

**A STUDY ON ENVIRONMENTAL AND HUMAN IMPACT ASSESSMENT OF
PARLIAMENT BUILDING IN DELHI.**

A

PROJECT REPORT

Submitted in partial fulfilment of the requirements for the award of the degree

of

BACHELOR OF TECHNOLOGY

IN

CIVIL ENGINEERING

Under the supervision

of

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HIMACHAL PRADESH, INDIA

May 2021

DECLARATION

I thus pronounce that the work introduced in the task report named “**A study on Environmental and Human Impact Assessment of Parliament Building in Delhi**” submitted for partial fulfilment of the requirements for the degree of Bachelor of Technology in civil Engineering at **Jaypee University of Information Technology, Waknaghat** is legitimate record of my work completed under the supervision of **Dr. Tanmay Gupta**. This work has not been submitted somewhere else for the prize of some other Degree/Diploma. We are fully responsible for the content of my project report.



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CERTIFICATE

This is to guarantee that the work which is being introduced in the undertaking report named “**A study on Environmental and Human Impact Assessment of Parliament Building in Delhi**” in partial fulfilment of the prerequisites for the honour of the level of Bachelor of Technology in Civil Engineering submitted to the Department of Civil Engineering, **Jaypee University of Information Technology, Wagnaghat** is a genuine record of work did by **Saurabh Thakur(171624)** and **Sonam Wangmo(171675)** during a period from August, 2020 to May 2021 under the oversight of **Dr. TanmayGupta**, Assistant Professor of Department of Civil Engineering, Jaypee University of Information Technology, Wagnaghat.

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This learning experience has been a unique one and we aspire to continue with our project in the next semester with the same zeal and passion.

We would like to extend our heartfelt gratitude to all of them for all the supports and guidance. We will remain grateful always.

ABSTRACT

The need for Sustainable Development is an ever-growing demand in this time of Global Climatic Change and to analyse the negative outcomes of a particular project on the environment and social life we prepare an Environment impact assessment (EIA) and Human Impact Assessment (HIA) Report.

Our project comprises of preparing one such EIA, HIA and air and noise pollution studies for Parliament Project in Delhi

The primary reason for choosing this project is because of the expected impact on the environment as well as to the population since the project is proposed in the densely populated capital of the country- Delhi.

The areas of study and research includes:

- i. Introduction to the parliament project.
- ii. Analysis of various ill-effects to the environment due to construction of new parliament.
- iii. Assessing the human impact of parliament project.
- iv. Modelling of parameters like air Pollution using software CALINE4.
- v. Analysis of the impact to the social life in the vicinity of the project.
- vi. Study on noise pollution due to construction of new parliament.

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CHAPTER 1. INTRODUCTION

1.1. ENVIRONMENTAL IMPACT ASSESSMENT OF DELHI PARLIAMENT BUILDING

Environmental Impact Assessment (EIA) can be characterized as the investigation to foresee the impact of a proposed action/project on the environment. A dynamic device, EIA analyzes different options for a task and looks to recognize the one which addresses the best blend of financial and environmental expenses and advantages. EIA methodically analyzes both helpful and antagonistic outcomes of the task and guarantees that these impacts are considered during project plan. It assists with recognizing conceivable environmental impacts of the proposed project, proposes measures to moderate antagonistic impacts and predicts whether there will be critical unfavorable natural impacts, even after the alleviation is executed. By considering the environmental impacts of the undertaking and their relief right off the bat in the task arranging cycle, natural appraisal has numerous advantages, like security of climate, ideal use of assets and saving of time and cost of the venture. Appropriately directed EIA additionally decreases clashes between human activities and the surroundings. Advantages of coordinating EIA have been seen in all phases of a venture, from investigation and arranging, through development, tasks, decommissioning, and past site conclusion.

The new Parliament Project is assessed at an incredible expense of Rs.971 Crores and it would be of four-story structure with capacity of 1224. As per the Minister's Office (PMO), the new building is an essential part of the vision of "Aatmanirban Bharat" and will be a landmark opportunity to build peoples' parliament for the first time after independence, one which will match the needs and aspiration of "New Delhi" in the 75th anniversary of independence in 2022. The completion of the structure was expected around 2022. The primary reason of building this new parliament is because of inadequate office facilities and infrastructure and most of the structures have last beyond its designed period. Not only that, it was found that the central offices leading to pollution and hindrances to inter-office coordination and unnecessary travel.

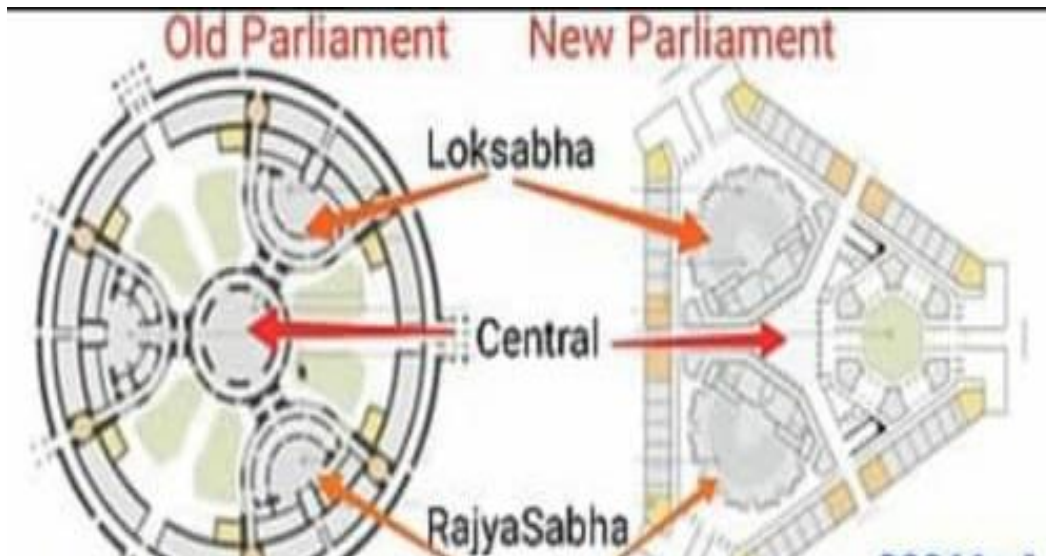


Figure 1. map of old and New parliament building

The main difference between old and new parliament building is that the old building has central hall whereas new building does not have central hall. Number of seats in Lok Sabha and Rajya Sabha have been revised. The Rajya Sabha has 245 seats currently but in the new parliament will have 384 seats whereas current Lok Sabha seating capacity of 552 MPs but it will be thrice the present size in new building. As Delhi falls under seismic zone 4 in current situation, the risks of earthquake have increased so, the new parliament would be constructed in such a way that it would withstand the effect of earthquake. The government have aimed to use green material in the new parliament building. About 30% of electricity will be saved by installing devices, even the arrangement of harvesting rainwater will be done.



Figure 2. Overview of New parliament building

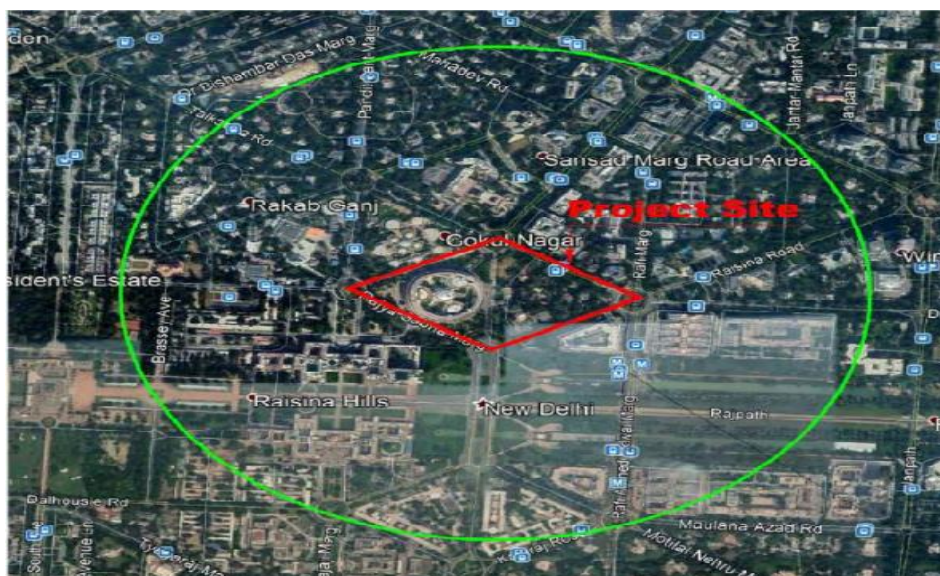
Tata projects Limited will construct the new parliament on total area of 64,000m² and the designing of the new parliament building is designed by HCP Design Planning and Management Private limited.

Since Delhi parliament building is considered to be located in the densely populated area where the risks of affecting people and environment are more due to it activities are more. To assess the impact on population, the human impact assessment through some survey containing some questionnaires will be done. People living there are affected by various pollution such as air and noise pollution. To determine the need of proper EIA, study on air and noise pollution has been carried out.

1.2. SIGNIFICANCE OF EIA

In order to have minimal impact on both human and environment due to various activities, the good EIA should be focused. EIA is the systematic steps which determines whether the proposed project hampers the environment as well as human and it also helps in deciding the significance of it. -Moreover, it is useful component which helps in managing a good environment and helps the organisation to measure and monitor the impact of the environment due to various activities. Good EIA not only helps in managing good environment but also helps in saving resources and time.

1.3. PROJECT AREA



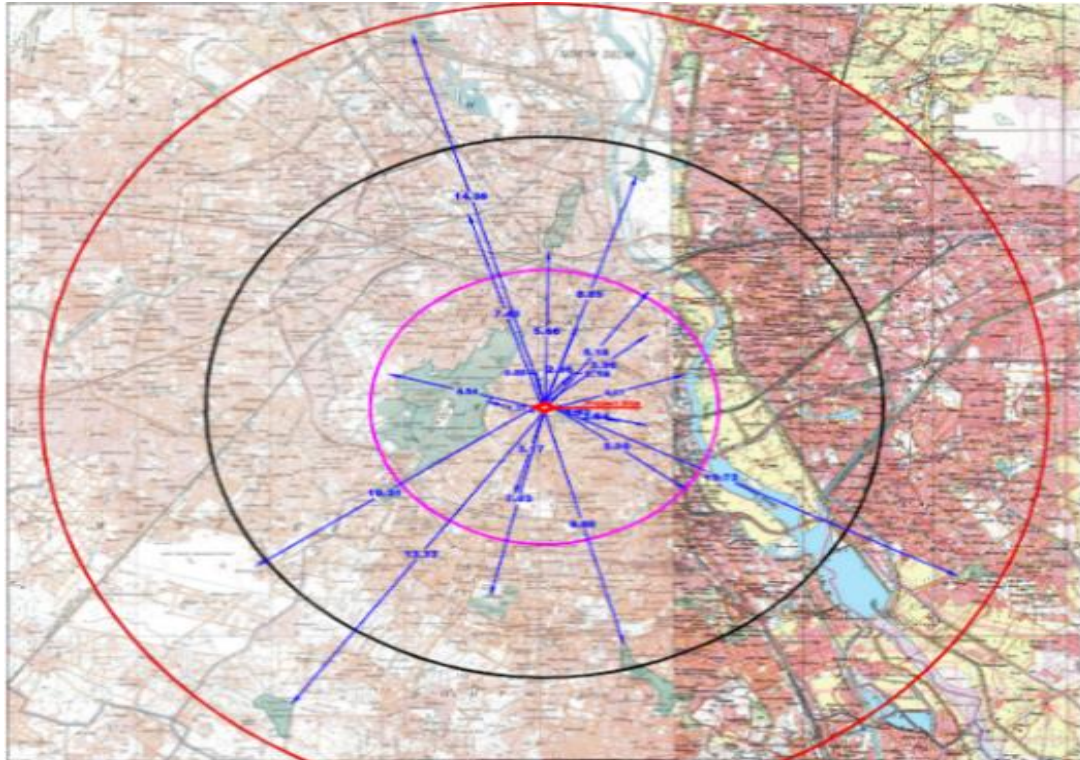






Figure 3. Map showing our project area in Delhi

Name	Symbol / Colour
Project Site	
Study Area 5 Km	
Study Area 10 Km	
Study Area 15 Km	

- Proposed Construction Area- 65,000 m²
- Company undertaking the project: Tata Projects Limited
- Total Build Up Area-104740 sqm
- Total Plot Area-81951 sqm
- Duration: 21 Months

- Cost: Rs.20,000 Crores
- Land Requirement- 8.91 Ha
- Mode of Transportation- Road
- Total Population- 5000

There are ~326 trees on the plot out of which 194 trees are required to be removed (either transplanted or cut). In addition, other vegetation, growing in the plot will also be cleared to develop the new Parliament Building. 250 trees are proposed to be planted on the plot.

