

ORIGINAL ARTICLE

# Assessment of particulate matter and lead levels in the Greater Cairo area for the period 1998–2007

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## KEYWORDS

Particulate matter (PM);  
Lead (Pb);  
Air quality monitoring;  
Air quality limits (AQL)

**Abstract** A health risk assessment study conducted in 1994 for the Greater Cairo (GC) area evaluated the environmental health risks to Cairo residents and determined the major health hazards of ambient lead and particulate matter. In order to determine the spatial and temporal trends in the concentration of these substances, the Egyptian environmental affairs agency (EEAA) decided to initiate a pollutant monitoring program. This was conducted with the help of the USA and Denmark. Numerous monitoring sites were established in Egypt. These sites monitored ambient particulate matter (PM<sub>10</sub> and PM<sub>2.5</sub>) and lead through the Cairo air improvement project (CAIP) funded by USAID. In addition, measurements of SO<sub>2</sub>, NO<sub>2</sub>, CO, and O<sub>3</sub> were performed through the Egyptian information and monitoring program (EIMP) funded by DANIDA. This paper describes the ambient particulate matter and lead levels over a period from 1998 through 2007 for the all monitoring sites in GC. In addition, discussions of the sources of the observed pollutants are presented.

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## Introduction

Megacity is a general term for cities together with their suburbs or recognized metropolitan area, usually with a total population in excess of 10 million people. There is no exact

definition of its boundaries. In 2000, 22 cities were identified as megacities: they are Tokyo, Osaka-Kobe, Mexico City, New York, Los Angeles, São Paulo, Mumbai, Delhi, Kolkata, Buenos Aires, Shanghai, Jakarta, Dhaka, Rio de Janeiro, Karachi, Beijing, Cairo, Moscow, Manila and Lagos.

Air pollution in urban areas comes from a wide variety of sources. The single most important source for the classical pollutants sulfur dioxide (SO<sub>2</sub>), nitrogen oxide (NO<sub>x</sub>), carbon monoxide (CO), volatile organic compounds (VOCs) and particulate matter (PM) is generally fossil fuels. Of particular importance is the burning of fuels for road transport and electricity generation. There are three major sources of air pollution in urban areas, namely mobile sources, stationary sources, and open burning sources and these can be categorized into source groups: motor traffic, industry, power plants, trade and domestic fuel.

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Gurjar et al. (2007) [1] evaluated emissions and air quality pertaining to all megacities. They also ranked megacities in terms of their trace gas and particle emissions and ambient air quality, based on the newly proposed multi-pollutant index (MPI) which considers the combined level of the three criterion pollutants (TSP, SO<sub>2</sub> and NO<sub>2</sub>) in view of the World Health Organization (WHO) guidelines for air quality [2]. Based on

present MPI values, they found that Dhaka, Beijing, Cairo and Karachi appear to be the most polluted, while Osaka-Kobe, Tokyo, São Paulo, Los Angeles, New York and Buenos Aires are the least polluted megacities.

Cairo, the capital of Egypt, is the largest city in Africa and the Middle East. It is located on the banks and islands of the Nile in the north of Egypt. The population of the Cairo urban

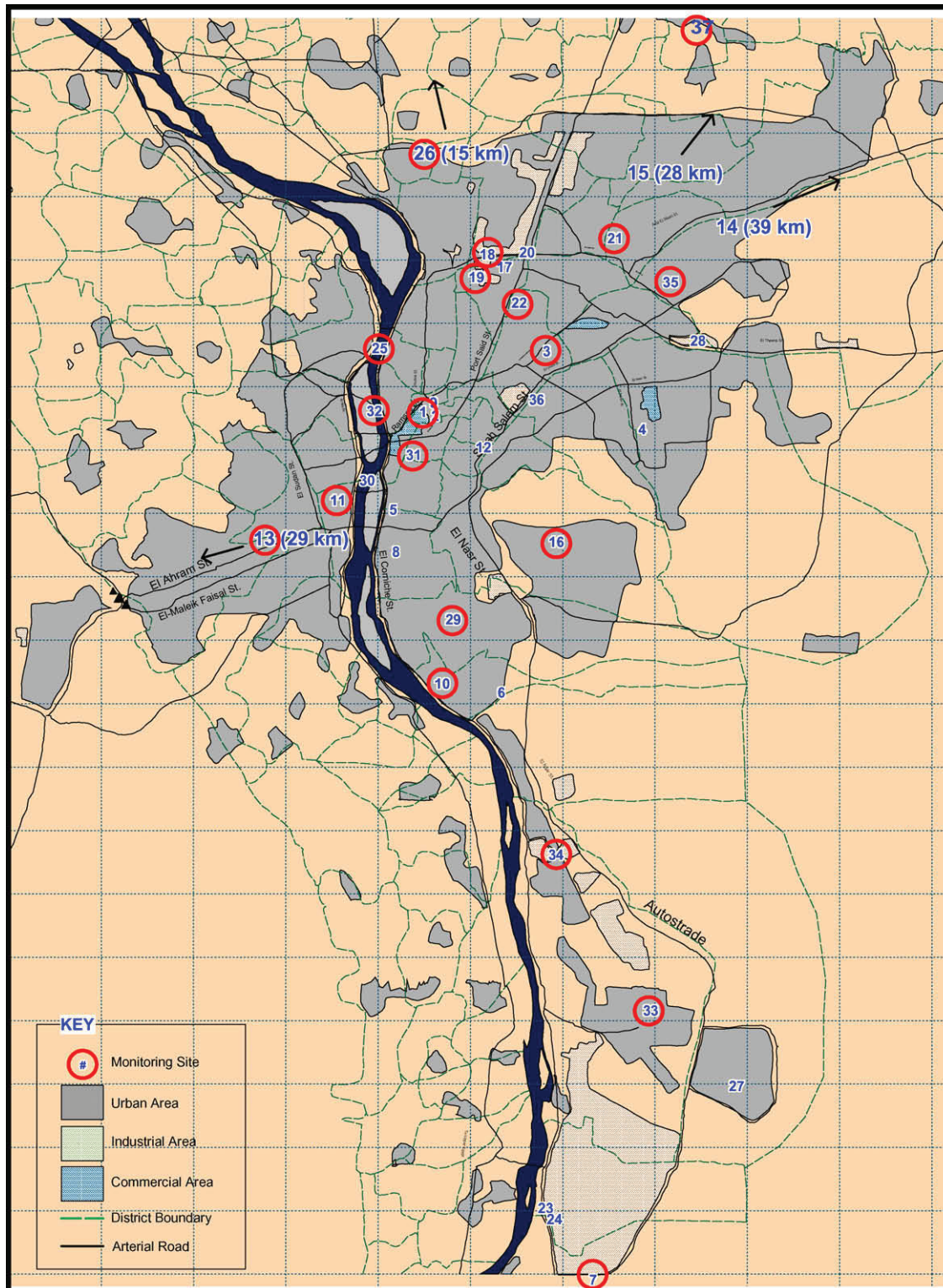


Figure 1 CAIP monitoring site locations in the GC area.

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