MONITORING OF THE CO_2 EMISSIONS IN TIRANA DISTRICT FROM THE ROAD TRANSPORT

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ABSRACT
Over the last decade, environmental pollution in Tirana district caused from road transport is one of the main problem and in directly way have been touched 1500 persons/year that suffer from internal disease in accordance to Albanian Health Institute. High level of pollution is becoming a threat to the health of its citizens. Currently in Albania the total number of the cars is 495.215 where 35% of this total number are in Tirana. This situation has grown interest to study the total amount of the CO_2 emission in Tirana district as an important factor that effects in majority of greenhouse gas (GHG) emissions from road transportation. The transport sector is the main source for over 3/4 of the GHG emissions. In this paper, the Clean Development Mechanism (CDM) used for monitoring CO_2 emissions caused from road transport and suggestions for improvement this situation in Tirana district were described briefly.

Keywords: CO_2 emissions, Clean Development Mechanism (CDM), Greenhouse Gas (GHG), monitoring.

1. INTRODUCTION

Over the last decade, environmental pollution in Tirana district caused from road transport is one of the main problem and in directly way have been touched 1500 persons/year that suffer from internal disease in accordance to Albanian Health Institute. High level of pollution is becoming a threat to the health of its citizens. This park of vehicles is the main source of environmental pollution in Tirana. Currently in Albania the total number of the cars is 495.215 where 35% of this total number are in Tirana, as can be seen in Figure 1 [1]. This situation has grown interest to study the total amount of the CO_2 emission in Tirana district as an important factor that effects in majority of greenhouse gas (GHG) emissions from road transportation. CO_2 is a product of complete combustion of the fuel. CO_2 does not affect directly to the human health but it is a greenhouse gas and is one of the important factors that contribute to the global warming. The transportation sector is the main source for over 3/4 of the GHG emissions. The methodology for evaluation of the CO_2 emissions in Tirana district has been based on Clean Development Mechanism (CDM). The CDM is a project-based flexible offset mechanism under the Kyoto Protocol that allows the crediting of emission

reductions from greenhouse gas (GHG) abatement projects in developing countries [2]. In this paper, the monitoring CO_2 emissions caused from transportation sector in Tirana district by using CDM and suggestions for improvement of this situation were briefly described.

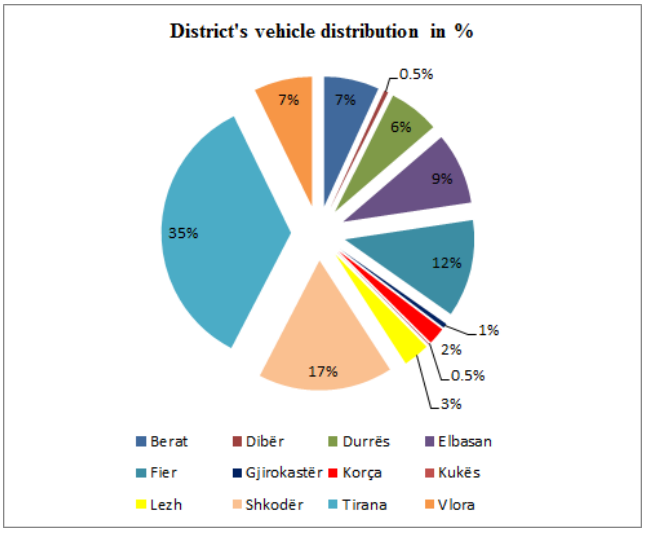

Figure 1: District's vehicle distribution (%).

2. METHODOLOGY

The methodology is based on CDM method for monitoring CO_2 emissions in Tirana district for diesel and petrol passenger cars. Based on this method, the CO_2 emissions from fossil hydrocarbons fuel combustion in process are calculated based on the quantity of fuels combusted and the CO_2 emission coefficient of those fuels as can be seen in equation 1.

$$E_{CO_2} = \sum_{i=1}^{n} q \cdot A \cdot N_{i,j,k} \cdot b\,, \tag{1}$$

where, q - Specific consumption [3]

A - described average kilometers outlined over a year for the category of passenger cars in Tirana district

$N_{i,j,k}$ - number of the cars, by category, fuel type and cubic cm.

b - the amount of $kgCO_2$/litre

The total CO_2 emision is calculated by using equation 2 for petrol and 3 for diesel passenger cars.