1.4. VEHICULAR POLLUTION AND ITS EFFECT.

Because of increased in the number of gas-powered vehicles, numerous unsafe materials (harmful emission) are delivered to the surrounding which has a greatly impact on the surrounding and human as well. Diesel vehicles are observed to be the contribution of more emission limit for oxides while petrol have higher emission limit for carbon monoxide. Types of vehicles which contributes to the air pollution are cars, 2-wheel vehicles, 3-wheels vehicles, buses trucks, etc. Different amount of emission is produced from different vehicular type. Following are some emissions from vehicles and their ill-effect;

a. Particulate matter

Microscopic particles of solid and liquid matter suspended in air. It causes many health and environmental such as lung disease, nonfatal heart attacks, depletion of nutrients in soils, makings lakes and streams acidic, etc.

b. Carbon monoxide

It is formed by the ignition of non-renewable energy sources like fuel. Vehicles and trucks are the primary wellspring of CO creation. When breathed in, it causes windedness, obscured vision, dull migraine and so forth.

c. Nitrogen oxides

Expanded degree of nitrogen oxide can cause damage to the human respiratory plot. Also, long haul openness to nitrogen oxides can even reason constant lung sickness.

1.5. CONNECTIVITY FROM PROJECT.

Table 1.1. connectivity of our project

S.No.	Connectivity	Road & Transport Facilities	Approx. Distance and direction from Project site
1.	Nearest National Highway	NH 48	4.68 Km in WSW
2.	Railway Stations	New Delhi Railway Station	2.96 km in NNE
		Old Delhi Railway Station	4.92 km in NNE
		Nizamuddin Railway Station	5 km in SE
		Sarai Rohilla Railway Station	5.21 km in NNW
3.	Airports	Indira Gandhi International Airport, Delhi	10.31km in SW
		Safdarjung Air-Port, Delhi	3.17km in SSW
4.	Nearest State, National boundaries	Delhi-UP State Boundary	9.08 km in ESE
		Delhi-Haryana State Boundary	16.50 km in SSW

The project area is connected to particular highways at above mentioned distances (NH 48 is the nearest national highway), to railway station, to airports and also to above mentioned state and national boundaries as shown in above Table 1.1.

1.6. ORGANIZATION OF REPORT

The project report contains six chapters where each chapter have different content.

First chapter in the report contain the introduction of our project title “A study on Environmental and Human Impact Assessment of Parliament Building in Delhi” and project site along with the significance of EIA. Various parameter effecting the environment are included.

Second chapter contain the literature review representing various researches paper that were studied in order to get required information to carry out the project.

Third chapter of the report contain the Human impact Assessment which was done for Delhi parliament building to study how the construction parliament building would affect people living nearby. Short online survey was done where various question were asked to individual regarding how the new parliament construction would add on the existing pollution of the place.

Fourth chapter is whole procedure of using air quality modelling software CALINE4. Detailed description of CALINE4 such as definition of CALIN4, how and by whom it was developed, what are the advantages of using it, ho wit is set up and use to mode any type of pollutant, etc., are mentioned. Using CALINE4, the concentration of carbon monoxide is predicted.

Fifth chapter of report is about the noise pollution due to parliament building. Here, the factors affecting noise pollution and how government are handling the pollution are mentioned. Moreover, the standard sets by Government are also included.

Chapter six of the report is all about writing up the result from the project and also it includes what are the measures that the government and people living in Delhi must take in order to have minimal impact due to the parliament project.

CHAPTER 2. LITERATURE REVIEW

2.1 RESEARCH PAPER REVIEWS

This chapter includes the analysis of different research papers, books and journal about the environment impact assessment by various researchers and authors. We collected several research papers and analysed it for our better understanding about our project. From every research we got to understand how and when to consider EIA of the site. Following are the summary of research paper;

1. *CPWD and M/O of housing and urban affairs.*

February, 2020 on

Conceptual plan for Environmental clearance of expansion and renovation of existing parliament building.

It is evident that the project would have serious impact on the environment if the activities are not analyzed carefully. Every required analysis on the pollutions and negative impact should be carried out so that we can eventually achieve the sustainable development and also to reduce the carbon footprint and also to prevent global climate change. They expected increase in the amount of traffic as the number of building increase.

2. *M/S of Stanford developers and infrastructure.*

July, 2018 on

Air quality modeling for proposed airport 'Amaara Residence'

From this research paper, they have made use of AERMOD software and they also come out with some standards of the emission rate viz. SO₂ calculated based on 0.25% Sulphur content in HSD, PM on 0.01% of ash content in the HSD, NO_x on emission limit provided in EPA rule no. 95(9.2gm/kw-hr) and earth surface was assumed as perfect reflector of plume and physic-chemical process. They studied about solar for all the season. And compared the result. They found that in summer (from march to June, the weather remains hot and temperature ranges between 48 degree Celsius to minimum of 28 degree Celsius. In monsoon (mid-June-mid September, temperature falls to 3 degree Celsius to 4 degree Celsius.

3. S. Nagendra¹, M. Khare², P. Vijay¹ & S. Gulia² ¹Department of Civil Engineering, Indian Institute of Technology Madras, Chennai, India ²Department of Civil Engineering, Indian Institute of Technology Delhi, New Delhi, India, September 2011 on

Performance evaluation of the ADMS-Urban model in predicting PM10 concentrations at the roadside in Chennai, India and Newcastle, UK-

They have Used ADMS-Urban software Using the parameter such as Wind speed, Wind direction and Cloud cover and used GRIMM with model number 107 to measure PM. Moreover, they used poly-tetra-fluoro-ethylene (PTFE) filter of 0.2 micro meter size is used to collect dust particles. They aimed to evaluate the performance of the ADMS urban model in roadside of two cities I.e., in Chennai and one in UK and they have used some statistical parameter to evaluate performance. As a result, they concluded that India lacks some input data where the usage of this model is not advisable.

4. Mayer, H. (1999) 'Air contamination in urban communities', *Atmospheric Environment*, Vol. 33, Nos. 24–25, pp.4029–4037.

This examination says that air quality which is the mind-boggling consequence of cooperation among common and anthropogenic natural condition has become genuine ecological issue particularly in the agricultural nation. One of the variables that hampers air quality is outflow from the engine traffic. A portion of the instances of metropolitan air contaminations by engine vehicles are normal yearly, week by week and diurnal patterns of NO, NO₂ and O₃.

5. CPCB (2000) *Transportation Fuel Quality for Year 2005: Program Objective Series, PROBES/78/2000-01, Central Pollution Control Board, New Delhi, Govt. of India.*

This is the standard value sets by CPCB and it shows the overall emanation from different engine traffic. They have set standard limit for noise produced from various places. For industrial area, they have limited the noise level 75dB during day and 70dB during night, for silence zone 50dB during day and 40dB during night, for residential area, 55dB during

and 45dB during night and for commercial it is 65dB during day and 55dB during night. It was warned that the any offender will be punished according to the vehicle motor act, 2000.

6. Goyal, P., Anand, A. furthermore, Gera, B.S. (2006) '*Assimilative limit and toxin scattering reads for Gangtok City*', *Atmospheric Environment*, Vol. 40, No. 9, pp.1671–1682.

They have assessed the assimilative limit of Gangtok's environment in two unique methodologies i.e., in light of ventilation coefficient and another dependent on contamination potential. What's more, they picked just winter and summer to limit the show. From first methodology, they saw that the assimilative limit of air is high during evening hours in the two seasons. Furthermore, from the subsequent methodology, they have presumed that colder time of year is the most basic season having greatest contamination. Result from the two methodologies shows that the assimilative limit of the area isn't acceptable particularly during winter season.

7. Dhyani. R, Singh. A, Sharma. N, and Gulia.S.(2003). "*performance evaluation of CALINE4 model in a hilly terrain-a case study of highway corridor in Himachal Pradesh*". In this paper, they had collected required parameter such as wind speed, wind direction, temperature etc. for Darlaghat corridor modelled using CALINE4 software and they have found out that the carbon monoxide is majorly contributed from the trucks.

2.2 PROJECT OBJECTIVES

The main objectives of our project “Environmental Impact Assessment” which was done in the Delhi place is mainly to;

- Assess and analyse the air quality of the parliament building in Delhi.
- To study the Human Impact Assessment for the people living nearby.
- To study and analyse the noise pollution due to parliament construction.

Chapter 3. HUMAN IMPACT ASSESMENT

HIA tries to improve the nature of strategy choices by assessing the presumable positive and negative wellbeing impacts from proposed projects or approaches, and making proposals to improve positive wellbeing impacts and moderate negative ones.

HIA stresses the interest of public partners and accommodates a social model of wellbeing and prosperity where there is an unequivocal spotlight on value, manageability and social equity, and a pledge to transparency and public examination. It tends to be incorporated as a component of an Environmental Impact Assessment (EIA), Strategic Environmental Assessment (SEA), Social Impact Assessment (SIA), or Integrated Impact Assessment (IIA).

There aren't any uncommon tool compartments for Human Impact Assessment however different techniques, for example, polls are utilized.

3.1 STEP TO PERFORM HIA

The protocol to be followed while considering HIA consists of various steps:

- i. **Screening:** Screening determines the potential health implications of the policy or project under consideration to determine if an HIA is, in fact, required.
- ii. **Scoping:** Key health issues and public concerns are identified that should be considered in the assessment. Health determinants that may be included in the scope of the review include factors such as the social and physical environment (i.e., housing quality, crime rates, and social networks), personal or family circumstances (i.e., diet, exercise, risk-taking behaviour, and employment), and access to public services.
- iii. **Appraisal:** Inside the characterized scope, accessible proof is accumulated and used to assess the potential wellbeing gains or misfortunes. Contemplations ought to incorporate inquiries regarding who will be influenced by the proposed strategy intercession or set of mediations and an audit of benchmark information demonstrating current populace wellbeing status in the spaces characterized as determinants. Forecasts are made as to likely changes in wellbeing status because of the mediation, and potential methodologies that would relieve climate and

wellbeing impacts. Quick or inside and out appraisal techniques might be picked relying upon impediments of time, spending plan and epidemiological/quantitative proof.

- iv. **Reporting:** Ends are drawn from accessible information, and proposals are made that may eliminate/alleviate adverse consequences on climate and wellbeing, and upgrade positive advantages.
- v. **Monitoring:** Action, where appropriate, is taken in order to monitor the actual impacts on health of the intervention, and to enhance the existing evidence base regarding impacts.

To conduct a Human Impact Assessment on the New Parliament project, we created a survey through Google Forms and circulated it to the primary location i.e., Delhi and even remote parts of the country to have their opinion included.

3.2 SURVEY

A survey was performed to assess the human impact to the people living in Delhi and the following are the question asked

1. Whether they have breathing Abnormalities or not.
2. Whether they are awareness regarding EIA/HIA.
3. Importance of HIA in our countries' EIAs.
4. Impact of the New Parliament Project on the prevalent air pollution in Delhi.
5. Possibility of traffic issues increasing owing to the large-scale project.
6. Impact on people who exercise in the Rajpath daily.
7. Impact on the already prevalent Noise Pollution.
8. Possibility of COVID outburst while undertaking the activities of the project.

