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Investigation Benzene emission from Gas Stations in Tehran and its Modeling in Regions with the Highest Emission Levels

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Abstract: Volatile organic compounds including benzene that are produced in industrial activities, especially those emitted from gas stations, can have undesirable effects on the environment and human health. TANKS 4.09 d software was used to calculate benzene emissions from gasoline storage tanks in gas stations throughout the 22 Districts in Tehran. Benzene emissions 1.5 m above the ground was modeled for a 12-month statistical period (2018) using AERMOD. Based on the results of emissions, the maps of benzene dispersion and comparison with the number of loading, storage capacity and numbers of storage tanks and active nozzles. In this study, it was identified that benzene emissions have increased due to lack of proportionality between gasoline storage capacity and demand for it and the concentration of gas stations at specific sites without observance of the suitable distance between them. The highest of benzene emissions was recorded in Districts 4,2,15 and 1 (0.143, 0.128, 0.121, 0.118 gr/s respectively) and the lowest in Districts 17 and 14 (0.008, 0.03 gr/s respectively). In heavy traffic Districts, the number of loading and hence benzene emissions have increased due to the high demand for gasoline, the disproportionality between storage capacity and consumer demand for gasoline, and the small number of gas stations. In light traffic Districts, benzene emissions have increased because of the low demand for gasoline, the lack of proportionality between storage capacity and demand for gasoline, and the large number of gas stations that leads to gasoline storage in excess of the demand for it.

Keywords: Benzene Emission, Gas Station, Modeling, Tehran's 22 Districts

1. Introduction

Volatile organic compounds (VOCs) including benzene, which are emitted in industrial activities, can considerably influence air quality and negatively affect human health (Tohid et al., 2019; Hedayatzadeh and Hassanzadeh, 2020, Muhibbu-din, 2020). One of the main sources of benzene emissions in the environment is the activities of gas stations (Esmaelnejad et al,2015). Benzene is a human carcinogen presented in gasoline (1% by volume) may influence health outcomes (Chaiklieng et al, 2019). Exposure to BTEX in gas stations can result in adverse health outcomes in workers such as cancer and neurological effects (Soltanpour et al, 2021). Neurological complications resulting from inhalation of benzene include, dizziness, headache and syncope (Shuai et al, 2018). Benzene cause atherosclerosis, occurrence of genetic mutations, connective tissue degradation, and reduction in bone marrow cells, severe anemia, and immunodeficiency (Okonkwo et al., 2014; Neghab et al., 2015). VOCs have undesirable effects on the environment and increases in their concentrations cause global warming, climate change, acid rain, chemical reactions, smog formation etc. (Tsai, 2016). Chemical reactions between VOCs and nitrogen oxides (NOx) in the presence of sunlight produce tropospheric ozone (Saxena and Ghosh, 2012; Burghardt et al., 2016). The United States Environmental Protection Agency (USEPA) has classified benzene in Group A (known human carcinogens), and the International Agency for Research on Cancer (IARC) has introduced it as a human carcinogen (Hajizadeh et al., 2018). The Iranian Supreme Council for Environmental Protection has set the limit for benzene at 5 µg/m^3 and the Iranian Department of Environment published the

"Standards of Clean Air Quality" in 2016 in which the annual standard of benzene was set at 5 μg/$m^{3.}$ Health problems and the destructive effects of benzene on the environment have caused this research to investigate benzene emissions from gas stations in Tehran's 22 Districts and modeling it in regions with the highest emission levels. In the following, some studies have been done to investigate the emission of pollutants in the environment using common software.

Researchers used the AERMOD atmospheric dispersion modeling system to model air dispersion of point and major line emissions of $PM_{2.5}$ in Halifax, NO_x in Pictou and SO_2 in Halifax, Canada. They employed a number of statistical methods to evaluate the model based on annual, monthly and hourly results. As a model, AERMOD was suitable for modeling annual and monthly SO_2 concentrations in Halifax (Gibson et al., 2013). Researchers used the Model (AERMOD) to assess the risk caused by an accidental release and dispersion of the toxic chemical benzene in the vicinity of a highly populated urban area. The results revealed that benzene dispersion affects a much larger area during the nighttime owing to the presence of a nocturnal stable boundary layer with significant temperature stratification. The affected area is smaller during the day-time owing to decreased stability and enhanced vertical mixing in the boundary layer (Truong et al, 2016). Scientists used AERMOD in a case study in one of the cities in Thailand for the PM_{10}, CO, SO_2 and NO_x pollutants. These pollutants originated from residential, furnace, urban traffic and industrial sources. The levels of annual pollution estimated by the model were compared with measurements of pollution levels made at the same location (Katika and Karuchit, 2018). Researchers using the TANKS 4.0.9d and AERMOD dispersion model to determine the emission rate and analysis of VOCs due to surface evaporation from oil tank was conducted in four seasons on the Kharg Island. The maximum average concentration of airborne benzene was obtained in the spring and, summer which are higher than the standard limit determined by DOE and EPA. Considering the estimation of predictions, the performance of the AERMOD dispersion model can be considered acceptable in predicting the concentration of benzene (Karbasi et al, 2018). Researchers in Barnett Shale, Texas (USA) studied emissions of the pollutants CO, NO_x, PM_{10}, SO_2 and benzene using AERMOD. The highest concentrations of CO, NO_x, PM_{10} and SO_2 were lower than the 1-hour National Ambient Air Quality Standards (NAAQS). The highest modeled level of benzene emission indicated that the situation was the worst possible one in this city (Khalaj and Sattler, 2019). Using AERMOD, researchers evaluated total suspended particles (TSP), CO, and NO_x resulting from transportation vehicles in one of the streets in the Brazilian capital. The dispersion map indicated that the pollutants were concentrated around the sources. In addition, weather conditions and topography dispersed the atmospheric pollutants, and mathematical modeling was a useful tool for studying atmospheric dispersion (Macêdo and Ramos. 2020). Different types of software have been used to calculate vapor emissions resulting from burning fuels and organic liquids stored in storage tanks for petroleum products at gas stations. In the present research, TANKS 4.09 d (US Environmental Protection Agency) was used. This software is utilized for various vertical fixed roof tank/ internal floating roof tanks (with a fixed roof)/ external floating roof tanks (without a fixed roof)/ cone-shaped external floating roof tanks. This software can be used to estimate vapor emissions from tanks during storage and when emptying and filling the tanks (USEPA, 1999). Air pollution distribution models are used to determine the distribution of benzene concentration. AERMOD is a dispersion model that can be used for flat and rough surfaces in rural and urban areas. It has the capability of defining point, area and volume sources and consists of a meteorological preprocessor named AERMET and a geological preprocessor called AERMAP. AERMOD uses the results from these two preprocessors and complementary information on emission sources and receptor networks to perform its calculations and present the final results (USEPA, 2018).

