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Controlling Of Greenhouse Gases (Ghg) Emissions Caused By Transportation

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Abstract

The aim of this research to control of GHG emissions from transportation that caused as a resulting of combustion of fossil fuels inside vehicle engine.GHG emissions contain types of gases that produced from burning fossil fuel such as carbon dioxide (CO_2), methane (CH_4), carbon monoxide (CO) , nitrous oxide (N_2O), sulfur hexafluoride (SF_6), which distributed and trap into atmosphere caused high temperature named as (global worming). CO_2 is the most common unwanted gas formed about 83% of total GHG into atmosphere, since 1 Kg of Fuel produces about 3Kg CO_2.The objective of research to reduce GHG pre-combustion and during combustion of fuels, measuring and calculation fuel emissions as smart steps using different methods as emissions factors, carbon footprint, with review materials and operation to reduce emissions using tools with all databases and resources of transport sector to analyzing and estimate approximate over all GHG emissions impact occurs due to growth in developing world therefore arrange mobility management of strategies to address fuel consumption and emissions in the future depending on upon number of factors and use suitable tools to analyzing and measuring any change in environmental impact to avoid consequences of GHG emissions in the future. Finally provide the travelers with all information to use public transportation that will be reduced 86% of all emissions caused by transportation.

Key wards: GREENHOUSE ,GASES (GHG) EMISSIONS , TRANSPORTATION

1. Introduction

Greenhouse gas emissions (GHG) generated from transport(including land , railways, sea-shipping and Air-flight) are among the fastest growing in the world , greenhouse gas emissions is serious real problem facing our world and whole the planet today , it is one of the biggest challenges ever ,something more dangerous threaten human being , pollutant the atmosphere , increasing temperature degrees that are effecting on melting snows , destroying plants, kill animals, witnessing more floods , all these collections events call (‘change climate’). Change climate as a result of increased concentrations of greenhouse gases

(GHGs) in the atmosphere. Economic development is required for poverty reduction, at the same time; development could also lead to increased greenhouse gas (GHG) pollution caused by the resulting growth in vehicular traffic, energy use, and other activities.Transport is a key facilitator of economic well-being worldwide and is likely to continue to grow to meet increasing demand for decoupling GHG emissions from the transport sector and economic growth or at least lowering the GHG intensity of future transport growth represents the key challenge and will require departure from the "business as usual" policies in the transport sector.The transportation system is the second-largest contributor to GHG. The report states "While transportation planning can play an important role in contributing to GHG reductions, transportation agencies have limited control over many of the factors that influence GHGs, including changes in vehicles and fuels. Reducing global transport greenhouse gases (GHG) emissions will be more challenging since the continuing growth in financial investments increasing.

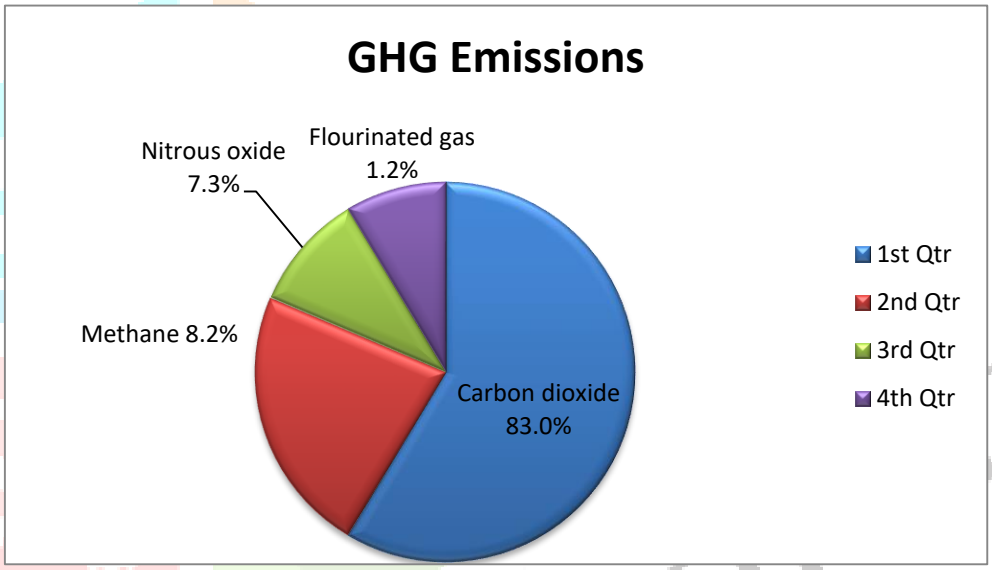

Fig (1) types of GHG by type of Gas

Greenhouse gases contain many dangerous gases as shown in table (2-1) below:

