UNIVERSITI TEKNOLOGI MARA

MAPPING OF THE AIR POLLUTION DISPERSION IN THE KLANG VALLEY USING REMOTE SENSING AND GIS TECHNIQUES

SUHARTI BINTI ISMAIL

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ABSTRACT

Degradation of air quality in Malaysia recently is very concerning and getting worse day by day. Therefore, this study intent to map the air pollution dispersion by acquiring aerosol information using remotely sensed data and then interpolate the information to produce air pollution map. Satellite sensors have been used widely in monitoring and observing the atmosphere; nowadays there are a number of sensors capable of monitoring the aerosols, atmosphere and Earth dynamical changing. Abroad studies have shown tremendous results in mapping the air pollution using remotely sensed data and GIS techniques.

This research comprises of three different stages; i) data preparation and study area selection, ii) processing stage and iii) data and results analyzing. This study addressed the Klang Valley as the study area and major pollutants (SO_2, NO_2, O_3, CO and PM_{10}) are used in selecting the image and results validation. The software packages used are mainly Erdas Imagine (digital data processing) and ArcGIS (Kriging technique).

The method used is based on radiometric comparison between two sets of image; clear and polluted. Clear image is polluted-free image and consumed as reference image while polluted image is the image considered to be contaminated by pollutant. This study investigates the aerosol contents through remotely sensed data for the polluted day. Aerosol optical thickness (AOT) is quantified to represent the amount of pollutant loading in the atmosphere thus presenting the air pollution level. Satellite imageries have to go through several methods; geometric correction, calibration and conversion to apparent reflectance image before calculating of AOT. The image is divided into 625 pixel grids and each grid produces one standard deviation. All standard deviations of the apparent reflectance image are used in formulation of AOT. Certain algorithms and equations are employed in this study. The values of AOT constituted the pollution level and Kriging technique is used to estimate the missing values and generate the air pollution map.

Based on the profile result, satellite-derived AOT has proven to be in relationship with the ground data when all the pollutants are considered altogether as well as when they are considered separately. Four bands are used in quantification of AOT and each band resulted in moderately different aerosol dispersion. Therefore, AOT has proven to be a good air quality indicator. The final results are maps showing the air pollution dispersion in the atmosphere based on satellite-derived aerosol values.

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Suharti Ismail

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INTRODUCTION

1.1 Introduction

Environmental issues have been discussed and studied all over the world not only by people who are directly involved with it but also people who believe that it is important to have better environment. Nowadays, environmental issues have increased global awareness because of the critical situations take place in many parts of the world. Environmental issues represent a growing public concern and have becoming a major topic for scientific research. Examples of environmental problems are global warming that made the dilution of iceberg and glaciers become worsened progressively, ozone that increasingly thinning causing skin peeling and cancers as well as greenhouse effects due to unplanned development in major cities of the world.

Environmental pollution, a problem that used to affect only the most industrialized areas in the world a few decades ago, has now expanded virtually to all countries. Urban air pollution not only affects environmental circle but also human being. A lot of humans' diseases are believed to occur because of bad air quality. These diseases include asthma, wheezing, coughing, allergy and all the respiratory related diseases. Air pollution reoccurrence happens due to expansion of existing industries, more development in new technologies and products, growth of population in urban areas as well as the increasing use of motor vehicles.

There are two types of pollutions: primary and secondary. The former is where the pollutants are directly from sources such as industrial sites, factories or traffic whilst the latter is where the pollutants are formed in the atmosphere as a result of photochemical