Assessment of GHG Emission Through Cement Plant in India

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Abstract: ***Anthropogenic activities are the important cause of Green house Gases (GHGs) emissions to the atmosphere. The continuous development in Asian region leads significant increase to the global GHGs emissions. The industry sector focused to conduct GHGs inventory assessment in order to know the critical area of GHGs emissions and to find the options for reducing the GHGs emissions [1]. This research uses for estimating the GHGs emissions in a Cement factory through Bilan Carbone method. The activity data was collected at Jai prakash Associates limited (JAL), Jamuna village, Rampur Baghel Tehsil, Satna district, Madhya Pradesh for the 2016-17 season. The current capacity of the Cement plant in Satna are 1.5 MTPA, 2.0 MTPA cement and 35 MW coal based captive thermal power demand of the cement plant.***

I. INTRODUCTION

India, being the second largest cement producer in the world after China with a total capacity of 151.2 Million Tons (MT), has got huge Cement Company. With the government of India giving boost to various infrastructure projects, housing facilities and road networks, the cement industry in India is currently growing at an enviable pace. More growth in the Indian cement industry is expected in the coming years. The cement industry in India is dominated by around 20 companies, which account for almost 70% of the total cement production in India. Total installed capacity of 420 million tons as of June 2017.Domestic consumption to outpace supply in next three fiscals.210 large cement plants account for a cumulative installed capacity of over 420 million tons, while over 360 mini cement plants have an estimated production capacity of nearly 11.10 million tons, as of 2017.

1.1 An Overview of Cement Industry

The history of the cement industry in India dates back to the 1889 when a Kolkata-based company started manufacturing cement from Argillaceous. But the industry started getting the organized shape in the early 1900s. In 1914, India Cement Company Ltd was established in Porbandar with a capacity of 10,000 tons and production of 1000 installed. The World War I gave the first initial thrust to the cement industry in India and the industry started growing at a fast rate in terms of production, manufacturing units, and installed capacity [2]. This stage was referred to as the Nascent Stage of Indian Cement Company. In 1927, Concrete Association of India was set up to create public awareness on the utility of cement as well as to propagate cement consumption.

1.2 GHG Emission and energy consumption in India

The continual insert to in the world population leads to then large use of energy with green house gases (GHGs) emissions increment. The environmental concern has made people aware of GHGs emissions and more attention is paid for using energy rationally or reducing energy consumption without compromising the end-use. The most important input for human development and economic growth is energy. India's economy needs to grow at 8 % to 10 % per year for two to three decades to meet its human development needs [3]. Growth coupled with growing population puts significant stress on natural resources & environment. Major threat to sustainability of India's development arises from energy use [3]. India energy consumption in sector wise show in Fig. 1

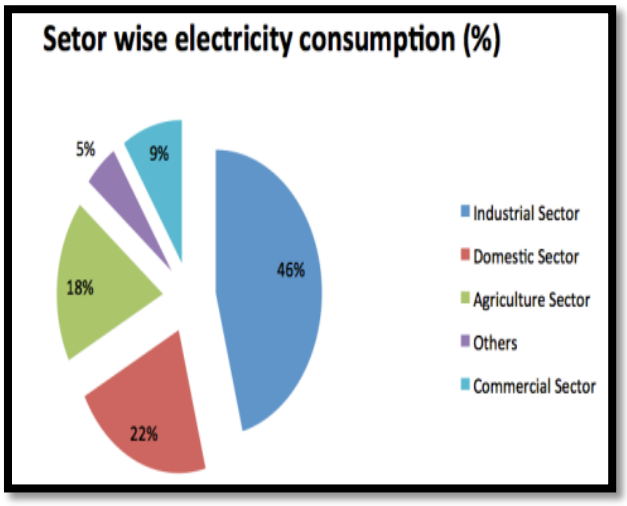

Fig. 1: Sector wise electricity consumption in India [2]

Cement manufacturing is an energy-intensive process. The kiln process consumes around 90 percent of the cement manufacturing energy. The remaining 10 percent is consumed in almost equal amounts by activities related to fuel and raw materials preparation, grinding of clinker and the blending of materials to prepare the finished cement product.

