7.20 EMISSION INVENTORY FOR MOBILE SOURCES IN A LOCAL LEVEL INTO THE METROPOLITAN ZONE OF THE MEXICAN VALLEY (MZMV), WITH ATMOSPHERIC MODELING PURPOSES

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INTRODUCTION

A common weakness into the implementation and application of the regional air quality models is the truthfulness of the data that are the inputs on that tools, the reason is that the diagnostic and prognostic can be obtained when we apply air quality models is directly proportional to the quality of input data. Due to previous, this work has been focused specifically to develop the emissions inventory to the atmosphere for mobile sources, due to this type of emission source is the most difficult to distribute spatially and temporally.

At present, the emissions inventory that has been estimated in the region of Mexico Valley are global and with methodology that are different to the zone of study. In fact, these emissions inventory had been used to apply and implement photochemical models into the Mexican Valley.

The methodology that is used in this paper is the typical to estimate the emission inventory for mobile sources [1], using activity data and emission factors. This methodology is different because it was couple to be used at local level, which allow diminish the uncertainty of the emission inventory. On the other hand, the emission inventory was distributed hourly and spaced by each route whit greater certainty.

The pollutants than we estimated are: total hydrocarbons (HC), oxide nitrogen (NOx), and monoxide carbon (CO) at local level for primary and secondary road. This emission inventory is distinguish from others, because it include vehicle profile for each category and the emissions were distribute, percently, by each day of the week.

METHODOLOGY

The typical form that the emission inventory are estimated is using emission factors and activity data, where the emission factor can be in kilometres travel or fuel consumption by type of vehicle. The emission factor for each pollutant suggested, reveal the operation and maintenance vehicle, whereas the activity data represent the kilometres travel by each vehicle.

The emission estimated are represented as follow:

$$E = (\#\,vehicle) \times (EF) \times (AD) \qquad (1)$$

Where:
E = Emission estimated in Kg./Hr.
EF = Emission factor Kg./Km.
AD = Activity data which represent the kilometre travel by vehicle.

The emission factor where obtained by using the Mobile model [2], considering several parameters: vehicle speed, environmental temperature and fuel quality. The Mobile model reports the results by vehicle model, vehicle type, and fuel type for each pollutant (HCT, NOx, CO).

The quantity of vehicles was obtain through the campaign which was carry out from 06 hrs. to 22 hr. for a typical week. The vehicles were classify in eight categories taking into account the vehicle weight and fuel type. The vehicle categories are: private car, taxis, microbus, bus, light truck, heavy truck 2 axis, heavy truck +2 axis. The emissions were estimate for all day and all week by each vehicle category. The activity data is the number of kilometre which are travel by each type of vehicle therefore it depends directly of the route length.

Whit the purpose of facilitate to achieve the emission inventory estimation, was develop the program "Tecmobile v1", which contain in a data base the emission factor profiles, geographic characteristics for each route, meteorological parameters, average speed, and vehicle number for each route. The emission factor profile for each route and vehicle in the "Tecmobile v1" program is function of speed, model, and temperature. Equation 2.

$$EF = f(V, T, FQ) \qquad (2)$$

Where:
EF = Emission factor (Kg./Km.)
V = Average speed per hour for each category of vehicle and route (Km./Hr.)
T = Environmental temperature of the study region (^oC).
FQ = Fuel quality

Finally, we use the "Tecmobile v1" program to estimate the emission for each pollutant (HCT, NOx, CO), route, and type of vehicle, through the product of emission factor, vehicle number, and activity data.