$$TE_{CO_2} = \sum_{1}^{5} \begin{bmatrix} q_{1200} \cdot A \cdot T_{M1} \cdot P\% \cdot c_{1200}\% \cdot b_p + q_{1600} \cdot A \cdot T_{M1} \cdot P\% \cdot c_{1600}\% \cdot b_p + \\ + q_{2000} \cdot A \cdot T_{M1} \cdot P\% \cdot c_{2000}\% \cdot b_p + q_{2500} \cdot A \cdot T_{M1} \cdot P\% \cdot c_{2500}\% \cdot b_p + \\ + q_{3000} \cdot A \cdot T_{M1} \cdot P\% \cdot c_{3000}\% \cdot b_p + q_{>3000} \cdot A \cdot T_{M1} \cdot P\% \cdot c_{>3000}\% \cdot b_p \end{bmatrix}, \tag{2}$$

$$TE_{CO_2} = \sum_{1}^{5} \begin{bmatrix} q_{1600} \cdot A \cdot T_{M1} \cdot D\% \cdot d_{1600}\% \cdot b_d + q_{1900} \cdot A \cdot T_{M1} \cdot D\% \cdot d_{1900}\% \cdot b_d + \\ + q_{2500} \cdot A \cdot T_{M1} \cdot D\% \cdot d_{2500}\% \cdot b_d + q_{3000} \cdot A \cdot T_{M1} \cdot D\% \cdot d_{3000}\% \cdot b_d + \\ + q_{>3000} \cdot A \cdot T_{M1} \cdot D\% \cdot d_{>3000} \cdot b_d \end{bmatrix}, \quad (3)$$

where, T - the total number of cars
D - is % of the cars diesel
d - is % of the diesel passenger cars by cubic cm
P - is the total number of the petrol passenger cars
c - is % of the petrol passenger cars by cubic cm

The data for applying this method has been collected from General Directory of Transportation Services in Albania [4].

3. MEASUREMENT RESULTS

The measurement results for total emission of the CO_2/year caused from internal combustion engine of the diesel and petrol pasenger cars in Tirana district as can be seen in the Figure 2 and Figure 3.

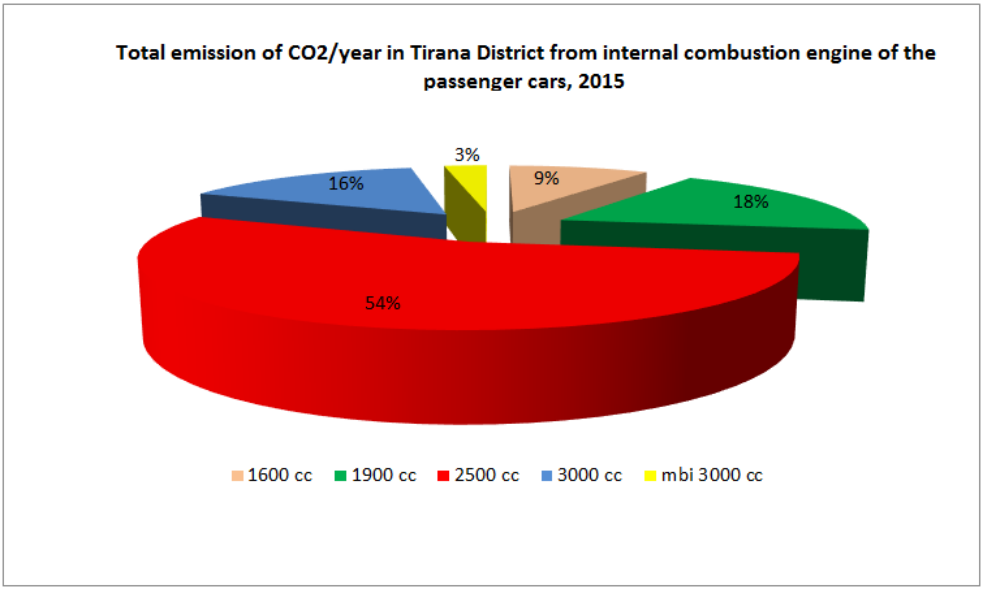

Figure 2: Total emissions of CO_2/year from internal combustion engine of the diesel passenger cars in Tirana district, 2015.

