Uluslararası İleri Doğa Bilimleri ve Mühendislik Araştırmaları Dergisi
Sayı 8, S. 489-493, 4, 2024

Araştırma Makalesi

International Journal of Advanced Natural Sciences and Engineering Researches
Volume 8, pp. 489-493, 4, 2024

Research Article

https://as-proceeding.com/index.php/ijanser
ISSN: 2980-0811

ESTIMATION OF GREEN HOUSE GAS (GHG) EMISSIONS IN NUST H-12 ISLAMABAD

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(Received:17 May 2024, Accepted:26 May 2024)

(3rd International Conference on Engineering, Natural and Social Sciences ICENSOS 2024, May 16-17, 2024)

ATIF/REFERENCE: Mahmood, S. M. H., Aamir, E., Ali, B., Ahmed, J. & Khan, M. A. (2024). Estimation Of Green House Gas (Ghg) Emissions In Nust H-12 Islamabad. *International Journal of Advanced Natural Sciences and Engineering Researches*, 8(4), 489-493.

Abstract **-** Green House Gas (GHG) emissions are the major contributors to extreme climate such as global warming and severe heat waves as well. To provide the remedial measures for these hazardous emissions the first step is to track the sources of these emissions and to find out the cost analysis confined to those sources. As the study explains within the restrictions of lack of access to all the sources, the time factor as well as the due to security reasons whole amount of data could not be gathered. The study encompasses the observance of monthly GHG emissions through the National University of Sciences and Technology (NUST) transport facility including the students, faculty, and staff transport along with the transport required for industrial visits. As a result, a massive influx of GHG emissions was found because of the daily and occasionally transport services. The most appropriate alternative to cut off the emissions is to increase electric vehicles as well as switch towards conscious practices to significantly reduce the emissions. There are many universities in the capital of Pakistan if this approach could be implemented in maximizing numbers a phenomenal cost and health-efficient environment can be promoted.

Keywords- Carbon Dioxide, Environmental Degradation, Greenhouse Gases, Hazards, Transportation.

I. INTRODUCTION

With global development in each sector. The rapid industrialization is becoming a bottom neck problem in developing countries as they are progressing daily but with the lack of proper management of resources the resource availability is becoming insufficient also the hazardous environmental impacts are becoming more

and more violent. Increase in the number of constructions to accommodate the upcoming influx of individuals as well as the development of excellent facilities like labs, and the other facilities Reaction chambers are the major contributors in this regard[1]. NUST the Prior educational institute of Pakistan is under the same stressful conditions right now due to massive inflow of population inn past five years for the aid of betterment in their life prospectus [2]. The population increase has forced the excessive consumption of natural resources, and it is a cutoff to nature's assets as well. The United Nations environmental protection agency (USEPA) has described some guidelines for the control of hazardous environmental impacts, but they have not yet implemented as per their importance. GHG are becoming more prior as they are directly affecting the environment. Rapid increase in earth's temperature, frequent flood scenarios, habitat loss and many more issues are constantly arising. Many of the studies have been conducted regarding GHG emissions on different levels but educational institutions are always being lined up in this purpose [3]. The study aims to focus on the educational consumption pattern of GHG and to observe the mitigation measures that can be implemented to reduce environmental degradation. [6]

II. Research Methodology

The methodology for estimating the amount of GHG emissions is to track it with the transportation of NUST accompanied by the staff, faculty and students and formulating using Microsoft Excel. The calculations were synchronized with the "**UNFCCC**" model for the estimation of GHG emissions. The data was collected by the NUST administration with proper channels. The Transportation of the institute consists of the vehicles operational on daily basis as well as the transport on occasional times comprising industrial visits and educational tours as well. The data collected from the transport department is an average estimation of the total fuel consumption and the release of greenhouse gases because of that consumption. Different statistical analysis is also incorporated to observe an overview of the adversity of these emissions. [2]

A. Study Area:

NUST is the 1st ranked educational institution in Pakistan and ranked 64th in the continent. Due to the purpose of advanced career prospects, there is a massive influx of individuals at the institute thus an abrupt increase in transportation and increase for emissions. The total number of individuals currently enrolled is 12000 and the total staff members are 650. NUST Islamabad occupies a total area of $2.86 km^2$. NUST University is in geographic coordinates of 33.6425° N, 72.9930° E. [3]

GHG gases

The most common greenhouse gases include Carbon Dioxide, Methane, NO_x, Tropospheric ozone, CFCs and other as well. These gases play a huge role in increasing the earth's temperature up to an alarming level, which in turn damages the environment adversely. [4]

Carbon Dioxide (CO_2)

Carbon dioxide (CO_2) is one of the major constituents of greenhouse gas. Like a greenhouse glass material, it lets the sunlight travel inside the glass but absorbs it on its way back thus increasing the internal temperature.