RESULTS

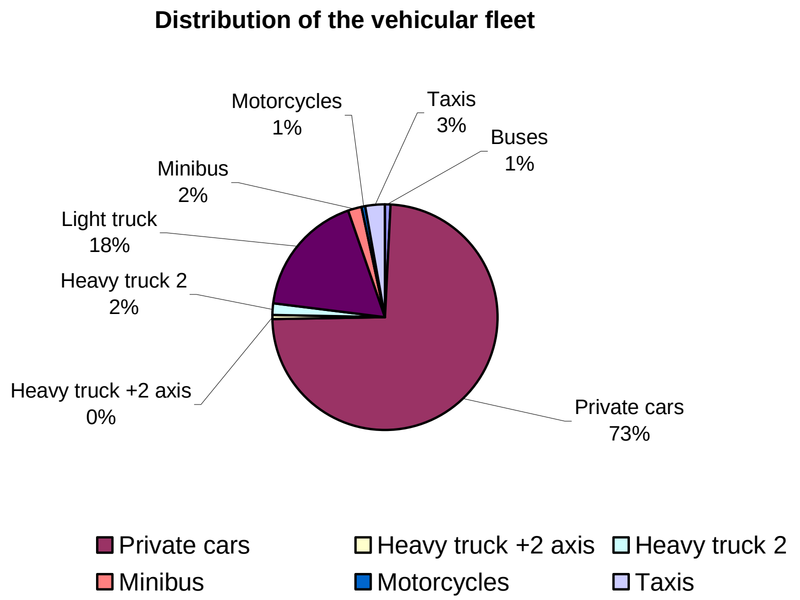

Figure 1. Average distribution of the vehicular fleet.

The Figure 1, show the average distribution of the vehicular fleet in the region of study. In this figure we can see that the highest number vehicles are the private cars, and after the light truck. The light truck are of use private (already 10 percent) and public transportation (already 8 percent).

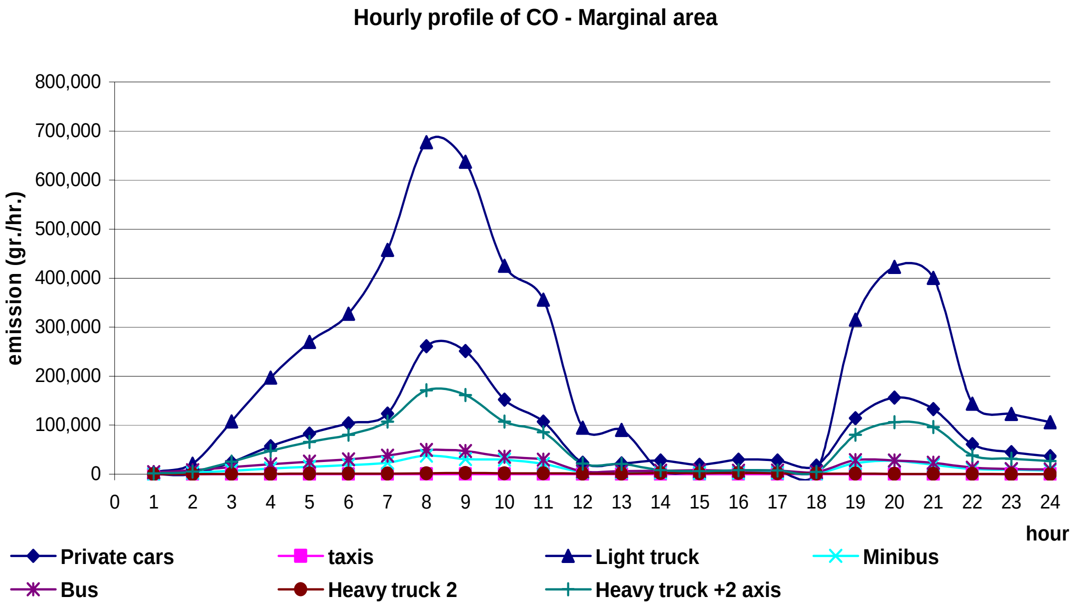

Figure 2. Hourly profile of CO emissions to all the categories of vehicles in the marginal area.

As we can see on Figure 2, that in this zone of metropolitan valley, the high emission of CO is produced by light truck. The main hours which are emitted the CO are between 06-09 a.m. and 17-20 p.m. The second mobile source that emits CO in this zone is the private cars with similar hourly behaviour of emission.