And according the data came from audience have been recorded and shown below;

1. age group of audience

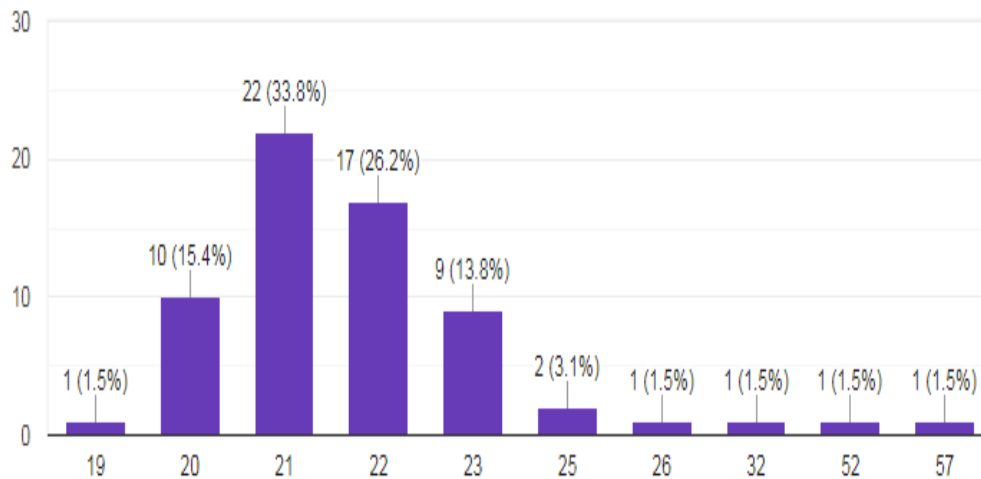


Figure 4. graph of audience age group

Majority of people that were responded to our survey were youth whose age are ranges between 21-22 followed by people of age group 23.

1. The gender ratio of the audience as shown by the pie chart:

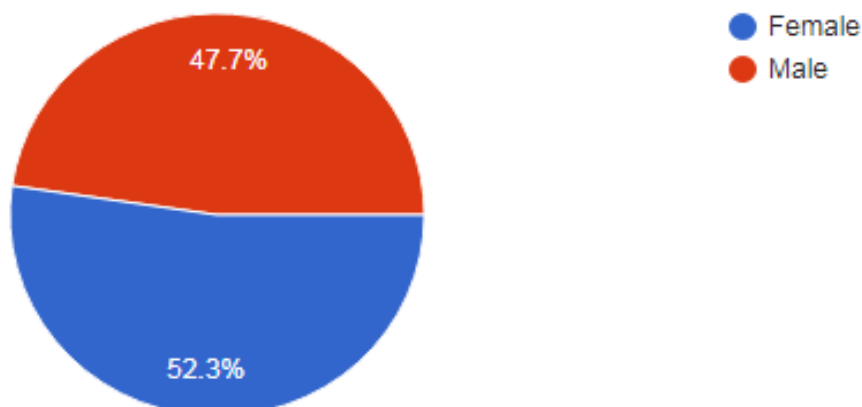


Figure 5. Gender ratio

About 52.3% of our responder were female and 47.7% responds came from the male.

2. Profession of audience

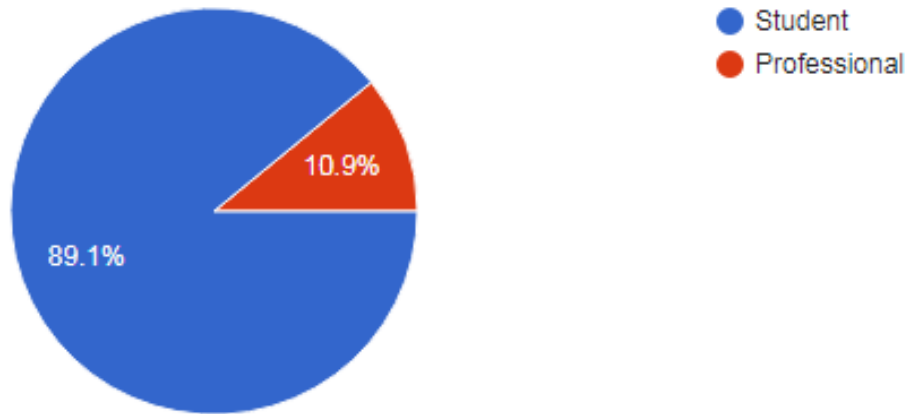


Figure 6. Audience involved in survey

About 89.1% in our audience were student and the rest 10.9% were professionals.

3. People with and without various breathing abnormalities are shown by the following graph:

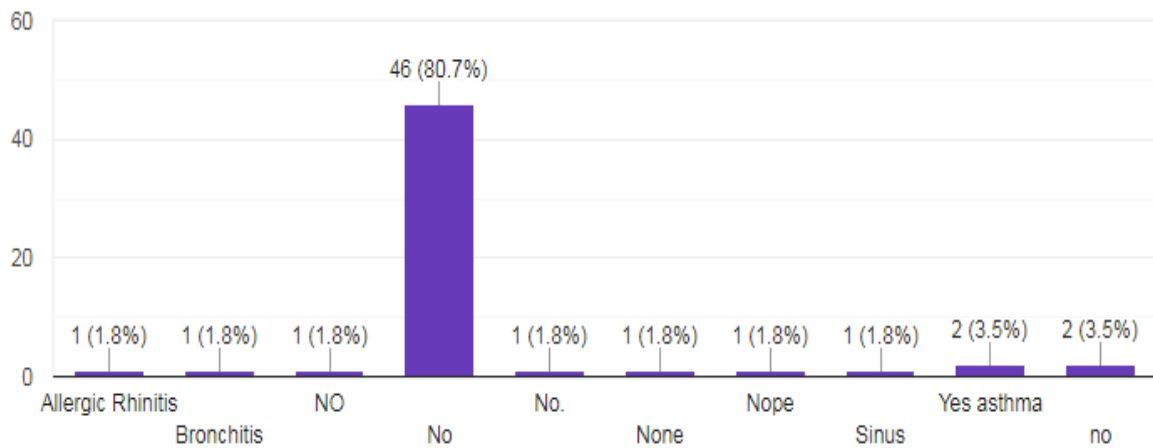


Figure 7. breathing abnormality

This clearly depicts that 1 person in every 11 people have some breathing abnormality.

4. The first question of our survey was: Whether people are aware of what Human Impact Assessment is or not, and the following pie chart shows the results:

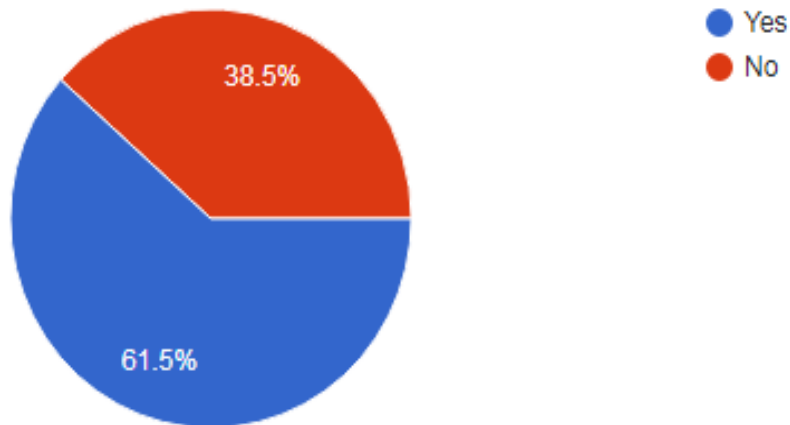


Figure 8. Data showing how aware people are about HIA

As shown above nearly 38.5% people are totally unaware of what Human Impact Assessment is which throws light on the importance and value of HIA in the projects carried out in our country.

- The next question was: What do people feel regarding consideration of importance of Human Health in the EIAs of our country and the results as depicted by the following pie chart:

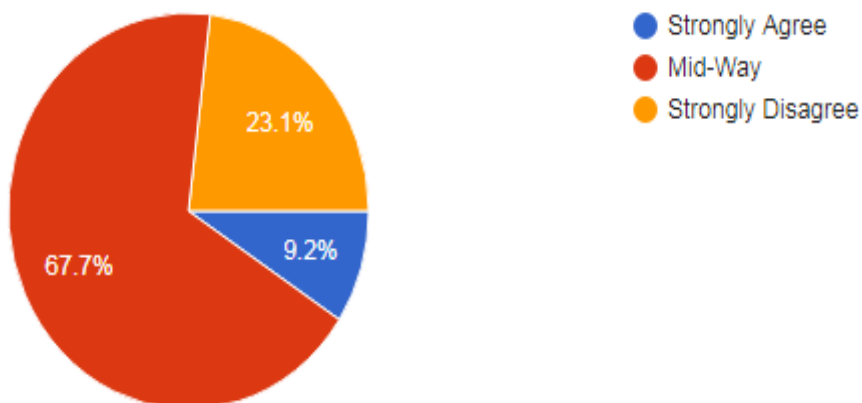


Figure 9. perception of people towards HIA

This is an important revelation as only 9.2% people think that Health is an important factor while preparing an EIA of any project and 67.7% people think that health is only considered moderately while 23.1% clearly disagree to the fact that health is an important factor in the EIAs prepared in our country.

6. The third question was: Whether the New Parliament Project would add on to the already prevalent air pollution in Delhi or not, and the following pie chart shows the answers:

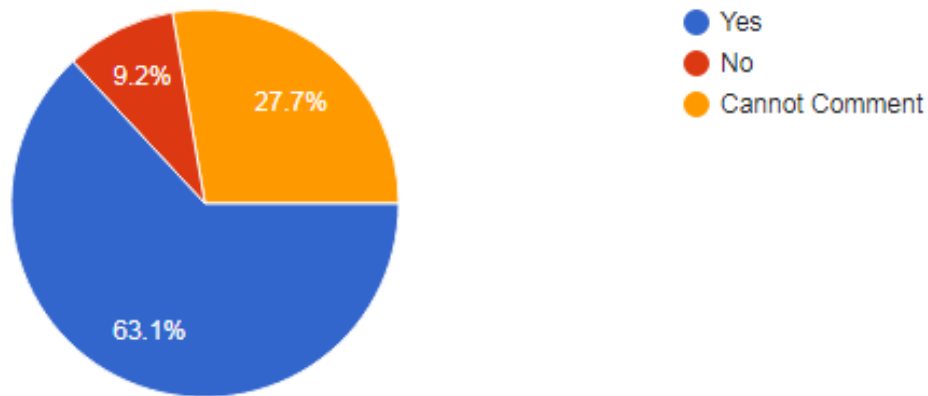


Figure 10. if parliament would add on existing air pollution

While 63.1% people strongly agree to this, 9.2% people completely disagreed to it and 27.7% people had no opinion on this.

7. Since we all are aware of the importance of Raj Path for people who exercise-Run/Jog/Cycle we asked the audience that whether the revamping of Rajpath would cause hindrance to such people or not, and the following are the answers:

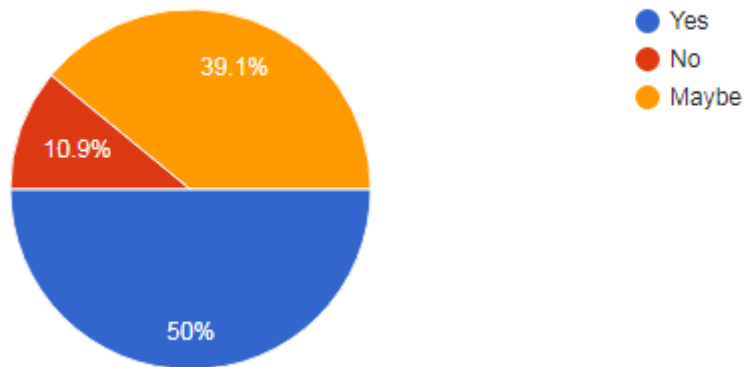


Figure 11. how revamping of Rajpath would cause hindrance to people

While 50% people strongly agreed to the fact that the revamping would definitely cause hindrance to such people, 10.9% people disagreed and 39.1% could not comment on the same.

