

MATHEMATICAL MODELING FOR AIRPORTS GASEOUS EMISSIONS

CASE STUDY ON CAIRO INTERNATIONAL AIRPORT

Submitted By

Usama Ali Mahmoud Abd Elwahab

B.Sc. of Science (Physics, Computer Science), Faculty of Science,

Ain Shams University, 2006

Diploma in Environmental Sciences, Institute of Environmental Studies and
Research, Ain Shams University, 2010

A thesis submitted in Partial Fulfillment

Of

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

Name

Signature

1-Prof. Dr. Mostafa Hassan Ragab

Prof. of Community Medicine and Environment in Department of
Environmental Medical Sciences
Institute of Environmental Studies & Research
Ain Shams University

2-Dr. Ashraf Saber Zakey Abdel Mawgoud

Under Secretary of State for Research and Climate
The Egyptian Meteorological Authority
Ministry of Civil Aviation

3-Prof. Dr. Mahmoud Ahmed Ibrahim Hewahy

Prof. of Public Health in Department of Environmental Basic Science
Institute of Environmental Studies & Research
Ain Shams University

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Under The Supervision of:

1- Prof. Dr. Mahmoud Ahmed Ibrahim Hewehy

Prof. of Public Health in Department of Environmental Basic Science
Institute of Environmental Studies & Research
Ain Shams University

2-Dr. Mohamed Hassan Mahmoud Khalil

Associate Prof. in Department of Geophysics
Faculty of Science
Cairo University

2016

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ABSTRACT

Cairo International Airport (CAI) is the major airport in Egypt and it is going on to expand its operations and strategic plans aiming to become a large hub airport in the Middle East while the civil aviation is one of the most growing up industries around the world, which consumes large amounts of fossil fuel in its various operations. So its gaseous emission may effect on human health, agriculture, economic and climate. This makes determination of its gaseous emissions sources and inventorying the pollutants from its different operations very important in studying the impacts of these emissions on its vicinities, Workers and determination the airport footprint.

Using mathematical count and calculations for Aircraft landing and takeoff cycles, Ground service vehicle, fuel used in power generators and land side traffic in airport roads and using there emission factor to determine the Airport emissions then use this inventory as input data In Flexpart modeling software to calculate the dispersions of these emissions in two scenarios for winter and summer.

We found that the most polluted area is the area near runway end 05C which is near to Nasr city district due to aircraft operation as the landing takeoff cycle is concentrated in this area 77624 movement/year, which represent about 52.8% of the annual total LTO Cycles . Also there are high traffic movements in comparison to the total passenger movement 245,000vehicle/day.

So for 2013 the annual emission calculated emitted from CAI is CO₂: 208,217.40 Ton/Year, HC: 5,180.88 Ton/Year, CO 27,285.86

Ton/Year NO_x 3,270.80 Ton/Year, N₂O: 0.001 Ton/Year and So₂: 67.94 Ton/Year.

We noted that The most of land side vehicle are public transportations and Aviation services companies employ owned cars; thus makes the underground is recommended as an effective environmental control measure to reduce the traffic emission, also Some of Narrow bodies Aircrafts Such like Embraer- E190, Tupolev Tu-204 and like Embraer- E170 which represent about 20% of CAI operation and more polluter than others aircrafts such like A320 and B738 need more research to study the benefits of using those model or use another alternatives to reduce the emissions and improve the air quality, Runway Sid 05R and 05L should be used to reduce the load on 05C and reduce the environmental weight on Nasr city and Sheraton districts

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