Table (2-1) components of GHG Gases

Greenhouse gas	**Chemical formula**	**Global Warming Potential**
Carbon Dioxide	CO_2	1
Methane	CH_4	21
Nitrous oxide	N_2O	310
Hydro fluorocarbons	HFCs	140 ($C_2H_4F_2$) to 11700 (CHF_3)
Per fluorocarbons	PFCs	5700 (CF_4) to 11900 (C_2F_6)
Sulphur hexafluoride	SF_6	23900

2-1 Carbon Cycles:

Plants absorb CO_2 from the air; Animals eat plants that contain CO_2, so when Animals or Plants die! CO_2 released into the atmosphere or ground, see figure (2-2) below:

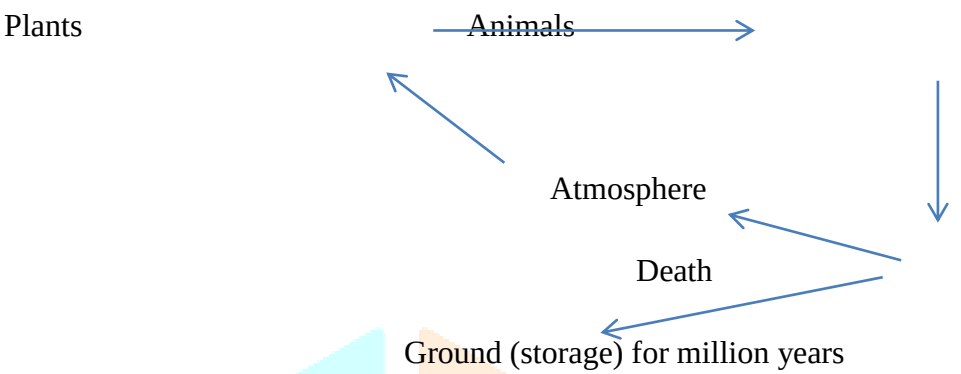

Fig (2) review Carbon Cycle

2-3Plant more trees (Photosynthesis)

In this operation trees use CO2 to make glucose release oxygen to atmosphere as below

Carbon dioxide + water (chlorophyll) → glucose + oxygen

$6CO_2 + 6H_2O$ Sunlight → $C_6H_{12}O_6 + 6O_2$ → (5-1)

Take place in plant leaves.

Chlorophyll in cells takes in sunlight.

CO_2 in atmosphere enters leafs through stoma in epidermis;

Water enters through roots.

Oxygen also produced – this is how most of our oxygen is produced.

Glucose changed to starch, cellulose, and fats, combined with nitrates to make amino acids, proteins.

Photosynthesis /respiration keep the balance of oxygen (20%) and CO_2 (0.3%).

3. Materials & Methodology

3-1 Methodology

Currently, data resources and tools to analysis and contain GHG impact in the transport sector are available to address, measurable and analysis needs. As a result, this study develops a new set of GHG impact analysis tools, and calculation emissions and reviews existing global research literature on CO_2 estimation methods and emissions factors for various transportation control types and develops a new set of CO_2 impact analysis tools, since CO_2 in not danger comparing with methane but CO_2 is most common with high percentage about 83% of total GHG emissions. These methods and factors are synthesized and applied to data from operations reports, feasibility studies, and other sources for derive indicative CO_2 footprint and savings indicators by operation type, these intensity indicators are applied to a database of transport

projects to estimate the approximate overall GHG impact and update any change in emissions factor based on type of fuel.

3-2 Calculation Emissions of Fuels types

3-2-4 Calculation:

For every kg of gasoline burned in and automobile, calculate the amount of CO_2 produced?

Gasoline is octane (C_8H_{18}) from equation below

$$\mathbf{C_8H_{18} + 10O_2 \rightarrow 8CO_2 + 4H_2O} \rightarrow (\mathbf{3-1})$$

1kmole (gas) of C_8H_{18} gives 8kmol CO_2

M C_8H_{18} = 114kg/kmol

MCO_2 = 44kg/kmol

So 1kg gasoline produces

1kmole C_8H_{18} → 8kmol CO_2

114kg/kmol C_8H_{18} → 8(44)kg/kmol

So 1kg gasoline produce 8*44 /114 = 3.09kg CO_2

4. Results & Discussion

4-1 Fuel Combustion inside Engine Vehicles;

4-1-1 Complete ('ideal') Fuel Combustion;

Air – 21%O_2 , 79% N_2 , or (O_2 = 3.76N_2) basis on molar

Fuel: C_aH_b, gasoline (C_8H_{18}): diesels ($C_{12}H_{23}$)

Under ideal condition stoichiometric combustion fuel reaction products CO_2, H_2O N_2, represent the equation

C_8H_{18}+12.5O_2 →8CO_2+9H_2O_2 → (4-1)

4-1-3 reduction emission; using catalytic convertor;

So to fix this harm gases we use catalytic convertor such as (Platinum & Rhodium, palladium & Palladium) to reduce GHG emissions in exhaust pipeline in vehicles.