2. Data and Methods

2.1. Study Area

Based on information from the Department of Environment, Tehran Province, located on the southern slopes of the Alborz mountain range and on the northern margin of the central desert of Iran, has an area of about 12,981 km^2 and latitude 34-36.5◦N and longitude 50-53◦E. In this study, 148 gas stations in 22 districts in Tehran city (Fig. 1) was examined.

Table 1 shows characteristics of the gas stations in 2018 for each of Tehran's 22 Districts, including the number of storage tanks, gas stations, active nozzles delivering gasoline, maximum storage capacity, and the number of loading separately. In this study 148 gas stations, 412 storage tanks with a maximum storage capacity 12560000 L, 2433 active nozzles were investigated (NIOPDC, n. d.).

In the present research, TANKS 4.09 d Software (US Environmental Protection Agency) and AERMOD view 8.9 software (The American Meteorological Society/Environmental Protection Agency Regulatory Model) was used.

First, the information related to each of the physical, chemical and meteorological parameters required by TANKS 4.0d for the storage tanks in this research were entered into it to study benzene emissions. In the physical part of the software, based on the type of the storage tank (horizontal/ vertical/ above-ground/ underground etc.), information such as the dimensions of the storage tank, the maximum stored volume, the number of emptying and filling the storage tanks, and the characteristics of the inner shell, coating and color, and type of tank. In the chemical part of the software, the chemical properties of the stored liquid inside the tank, its composition, ingredients and temperature and the like are the required information. The needed meteorological information for the software is the position and location of the tank, meteorological parameters such as daily and annual air temperature, mean wind speed and atmospheric pressure (USEPA, 1999). Based on software outputs, the volume of gasoline vapors emitted from 148 gas stations in 22 districts in Tehran was presented in gallons per year. According to calculations and considering 1 vol% of benzene concentration in gasoline accordance with the standards EN228 and ASTM D1319, the rate of benzene emitted from gas stations in terms of grams per second was obtained to enter the second software. AERMOD view 8.9 was used in the next step for modeling benzene emissions. Information including emission rates of the pollutants (gr/s), pollutant emission height (the center of the volume) from the ground (m), the initial lateral dimension of the volume (m), the initial vertical dimension of the volume (m), the coordinates of the center of the volume relative to the selected origin for it (m) was entered into the software. Raw land surface and upper atmosphere meteorological data such as wind speed (FF), wind direction (DD), humidity (U), temperature (t), and cloud cover (a) are required for the AERMET preprocessor. The meteorological information (8760 data items) for 2018 was obtained from the MEHRABAD synoptic station of the Iran Meteorological Organization (IMO), which is the closest station to the study area. These data were then prepared in a format acceptable by AERMET. The digital elevation model of Tehran for studying the effects of topography on concentrations of the pollutants and processing the topographic information was prepared for the AERMAP preprocessor. Benzene emissions in Tehran for the 12-month statistical period (2018) at the height of 1.5 m above the ground (the breathing height) was then modeled for Tehran's 22 Districts using AERMOD. Finally, benzene concentrations and maps of its emissions in the Districts with high benzene concentration were studied. Also, to evaluate the performance of the model, the data obtained were analyzed using the software SPSS 20 and ANOVA test.

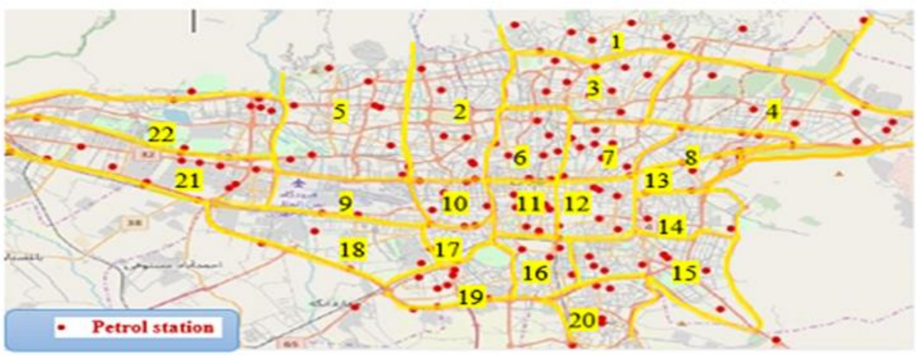

Figure 1. The location of 148 gas stations in 22 districts in Tehran

Table 1: Characteristics of the gas stations in 2018 for each of Tehran's 22 Districts (NIOPDC, n. d.)

