



Level of Air Contaminants in Tiruchirappalli City in Central Tamil Nadu, India

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ABSTRACT

Contribution of automobiles to air pollution is reported in the range of 40 to 80% of the total air pollution. The challenge facing cities is how to reduce the adverse environmental impacts and other negative effects of transportation without giving up the benefits of mobility. The dilemma becomes most pressing under conditions of rapid urban growth, which is likely to increase travel demand significantly. The growing number of automobiles in urban Tiruchirappalli poses a serious threat to its air environment. Ambient air quality in the city was monitored for concentration of SPM, SO₂ and NO_x at different traffic areas namely Central bus stand, Chattram bus stand, Puthur, Palakarai, Srirangam, Main guard gate, TVS toll gate and Old Paalpanne Circle.

INTRODUCTION

Growing cities, increasing traffic, rapid economic development and higher levels of energy consumption lead to the pollution of air. Air pollution caused by automobiles has been described as the "disease of wealth". Around the world, five major types of materials are released directly into the atmosphere in their unmodified forms and in sufficient quantities to pose a health risk. They are carbon monoxide, hydrocarbons, particulates, sulphur dioxide and nitrogen oxides. This group of pollutants is known as primary air pollutants. These materials may interact with one another in the presence of an energy source to form new secondary air pollutants such as ozone and other reactive materials. Secondary air pollutants also formed from reactions with natural chemicals in the atmosphere (Miller 2002). The contamination of the atmosphere is so severe that it was recognized as the top issue among the ten major environmental issues identified by the latest UNEP report (Kumar 1999). Thus, it is necessary to evaluate the status of urban air pollution and to assess its impact on human health so that proper controlling measures can be implemented. To evaluate such impacts, a fact-finding survey is essential. In this study, attempts have been made to know the level of air contamination in Tiruchirappalli, Tamil Nadu.

STUDY AREA

Tiruchirappalli city (10.5°N, 78.43°E, 78.8 MSL) is situated on the banks of River Cauvery and spread over an area of 146.90 sq. km with total population of above 7,50,000. Tiruchirappalli, the fourth largest city of Tamil Nadu, is rapidly growing in terms of its population and number of vehicles. The 4 major highways NH 45, NH 67, NH 210 and NH 277 pass through the city. The heavy traffic on these highways has significantly contributed to air pollution in the city.

MATERIALS AND METHODS

The present work was carried in Tiruchirappalli city over a period of 6 months from July 2008 to December 2008. Ambient air quality was monitored for major air contaminants viz., suspended particulate matter (SPM), sulphur dioxide (SO₂) and oxides of nitrogen (NO_x). The air sampling was done by High Volume Sampler (HVS) APM 430. The instrument measures the volume of air sampled, while the amount of particulates collected was determined by measuring the change in weight of the filter paper. HVS was also fitted with absorbers which sample gaseous pollutants. The atmospheric concentration of gaseous pollutants was determined by chemical analysis of the absorbing solutions. SO₂ and NO_x were absorbed in sodium tetrachloromercurate and sodium hydroxide and the analysis of this solution was carried out by West and Gaeke method and Griess-Saltzman method, respectively. The monitoring was done for 24 hours. Eight sampling stations were selected to represent 8 different traffic volumes and activities. They were Central bus stand, Chattram bus stand, Puthur, Palakarai, Srirangam, Main guard gate, TVS toll gate and Old Paalpanne Circle.

RESULTS AND DISCUSSION

Average concentrations of SPM, SO₂ and NO_x at each sampling station are given in Table 1. The highest concentration of SPM and SO₂ was recorded at Palakarai, while the highest NO_x concentration at Chattram bus stand. SPM concentration ranged from 426.88 to 1301.92 µg/m³. SO₂ concentration ranged from 10.07 to 31.00 µg/m³. NO_x concentrations ranged from 149.81 to 182.00 µg/m³. Both SPM and NO_x concentrations exceeded ambient air quality standards of Central Pollution Control Board (CPCB) at Central bus stand (www.cpcb.com). High traffic volume in this region is major reason for these high values. But SO₂ is well within the standards of CPCB. At Chattram bus stand, both SPM and NO_x concentrations exceed the standards of CPCB. High vehicular density at this sampling station is the major reason for these high values of SPM and NO_x. The concentrations of SO₂ are within the prescribed limits. At Puthur, the concentrations of all the three major pollutants viz. SPM, SO₂ and NO_x are well within the prescribed ambient air quality standards of CPCB. The main reason for this might be the wide roads and fast movement of vehicles in this area. At Palakarai, SPM and NO_x concentrations exceeded the standards, whereas SO₂ were within the limits of CPCB. The high levels of SPM were due to slow movement of large number of vehicles. As vehicles move slowly, they emit more smoke. The existing poor road conditions might have increased the emissions from automobiles. Concentrations of SPM and SO₂ are will within the prescribed limits of CPCB at Srirangam, but NO_x values exceeded the standard. Both, SPM and NO_x at Main guard gate, TVS toll gate and Old Paalpanne circle exceeded the standards, whereas SO₂ were within the limits prescribed by CPCB. The quality of ambient air within the Tiruchirappalli city has been deteriorated mainly due to uncontrolled emission of pollutants by motorised traffic, and poorly main-

Table 1: Average concentrations of SPM, SO₂ and NO_x (µg/m³) at 8 sampling stations from July to December 2008.

Sampling Station	SPM	SO ₂	NO _x
Central Bus Stand	1131.35	21.80	168.67
Chattram Bus Stand	1030.43	19.00	182.00
Puthur	426.88	12.00	167.93
Palakarai	1301.92	31.00	171.21
Srirangam	834.65	10.07	149.81
Main Guard Gate	986.42	18.24	174.33
TVS Toll Gate	1018.00	20.73	157.42
Old Paalpanne Circle	1001.63	17.22	159.61

tained and congested roads with heavy traffic. Except at Puthur, in all the eight sampling stations, the concentration of SPM exceeded the ambient air quality standard of CPCB.

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