- Delhi being the capital is home to nearly 1.9 Crore people with nearly 11.2 Million Vehicles (as of 2018 census). So, we asked the audience about their opinion of rise in traffic problems owing to the beginning of the New Parliament project, and the following pie chart shows the answers:

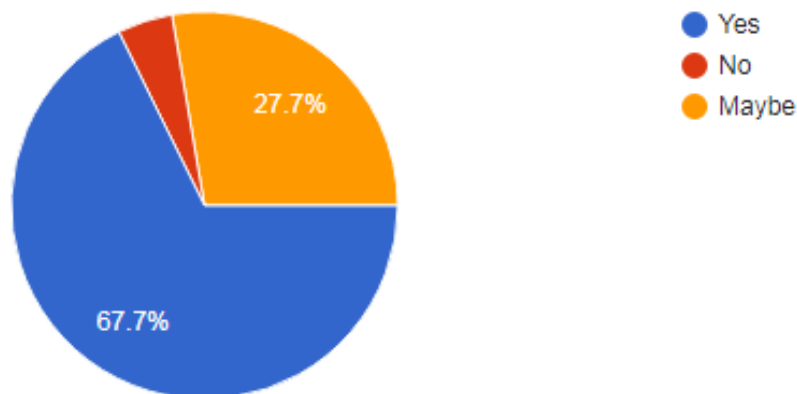


Figure 12. opinion in the rise of traffic problem

While 67.7% people believe that the New Parliament Project would lead to a rise in the traffic problems owing to various activities such as transportation of raw material and other construction material required, movement of labourers/engineers/helping staff and other people of importance for the project, 4.6% people feel that there won't be any rise in the traffic problems in the vicinity and 27.7% people chose not to comment on the same.

9. Since Noise Pollution plays an important role in determining how suitable a particular environment is for the people living in the vicinity, we asked the whether the project would lead to an increase in the noise pollution in the already busy area or not, and the following pie chart shows the answers:

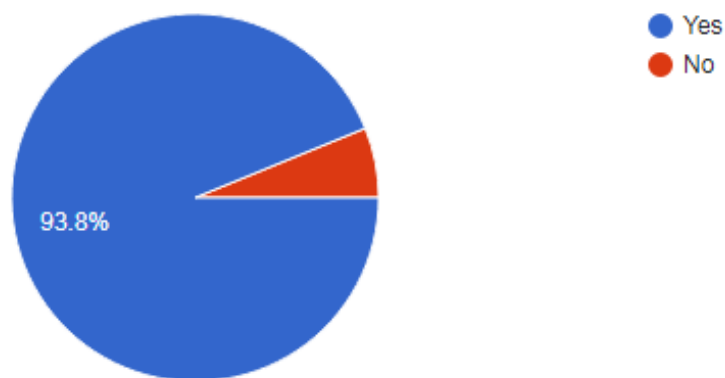
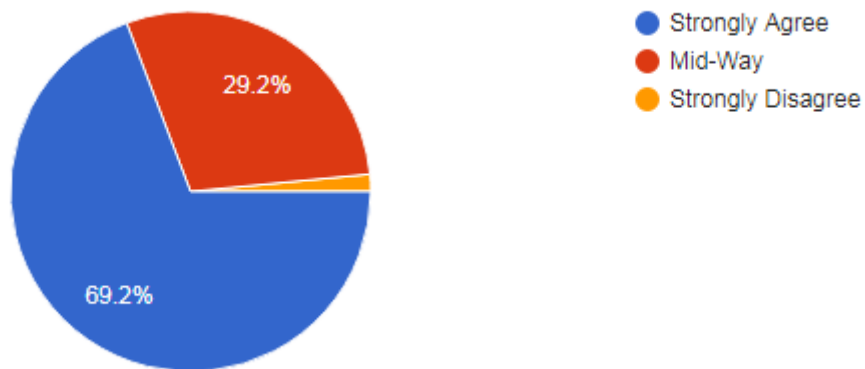


Figure 13. how project would affect noise pollution

As clearly depicted by the chart 93.8% people believe that this project would lead to an increase in the already prevalent noise pollution and disturb the status-quo required for living peacefully.

10. At last, considering the current situation of COVID-19 and especially in an area with an uncontrollable explosion we asked the audience whether according to them the accumulation of so much labour/engineers/helping staff could act as a catalyst in adding on to the already so high COVID covid-19 patient count or not, the following were the answers received:



As clearly shown 69.2% people strongly believe that this could happen while 1.6% people believe that this won't happen and on the other hand 29.2% people couldn't comment on the same.

11. Finally, some other opinions/thoughts were invited from the audience and after compiling them all the following was comprehended:

People believe that at a time when the Indian Economy is struggling and the country is battling the deadly Corona Virus, such a project is not at all required and appropriate. People also believe that such projects in a place like Delhi which is one of the cities with the worst Air Quality Index are not at all required and that primary concerns of the people should be redressed first.

3.3 CONCLUSION OF HIA

As highlighted earlier the primary concern of the Human Impact Assessment is to improve the quality of decisions by analysing the impact of a particular project (either negative or positive) on the people living in the vicinity of the project.

Through our survey we penned the following conclusions:

- i. Since every 1 person in 11 people have some breathing abnormality the rise in levels of air pollution due to the project could either create a worse situation for them or else would act as a probable reason for the deterioration of their health.
- ii. People who commute daily to their work place from home in Delhi feel that there would be possible increase in the traffic issues owing to the project.

- iii. The visits by High Level Officials and Ministers who would be looking after the project could act as a probable hindrance for the daily routine and working of people associated to the area.
- iv. People also feel that the beginning of such a huge project in times of COVID-19 would act as a catalyst in increasing the Corona Positive count.
- v. In a crowded place like Delhi high level of Noise Pollution is already a factor which makes it non-suitable for living and this project would add on to it making it further more unsuitable for quality life.

Overall people are not satisfied with this project and believe it could be another reason to stay away from Delhi to have a quality and healthy life.

Thus, the Human Impact Assessment stays very much oriented towards the notion that this project is not satisfactory to the people and there is an urgent and important need to rethink over it and consider the Human Impact seriously for keeping the spirits of a Democracy high and unshakable.

Chapter 4 AIR QUALITY MODELING FOR PARLIAMENT BUILDING.

As indicated by IQAir AirVisual's 2019 world air quality report; six Indian urban areas are in top ten which have most extreme air contamination making danger general wellbeing and climate simultaneously. Among all urban communities in India, Delhi (the capital of India) was seen to have the 3worst air condition. Vehicular development, developments, businesses, and so forth are a few elements which adds to the ascent in contamination.

4.1 SIMULATION OF AIR QUALITY SOFTWARE

CALROADSView Software

It is the model which was created by Lakes Environmental Software, Canada, 2008. It has different trademark which is dynamic and natural which gives easy to use interface to three California Department of Transportation (CALTRANS) and U.S Environmental Protection Agency (EPA) air scattering demonstrating code which incorporates Caline4, Cal3QHC and Cal3QHCR.

The product enjoys the accompanying benefits;

- The CALRoads View gives simple to-utilize alternatives. that It has different choice which make out of CALINE4, CAL3QHC and CAL3QHCR run stream document.
- It helps in bringing prior input records into the CALRoads View interface from Caline4, Cal3QHC, and Cal3QHCR.
- It helps in simple representation as it can import base guide.
- It gives brings about graphical structure whereby the client can make amazing show of the specific model.
- The model is inherent lattice receptor so the client can easily determine the degree of poison at different areas over the given guide.
- With the assistance of discrete receptor option, user can discover the specific measure of toxin at specific site.

General

The street transportation area is assuming the weak part to ascent of monetary development of any country. IN India street transportation area has enrolled a supportable increment pace of 9.9% throughout the most recent decade. The complete number of enrolled engine vehicles has expanded in a long time from about 21.4 million of every 1991 to around 142 million out of 2011 (MoRTH 2012). The rapidly development of vehicles, distance went by every vehicle types are the main sources of increment the air contamination and diminish the air quality. To decide the level of the various toxins air contamination scattering models have assume the amazing part to over air quality observing. Air demonstrating can give better detail and gauge the toxin fixation at various receptor areas. The CALINE 4 model is most recent modular in CALINE arrangement of models and this is most use in vehicular contamination scattering model to foresee air contamination fixations along the street under provincial and semi-metropolitan conditions. CALINE 4 model is utilized to appraise the vehicular toxin fixation at various receptor in distance of tens to many meters (R. Dhyani et al., 2013). CALINE 4 has been utilized in various urban areas in India to anticipate vehicular toxin fixations along the streets/thruway hallway. In the current examination, single site streets/parkway hallways have been chosen in the Solan District of Himachal Pradesh. The chose site has distinctive geological highlights (bumpy territory) to assess the exhibition of the CALINE 4 model.

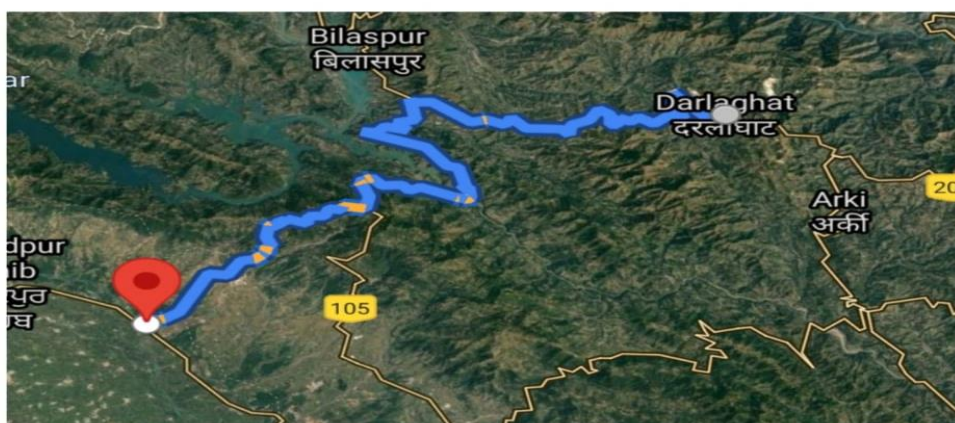


Figure 14. Map showing Darlaghat and Kiratpur road

CALINE 4 model description-CALINE 4 model is the fourth-age straightforward line source Gaussian crest scattering model which helps the client to predicts the grouping of toxins like carbon monoxide, nitrogen dioxide and particulate matter in particular PM2.5 and PM10. specifically site. It has a capacity to anticipate the grouping of toxin for receptors situated inside 200m under given traffic and meteorological conditions. Input information, for example, traffic volume (number of vehicles each hour), meteorological boundaries (wind speed, wind course, encompassing temperature, blending tallness and security class), discharge boundaries (weighted outflow factor, WEF), street math (street width, middle width, street rise), sort of landscape (provincial or metropolitan), foundation convergence of contaminations (ppm or $\mu\text{g}/\text{m}^3$) and pre-recognized receptor areas along the street halls are the significant boundary needed by the CALINE4 to display any kind of poison.. In the current investigation, we will anticipate the convergence of CO along the expressway passages of the two streets with the assistance of this scattering model CALINE4.

4.2 CALINE4 DESCRIPTIONS

For CALINE4, the following parameter are required;

- i. Type of pollutants: select the sort of poison you need to show. Toxins like carbon monoxide, Nitrogen Dioxide, and so forth.
- ii. Molecular weight:Determine the sub-atomic load of the picked toxins.
- iii. Settling Velocity:Calculate the settling speed of the toxins. Settling speed can characterized as the rate at which a molecule falls regarding its quick environmental factors. (recipe to figure settling speed =n/a for Carbon Monoxide and Nitrogen Dioxide). Just a worth more prominent than or equivalent to zero can be utilized in the model.
- iv. Deposition Velocity:calculate the statement speed of picked poison. Testimony speed is the rate at which a contamination can be adsorbed or absorbed by a surface. Just a worth more noteworthy than or equivalent to zero can be utilized in the model.