District	Number of gas stations	Maximum capacity in liters	Number of storage tanks	Annual number of loading	Number of active nozzles
1	9	704,000	22	9,327	121
2	7	744,000	25	10,699	139
3	8	844,000	28	8,703	108
4	13	1,044,000	33	10,124	242
5	6	672,000	21	8,809	107
6	8	644,000	22	7,285	114
7	7	592,000	20	6,475	84
8	3	256,000	8	3,656	64
9	5	384,000	12	4,905	79
10	4	320,000	10	2,543	71
11	5	320,000	10	3,318	68
12	7	520,000	17	3,160	97
13	10	764,000	25	7,897	111
14	2	224000	7	2126	70
15	12	980,000	31	8,526	205
16	5	392,000	13	3,437	78
17	1	64,000	2	563	10
18	4	512,000	16	3,257	56

19	10	832000	26	6,753	194
20	7	564000	18	4,939	128
21	5	416000	22	6,211	102
22	10	768000	24	7,336	185

3. Results

Based on TANKS 4.09d output, the volume of gasoline vapors emitted from 148 gas stations in 22 districts in Tehran city is about 2037660 gallons per year. The following calculations were used to evaluate benzene vapor emissions and its correlation with relevant factors including the maximum operating capacity, sales rate, and number of loading times.

2037660.28 gal/year × 3.78 = 7702355.85 lit/year

Assuming a density of 0.72 g/cm^3 for the liquid gasoline, the rate of gasoline vapor emissions equals 12242997.14 pounds per year.

12242997.14 lb. /Year × 453.59 = 5553301072.73 gr/year

5553301072.73 gr/year / (365×24×3600) = 176.094 gr/sec

According to the above calculations and considering 1 vol% of benzene concentration in gasoline accordance with the standards EN228 and ASTM D1319, the rate of benzene emitted from 148 gas stations in Tehran is about 1.76 g/s. Levels of benzene emissions were determined based on TANKS 4.09d output and the above calculations for each region. The highest concentration of benzene emissions in 2018 was recorded respectively in Districts 4, 2, 15, 1, 5, 13, 19, 22, 3, 6, 21, 7, 20, 9, 18, 12, 16, 8, 11, 10 (0.143, 0.128, 0.121, 0.118, 0.112, 0.108, 0.106, 0.103, 0.098, 0.091, 0.09, 0.083, 0.069, 0.061, 0.054, 0.053, 0.049, 0.045, 0.044, 0.039 gr/s respectively) and the lowest in Districts 17 and 14 (0.008, 0.03 gr/s respectively.

3.1. Study of benzene emission and its modeling in the Districts with the highest levels of emissions (districts4, 2&1)

Figure 2 shows benzene emissions in relation to the factors influencing these emissions including capacities of the gasoline storage tanks, number of storage tanks, number of loading and number of active nozzles in the gas stations of District 4 in 2018. Figure 3 presents the map of benzene emissions from the gas stations in District 4. Figure 4 compares the mean annual benzene concentration with the annual benzene standard of 5 µg/m^3 in District 4 in 2018. Benzene emissions at gas stations number 140,227,203,36,194,54 and Figure 3 presents the map of benzene emissions from the gas stations in District 4. Figure 4 compares the mean annual benzene concentration with the annual benzene standard of 5 µg/m^3 in District 4 in 2018. Benzene emissions at gas stations number 140,227,203,36,194,54 and 228 at a distance of 20 m from the gas stations are at the annual standard level (storage capacity, number of storage tanks, numbers of loading and active nozzles are low). Benzene emissions at gas stations number 213,169,193and 157 at a distance of 30 m from the gas stations are at the annual standard level (storage capacity, number of storage tanks, numbers of loading and active nozzles are average). Benzene emissions at gas stations number 224 and 261 at a distance of 40 m from the gas stations are at the annual standard level (numbers of loading and active nozzles are high). Figure 5 shows benzene emissions in relation to the factors influencing these emissions including gasoline storage tank capacity, number of storage tanks, number of loading, and the number of active nozzles at the gas stations in District 2 in 2018. Figure 6 shows the map of benzene emissions from the gas stations in District 2. Figure 7 compares benzene concentrations with its annual standard of 5 µg/m^3 in District 2 in 2018. Benzene emissions in none of the gas stations in this District at a distance of 20 m from the gas station is at the annual standard level. Benzene emissions at the gas stations number 132,248,275 and 197 at a distance of 30 m from the gas stations are at the annual standard level (storage capacity,number of storage tanks, number of loading and number of active nozzles in gas stations number 197 and 132 are average and number of loading in gas stations number 248 and 275 are low). Benzene emissions at gas stations number 191,195 and 121 at a distance of 40 m from the gas stations are at the annual standard level (number of loading is high). Figure 8 shows benzene emissions in relation to the factors influencing these emissions including gasoline storage tank capacity, number of storage tanks, number of loading, and number of active nozzles in the gas stations in District 1 in 2018. Figure 9 shows the map of benzene emissions from the gas stations in District 1. Figure 10 compares benzene concentrations with its annual standard of 5 µg/m^3 in District 1 in 2018. Benzene concentration in the gas stations number 55,206 and 134 at a distance of 20 m from the gas stations are at the annual standard level (storage capacity, number of storage tanks, number of loading and number of active nozzles are low). Benzene emissions at gas stations number 196,237,255 and 246 at a distance of 30 m from the gas stations are at the annual standard level (storage capacity, number of storage tanks, numbers of loading and active puzzles at the gas stations are average and the number of loading and active nozzles at gas station number 196 are high). Benzene emissions at gas station number 148 at a distance of 40 m from the gas station is at the annual standard level (storage capacity, number of storage tanks and numbers of loading at gas station number 148 are high).

