شبكة المعلومات الجامعية

بسم الله الرحمن الرحيم

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

شبكة المعلومات الجامعية

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات

يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار

شبكة المعلومات الجامعية

بعض الوثائق الأصلية تالفة

بالرسالة صفحات لم ترد بالأصل

ANALYSIS AND ASSESSMENT OF MAJOR INORGANIC AIR POLLUTANTS IN ALEXANDRIA AND THE DELTA

Thesis

Submitted in partial fulfillment of the requirements for the degree of

M. Sc. In Environmental Studies

(Physical Sciences Branch)

By

Heba Allah Said Saad

(B.Sc. Chemistry special, 1996)
Faculty of Science, University of Alexandria

Department of Environmental Studies
Institute of Graduate Studies and Research
University of Alexandria

2005

SUPERVISORS

1- Prof. Dr. Mohamed EL Raey

Professor of Environmental Physics
Department of Environmental Studies
Institute of Graduate Studies and Research
University of Alexandria

2- Prof. Dr. Elsayed Ahmed Shalaby

Professor of Soil Environment
Department of Environmental Studies
Institute of Graduate Studies and Research
University of Alexandria

3- Dr. Zekry Fahmy Ghatass

Associate Professor of Environmental Studies
Department of Environmental Studies
Institute of Graduate Studies and Research
University of Alexandria

Analysis and assessment of major inorganic air pollutants in Alexandria and the Delta

Referees:

1-
2-
3-

Place of Discussion:

Institute of Graduate Studies and Research
University of Alexandria
Egypt

Date / /2005

TABLE OF CONTENTS

ACKNOWLEDGMENT

I wish to express my profound gratitude and sincere appreciation to Professor Mohamed E. El-Raey, Professor of Environmental Physics of Environmental Studies Department, Institute of Graduate Studies and Research (IGSR), Alexandria University, for suggesting the problem, planning this research, keen supervision, valuable discussions, sympathetic encouragement, reading and reviewing the thesis.

My sincere gratitude and thanks are extended to Professor Elsayed A. Shalaby Professor of Soil Environment of Environmental Studies Department, Institute of Graduate Studies and Research (IGSR), Alexandria University. I am greatly indebted to him, for planning this research, keen supervision, valuable discussion, kind assistance, continuous encouragement, guidance and reviewing the thesis.

I would also like to express my deepest appreciations to Dr. Zekry F. Ghatass Associate Professor of Environmental Studies, Institute of Graduate Studies and Research (IGSR), Alexandria University for his keen supervision, valuable discussion, reviewing this transcript and many thanks are due to his continue encouragement.

Chapter (I)

Introduction

I-Introduction

Air pollution is the change in chemical or physical characteristics of air by increase of substance according to natural or man made and their effect on ecosystem (Sallam,1990)[1]. It has also been suspected since the mid 19th century of accelerating the degradation of cultural property (Gauri and Holdren, 1981)[2]. Egypt has experienced a rapid rate of economic and technological development over the last 20 years. This development, combined with rapid population growth, has led to an increase in the pollutants released into air, water, and soil. The high pollution levels have raised major concerns for public health (Howes et al., 1999)[3]. The main air pollution problem is the levels of particles especially PM_{10}. The measured PM_{10} concentrations often ranged from 6 to 8 times the Air Quality Limit (A.Q.L.) as given by Environmental law no. 4 for Egypt (EIMP, 1999)[4].

An understanding of pollution sources and emissions, and their interactions with terrain and the atmosphere, is most important first step in developing appropriate air pollution management plans and action strategies. Without this type of knowledge, incorrect decision making related to air pollution management is possible, creating wasted resources and undesirable results (Bridgman et al., 2002)[5]. The air quality due human action can be investigated by long term and large area monitoring. Air quality monitoring networks continuously monitor air quality over large areas. The network should be designed to meet one or more of four basic monitoring objectives listed below:

1. To determine highest concentrations expected to occur in the area covered by the network,
2. To determine representative concentrations in areas of high population density,
3. To determine the impact on ambient pollution levels of significant sources or source categories and
4. To determine general background concentration levels.

The network's aims are:

- to provide the public with easy and free access to information about the quality of the air that they are breathing
- to provide regular reports comparing air quality across the region
- To assist in developing local and national strategies to improve air quality
- To set up an archive of monitoring results.

The collected air quality data are often recorded as air pollutant concentration time series and are characterized by large fluctuations with no obvious autocorrelation (Liu, 2002a)[6]. So, the air quality data should be analyzed well by specialists.

The air quality data analysis group is responsible for tracking and analyzing ambient air quality trends and gathering, producing and distributing information on progress in air quality. Thus, they analyze air pollution trends, and distribute information on progress toward reaching air quality goals. Therefore, analyses on complex air quality databases should be performed to identify patterns, understand cause-and-effect relationships, and provide support to the development of pollution control programs.

1.1 Air pollutants: An overview.

Air pollution in the ambient air is the presence in the outdoor atmosphere; of any one or more substances in quantities which are or more may be harmful or injurious to human health or welfare, animal or plant life, or property, or unreasonably interfere with the enjoyment of life or property, including outdoor reaction. By the preceding definition any solid, liquid, or gas that is present in the air in a concentration that causes some deleterious effect is considered an air pollutant (Cooper and Alley, 1986)[7]. Air pollutants are classified according to their origin, physical state and chemical composition (El Sharkawy , 1989) [8].

On the basis of the pollutants origin, there are two classes, primary and secondary pollutants. Primary pollutants are those emitted directly from sources into the atmosphere, while secondary pollutants formed after emission into the atmosphere (Cooper and Alley, 1986)[7]. Gaseous, liquid or solid (particulate matter) air pollutants are other category that are classified according to physical state (Freedman, 1989)[9]. On the other side, air pollutants could be classified chemically into two main categories: organic and inorganic air pollutants. The organic air pollutants are two different types:

1- Living organic pollutants such as bacteria, fungi, algae and micro organisms.
2- Non living or chemical pollutants which are divided into two types; organic gases such as hydrocarbons and organic particulate such as industrial solvents (El Sharkawy, 1989)[8]. Inorganic air pollutants will be discussed in details, because they are the subject of our thesis.

1.2 Sources of inorganic air pollutants.

There is a continuous increase in the number of sources of inorganic air pollutants. Firstly, natural sources (volcanoes, earthquakes); secondary, man made sources (Industrial and transportation) (Sengupta and Venkatachalam, 1994)[10]. Here we mention the sources of the inorganic air pollutants of our study, which are particulate matter (PM_{10}), nitrogen dioxide (NO_2), sulfur dioxide (SO_2) and ozone (O_3).

(i) Particulate matter (PM_{10}).

PM is emitted into the atmosphere by a number of anthropogenic and natural sources; globally nthropogenic sources account for only 10 % of total PM emissions, whereas the natural primary PM emission reach 85 % (2900 million tones / year (Querol et al., 2001; Rodriguez and Guerra, 2001)[11, 12].

Natural sources are those such as marine and crustal contribution under air mass intrusions (Qeurol et al., 2001)[11]. Other sources of PM_{10} include road dust and soil dust (Hien et al., 2001)[13]. Anthropogenic prime sources of PM_{10} are combustion (coal burning and biomass burning, Hien et al., 2001)[13] and industrial process.Vehicular traffic generates dust from the road which has PM_{10} content and remains suspended for several hours. Black smoke from the exhausts of diesel vehicles is also an important source of PM_{10} (Perez and Reyes, 2002)[14]. Industrial sources of PM_{10} include Kraft pulp mills, chemical plant, oil refinery and sawmill