- v. Aerodynamic Roughness Coefficient: These choice aids in deciding the measure of neighbourhood air choppiness that influences tuft spreading. CL4 offers the accompanying four decisions for streamlined harshness coefficient:

Table 4.1. Roughness coefficient for different landscape

Types of area	Roughness coefficient
Rural	10
Suburban	100
Central Business District:	400

For different landscape of area there is different roughness of coefficient. Roughness coefficient for three different landscape is shown in the table 4.1.

Run Conditions

This tab contains the meteorological boundaries which are needed to run CALINE4 while demonstrating the contaminations where the client need to enter run condition information for each run hour, Hour 1 to Hour 8 for Multi-Run. It contains the accompanying boundary;

- a) Wind Speed: wind speed of particular selected site needs to be included. Generally, wind speed is in meters per second (m/s). It is recommended that the minimum value of wind speed for CALINE4 can be taken as 0.5 m/s and EPA (1992) recommends a value of 1 m/s as the worst-case wind speed.
- b) Wind Direction: The wind direction for selected site is measured clockwise in degrees from the north north=0, east=90, south=180 and west=270). CALINE4 do not run if the worst case is selected.
- c) Wind Direction Standard Deviation: Table below shows the guidance for specifying the statistical standard deviation of the Wind direction for the selected site. CALINE4 requires this value range to be between 5 and 60 degrees.

- d) Mixing Height: mixing height generally means the altitude at which thermal turbulence occurs due to solar heating of the ground. Values of mixing height for the worst-case have very least impact on CALINE4 model results. User should ask permission from the local air district guidance if the extreme condition need to be included. A mixing height of greater than or equal to 5 meters can be taken by CALINE4.
- e) Ambient Temperature: In order to convert mass to volumetric concentration, we need to have the ambient air temperature. A temperature that reflects wintertime conditions should be selected, expressed in degrees Celsius.
- f) Ambient CO Concentration (Pollutant Type = Carbon Monoxide): This action shows the previous foundation level of carbon monoxide which is communicated in parts per million (ppm). CALINE4 adds the previous and displayed CO fixations together to helps in distinguishing the absolute effect at every receptor. Client can Consult the Transportation Project-Level Carbon Monoxide Protocol (produced for Caltrans by U.C. Davis in December 1997) and the nearby air area for additional direction.

Similarly, there are different Ambient for different type pollutant as follows,

- g) Encompassing O3 Concentration (Pollutant Type = ozone): This action mirrors the previous foundation level of O3, communicated in parts per million.
- h) Encompassing NO Concentration (Pollutant Type = Nitrogen monoxide): This action mirrors the prior foundation level of NO, communicated in parts per million.
- i) Encompassing NO2 Concentration (Pollutant Type = Nitrogen Dioxide): This action mirrors the previous foundation level of NO2, communicated in parts per million.
- j) NO2 Photolysis Rate Constant (Pollutant Type = Nitrogen Dioxide): The rate consistent for the photodissociation of NO2, in units of 1/second. The displayed

NO₂ fixations decline when the photolysis rate steady qualities increment; in this way, CALINE4 gives the most moderate assessments to NO₂ focuses when the photolysis rate consistent is set to zero through CL4. Counsel the neighbourhood air area for additional direction on indicating a sensible incentive for the photolysis rate steady.

- k) *NO₂/NO_x Ratio (Pollutant Type = Nitrogen Dioxide)*: The proportion of tailpipe NO₂ outflows versus NO_x discharges. Note that CL4 and CALINE4 require contribution of g/mi NO_x emanations factors (on the Link Activity tab) when displaying NO₂ fixations. This proportion is utilized to change NO_x outflows over to NO₂ emanations from on-street vehicles.

- l) *Encompassing PM Concentration (Pollutant Type = Particulates)*: This action mirrors the previous foundation level of particulates, communicated in micrograms per cubic meter. Note that PM_{2.5} and PM₁₀ are not straightforwardly separated in the CL4 UI or the CALINE4 model capacities, however the information boundaries, for example, surrounding focuses and discharge factors, would be distinctive when demonstrating PM_{2.5} and PM₁₀ individually utilizing CL4 and CALINE4. CALINE4 adds the prior and demonstrated PM_{2.5} or PM₁₀ fixations together to decide the complete effect of PM_{2.5} or PM₁₀ at every receptor. Counsel the neighbourhood air region for direction.

Link Geometry

The Link Geometry tab contains a grid which helps in characterizing the organization of the street which is chosen to show. Each column in the network ought to be so that it characterizes a solitary connection. We can enter an information Up to 20 connections (100 connections if Caline4_100.exe, the 100-interface variant of CALINE4 executable record as present in the program organizer). Connections are characterized as straight-line portions. Furthermore, above all, client should keep in the brain that the distance between the centreline of the bended street and the straight-line connection ought to be no more prominent than 3 meters.

On the off chance that the client enters Invalid data, then the product will demonstrate it as blunder by showing red interjection mark symbol in the column header. Prior to leaping to the following cell, entering the right information in the right arrangement is required. To clear the mistake information entered in the cell and to erase the invalid information, client can press the Esc key from the console.

Information esteems may likewise be reordered to or from lines, segments, and cells inside this, and all, information input frameworks in the CL4 program. The client may wish to get ready information in a bookkeeping page program and afterward duplicate/glue them into these information frameworks.

At the point when the cursor leaves the column its header shading will change from dark to yellow to green demonstrating that no information, some information, or all information have been entered. Just when all information have been provided and the header tone is green will the connection portrayal be passed to the Link Activity tab.

The following options are available under link geometry tab;

- i. Link Description: The software had limited the character of description to 12 and if more than 12-character description are entered then it by default used the first entered 12 character.
- ii. Link Type: The client should choose one of the accompanying five decisions to characterize the kind of street that each connection addresses.

At-Grade: For at-grade joins, CALINE4 doesn't permit the tuft to blend subterranean level which is thought to be at a tallness of nothing. The stature of the connection which is over the ground level should be zero.

Fill: in this connection, CALINE4 takes the worth accepting that wind current follows the surface landscape and undisturbed. Connection Height for fill areas should be range somewhere in the range of nothing and 10 meters (32.81 feet).

Discouraged: For discouraged connections, CALINE4 builds the home season of an air bundle in the blending zone in comparative with the profundity of the street misery.

Blending zone= $W_{tl}+3m$ on each side Where, W_{tl} =width of the traffic lane(s)

Assessed fixations nearby the blending zone are higher than those for a comparable at-evaluation or fill segment. The demonstrated focuses drop all the more quickly downwind of a discouraged connection since vertical blending expansions in with home time. Connection Height for discouraged connections should be among nothing and - 10 meters (- 32.81 feet).

Extension: For connect segments, CALINE4 permits air to stream above and beneath the connection. The crest is allowed to blend descending from the connection, until it arrives at the distance characterized in the Link Height cell. Connection Height should be somewhere in the range of nothing and 10 meters (32.81 feet).

Parking area: Parking parcel connections ought to correspond with the parking garage access ways. The CALINE4 calculations change in accordance with represent the decreased mechanical and warm choppiness expected from sluggish, cold-start vehicles. Connection Height should be zero for parking garage joins.

Endpoint Coordinates:Connections are characterized as straight-line portions. The whole length of each connection should veer off no farther than 3 meters from the centreline of the genuine street. The endpoint arranges, (X1, Y1) and (X2, Y2), characterize the places of connection endpoints.

- The units (meters or feet) are client indicated hands on Parameters tab.
- The length of each connection should be more noteworthy than the blending zone width (see beneath).
- The client should characterize the connection calculation and receptor positions with a predictable Cartesian arrange framework. The situation of the arrange framework beginning is discretionary and at the client's attentiveness. The y-pivot ought to be arranged north-south, with values expanding in the toward the north bearing. The x-pivot ought to be situated east-west, with values expanding in the toward the east heading. The decision of attractive north, genuine north, or some other estimation is at the client's attentiveness. Be

that as it may, the breeze course should be characterized on the Run Conditions tab as per a similar meaning of north.

- A guide of the connection math is appeared on the Receptor Positions tab.

Link Height: For all connection types with the exception of extensions, Link Height addresses the stature of the connection over the encompassing territory. Ground level is characterized at zero meters or feet. The units of measure (meters or feet) are client indicated hands on Parameters tab.

For at-grade connects, the connection tallness might be characterized as nothing. For fill connects, the connection stature should be more prominent than nothing. Notwithstanding, CALINE4 consistently regards the connection like its stature is zero; the information doesn't influence CALINE4 model estimations. Hence, the positive connection tallness worth ought to be utilized for documentation purposes. For discouraged connections, the profundity of the downturn ought to be shown as a negative worth. For parking areas, the connection tallness ought to be characterized as nothing. For spans, Link Height characterizes the tallness of the extension over the surface underneath it (a positive worth).

Blending Zone Width: Mixing Zone is characterized as the width of the street, in addition to 3 meters on one or the other side. The base suitable worth is 10 meters, or 32.81 feet. It should likewise be more prominent than or equivalent to the connection length.

Gully/Bluff Mix: The Canyon/Bluff Mix highlight has not been approved with field estimations. Truth be told, uncommon conditions warrant its utilization; utilize outrageous alert with this component. Clients of this component ought to be completely acquainted with scattering demonstrating, the key reference (D. B. Turner, Workbook of Atmospheric Dispersion Estimates, Environmental Protection Agency, 1970), and the CALINE4 source code. Any remaining clients should leave the Canyon/Bluff info esteems set to nothing, which handicaps the component. On the off chance that it is entered, Canyon/Bluff Mixing Width should be more prominent than one-portion of the Mixing Zone Width.

Link Activity

The Link Activity tab characterizes the degree of traffic and auto emanation rate saw at each connection. Invalid information esteems will be hailed by the presence of a red interjection mark symbol in the column header. A substantial worth should be entered before the cursor can leave the cell. Squeezing the Esc key will clear the blunder and erase the invalid information.

*Traffic Volume:*Hourly traffic volume expected to go on each connection, in units of vehicles each hour. On the off chance that a multi-run situation is chosen for displaying CO focuses, traffic volume should be characterized for every one of the eight hours.

*Emission Factor:*The weighted normal outflow pace of the nearby vehicle armada, communicated as far as grams per mile, per vehicle, for the poison chose. When demonstrating NO₂ focuses, NO_x outflow elements ought to be determined for each connection. Outflow components can be demonstrated utilizing the CT-EMFAC PC model. Emanation rates shift by season of day. Consequently, if a multi-run situation is chosen (for demonstrating CO fixations), discharge factors should be characterized for every one of the eight hours.

Receptor Positions

The Receptor Positions tab contains information contributions for all receptor positions and shows an outline of the connection calculation and receptor positions. Receptors ought to be characterized with a similar Cartesian arrange framework and units of measure as the connection calculation. For every receptor, space is accommodated a 8-character portrayal, the X-facilitate, the Y organize, and the tallness (Z). The most extreme number of receptors is 20 (or 100 if Caline4_100.exe, the 100-connect form of CALINE4 executable record, is available in the program organizer).

Invalid information esteems will be hailed by the presence of a red interjection mark symbol in the column header. A substantial worth should be entered before the cursor can leave the cell. Squeezing the Esc key will clear the mistake and erase the invalid information.

The connections and receptors will show up on the guide in their overall positions however the X and Y scales are not really equivalent. The client may grow the guide window by hauling the program edges or by tapping the program boost button. Zooming in to see map subtleties might be performed by utilizing the mouse to drag a crate around the space of revenue while holding the left catch. To un-zoom, click the left mouse button once.

4.3 SITE STUDY

The site location is Solan District which is one of the major industrial centres of Himachal Pradesh. In solan district setup of many types of industries like cement industries, chemical industries and others types of industries. There are nearly above the 5000 small and large industries in the district which is highest number in over all the state (Department of Industry, 2012). Due to quickly industrialization and urbanization in the solan district, the numbers of motor vehicles have increased day by day in every year. the sites have been selected for the study in the Solan District representing different terrain/topographical features. The site is part of NH-88 corridor at Darlaghat (Shimla to Bilaspur-Manali State Highway) represented by hilly terrain characteristics [1442m above mean sea level (MSL)] with a length of 1.2 km. The road corridors are single carriageway, having width of 16 m (10 m + 3 m at both sites) at both Darlaghat (r. Dhyani et al,2013).

