

Effect of Overloads on air Pollution and Environment in Palestine

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Introduction

This investigation aims to study the effect of emissions from automobile vehicles on air pollution in Palestine, as a part of integrated project to reduce engine emissions and procedures to reduce traffic jams, and increase environmental awareness in Palestine.

The complete report contains an introduction to air pollution, its reasons, types, and effects on environment, and then it investigates air pollution in Palestine and its special case that increases its values on its land due to the effect of Israeli occupation. After that, a research study about the effects of overloads on emission production in order to prove its effect on both Petrol and diesel engines in a scientific way, this leads to the fact that emissions are increased with overloads. A scan on air pollution and emissions laws and legislations implemented in Palestine was taking place; this shows an absence of tools of attention, inspection, and auditing to emit such emissions.

To measure overloaded vehicles in the real life, a field study was taking place on roads, this shows that a large percentage of trucks that work in the field of stone and building materials used to be carried on an overloaded vehicles, about 41% of the trucks were overloaded, this shows the volume and danger of this problem, that make it very important to take an action towards it.

Finally, a conclusion and recommendations were presented with hope to take actions towards this problem.

Air Pollution in Palestine

Air pollution in Palestine is affected by certain factors that might be the most ceruse all over the world, over the industrial activities, traffic vehicles, solid waist combustions, settlements effects; the control on emissions of air pollution is absent.

Atmospheric environment in Palestine (like other elements of environment), doesn't have any follow ups, or studies that enable the researcher and planner to put a hand on its fact in a correct scientific way. An estimation was done by Jerusalem institute for environmental research, stated that 78,000 tons of CO was produced in 1996, over 7750 tons of NO_x, 4830 tons of SO₂, 7800 tons of C_xH_y, and 300 tons of Pb, all this estimation was only from traffic.

Air pollution emissions might be tribbeled in amount due to the following observations:

- 1- The number of registered and no registered vehicles is about 3 times the number in 1996.
- 2- Most working vehicles in Palestine are getting older and older (about 75% of vehicles are more than 10 years old).
- 3- Many Arab Palestinians from Jerusalem live and work and socialize in the Palestinian territories, they inter by their various types of vehicles, and (these are uncounted).
- 4- Israeli settlers inter Palestinian territories by their automobiles, which emit their emissions to the environment; they also destroy their solid wastes by burning it near Palestinian villages.

The following table shows the latest statistics of vehicles counts in the year 2006.

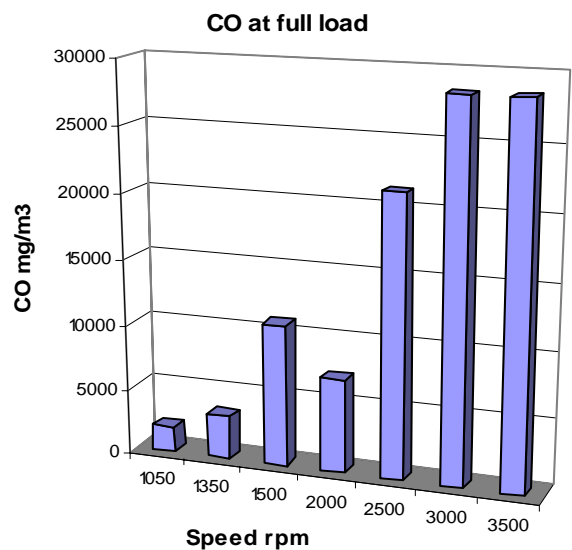
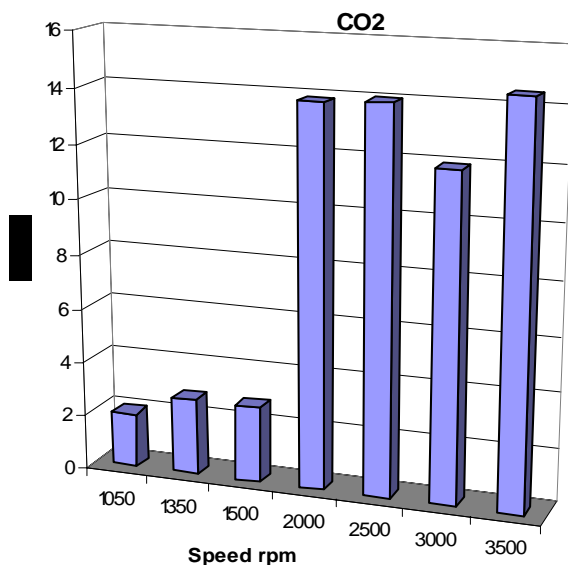
	Petrol vehicles	Diesel vehicles	Total
West Bank	91931	37365	129296
Gaza Strip	42271	15074	57345
Total All	134202	52439	186641

