The Impact Of Air Pollution On Health

The World Health Organization stated that most cities worldwide exceeded the concentration limit set by international standards. A good indicator of high concentration of particulates in an area would be the decreased visibility of the skyline and may even be observed by the naked eye. Unfortunately, this unsightly view is also common in the Metro Manila skyline. Global health statistics had supported the notion that air pollutants and minute particles were detrimental to human health, affirming that majority of the leading diseases causing death were respiratory-related. The Philippines had not been an exception and according to Philippine Health Statistics, the primary causes of morbidity and mortality in 2010 were mostly respiratory infections (i.e. acute respiratory infection, acute lower respiratory tract infection, pneumonia, and bronchitis). These diseases were eventually consistent throughout the regions. Health statistics had also shown that some citizens (i.e. infants, lower age group, and old age) were more vulnerable to unhealthy levels of air pollutants compared to others, thus, more prone to respiratory infections. Quantification of air pollutants had been one of the main targets of the Department of Environment and Natural Resources (DENR), specifically the Environmental Management Bureau (EMB). For awareness of the whole community, public access to current real-time air quality monitoring of Metro Manila was provided through a website and these estimates were included in the daily local news. National status reports, as required by the Clean Air Act of 1999, were also released every three years for an extensive inventory of emission count and some evaluations on promulgated policies. The Bureau trusts that knowing the air quality level of an area would promote public awareness and stimulus to the community, organizations, and local government units to resolve the underlying air pollution problems through legislation and policy making.

Two analytical tools were used in the proposed model for air quality health risk – Analytical Hierarchy Process (AHP) and Geographic Information System (GIS). AHP is a multi-criteria decision analysis (MCDA) tool that enables the decision maker to develop a certain hierarchy of alternatives or factors according to priority or importance. It was designed by Saaty (2008) to cope with both the subjective and qualitative attributes of a given problem, deriving weights using pairwise comparisons. Through a survey, the decision maker or stakeholder decides a score using fundamental scale on how dominant an element is to another. The priority vector or Eigen values that defines the relative preferences can then be obtained through Eigen vector method. Several studies were already made using AHP to describe the risk or vulnerability of certain areas to air pollutants present in the atmosphere and this study was inspired by the work of Khan and Sadiq (2005). In their case, they combined hazard (concentration of air pollutants) and exposure (population density, location, and population sensitivity) parameters. Definition of a 5-tuple fuzzy set was able to determine the risk levels as very low, low, medium, high, and very high. Essentially, this study was used as guide but with modifications on the parameters which would be described in succeeding sections. GIS, on the other hand, is basically a computer?based tool used to collect, store, manipulate, and display spatial reference information. Processing and manipulating geospatial data enhances the understanding of geographical measurements and assists in data analysis. Some common GIS operations are statistics, query optimization, and digitizing. It is also possible to provide a common ground for both the technical and layperson by communicating the information spatially and visually since GIS is able to store geographically large referenced data. Two parameters were evaluated using

AHP and GIS: hazard and exposure indices. Hazard index was estimated using the pollutant loading of sulfur compounds (SOx), nitrogen compounds (NOx), and particulate matter (PM) per source. Exposure index was assessed in terms of population sensitivity, population density, and location sensitivity.

According to Siador and Promentilla in their study ”An Air Quality Risk Evaluation Method for Metro Manila using Spatial Analytic Hierarchy Process” air pollution and health has been jointly studied for years and their correlation have been proven in the literature. In this regard, the Philippine government is regularly quantifying air quality pollutants for legislation and policy making. Currently, the reported values are only in terms of concentration and pollutant loading. To establish a better model for health risk, two parameters are combined – hazard and exposure indices. The Analytic Hierarchy Process (AHP) technique coupled with Geographic Information System (GIS) was used to derive the composite score for the risk index. The hazard index evaluated the mitigating strategies of the government in terms of source (mobile, stationary, and area sources) and pollutant loading (SOx, NOx, and PM). The 450 policy scenario projected emission values and was used as reference value for hazard index. A value for exposure index was achieved by considering the location sensitivity, population density, and population sensitivity.