Methodology

we will collect required data such as traffic volume representing the numbers of vehicles passing these roads daily or hourly as per the convenient, wind characteristics (such as speed of winds, direction of winds, etc.) and then we will be modeling out pollutants with the software and then will run the model.

Traffic data

The 24-hour classified traffic volume data the road corridors was collected by manual counting method. The observed different type pattern of traffic flow. To obtain the directional information on age profile (vintage) of vehicles (petrol and diesel), Fuel station surveys were carried out at different fuel stations along site the corridors using a set of questionnaires which included information on registration number, year of registration, fuel type of vehicle, engine technology of the vehicle etc.

Table 4.2. Traffic data for Darlaghat corridor.

Hour	2w	3w	cars	Buses	Trucks
0-1	20	3	152	60	300
1-2	25	5	163	70	350
2-3	30	4	170	75	360
3-4	35	5	180	80	380
4-5	40	4	240	75	450
5-6	45	9	250	95	480
6-7	150	8	260	85	450
7-8	160	9	235	60	450
8-9	170	6	245	50	465
9-10	120	12	240	49	470
10-11	102	13	300	57	480
11-12	105	10	350	98	460
12-13	103	9	298	84	461
13-14	114	5	260	76	465
14-15	150	12	310	84	463
15-16	107	10	367	57	470
16-17	203	4	341	58	460
17-18	165	11	350	45	410
18-19	227	10	220	36	418
19-20	169	9	215	49	427
20-21	202	7	205	50	450
21-22	120	5	170	57	440
22-23	35	4	160	50	420
23-00	30	3	150	45	400

The traffic data including different types of vehicles like 2-wheeler(2-W), 3-wheeler (3-W), cars, buses, etc., are recorded based on hourly and is shown in the above table 4.2.

Traffic flow characteristics along Darlaghat corridor

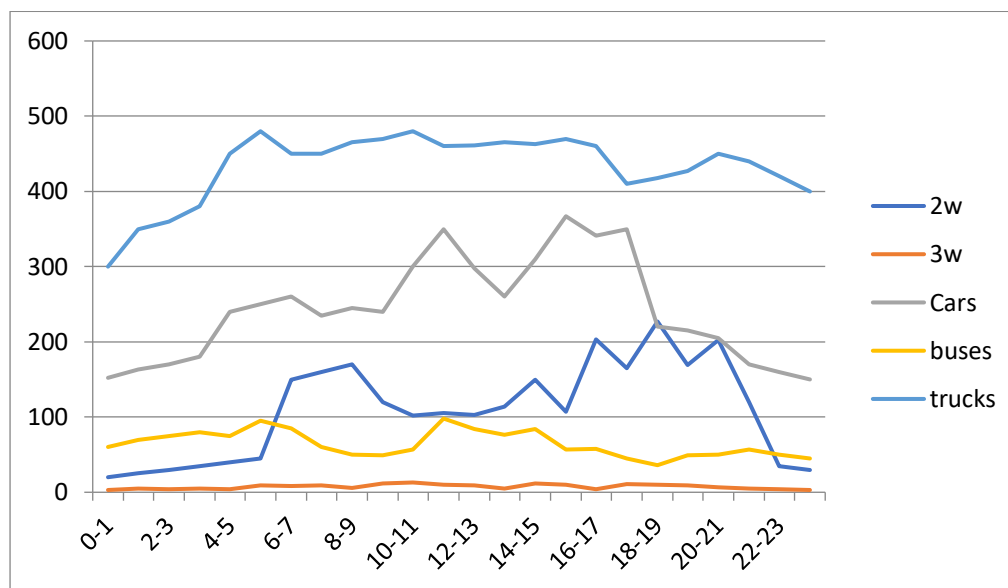


Figure 15. Traffic flow along Darlaghat corridor

The above graph shows that the number of trucks passing through Darlaghat corridor is very high and the number of 3-wheeler vehicles were found to be very less. And for other vehicles such as 2-wheeler, buses and cars, it was found to be the average.

Meteorological data-

The on-site meteorological data for e.g., wind speed, wind direction, temperature and relative humidity was measured at each of the locations in the study area and summarized. The hourly mixing height values were obtained from the Indian Meteorological Department. The meteorological conditions at Darlaghat were observed to be more dispersive in nature. Further hourly wind angle with respect to the measurement locations has been estimated between predominant wind direction and road alignment at the site. Comparative analysis of meteorological parameters at study sites due to incomplete emission factor CO for diesel buses in ARAI report, emission factor for buses has been taken from CPCB (2000); and CO emission factor appears to be on higher side.

Table 4.3. metrological data for Darlaghat

Metrological Parameters for Darlaghat			
	Temperature	Wind Speed(m/s)	Wind Direction
maximum	19	0.9	NE
minimum	6.3	0.5	NE
average	11.8	0.7	NE

The required value for parameter like temperature, wind speed and wind direction for Darlaghat is shown in above Table 4.3.

Table4.4. Hourly value of wind angle and stability class for Darlaghat site-

Hour of the day	Wind Angle(degree)	P-G stability class
0-1	7	F
1-2	6	F
2-3	12	F
3-4	2	F
4-5	8	F
5-6	45	E
6-7	23	B
7-8	75	B
8-9	88	A
9-10	63	A
10-11	33	A
11-12	85	A
12-13	27	A
13-14	6	A
14-15	19	A
15-16	80	B
16-17	53	B
17-18	86	D
18-19	56	D
19-20	33	E

20-21	16	E
21-22	17	E
22-23	7	F
23-24	4	F

For different observed hour, the angel of wind changes different type of stability class. Above Table 4.4 shows the hourly observed wind angle of Darlaghat along with its stability class.

Table 4.5. Emission factors for different vehicle types-

Type	Year	CO (gm/km)	PM (gm/km)
2w	2001-2005	1.65	0.035
	>2006	0.72	0.013
3w	2001-2005	4.3	0.007
	>2006	3.01	0.006
Cars	2001-2005	0.3	0.06
	>2006	0.06	0.015
Bus	2001-2005	3.6	0.56
	>2006	3.2	0.24
Truck	1991-2000	19.3	1.965
	>2000	6	1.24

Source: ARAI (2008)

Different vehicular type emits different level of concentration of various pollution such as carbon monoxide, particulate matters etc. Above Table 5 shows the type of vehicles along with its emission of pollutant i.e, carbon monoxide and particulate matter for observed period. The data is taken from ARAI (2000).

Emission load estimation-

vehicles were gathered in various classification dependent on their wheel type (2-wheeler, three-wheeler, and so on), in light of its ability (transports, trucks, and so forth) with the assistance of outflow factors (ARAI, 2008) and weakening variables (CPCB, 2000), the

all-out emanation heaps of different contaminations viz., CO is determined. Outflow factor that utilized in India are not reliant upon speed and dependent on Indian driving cycle. These discharge factors are accessible for various classes of vehicles and depend on vintage, motor innovation and furthermore fuel quality/type. A few model presentation assessments consider have been completed in ongoing past utilizing these emanation factors (Khare et al., 2012; Sharma et al., 2013, R. Dhyani et al, 2013).

4.4 MODEL SETUP

The convergence of carbon monoxide (CO) under two diverse geological conditions (street hallway) are anticipated utilizing winning traffic and meteorological conditions. Weighted outflow factors have been changed over from g/km to g/mile according to CALINE 4 model necessity utilizing the condition

$$W_{EF} = \sum (N * E_F) / \text{Total No. of vehicles}$$

Where;

W_{EF} = Weight emission factor

N = Number of vehicles of specific sort and explicit year

E_F = emission factor for toxin

One-hour (standard case) average CO focuses was anticipated utilizing the model. With the info boundary, for example, wind speed, wind headings, and so forth the forecast have been accomplished for uneven landscape.

Table 4.6. weighted emission factor for Darlaghat

Hour of the day	W_{EF} (gm/miles)
0-1	10.8
1-2	12
2-3	16.8
3-4	16.6
4-5	14.5
5-6	14.7

6-7	11.9
7-8	11.7
8-9	11.5
9-10	8.6
10-11	7.7
11-12	7.7
12-13	7.4
13-14	8.1
14-15	7.1
15-16	7.1
16-17	7.7
17-18	7.9
18-19	7.7
19-20	6.5
20-21	8.9
21-22	9.8
22-23	12.1
23-24	11.3

Source- (R. Dhyani et. Al,2013).

Above table 4.6 shows the weighted emission factor calculated for 24-hours in Darlaghat (source: R. Dhyani et. Al,2013).

Performance of CALINE 4 model-

Contamination transports and spreading in complex geography are normally hard to demonstrate sensibly. In complex territory winds fields can be profoundly factor on more limited distance. Mean of wind streams and disturbance are essentially adjusted by the intricate geography and auxiliary flows. These conditions are vital in deciding the viability of the scattering of street traffic poison and can't be treated with worked on models (Castelli et al., 2007). The site Darlaghat is encircled by slopes on one side and level territory on the other. The subtleties of every street connection of Darlaghat site (complex territory) alongside range from the Mean Sea Level. CALINE 4 model isn't proficient to consider the variety in height present at site. The mode takes single worth of height esteem

as info information for the entire site independent of the extensive variety in street angle, which is regular in street halls in uneven territory.

Table 4.7. Link geometry of Darlaghat-

Link name	X -coordinate	y-coordinate
R1	683573.12	3457377.82
R2	683803.8	3457315.95
R3	683951.24	3457245.44
R4	684074.18	3457020.07
R5	684187.39	3457005.81
R6	684249.6	3457094.08
R7	684419.00	3457167.15
R8	684895.07	3457285.24
R9	684968.62	3457269.01
R10	685014.73	3457269.01
R11	685014.73	3457123.89

About eleven link geometry with relative x and y-coordinates are collected and tabulated in the above table 4.7.

4.5 MODELLING CARBON MONOXIDE USING CALINE4

Why carbon monoxide?

Breathing air with high centralization of carbon monoxide lessens the measure of oxygen that can be shipped in the circulatory system to basic organs like heart and mind. Carbon monoxides cause a few dangers to individuals breathing it in. it can cause numerous medical problems like tipsiness, disarray, obviousness and passing whenever took in outrageous fixation.

4.6. CALINE4 INPUTS

CL4 v2.1

Job Parameters | Run Conditions | Link Geometry | Link Activity | Receptor Positions | Results | Help | About

Job Filename:

Job Title:

Pollutants

Pollutant Type: Carbon Monoxide Nitrogen Dioxide Particulates

Molecular Weight: 28 Settling Velocity: cm/s Deposition Velocity: cm/s

Aerodynamic Roughness Coefficient: Rural Suburban Central Business District Other: centimeters

Run Type

Standard Worst-Case Wind Direction Multi-Run Multi-Run / Worst-Case Hybrid

Model Information

Link/Receptor Geometry Units: Meters Feet Altitude Above Sea Level: meters

Number of Links: 10 Number of Receptors: 8 Averaging Interval: 8 hours

Figure 16. input data in job parameter

CL4 v2.1

Job Parameters | Run Conditions | Link Geometry | Link Activity | Receptor Positions | Results | Help | About

Run:	Hour 1	Hour 2	Hour 3	Hour 4	Hour 5	Hour 6	Hour 7	Hour 8
Wind Speed (≥ 0.5 m/sec)	0.5	0.5	0.6	0.5	0.5	0.7	0.6	0.5
Wind Direction (0-360°)	30	31	42	30	32	60	39	40
Wind Direction Std. Dev. (5-60°)	53	60	56	33	16	17	7	5
Atmospheric Stability Class (1-7)	2	1	4	5	5	5	6	6
Mixing Height (≥ 5 m)	500	500	500	500	500	500	500	500
Ambient Temperature (°C)	18.6	18.2	17.8	17.4	16	15.2	12	10
Ambient CO Concentration (≥ 0 ppm)	1.8	1.5	0.5	1.2	0.8	0.6	0.5	0.4

Atmospheric Stability Class	Valid Wind Speed (m/s)
1	< 4.0
2	< 5.5
3	< 1000
4	< 1000
5	< 5.5
6	< 4.5
7	< 3.5

Figure 17. input data in run condition.