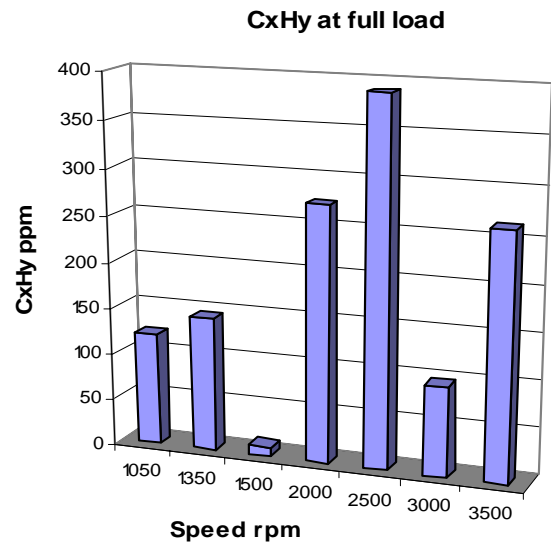
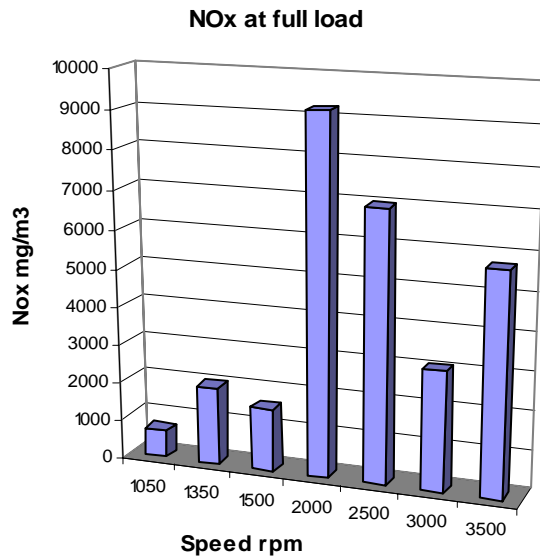
Effect of overloads on air pollution emissions from engines

1- Petrol Engine

Petrol engines are the main source of CO emissions since 72% of working vehicles in Palestine use petrol fuel (134202 out of 186641).

The following figures show amounts of pollutants at various speeds at full loads.





2- Diesel Engine

Diesel engine is considered the main source of black smoke (soot). Unfortunately there was no facility to measure its amount, so estimation was performed using the Australian procedure by the following equation:

$$E_{kpy,i} = L_y * EF_i$$

Where:

$E_{kpy,i}$ = emission of pollutant i for a specific type of engine, kg/ year

L_y = Distance traveled in reporting year, km/year.