Respectively in the first chamber as below in the fig (4-1) below

$NO_X \rightleftharpoons O_2 + N_2 \rightarrow$ (4-4)

Hydrocarbons (HC) + $(O_2) \rightleftharpoons (H_2O) + (CO_2) \rightarrow$ (4-6)

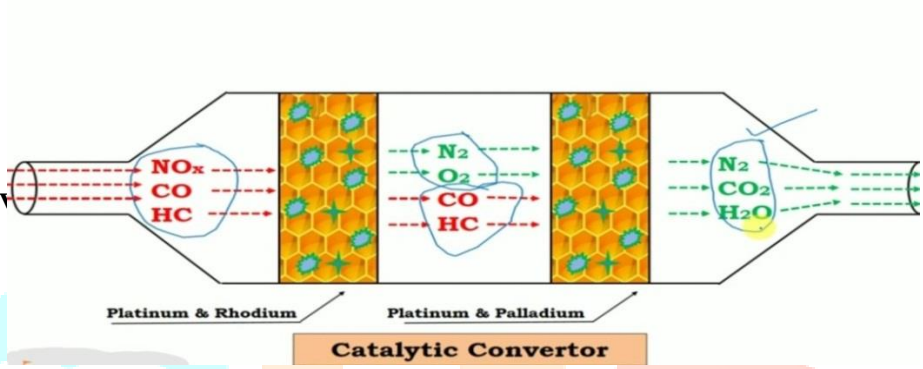

Fig (4-1) rev

4-2 Mechanical problems inside Vehicles;

4-2-1 Causes of High (HC) – Unburned fuel;

- Rich A/F mixture
- Defective O_2 sensor
- Leaky fuel Injector
- Clogged Air filter

4-2-5 Defective or worn Ignition components;

- Ignition Coil

4-4 discussion results

4-4-1 Standard Emissions control for Passing Vehicle;

Table (4-1) review standard emissions control system

ECS	Result	ECS	Result
PCV[A]	N/A	Thermostatic Air Cleaner[G]	Pass
Catalytic Convertor[B]	Pass	Air Injection[H]	N/A
EGR Visual[C]	Pass	Sensors/Switches[I]	Pass
Fuel Cap functional[D]	Pass	Ignition Timing[J]: 14BTDC	Pass
Fuel Cap Visual[E]	Pass	Wiring to Sensors[K]	Pass
Spark Controls[F]	N/A	Fill pipe Restrictor[L]	Pass

Every part of engine is important to vehicles health in some way neglecting to fix a single worn out could lead to bigger.

4-4-2 PCV[A] Valve;

Stands for positive crankcase ventilation, it is one-way valve attached to the crankcase to holds motor oil, it located bottom of engine to protect engine, from gases produces from burn fuel sneak in between engine mixed with motor oil and

Table (4-2) review ASM Emissions Test Result for vehicle

		CO_2 %	**O_2%**	**HC (PPM)**			**CO%**			**NO (PPM)**			
Test time	**RPM**	**MEAS**	**MEAS**	**MAX**	**AVE**	**MEAS**	**MAX**	**AVE**	**MEAS**	**MAX**	**AVE**	**MEAS**	**Result**
15mph	**1511**	**13.7**	**0.1**	**105**	**4**	**11**	**1.5**	**0.01**	**0.01**	**406**	**14**	**0**	**PASS**
25mph	**1476**	**13.5**	**0.5**	**29**	**4**	**4**	**1.7**	**0.01**	**0.01**	**149**	**19**	**0**	**PASS**
MAX= Maximum Allowable Emissions, AVE= Average Emissions for passing, MEAS= Amount Measured													

5. Conclusion & Recommendations

5-1 Conclusion;

GHG emissions from the transportation sector are projected to rise due to ongoing reliance on fossil fuels and increases in vehicle miles traveled.

Also expected due to growth in developing world therefore arrange mobility management of strategies to address fuel consumption and emissions in the future depending on upon number of factors and use suitable tools to measure environmental consequences of transportation that will remain important.

Finally provide the travelers with all information to use public transportation.

5-2 Recommendations;

- Controlling emissions must be done at sources of emissions that will be more efficiently.
- Use public transportation that will be reduced 86% of all emissions caused by transportation.
- Encourage investors and companies to invest in CO_2.
- Plant more trees (Photosynthesis)

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