbon monoxide (31%), hydrocarbons (68%) and nitrogen oxides (1%). Present findings for the same type of

automobiles are carbon monoxide (65%), hydrocarbons (92%) and nitrogen oxide (1%). These data show higher percentage of pollutants in the environment of Faisalabad city. Effect of diesel and petrol driven vehicles was similar on environmental pollution. The analysis of variance indicated that the contribution of various pollutants to environmental pollution was significantly different. The air pollution due to automobiles depends upon many factors such as the type of engine, its life and condition, quality of fuel used and attitude of drivers (Anonymous, 1996), and the condition of roads (Due, 1996).

Table 2. Total emission (kg/hr km) by various motor vehicles

Motor vehicle type	Emission								Total (1+2+3+4)
	Carbon monoxide kg/hrkm (1)	%	Hydrocarbons kg/hr km (2)	%	Oxides of nitrogen kg/hr km(3)	%	Others kg/hr km (4)	%	
Motorcycles	506.71	50.0	301.64	70.0	2.97	3.2	15.50	38.5	826.82
Rickshaws	155.76	15.0	92.76	21.6	0.91	1.0	4.76	11.8	254.15
Cars	218.23	21.5	17.92	4.2	26.96	29.2	3.91	9.7	267.02
Jeeps	40.46	4.0	3.33	0.8	4.45	4.8	0.72	1.8	48.96
Mini buses	42.80	4.0	3.51	0.8	4.45	4.8	0.72	1.8	48.96
Mini buses, loaders diesel)	6.43	0.6	1.70	0.4	5.78	6.3	4.62	11.5	18.53
City-inter-city buses	30.14	3.0	5.71	1.3	30.59	33.1	6.64	16.5	73.08
Trucks	15.25	1.5	2.89	0.7	15.46	16.7	3.36	8.3	36.96
Total	1015.78	-	429.42	-	92.41	-	40.28	-	1577.89

Conclusion: The contribution from motorcycles and rickshaws to carbon monoxide, hydrocarbons and nitrogen oxides was 65, 92 and 1%, respectively. The quantity of total pollution from diesel driven mini buses and loaders was minimum (18.53 kg/hr km), while it was maximum (826.82 kg/hr km) from motorcycles.

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