ASSESSMENT THE PERFORMANCE AND OPERATION OF THE MEAN TRANSPORT IN GREATER CAIRO IN CONTEXT OF GREEN HOUSE GASES

Submitted By

Tarek Abdel Hafiz Kotb Shalaby

B.Sc. of Chemical Engineering, Military Technical College, 1990

A thesis submitted in Partial Fulfillment
Of
The Requirement for the Master Degree
In
Environmental Sciences

Department of Environmental Engineering Sciences
Institute of Environmental Studies and Research
Ain Shams University

2017

APPROVAL SHEET

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This thesis Towards a Master Degree in Environmental Sciences
Has been Approved by:

Name Signature

1-Prof. Dr. Aly Zain-Elabdin Salem Hikal
Prof. of Traffic & Transport
Faculty of Engineering
Ain Shams University

2-Prof. Dr. Hatem Mohamed Abdel Latif
Prof. of Traffic & Transport
Faculty of Engineering
Ain Shams University

3-Prof. Dr. Ezzat Lewis Hanna
Coordinator of Protocol Montreal
Manager of Ozone Project in Egypt

4-Dr. Mounier Wahba Labib
GHG Inventory Expert

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Abstract

Assessment of the performance and operation of the means of transport in Greater Cairo-GC in context of Green House Gases-GHGs research study is conducted to discuss the environmental problem presented as the rapid growth of car ownership with no available information about how much GHG has discharged into the atmosphere by vehicles powered by fossil fuels, and the methods used to reduce those GHG emissions; The increase of the GHG emissions flow increases the temperature due to the global warming, and the shortage of fossil fuels with the rapid growth of fuels consumption makes the planning of Transport sector opportunities for GHG mitigation options are very important, and that planning cannot be done without clear and complete data and information about the fossil fuels consumed or used.

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Glossary of Abbreviations

AFD	(Agence française de développement
BAU	Business as usual
BEV	Battery Electric Vehicle that operates only on electric power
BMI	Body Mass Index
BUR	Biennial update report
CAGR	Compound Annual growth rate
CAPEX	Capital expenditure, or CapEx, is fund used by a company to acquire or upgrade physical assets such as property, industrial buildings or equipment.
CAPMAS	Central agency for public mobilization and statistics
CARB	California air resources board
CCS	carbon capture and storage
CH4	Methane
CNG	Compressed Natural Gas
CO2	Carbon Dioxide which accounts for over 96% of GHG emissions from the transportation sector
COPERT	Software for Estimating of road transport emission
CRC	Coordinating Research Council
CTA	Cairo transportation authority
DMV	Department of Motor Vehicle
EAMA	Egyptian automobile manufacturers association
EDGAR 3.2	Emission database for global atmospheric research
EDGAR v.2	Electronic data gathering, analysis, and retrieval-global atmospheric research
EEAA	Egyptian environmental affairs agency
EGPC	Egyptian general petroleum corporation
EIA	energy information administration
ENR	Egyptian national railways
EPA	Environmental Protection Agency
FID	Flame ionization detector
GC	Greater Cairo
GDP	Growth domestic product
GHGs	Green House Gases
GMR	General motors research
HDVs	Heavy duty vehicles
ICE	Internal Combustion Engine
ICT	information and communication technology
IDSC	Information and decision support center
IEA	International Energy Association
IMC	Industrial modernization center
IPCC	Intergovernmental Panel on Climate Change
IVE	International vehicles emission
JGSEE	Joint graduate school of energy and environment
LDVs	Light duty vehicles
MDVs	Medium duty vehicles
MLIT	ministry of land infrastructure and transport
MMBTU	Million British thermal unit - BTUs

MOI	Ministry of interior
MOP	Ministry of petroleum
MOT	Ministry of transport
MtCO2e	Million ton CO2 equivalent
N2O	Nitrous Oxide
NAAMSA	National Association of Automobile Manufacturers of South Africa
NAT	National authority for tunnels
NCHRP	National cooperative highway research program
NCs	National communications reports
NMVOCs	non-methane volatile organic compounds
NOx	Nitrogen Dioxide, the pollutant emitted from ICEs that contributes most to atmospheric ozone
OEP	organization of energy planning
OPEX	An operational expenditure (Opex) is the money a company spends on an ongoing, day-to-day basis in order to run a business or system.
PCD	pollution control department
PHEV	Plug in Hybrid Electric Vehicle
PM	Particulate matter
QA/QC	Quality control/ quality assurance
SIS	State information service
SO2	Sulfur Dioxide, the pollutant emitted from burning coal that contributes most to the Brown Cloud
TAI	Thailand automotive institute
UNFCCC	United nation convention for climate change
VAP	Vehicle Average Power
VOC	Volatile organic compound
VKT	vehicle kilometers travelled
VMT	Vehicle Miles Traveled
VSP	Vehicle specific power

1.0. Introduction

Assessment of the performance and operation of the modes of transport in GC in context of GHGs research study is conducted to discuss the environmental problems presented recently such as:

1) The unavailability of the information relating to the amount of GHG released to the atmosphere from vehicles powered by traditional fuels, and how to reduce those GHG emissions;
2) The raising of the atmospheric temperature as one of the global warming indicators due to GHG emissions flow increased;
3) The difficulty of planning for GHG mitigation opportunities on transport sector due to the lack of information relating to the fossil fuels consumed or used.

This research study was prepared to represent the information collected regarding to the general managing of the GHG emissions including:

1) The national inventory practice work for transport sector in GC;
2) The methodologies for estimating GHG emissions for different gases in concern such (CO_2, CH_4, N_2O) for the road transport sector in GC;
3) The software established by the Intergovernmental Panel on Climate Change (IPCC – 1996), and IPCC good practice guidance-2000 used for estimating GHG;
4) The final energy consumption and ratio analysis on the transport sector;
5) The two approaches defined for data collection to calculate the emission factor, and the key potential levers for abatement assessed for feasibility in Egypt.

Benchmarking study and a successful story as case study are also represented in this research study.

1.1. Overview

Global climate change has become a serious problem in the world nowadays; some reports shows that the anthropogenic carbon emissions and atmospheric CO_2 are the