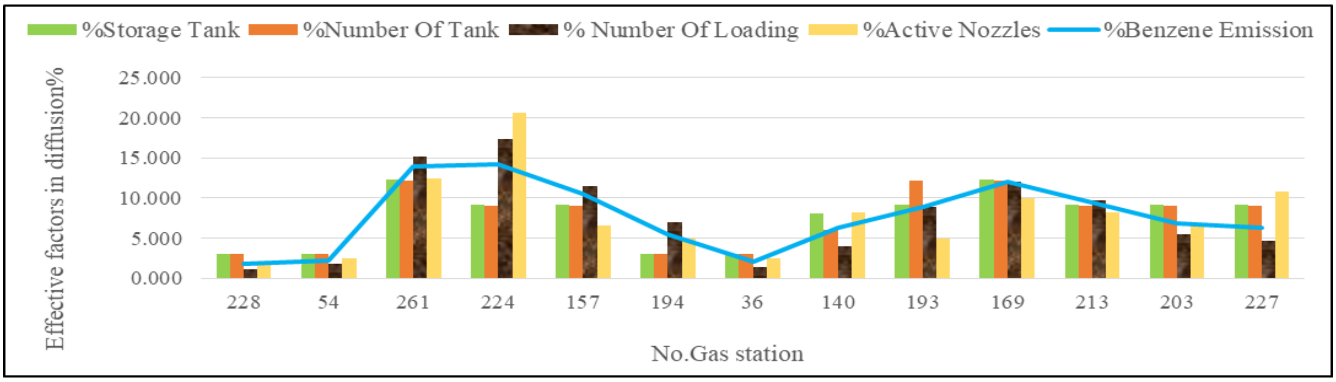

Figure 2: Benzene emission (gr/s) in relation to factors influencing them in the gas stations in District 4

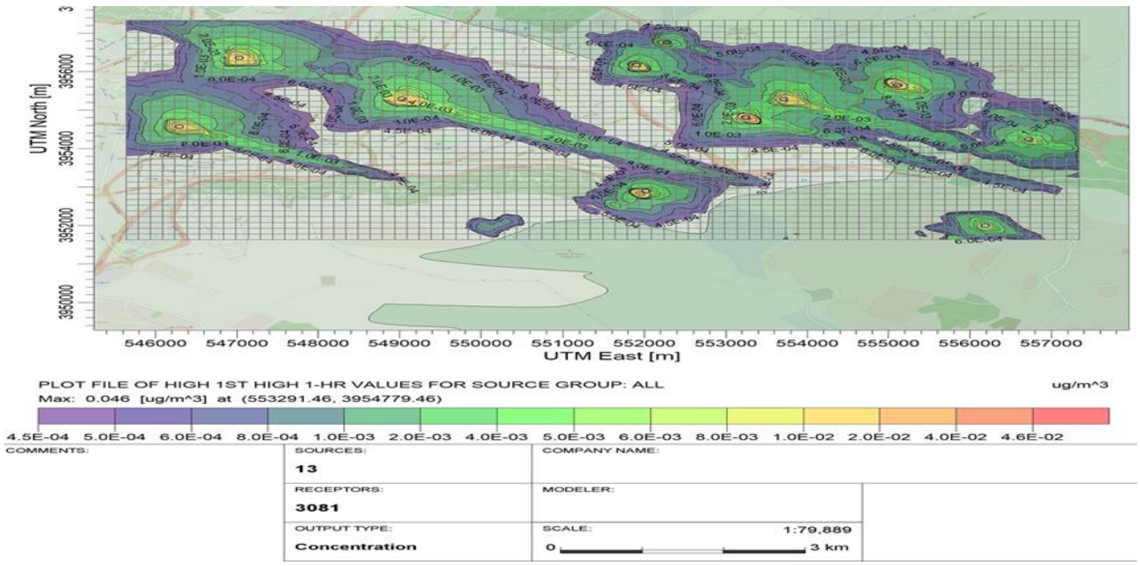

Figure 3: Map of benzene concentration from the gas stations in District 4

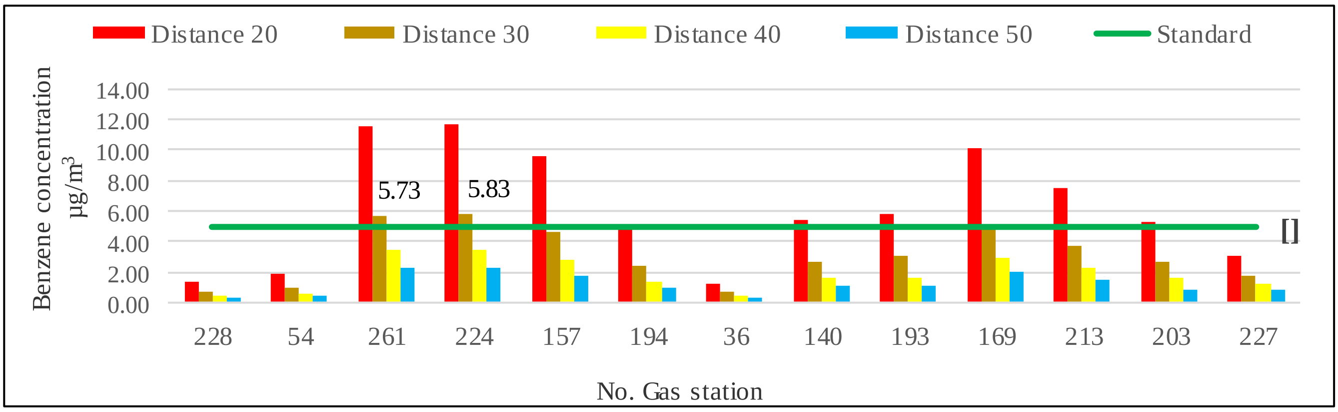

Fig4: Comparison of the mean annual benzene emissions at distances of 20-50 m from the gas stations in District 4