Link Description	Link Type	X1	Y1	X2	Y2	Link Height	Mixing Zone Width	Canyon/Bluff Mix Left	Canyon/Bluff Mix Right
R1	At-Grade	683753.1	3457377.82	683803.8	3457315.95	0	16	0	0
R2	At-Grade	683803.8	3457315.95	683951.3	3457245.95	0	16	0	0
R3	At-Grade	683951.3	3457245.95	684074.3	3457043.03	0	16	0	0
R4	At-Grade	684074.3	3457043.03	684187.4	3457020.07	0	16	0	0
R5	At-Grade	684187.4	3457020.07	684249.6	3457005.81	0	16	0	0
R6	At-Grade	684249.6	3457005.81	684419.00	3457094.08	0	16	0	0
R7	At-Grade	684419.00	3457094.08	684588.2	3457167.15	0	16	0	0
R8	At-Grade	684588.2	3457167.15	684895.1	3457285.24	0	16	0	0
R9	At-Grade	684895.1	3457285	684968.7	3457269	0	16	0	0
R10	At-Grade	684968.7	3457269	685014.8	3457123.89	0	16	0	0

Figure 18. input data in link Geometry

Link Desc. \ Run:	Traffic Volume (vph) Hour 1	CO Emiss. Factor (g/mi) Hour 1	Traffic Volume (vph) Hour 2	CO Emiss. Factor (g/mi) Hour 2	Traffic Volume (vph) Hour 3	CO Emiss. Factor (g/mi) Hour 3	Traffic \ (vph) H
R1	936	11.5	891	8.6	952	7.4	1073
R2	936	11.5	891	8.6	952	7.4	1073
R3	936	11.5	891	8.6	952	7.4	1073
R4	936	11.5	891	8.6	952	7.4	1073
R5	936	11.5	891	8.6	952	7.4	1073
R6	936	11.5	891	8.6	952	7.4	1073
R7	936	11.5	891	8.6	952	7.4	1073
R8	936	11.5	891	8.6	952	7.4	1073
R9	936	11.5	891	8.6	952	7.4	1073
R10	936	11.5	891	8.6	952	7.4	1073

Figure 19. input data in link activity

CL4 v2.1

Parameters	Run Conditions	Link Geometry	Link Activity	Receptor Positions	Results	Help	About
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EF * 7. 7. 7. 7. 7. 7. 7. 7. 7.

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 3

JOB: HILLY TERRIN
RUN: (MULTI-RUN)
POLLUTANT:

V. RECEPTOR LOCATIONS AND MULTI-RUN AVERAGE CONCENTRATIONS

RECEPTOR	* X	* Y	* Z	* AVG (PPM)
1. 1	* 683753	*****	1.5	* 0.6
2. 2	* 683951	*****	1.5	* 0.7
3. 3	* 684074	*****	1.5	* 1.0
4. 4	* 684187	*****	1.5	* 1.2
5. 5	* 684588	*****	1.5	* 0.8
6. 6	* 684895	*****	1.5	* 0.7
7. 7	* 684969	*****	1.5	* 0.6
8. 8	* 685015	*****	1.5	* 0.6

CL4 v2.1

Job Parameters	Run Conditions	Link Geometry	Link Activity	Receptor Positions	Results	Help	About
----------------	----------------	---------------	---------------	--------------------	---------	------	-------

8 VPH * 920 920 920 920 920 920 920 920 920 920
EF * 7. 7. 7. 7. 7. 7. 7. 7. 7. 7.

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 3

JOB: HILLY TERRIN
RUN: (MULTI-RUN)
POLLUTANT:

V. RECEPTOR LOCATIONS AND MULTI-RUN AVERAGE CONCENTRATIONS

RECEPTOR	* X	* Y	* Z	* AVG (PPM)
1. 1	* 683753	*****	1.5	* 0.8
2. 2	* 683951	*****	1.5	* 0.9
3. 3	* 684074	*****	1.5	* 1.0
4. 4	* 684187	*****	1.5	* 1.2
5. 5	* 684588	*****	1.5	* 0.8
6. 6	* 684895	*****	1.5	* 0.8
7. 7	* 684969	*****	1.5	* 0.7
8. 8	* 685015	*****	1.5	* 0.7

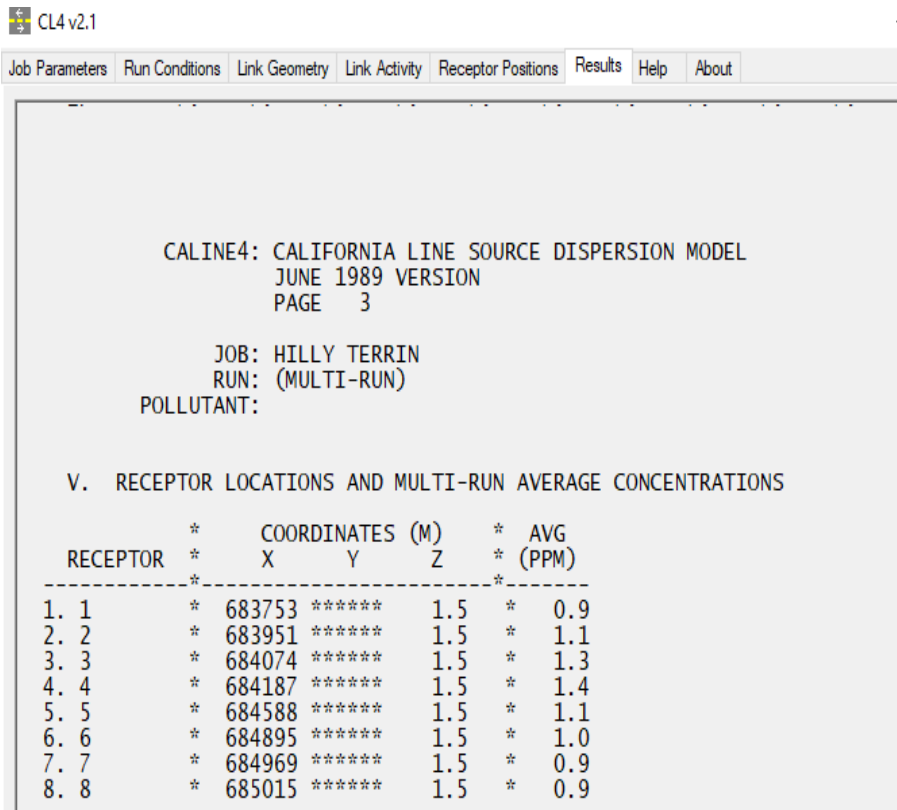


Figure 20. Result obtained from entered data

Table 4.8. Observation table-

Hour	Predicting co(ppm)	Observed co(ppm)
0-1	0.3	0.6
1-2	0.4	0.7
2-3	0.7	1.0
3-4	0.5	1.2
4-5	0.3	0.8
5-6	0.2	0.7
6-7	1.5	0.6
7-8	0.7	0.6
8-9	0.8	0.8
9-10	0.2	0.9
10-11	0.6	1.0
11-12	0.5	1.2
12-13	1.5	0.8
13-14	1.2	0.8

14-15	0.6	0.7
15-16	0.4	0.7
16-17	0.8	0.9
17-18	1.5	1.1
18-19	0.5	1.3
19-20	1.2	1.4
20-21	1.2	1.1
21-22	0	1.0
22-23	0.6	0.9
23-24	0.5	0.9

For 24-hours, the observation has been taken which primarily compares the concentration value of the carbon monoxide (CO) as shown in Table 4.8.

CO concentration at Darlaghat

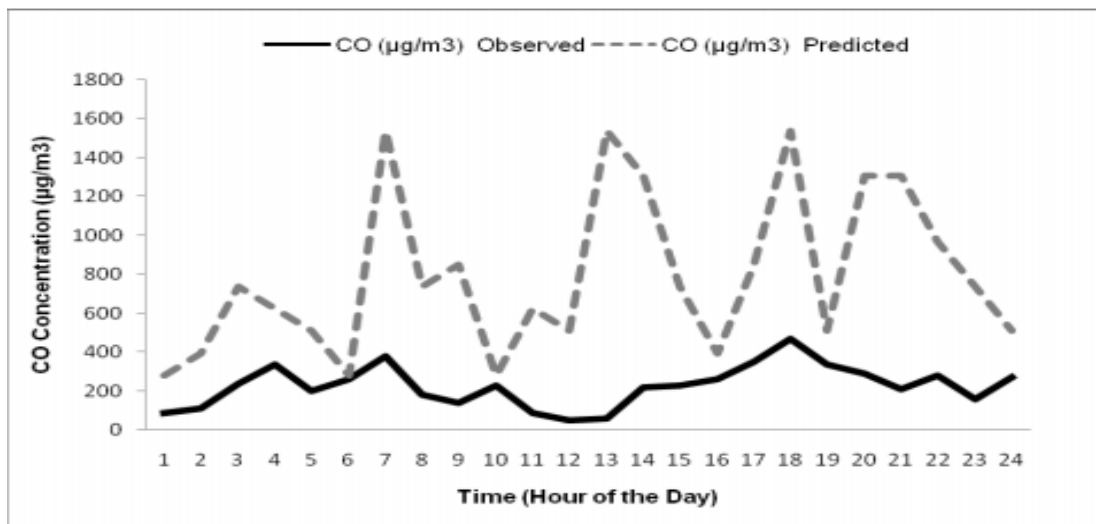


Figure 21. Graph 1 concentration of CO vs. Time for Darlaghat from research

We convert this all data from ppm to ug/m3. And plot the final graph for Darlaghat corridor

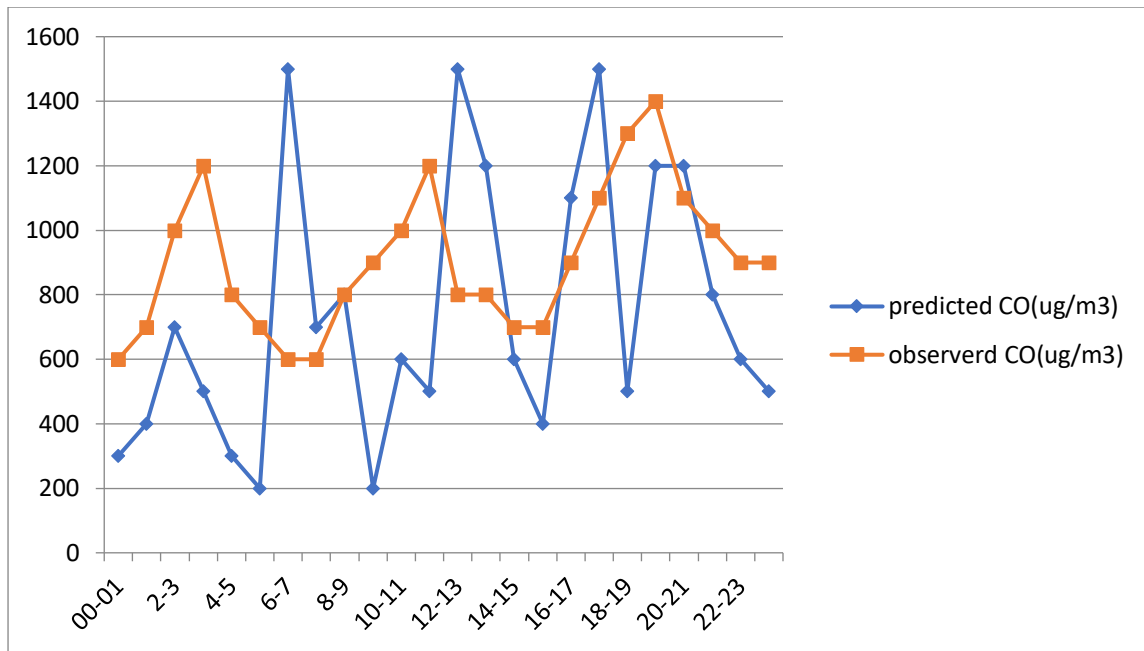


Figure 22. Graph 2 concentration of CO vs. Time for Darlaghat from software

The forecast has been finished utilizing model in Darlaghat which has sloping landscape by contrasting the worth of factual descriptors, i.e., file of arrangement (d), partial inclination (FB) and ordinary mean square blunder (NMSE) remembering the upsides of every boundary as followed;

- $NMSE \leq 0.5$;
- $-0.5 \leq FB \leq 0.5$ (Kumar et al., 2006)
- $0.5 \leq d \leq 1.0$ (Moriassi et al., 2007).

