Analysis of the CO pollutant in the path of Azadi Square - TehranPars by Envi-met model at summer

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1. Introduction

Air pollution caused by changes in the quantity and quality of atmospheric gases. This phenomenon is due to the increased use of fossil fuels in urban areas. Status of natural environment of the city and the characteristics of the weather elements and phenomena cause congestion, transport and displacement of pollutants, particularly in the central areas of a city. Tehran have Known as a one of the largest city in the world by population. It usually meets critical air quality condition special in central part of the city. In this context, for careful analysis of the physical and natural factors in mitigation or aggravation of air pollution, the micro-scale numerical modeling methods based on a laboratory model of airflow (CFDs) are used. The usefulness of this method is being the quantitative effect of each of the urban fabric and climatic factors in small-scale on spatial and temporal resolution. However, this method can be largely resolves this problem. To evaluate the effects of urban spaces on air pollution in micro-scale, the components such as street width and orientation, mass-produced building model, land use, and green space patterns and classes against atmospheric elements including local prevailing wind direction and intensity, temperature and humidity fluctuations have been discussed. In spite of the fact that numerical modeling can offset most part of micro-scale data deficiencies.

2. Study Area

The study pathway starting from Tehran Pars neighborhood to Azadi Square located in eastern and the west Tehran, respectively. It embraces different pollutant sources resulted from congested traffic and placing of numerous shopping, business and public centers. Since, central Main Street of Tehran with a length of 19km was chosen to be the study path of present research. In order to conduct an accurate study on air pollution, interaction between man-made features and natural environment, in particular atmosphere should be examined. However, because of limitations on data achieving and processing in micro-scale, it is partially neglected. Whereas micro-scale studies have been shown high relation between urban spaces and atmospheric elements in increase or decrease of air pollution intensity.
3. Material and methods

In this study a comprehensive library research, local sampling, and statistical methods complete it. In the second, three most congested points includes; Azadi Square (west Tehran), Valiasr cross (mid-city intersection) and TehranPars 3-way Junction(east Tehran) selected to be interpreted information from traffic films of morning (High-traffic) and noon (low-traffic) on July 26th 2011. The research continued with the statistical analysis of Calculated CO emissions and daily weather data recorded by the closest weather station to sampling points (Mehrabad synoptic station) and subsequently, defining them as ENVI-met model inputs to simulate air pollutants emissions.

4. Result and Discussion

The simulation output provides statistics on the output and input variables for each three cross sections of the pathway. According the simulations outputs for Azadi Sq. shows that the most air pollutants concentration is on emission lines sources, especially at crowded streets in the east edge of the Square. The lowest amounts are visible in open and green spaces as well as passages between the sub-blocks. In Azadi Square except the east edge that is characterized dense building blocks, all around the square have no the major and important obstacle down wind. As a result, despite the high level of daily traffic, the density of pollutants around Azadi Square is low.

Valiasr cross is another indicator that recognized by high dense structure, high traffic jam, and a medium park located in the southeast corner. On comparison two other sections, Valiasr cross is the most polluted by CO. the most concentration is shown on the center of cross and east-west streets. Because of katabatic and anabatic airflow along the north-south streets, Pollutants are dispersed into surrounding streets.

Condition in Tehran Pars as an end of the study pathway has different conditions in the north and south parts. Northern half characterized by dense building blocks and in contrast the southern half that recognized with open areas. The most important physical features of the area include two passenger terminals, relatively open texture, especially in the southern edge; the traffic is lighter than the other two passages.

Therefore, Valiasr cross is the most pollutant section of the study pathway in comparison Azadi sq and Tehran-pars. In addition, the highest amount of CO pollution is visible in the early morning depend on colder condition.

5. Conclusion

Results of simulation outputs show that the maximum concentration of pollutants, as expected, formed in dense urban areas, especially during the early hours of the day. Whereas, the lowest values were observed on wide passageways such as west side of Azadi Square and south side of Tehran Pars 3-way Junction, green spaces and areas far from the hotspots of emission during mid-day. In addition, the more increase in high, the lower level of CO emissions was simulated.

Key Words: Air Pollution, Carbon monoxide, Micro-scale modeling, ENVI-met.