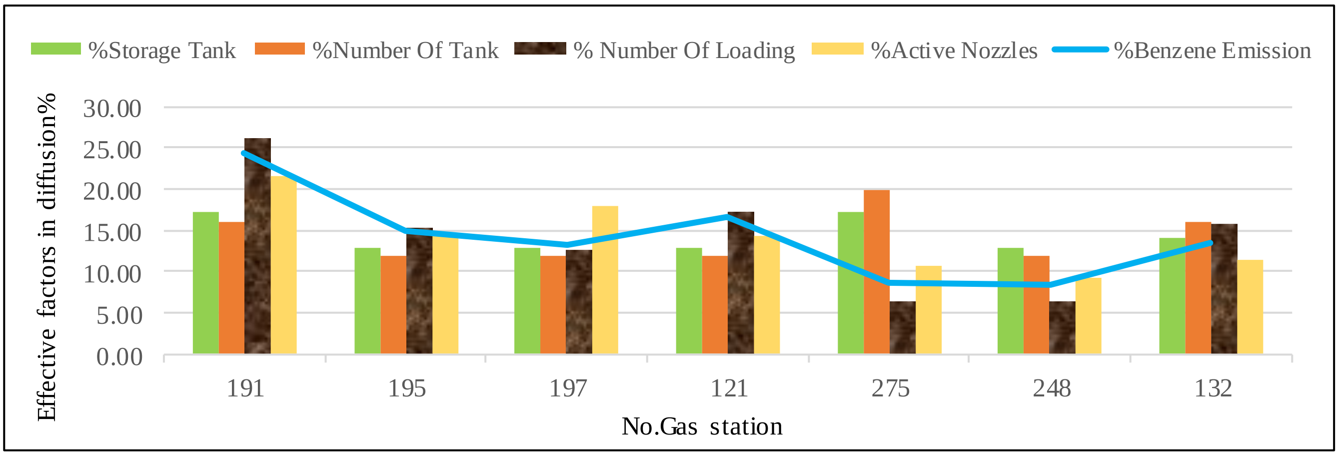

Figure5: Benzene emissions in relation to factors influencing them in the gas stations in District 2