Nitrogen oxides (NO_x)

With several processes nitrogen oxides meets other gases in the troposphere and stratosphere with absorption in spectral range causing the greenhouse effect.

Tropospheric ozone

In the region of upper atmosphere, tropospheric ozone is also the major contributor of greenhouse gas effect.

Chlorofluorocarbons (CFC's)

Chlorofluorocarbons are purely excluded from the industrial origin and are one of the strongest greenhouse gases. Its composition includes nontoxic, nonflammable chemicals with atoms of carbon, chlorine, fluorine.

B. Initial Data:

The initial data is the first step towards the calculation of GHG emissions of a particular society and it serves as a baseline to define the pathway to be followed throughout the research. The primary data comprises of the total information of the transportation vehicles being NUST'S property as well the transport required on daily pick up and drop off routes. A random survey among NUST community was being circulated with the aim of getting the response of public towards this adverse effect causing serious environmental damage.

C. Secondary Data

The secondary data includes the reference from previous resources and the tabular representation of the data to represent the cost, emissions on regular intervals as well as the amount of environmental damage done to the environment.

III. Results

The collected data was being analyzed with the aid of Microsoft Excel and then we check the trend of increasing Greenhouse Gases emissions w.r.t different vehicles used on daily, and one time use basis. The output helps us to evaluate the existing conditions of these emissions and allow us to predict the future change, which would be implemented at an urgency to reduce the hazardous impacts of Greenhouse Gases emissions. In addition, there is a great need for alternatives to be implemented so that the abrupt switching of the methods would not affect the routine work of the public in the institution. The relevant authorities to make people informed regarding the hazardous impact of the greenhouse gases must conduct awareness seminars and workshops and the ways to reduce their impact and an addition would be the involvement of environment protection as a compulsory course curriculum. The following calculations show the adverse greenhouse gas emissions occurring at NUST H-12 Islamabad. Through the analysis of these results, we can predict future mitigation measures to reduce the hazards. [5]

GHG Emissions of NUST Vehicles

Table 1: Estimation of CO_2 emissions per liter fuel consumption

Type of Vehicle	**No. of Vehicles**	**Average distance km per month**	**Fuel consumption liter per month**	**CO_2 Emission kg per km per month**	**Total passengers**	**Total average cost in Rs.**
Hiace	63	109620	9960	24900	945	9,450,000
Bolan	25	43500	3360	8400	175	1,750,000
Coaster	34	59160	7440	18600	1020	10,200,000
Buses	10	800	4800	12000	450	1,200,000

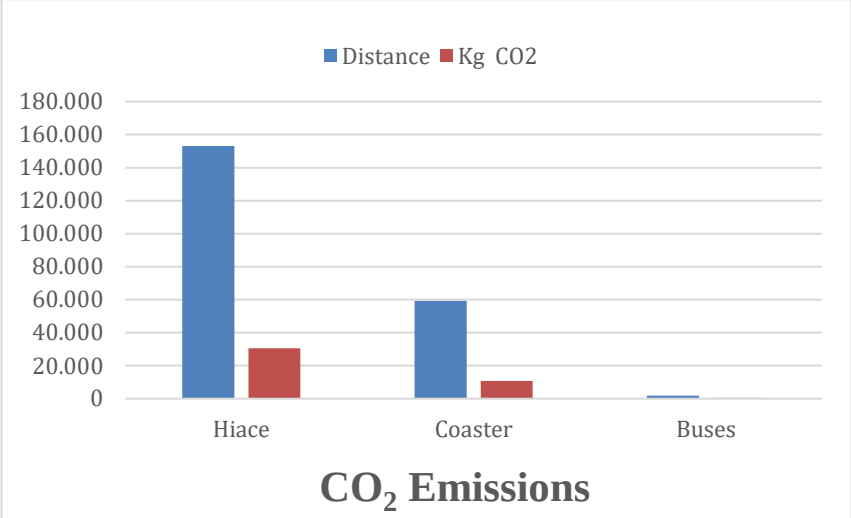

Figure 1: Graph showing the percentile Carbon Dioxide emissions.

IV. Recommendations and Mitigations

- With hybrid, electric vehicles there will be a massive reduction in GHG emissions.
- Switching towards public transport will be an impactful initiative to reduce emissions.
- With the plantation act a huge reduction in these GHG emissions will occur.
- The use of environmentally friendly fuel will be an appreciable step in this context.
- Use of Solar System in vehicles will be helpful as well in this regard.

V. Conclusion

The issue of climate change is having a multiplier effect on every disaster and any other threat with association of climate change becomes more violent. GHG emissions is one of the major hazards regarding climate change to be controlled. By controlling these phenomena, a dominant impact in reducing climate adversities can take place.

VI. Acknowledgment

The authors would like to thank esteemed faculty who helped throughout the research work, particularly IESE department, Sir. Ahsan and Engr. Erum Amir.

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