EF_i = emission factor for pollutant i, kg/km, for given engine and Fuel type

i = pollutant type

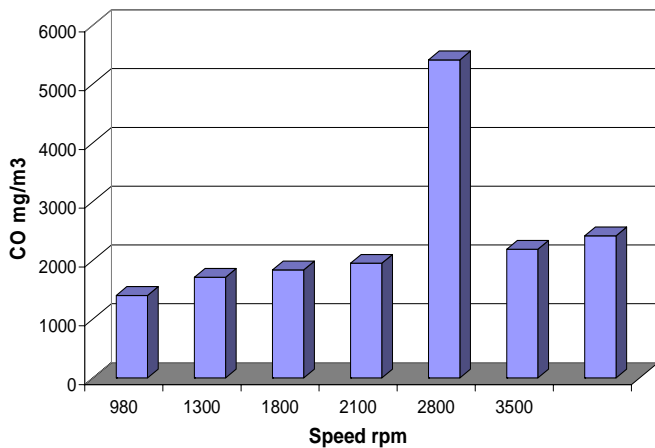
Using the above equation, assuming Diesel engine vehicles as commercial engines that travel 100,000 km/year, with knowing the emission factor($EF_i = 0.000494$) kg/km, and taking numbers of Diesel engine vehicles for the year 2006 to be 52439 vehicles, this gives 2591 ton of soot every year.

If overloads, rough and inclined roads are factors that affect the increase of these pollutants, this will double the amount of these pollutants, and the total annual amount is over 5000 ton/year. This is a huge amount of pollutants if compared with Israeli occupation amounts which are 19480 ton/year.

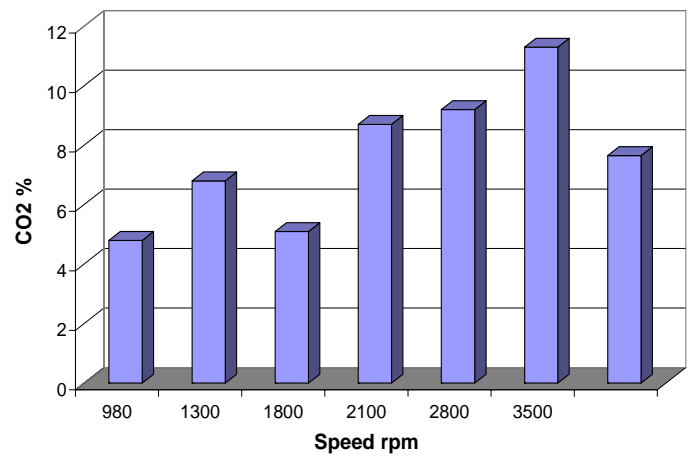
The average of Palestinian vehicle is 95 kg/year while the Israeli vehicle produces 50 kg/year.

The following figures show the amount of diesel emissions at full loads and various speeds.

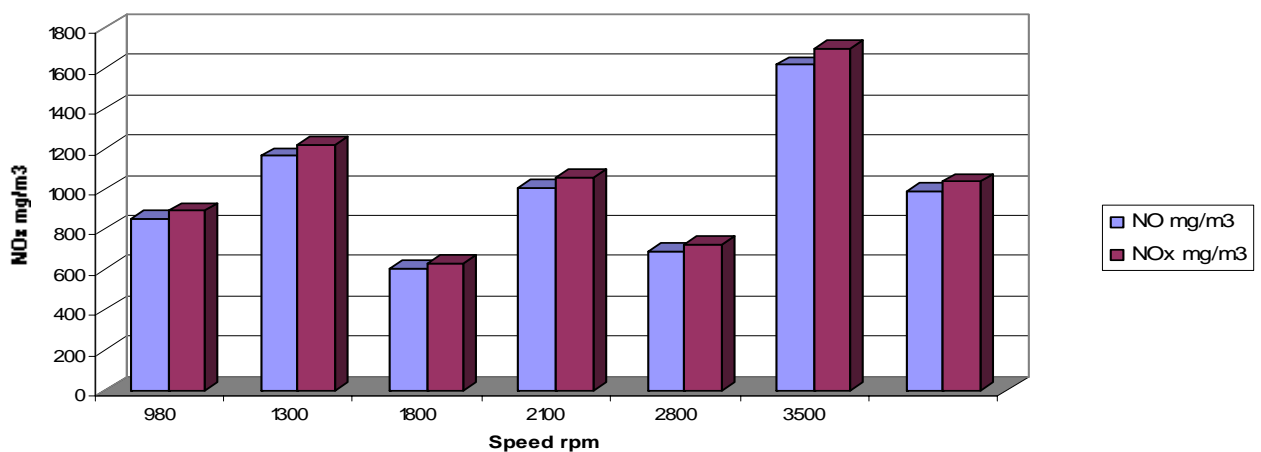
CO mg/m³ for Diesel engine at full load



CO₂ % for Diesel engine at full load



Nox mg/m³ for Diesel engine at full load



Field study on overloads

A sample statistics was performed during several hours and the following table shows the percentages of vehicles with overloads.