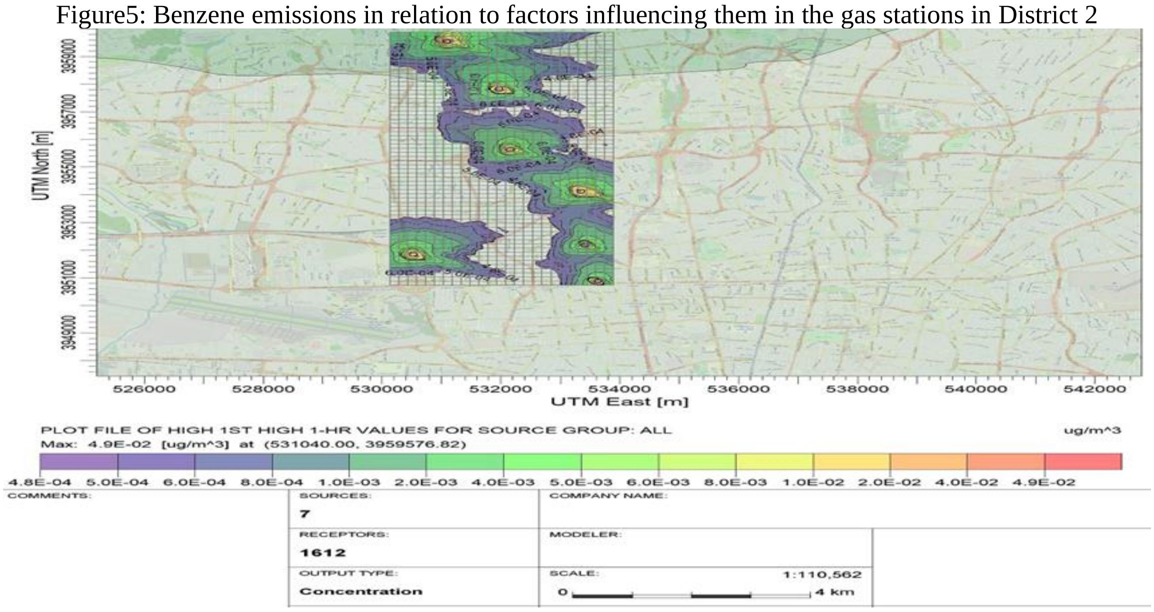

Figure6: The map of benzene emissions from the gas stations in District 2

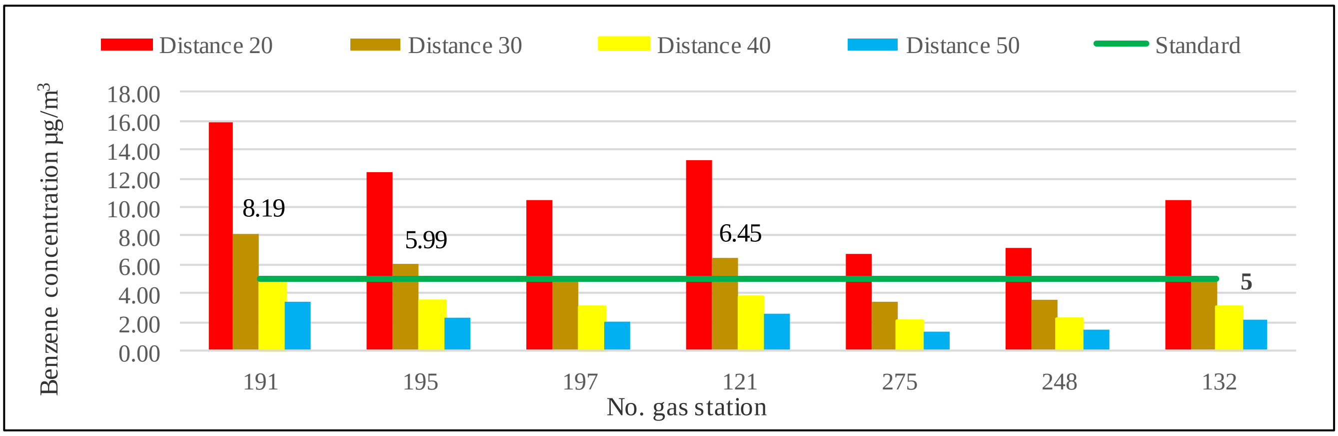

Figure7: Comparison of benzene concentrations at distances of 20-50 m from the gas stations in District 2

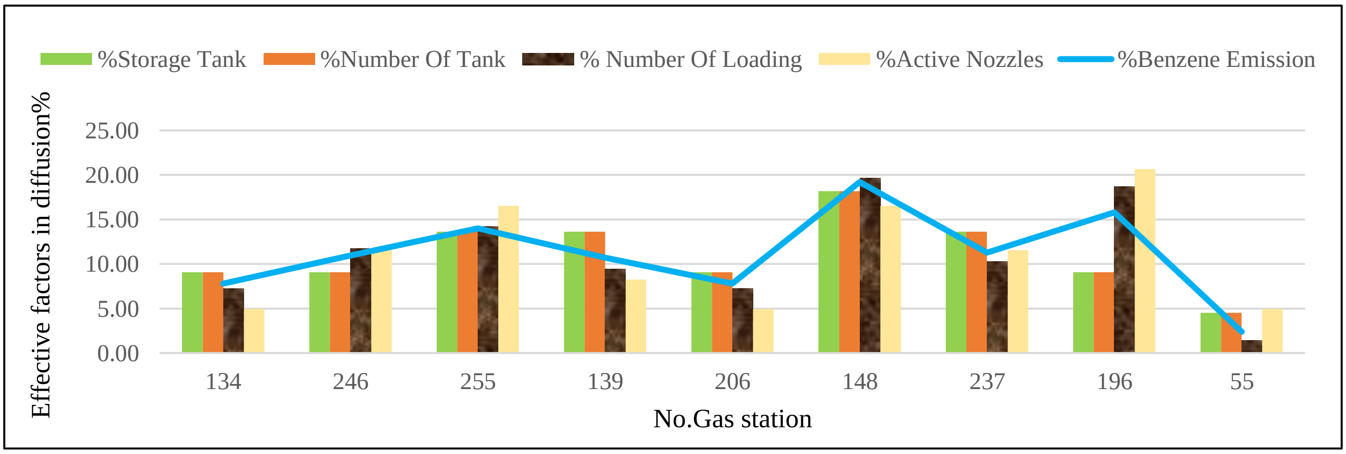

Figure8: Benzene emissions in relation to the effective factors at the gas stations in Tehran's District