The upsides of d, FB and NMSE were determined to be 0.22, - 1.11 and 1.78, separately for Darlaghat which was inadmissibly execution of CALINE4. The connection amongst noticed and anticipated CO fixation is discovered to be agreeably analyzed Darlaghat ($r = 0.092$).

Statistical parameters for model results are shown below;

Table 4.9. calculated value of parameter for Darlaghat

Parameters	Darlaghat
Correlation coefficient (r)	0.092
Index of agreement (d)	0.22

Fractional bias (FB)	-1.11
Normalised mean square error (NMSE)	1.78

Index of Agreement (IA), Fractional bias (FB), correlation coefficient(r) and normalised mean square error (NMSE) for Darlaghat is calculated and tabulated in the above Table 4.9.

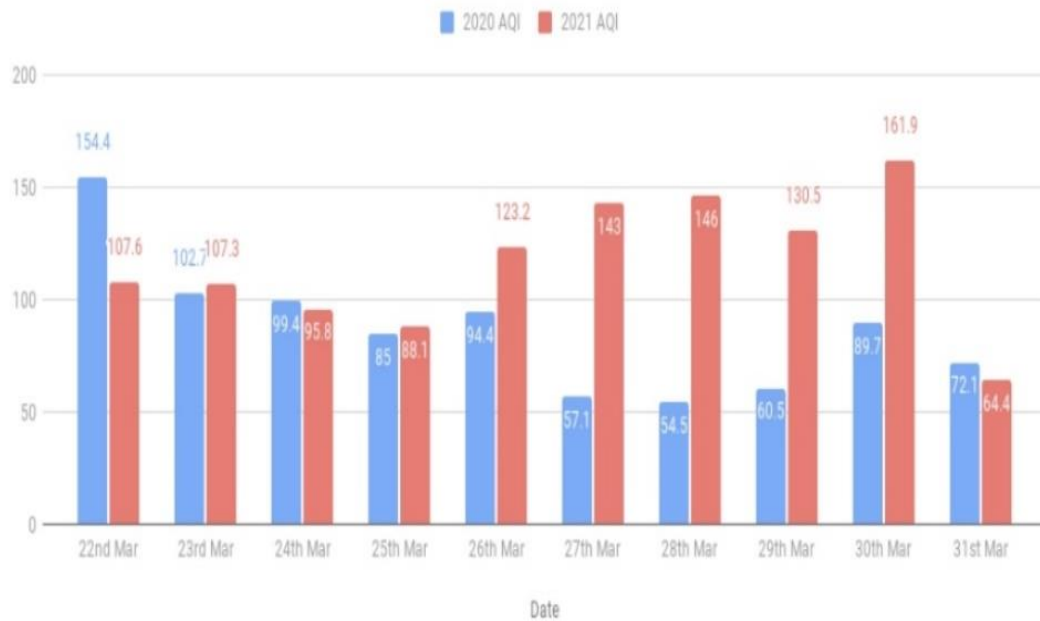
4.7 MODEL RESULT

Diesel fuelled vehicles like trucks, transports and LCV were discovered to be significant contributor of CO and NO_x discharge at both the areas. The higher portion of business vehicle (trucks/LCV) exercises is demonstrative of higher around there. The exhibition of CALINE 4 model has been assessed for foreseeing CO fixations under two unique sorts of territory along roadway passages in Himachal Pradesh.

As the presentation of the model, we could quantify the concentration of carbon monoxide for 24 hours to Darlaghat corridor and we made the graph addressing the concentration of carbon monoxide with time. We gathered not many information from R. Dhyani as they have additionally chipped away at the CALINE4 for a similar corridor. For our situation, the CALINE4 model execution came out more exact as our anticipated worth is a lot nearer to the noticed worth which was appeared in the graph 2. On account of R. Dhyani execution, the CALINE4 model has assessed for CO fixation on the site of Darlaghat passage anticipating CO focus is additionally came out closer and the result is demonstrated in graph 1. At last, in both the case. Anticipated value of CO came out around same in spite of the data entered was extraordinary.

Graph showing the comparison between 2020 and 2021

Delhi - March, 2020 Vs March, 2021



As Covid-19 cleared across the globe killing a great many populaces, everything has been changed when contrasted with the typical days. Development of individuals were limited to keep away from the spreading of lethal infection. With the lockdown, air contamination because of vehicles, planes and production lines have been radically diminished.

Delhi Before covid outbreak



Delhi After covid outbreak



Since the movement of people are restricted after the deadly covid-19, it is found that the level of air pollution in Delhi got reduced drastically. “In Delhi-NCR, one of the major factors that led to the drop in pollution was 97% reduction in overall traffic and 91% reduction in trucks and commercial vehicles entering the capital during April, as compared to the pre-lockdown months of December-January”, the Centre for Science and Environment said a report.

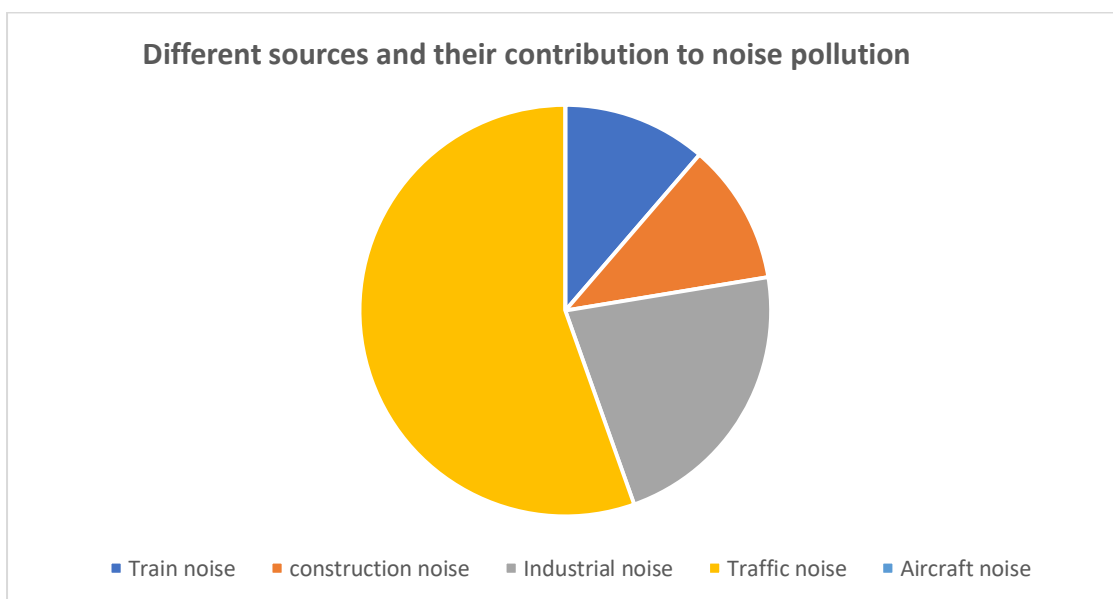
Air Quality Index remained moderate in the month of May 18 to June 5 and the AQI in August with average of 63.8 was observed as the cleanest month of the year (according to CPCB). However, the air condition worsens in the month of October which raises concern.

CHAPTER 5 NOISE POLLUTION DUE TO PARLIAMENT PROJECT

5.1 GENERAL

Noise pollution is also one of the harmful pollutions that brings threats to millions of populations worldwide. Particularly, India has become one of the noisiest countries as they have so many occasions where more noise is being created. Occasion like marriage and even their cremation is accompanied by bands, twists, etc. In addition to that, the cracking of crackers also contributes in production of sounds and in making environment noisy. Several research and survey have been conducted in almost all the country to measures the level of noise pollution and to determine its impact on the public and environment. Similarly, research and survey were done in India by many students and agencies. From research and survey, it was observed that the maximum population residing in Delhi has problem in hearing regardless their age.

5.2 FACTOR AFFECTING NOISE POLLUTION



(Data of 2016)

In 2011, the center for science and environment (CSE) conducted a decibel survey and following observation were made;

- Delhi has some noisiest road in India.
- About 64% of population residing in Delhi were found to have trouble in hearing.

- It was discovered that Delhi has clamor level more than 106dB due to vehicular blaring.

Table 5.1. The standard set by Central Pollution Control Board (CPCB, 2011

Types of Area	Decibel during day(dB)	Decibel during night(dB)
Silence zone	50	40
Industrial zone	75	70
Residential	55	45
Commercial zone	65	55

With the rise in level of noise, the Central Pollution Control Board (CPCB) had come up with some noise level value so that every noise produced from different zone brings minimal impact on it people and surroundings. Table 5.1 is the standard value set by CPCB for four different zone.

Bureau of Indian Standard (BIS) also sets standard for vehicles emitting noise as

- Commercial vehicles=125dB
- Two-wheeler=105dB

5.3 EFFECTS OF NOISE POLLUTION

According to WHO, prolonged noise exposure may lead to

- ✓ Deafness
- ✓ Heart condition
- ✓ Sleep disorder
- ✓ Cognitive impairment
- ✓ Irritation
- ✓ Increased blood pressure

5.4 ACTION OF GOVERNMENT TO CURB NOISE POLLUTION

- A space of 100m around schools, clinics, courts and workplaces were assigned as quietness zone. (Hindustan Times, New Delhi, 2019)
- They have dispatched a commotion contamination helpline in April 2019, so they can have data about the clamours delivered in the specific spots.
- Government orders 'sound limiter' in any open aggress framework or sound framework. Sound limiter is a gadget introduced in a sound framework which works naturally. It estimates the degree of commotion and on the off chance that the degree of clamour surpasses the breaking point, it cuts off the force supply itself.
- Honking is restricted on numerous streets and close to schools and clinics.
- Delhi police presently utilizes sound level meter which estimates the sounds (in dB) and they have fixed the worth according to the proposal of CPCB. What's more, they have chosen to fine the wrongdoer under the Noise Pollution (guideline and Control) Rules 2000.
- Delhi had introduced 15 Air checking station at Anand Vihar, Civil lines, Mandir Marg, Punjabi Bagh and R.K Puram.

5.5 CONCLUSION

Across the globe, it has been troublesome destroying the hurtful sounds that are delivered from such countless exercises like development of vehicles, from public, from enterprises and so on Delhi is probably the noisiest spot in India as numerous specialists saw that the Delhi produces commotion more than its standard level. It was tracked down that about 64% of populace living in Delhi has issue in hearing paying little mind to their age. Administration of India has Implemented such countless standards and guideline so they can diminish the level of the commotion created from different exercises. Regardless of the different principles executed by government, a portion of the piece of Delhi like R.K Puram have been recording the expansion in clamour both during day and night.

CHAPTER 6. CONCLUSION AND RECOMMENDATION.

For the length of one year (from August, 2020 - May, 2021), we have done our significant undertaking on the point Environment Impact Assessment. We chose Delhi parliament building as our site project as it is considered as one of the thickly populated territory in India with bunches of contamination contributed from such countless different activities. In this study, we have limited our investigation to air, noise and also, we have led Human Impact Assessment (HIA) in Delhi. We did some online overview to know the data of individuals living in Delhi with respect to air contamination and we have come to realize that most of populace are being influenced by the dirtied air. On top of that we have perused some exploration paper about how the chose site is being hampered due to clamor and we have seen that about 64% of individuals are losing hearing capacity regardless of their age. Government had executed such countless guidelines however the end of clamors is still yet to be finished.

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