Without overload	With overload	No load	Total
57	39	74	170
34%	23%	43%	Percentage to all
59%	41%	-	Percentage to loaded only

From the above table it is shown that 23% of total vehicles on roads are overloaded, and 41% of vehicles are overloaded.

Results

- 1- Absence of national comprehensive plan to tackle the various environmental problems and hence air pollution problems.
- 2- Absence of any type of control against violating the permitted values of pollutants even by ministry of transportation, environmental authority, or any other executive authority.
- 3- Absence of control and observation on testing centers responsible for licensing vehicles to work on roads.
- 4- Absence of any measuring sight or station for air pollution in crowded areas and city centers.
- 5- Absence of follow up for overloaded vehicles that violate safety and environmental regulations.
- 6- Absence of specialized teams in air pollution, and scarcity of specialists in this field, this leads to scarcity of studies and real information about air pollution.

Recommendations

a) On the technical side there is a possibility to follow various recommendations such as:

- 1- To try changing the use of Petrol and Diesel engines by other more environmental friendly vehicles such as electric, LPG fuel, Hydrogen, or even solar vehicles.
- 2- To oblige all types of transportation vehicles to use catalytic converters to transfer CO, C_xH_y to CO₂, and reduce NO_x and hence reduce emissions.

b) On the field side, there are many tasks that could be performed:

The governmental side:

The governmental authority has to do the following:

- 1- To apply all legislation procedures and inspections on vehicles working on roads.
- 2- To check and inspect testing centers that gives the permissions to the vehicles to travel on roads.
- 3- To determine a special regulations for old vehicles and make frequent checks on them.
- 4- To make frequent checks on overloaded vehicles.
- 5- To oblige vehicle importers to import it with catalytic converters, and oblige vehicles that has such a converter to keep it in use.
- 6- To reduce authorities service vehicles in the crowded areas and change some of it by friendly motorbikes, electric cars...etc.
- 7- To start immediately by activating environmental authority by a comprehensive plan to study air pollution problems and there solutions.
- 8- To solve the problems of crowded city centers by creative ideas.
- 9- To prevent large Diesel vehicles and trucks from entering the city center on a circular track determined by local authority.

On the societies and associations side.

There are few associations concerned by environmental issues, they do a big effort, but still a lot of things have to be done such as:

- 1-To establish a kind of an environmental awareness through many ways such as bulletins, workshops, stickers...etc.
- 2- Encourage people to use friendly environmental traffic means, such as public busses, or massive movement, or even by foot for short distances.
- 3-Doing more research and projects to help in reducing emissions from combustion engine vehicles.

On the individual side.

No doubt individuals have a big role in reducing air pollution through the following:

- 1- To eliminate as much as possible the use of privet cars inside crowded areas and city centers.
- 2- To use massive movement inside crowded areas.
- 3- To maintain their vehicles in a professional and legal ways in order to keep it in very good conditions on roads.

- 4- To try to use good fuels.

Finally, our hope to see Palestinian air clean from all types of pollutants.

References

1-www.pcbs.gov.ps

2-www.pnic.gov.ps

3-www.psi.gov.ps

4-- Australian government, department of the environment and heritage” Emission Estimation Technique Manual” for combustion engines, 2003.

5-EPA, California Certification Exhaust emission Standards for vehicles, February 2000.

6-William W Anzaroff, Lisa Alvarez-Cohen, “Environmental Engineering Science”. John Wiley&Sons, Inc 2001.

7- Eran Sher, “Handbook of air pollution from internal combustion engines” Academic press, 1998.