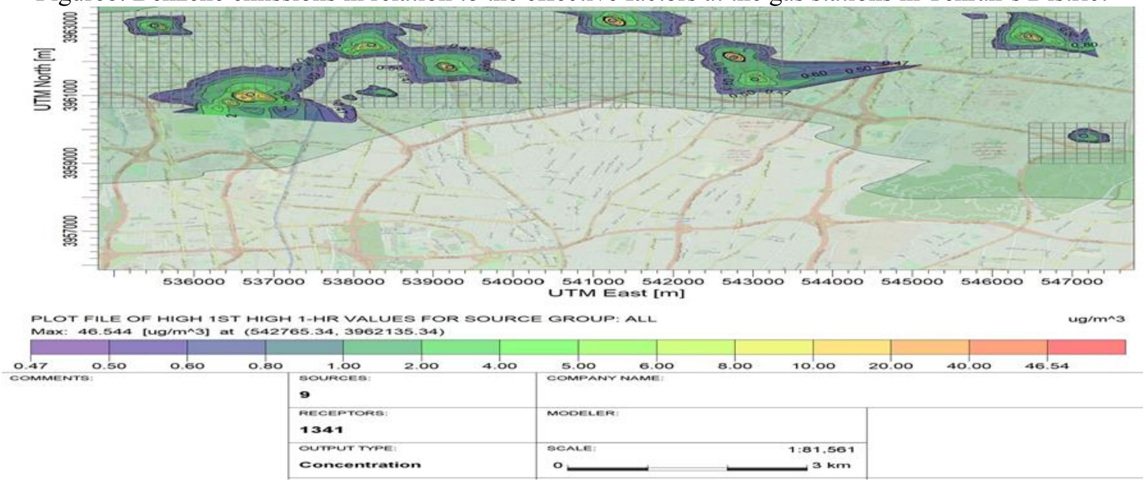

Figure 9: The map of benzene emissions from the gas stations in District 1

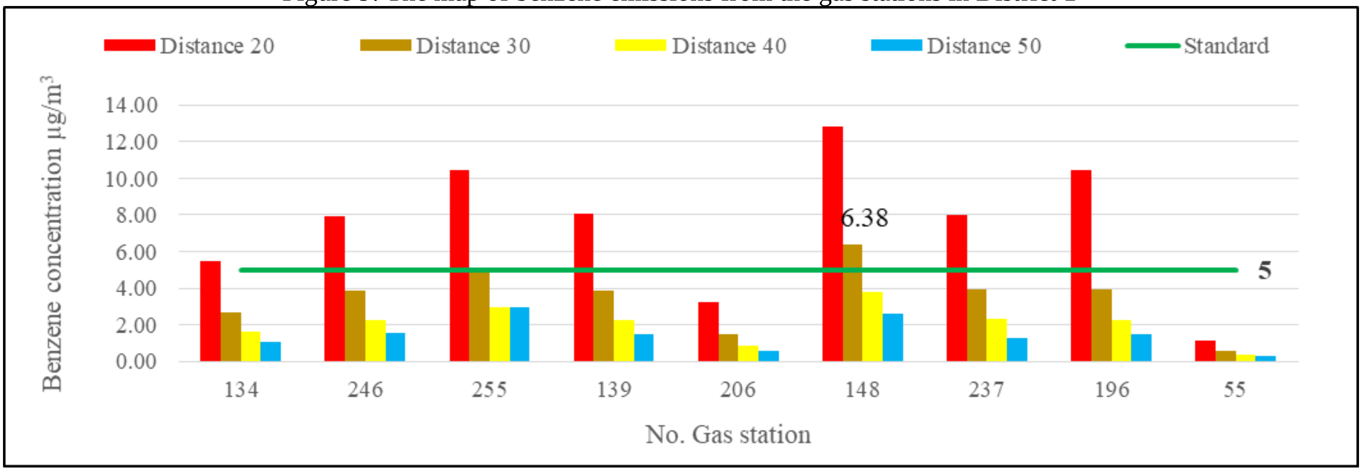

Figure10: Comparison of benzene concentrations at distances of 20-50 m from the gas stations in District 1

The results of the study indicate that the highest level of benzene emissions are in Districts 4,2,15and 1. These districts have the largest number of loading, the highest storage capacities, and the largest numbers of storage tanks and active nozzles. District 4 has the highest storage capacity (1,044,000 liters) because it posseses the largest numbers of gas stations (13) and storage tanks (33). Moreover, the number of active nozzles is large (242) and so is the number of annual loading (10,124). Therefore, it has the highest level of benzene emissions. District 2 also has a high level of benzene emissions as its annual number of loading is 10,699. The number of loading (emptying and filling the storage tanks) in each District is determined by the amount of sold gasoline. The larger the population living in the District and the greater the demand for gasoline in it are the more the volume of sold gasoline and the larger number of loading (and hence the level of benzene emissions into the environment) will be. There are 12 gas stations and 31 storage tanks with the capacity of 980,000 liters in District 15, and the numbers of annual loading and active nozzles are 8,526 and 205, respectively. Consequently, the level of benzene emissions is high. In District 15, gasoline storage capacity is high compared to the demand for it, and this excessive storage capacity increases benzene emissions. The diagrams of benzene emissions show that the increase and decrease of vapor emissions is directly related to the number of loadings (volume of sold gasoline) in the gas stations in Districts 4, 2 and 15. The larger the number of loading is the higher the level of benzene emissions into the environment will be. The capacities of the storage tanks in this Districts are not identical (some have the capacity of 45,000 liters and others the capacity of 24,000 liters). Therefore, these storage tanks do not have the same effect on benzene emissions. Moreover, they rank second with respect to their effect on benzene emissions after the number of loading. District 1 has nine gas stations and 22 storage tanks with the total capacity of 704,000 liters. The numbers of annual loading and active nozzles are 9,327 and 121, respectively. This District ranks third in benzene emissions. Study of the diagrams of benzene emissions reveals that the level of these emissions is high in the gas stations in District 1 and the decreases in these emissions are directly related to the number of loading (volume of sold gasoline). The larger the number of loading is the higher the level of benzene emissions into the environment will be. The number of storage tanks and their storage capacity have identical effects on benzene emissions (all the storage tanks have the capacity of 45,000 liters). They are the second most influential factor in benzene emissions after the number of loading.

3.2.Validation of the model using statistical analysis

To evaluate the performance of the model, data related to variables (number of loading times, tank capacity and benzene concentration) were entered into SPSS 20 software as primary data. Multivariate regression was calculated for the parameters of number of loading times and tank capacity as an independent variable and benzene concentration as a dependent variable. The data obtained from modeling were analyzed using the above software and ANOVA test. It was found that there is a significant relationship between the variables of number of loading times and tank capacity with the benzene concentration variable (P value <0.05). The standardized regression coefficient (beta) shows the share of the effect of independent variables on the dependent variable. Analysis of the enter regression method indicates that the share of the impact of the number of loading times (BETA=0.721) is greater than the share of the impact of the storage capacity (BETA = 0.409) in determining benzene concentration and permissible distance of the emission source.