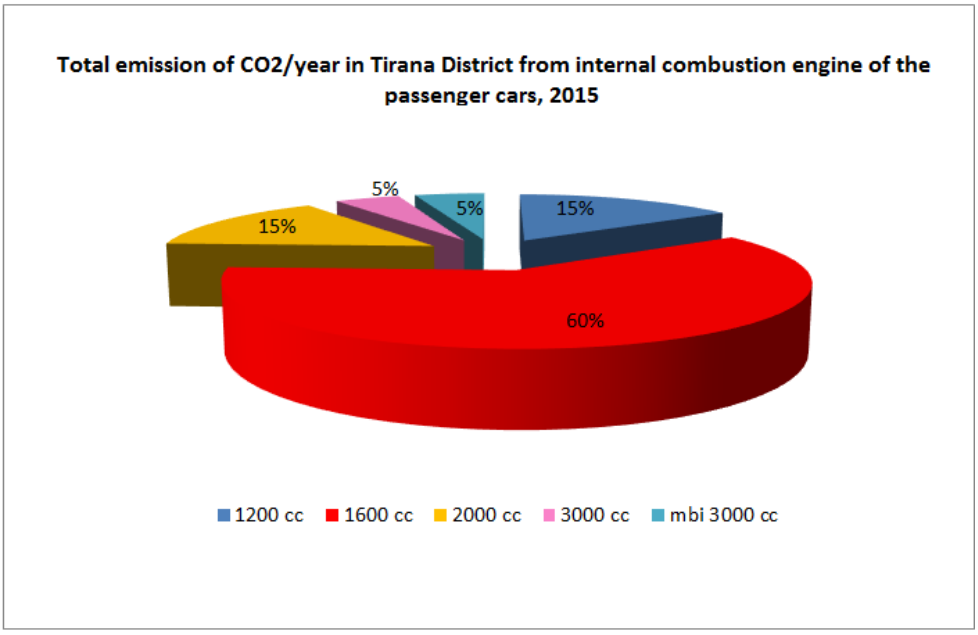

Figure 3: Total emissions of CO_2/year from internal combustion engine of the petrol passenger cars in Tirana district, 2015.

In the Figure 2 is shown that the diesel passenger cars with 2500 cc has the highest total emission of the CO_2 in Tirana district with 54 % as can be seen in Table 1.

Table 1: Total emission of the CO2/year in Tirana district (diesel), 2015.

Cars	q	A	d %	D	%	b	kg CO2/year	tonCO2/year
1600 cc	0.053	8500	0.14	147529	0.71	2.9	19158282.65	19158.283
1900 cc	0.0564	8500	0.26	147529	0.71	2.9	37862137.03	37862.137
2500 cc	0.0942	8500	0.46	147529	0.71	2.9	111882305.1	111882.31
3000 cc	0.105	8500	0.12	147529	0.71	2.9	32532932.8	32532.933
up 3000 cc	0.113	8500	0.02	147529	0.71	2.9	5835272.073	5835.2721
Total								207270.93

In the Figure 3 is shown that the petrol passenger cars with 2500 cc has the highest total emission of the CO_2 in Tirana district with 60 % as can be seen in Table 2.

Table 2: Total emission of the CO2/year in Tirana district (petrol), 2015.

Cars	q	A	c %	C	%	b	kg CO2/year	tonCO2/year
1200 cc	0.0626	8500	0.19	147529	0.29	2.8	41762096.24	41762.0962
1600 cc	0.0733	8500	0.63	147529	0.29	2.8	162143252.2	162143.252
2000 cc	0.0913	8500	0.12	147529	0.29	2.8	39842478.4	39842.4784
3000 cc	0.1124	8500	0.03	147529	0.29	2.8	12262580.97	12262.581
up 3000 cc	0.1212	8500	0.03	147529	0.29	2.8	13222640.69	13222.6407
Total								269233.049

4. CONCLUSIONS

The level of CO_2 emissions causes from internal combustion engine of the passenger cars in Tirana district is 0.159 tonCO_2/capita or approximately 10% of the total amount in comparison of the 1.6 tonCO_2/capita of the all sectors of economy [5].

Most of the contributors of the CO_2 are the diesel passenger cars from 1601 cc up to 2500 cc. From our monitoring of the total CO_2 emissions in Tirana district is the function related to the enigne capacity for diesel passenger cars (cc).

The CDM method has shown clearly that government will improve their legislation which favor the diesel passenger cars with cilynder displacement up to 1900 cc.

6. REFERENCES

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