

HIGHER TECHNICAL INSTITUTE

CIVIL ENGINEERING DEPARTMENT

DIPLOMA PROJECT

AIR POLLUTION MODELLING

C/971

IOANNOU SOCRATES

JUNE 2003

**HIGHER TECHNICAL INSTITUTE
CIVIL ENGINEERING DEPARTMENT**

DIPLOMA PROJECT

AIR POLLUTION MODELLING

C 971

IOANNOU SOCRATES

JUNE 2003



AIR POLLUTION MODELLING

BY

SOCRATES IOANNOU

Diploma project

Submitted to the
Department of Civil Engineering of the
Higher Technical Institute
Nicosia Cyprus

In partial Fulfilments for the diploma of

TECHNICAL ENGINEER

In

CIVIL ENGINEERING

JUNE 2003

HIGHER TECHNICAL INSTITUTE	PROJECT NO. 3382
----------------------------------	---------------------

HIGHER TECHNICAL INSTITUTE
NICOSIA CYPRUS

CIVIL ENGINEERING DEPARTMENT
Academic Year 2002/2003
Diploma Project Number: C/971

Title: Air Pollution Modelling

Objectives:

- 1.To state and define major air pollutants and their sources.
- 2.To state effects of air pollutants on humans,buildings and vegetation.
- 3.To state meteorological and natural purification processes
- 4.To present a case study by modelling an area under investigation.

Terms and conditions:

Site of invgestion will be assigned by the project's supervisor.

Student : Socrates Ioannou
Supervisor :Dr. Nicholas Kathijotes
External Assesor:

ACKNOWLEDGMENTS

This project could not have been created without the valuable assistance of a particular number of people.

The supervisor's and teacher's support, Mr. Nicos Kathijotes, is gratefully acknowledged.

Furthermore, I wish to thank Mr. Georghiades for his noticeable and worthy help, as well as the guys of Stuttgart University in Germany who supported this project.

SUMMARY

It has been widely accepted that Air pollution is a noticeable, serious problem in our planet, and the consequences that befell us are very important. Many generations have become environmentally aware and conscious of their responsibilities to the planet.

An effort has been made in order to provide a better understanding of harmful air pollutants to serious health problems.

Methods to solve air problems were developed, including a model to use in the long term. Another aim was to raise public awareness on the harmful effects of urban and rural air pollution, benefiting the population's general health.

CONTENTS

Ø ACKNOWLEDGEMENTS

Ø INTRODUCTION

Ø CHAPTER ONE: Definition of all major pollutants. Sources and effects of pollutants on humans, buildings and vegetation.

1.1	Air Pollution.....	1
1.1.1	The atmosphere.....	3
1.2.1	Types and sources of gaseous air pollutants.....	5
	-Carbon Monoxide.....	5
	-Hydrocarbons.....	6
	-Sulfur Dioxide.....	6
	-Particulates.....	6
	-Nitrogen Oxides.....	7
	-Photochemical Oxidants.....	8
	-Hazardous air pollutants.....	8
	-Lead.....	9
	-Carbon Dioxide.....	9
	-Ozone.....	10
1.3.1	Effects of major air pollutants on humans.....	11
	-The respiratory system and lungs.....	11
	-Undesirable Smells.....	12
	-Carbon Monoxide.....	13
	-Visibility.....	13

-Acid Rain.....	16
-Sulfur Dioxide.....	17
-Toxic Air Pollutants.....	18
-Nitrogen Dioxide.....	19
-Lead.....	20
-Global Warming and climate change.....	21

1.3.2 Effects of major pollutants on vegetation and buildings

-Air Pollution Effects on vegetation.....	22
-Air Pollution effects on buildings.....	24
-Mechanism Corrosion by Acidic Deposition.....	25
-Effects on materials.....	25
-Cultural Heritage.....	25
-Economic Impact.....	26
-Impacts on developing Countries.....	27

CHAPTER TWO: Air pollution control Plant.Equipment.Natural purification processes.

2.1.1 Air pollution Control Plant

-Electrostatic Precipitators.....	28
-Design and operation.....	29
-Wet Collectors.....	30
-Dust Cyclones.....	31
-Baghouse Filter.....	31
-Settling Chamber.....	32
-Surface Filters.....	32

-Depth Filters.....	33
2.1.2 Natural Purification Processes.....	34
øCHAPTER THREE: Air pollution control in Cyprus.Presentation of case study under an area of investigation.	
3.1.1 Industrial Pollution Prevention in Cyprus.....	37
3.1.2 Air Pollution Monitoring.....	39
3.1.3 World Directory of Country Environmental Studies.....	44
3.1.4 Emission Inventory by UNOPS.....	45
3.1.5 Atmospheric Pollution Control Laws.....	46
3.1.6 Measurements of ambient Air Pollution.....	53
-Masurement Strategies and Limits.....	56
3.1.7 Comments and conclusions.....	63

øREFERENCES