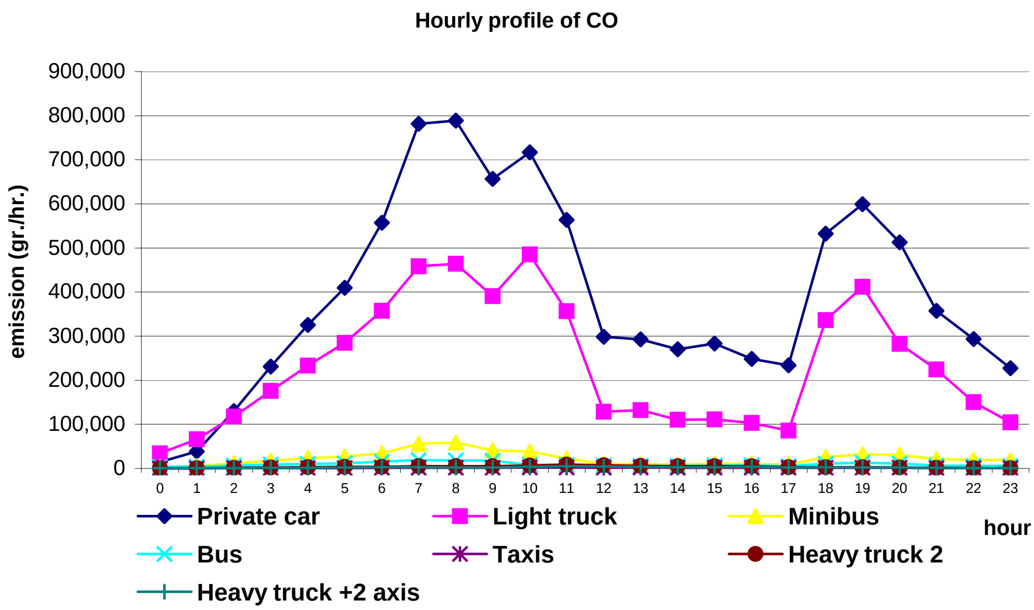

Figure 3. Hourly profile of CO emissions to all the categories of vehicles in the urban region.

In the Figure 3 we can see a change, because now are the private cars which mainly emit CO, but the graphic represent the average emission of CO for all study zone. The second significant source that contribute with CO is the light truck. As we can see, the hourly behaviour of emission of CO is similar to the first graphic.