4. Discussion

According to studies conducted on the emission of pollutants from eleven gas stations located at Rio de Janeiro, Brazil using a GC–MS technique, even regions at a distance of 150 m from gas stations contain high BTEX concentrations (Correa et al, 2012). Researchers investigation locating gas stations in Kuwait urban areas using GIS software. The output this study is a suitability map that contains feasible locations for future gas stations sites. According to their results location analysts and managers can easily use the concepts and procedures presented in analysing and solving similar problems that may be faced in real life (Aleisa et al, 2014). Scientists studied the location of filling stations in Kano Metropolis using Arc map environment of ArcGIS 10 against the physical planning standards set by Department of Petroleum Resource, DPR (2007) and Kano Urban Planning and Development Agency, KNUPDA (2013). The results showed, the minimum distance of gas stations from public centers should be 100 m (Mohammed et al, 2014). Researchers investigation the concentration of (BTEX) in the ambient air in Shahreza of 10 gas stations (points of 50, 150 and 250 m away from the gas stations) during cold and warm seasons using Sampling (analyzed by a gas chromatograph). The seasonal variation had no influence on the concentrations of BTEX. There was no significant difference between the pollutants concentrations at points 50, 150 and 250 m away from the stations. The number and volume of refueling in the gas stations influence the emission rates (Esmaelnejad et al,2015). Researchers investigation BTEX emission levels at gas stations in Semarang using Tanks 4.09 D software. Measured BTEX levels in the gas station location sample with charcoal tubes as adsorbent and PCXR4 mini pump sampler. The emissions from dispensers and storage tanks in gas stations have different emission characteristics.The amount of emissions from dispensers for VOC pollutants is 3.9261 tons/year and benzene is 0.0561 tons/year (case study UNDIP gas station). While the emission from a storage tank for VOC pollutants was 232.91 tons/year, benzene was 1.79 tons/year. (Huboyo et al,2019). According to the above studies it was found that due to the lack of measuring devices and equipment in relation to the number of target points and the impossibility of measuring all points at the same time, environmental and direct measurement of pollutant concentrations and its analysis at all points and times is impossible. In the studies that have performed direct measurement of pollutant concentrations, due to the limit in selective number of points, the desired results have not been achieved. In the studies that have been done using software and modeling, researchers have obtained a suitability map that contains feasible locations for future gas stations sites. Accordingly, air pollution dispersion models are the most useful method for monitoring and evaluating the concentration of pollutants. By using pollutant modeling software and knowing the status of their dispersion and distribution in spatial locations and analyzing information through modeling, implementation of air quality management and control system has become more efficient and helps experts and planners to use its analysis to make better solutions and decisions to improve and control air quality. Considering benzene emissions and dispersion of the emission sources it was found that the disproportionality between the gasoline storage capacity and the demand for gasoline increases benzene emissions. In the heavy-traffic Districts, there is high demand for fuel which is disproportionate to the storage capacity due to the small number of gas stations, and the insufficient capacity of the storage tanks compared to consumer demand for fuel leads to increases in the number of loading (because of the insufficient number of storage tanks, storage capacity and active nozzles) that has increased benzene emissions. In the light-traffic districts with low demand for fuel, there is disproportionality between the storage capacity due to the large number gas stations and storage capacity of gasoline and the volume of sold gasoline. Therefore, gasoline is stored for a long time in the storage tanks. This excessive storage of gasoline has increased benzene emissions. To evaluate the performance of the model, the data obtained were analyzed using the software SPSS 20 and ANOVA test. It was found that there is a significant relationship between the variables of number of loading times and tank capacity with the benzene concentration variable. Comparison between the output results of the model and statistical analysis of regression shows the optimal status of the accuracy of the model results**.**

5. Conclusions

Benzene emitted from gas stations can have undesirable effects on the environment and human health. Using the software and calculations performed, emissions of benzene vapor emitted from 148 gas stations in Tehran city was investigated. By analysis of information and charts it was determined that the number of emptying and filling the storage tanks, the volume of sold gasoline, the gasoline storage capacity, the number of storage tanks, the number of gas stations, and the number of active nozzles are effective factors in benzene emission and the disproportionality between the gasoline storage capacity and the demand for gasoline increases benzene emissions. Based on the output of the TANKS 4.09d software, the volume of gasoline vapors emitted from 148 gas stations in gal/year was obtained. With calculations performed on the data and assuming a density of 0.72 g/cm^3 for the liquid gasoline and considering 1 vol% of benzene concentration in gasoline accordance with the standards EN228 and ASTM D1319, emission of benzene in gr/s was prepared to enter the AERMOD software. By investigation of the benzene emissions, it was determined that the highest level of benzene emissions are in Districts 4,2,15 and 1. Considering the gas station as a volumetric source and using the results of two pre-processors (AERMET & AERMAP), for gas stations in districts 4, 2 and 1 modeling was done by AERMOD software. By study of the results and comparing with the annual standard limit of benzene 5 $\mu g /m^3$, showed that gas stations number 140, 227, 203, 36, 194, 54 and 228 in district 4 and gas stations number 55, 206 and 134 in district 1, have the lowest rate of emission and dispersion of benzene vapors in the environment, that at distance of 20 m from the gas stations are at the annual standard level (5 $\mu g /m^3$). Gas stations number 224 and 261 in district 4 (numbers of loading and active nozzles are high) and gas stations number 191, 195 and 121 in district 2 (the number of loading is high) and gas station number 148 in district 1 (storage capacity, number of storage tanks and numbers of loading are high), have the highest rate of emission and dispersion of benzene vapors in the environment, that at distance of 40 m from the gas stations are at the annual standard level (5 $\mu g /m^3$). In conclusion it was found that the emission of benzene is dependent on two effective variables. The first factor is the number of annual loading times and the second factor is the storage capacity of tanks in each gas station. Analysis of the enter regression method indicates that the share of the impact of the number of loading times is greater than the share of the impact of the storage capacity in determining benzene concentration and permissible distance of the emission source.

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