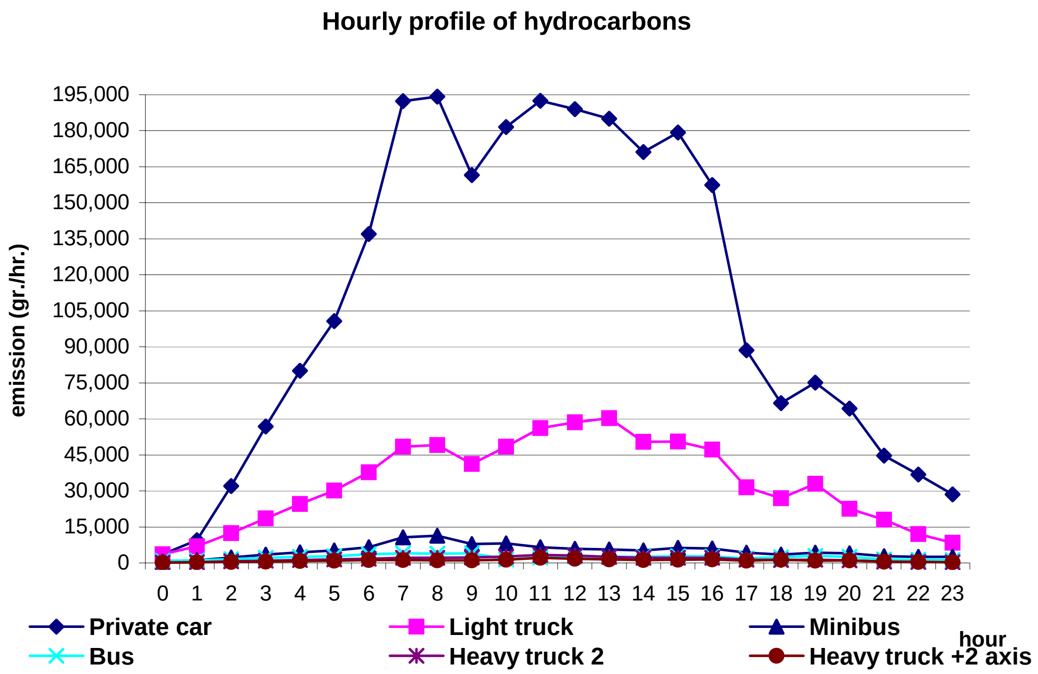

Figure 4. Hourly profile of HC emissions to all the categories of vehicles.

We see in the Figure 4, how the private cars are the main source the emission the HC. This figure represent the average emission of HC for all study zone. The second significant source that contribute with HC is the light truck.

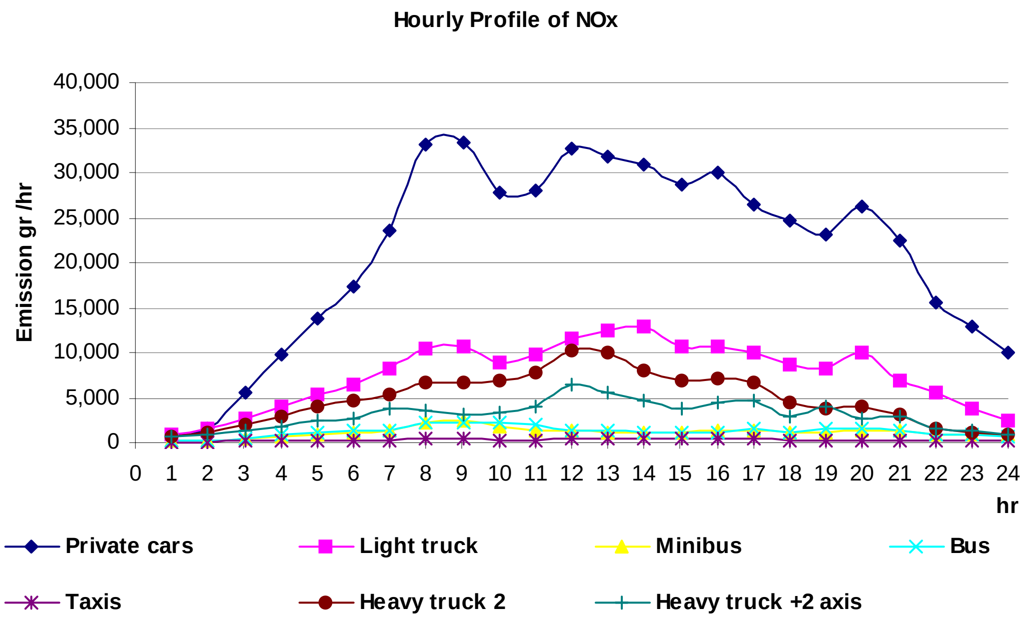

Figure 5. Hourly profile of NOx emissions to all the categories of vehicles.

The Figure 5 the behaviour of the emissions of NOx is appreciated per hour, in the one that you/they highlight at first sight they are particular vehicles, this is due to the vehicular fleet that is approximately of 49,000. In the first hour of the day a contribution is not observed bigger to 25000 gr/hr, while starting from 8 in the morning an emission of 2500-3500, is reached these levels they last a period of 9 hours, later to this a decrease of the emissions is observed per hour.

CONCLUSIONS

The vehicle type that contributes with more emissions to the atmosphere of anyone of the pollutants is the particular vehicles followed by the vans. This owes you mainly to that in their majority the vehicular fleet is vehicles of this type. However, while in the total of vehicles the vehicles of private use are 73%, their contribution of emissions is of around 50%, and this is justified, due to the technology with which they count this type of vehicles.

In the marginal area the main emissions are due to the vans, since in this region the vehicles of this type prevail, being their main function as transport publishes.

The HC emissions with regard to the NOx, are in a relationship from 2 up to 24, this is justified, since starting from models of vehicles previous to 1991 they present high emission factors.

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