II. MATERIALS AND METHOD

a. Over all methodology

The overall methodology is illustrated in the flow chart (Figure2)

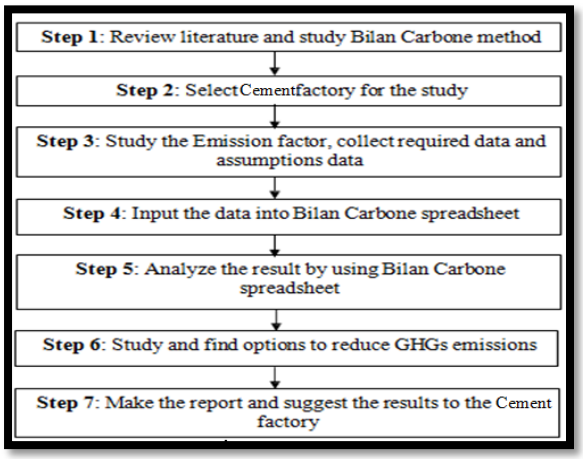

Fig.2: Overall methodology for this study

The details of overall methodology can be explained step by step as following

Step1: Review the literature to have ideas about general in formation of the cement industry and study the Bilan Carbone method for clear understanding the various activities and process which can cause GHGs emissions in cement factory.

Step2: Find and contact the relevant cement factory to ask permission for conducting the study as well as discuss with the mab out objective of the study, activities to be conducted and the data to be collected.

Step 3: Study the emission factor, which is especially related to cement industry, for accurate estimation. Collect required data related to the activities in the scope considered to use the data to input into Bilan Carbone spread sheet. However, if there are some data which cannot be obtained, we may have to assume that data.

III. ESTIMATION OF GHGs EMISSIONS

3.1InformationofselectedCementfactory

Jaiprakash Associates Limited (JAL) proposed to setup an integrated cement plant with a capacity of 1.5 MTPA clinker,2.0 MTPA Cement and 35 MW coal based captive thermal plant to meet the power demand of the cement plant[4]. The plant will be located at Jamuna village, Rampur Baghelan Tehsil, Satna district, M.P.

3.2 The boundary of the study

ThisstudywillfocusontheGHGsemissioncomingfromvariousactivitiesnamely;the energy consumption by factory, the input materials consumption, all of freight transportation related to the factory, waste generated in the factory and assets of the factory. Figure 3showsthe system boundary of this study.

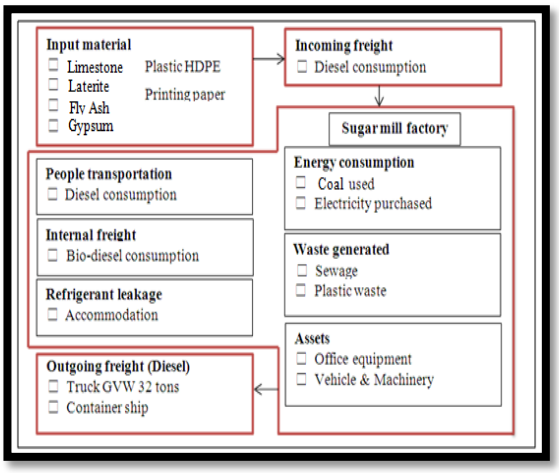

Fig.3: System boundary of the study

IV. ANALYSIS OF THE CAUSES OF GHGS EMISSION

The total annual GHGs emissions from different sources are giving in Figure 4.8.Total 69.5% GHGs emission from incoming material in the cement factory. Excluding in coming material sector, the interesting critical area of GHGs emissions is freight, energy use and travelling of people.

The major in coming material is coal and lime stone which can be accounted for emitting GHGs around 88% of the incoming material sector followed by lime and printing paper, respectively. As mentioned earlier, for the coal and limestone 51% of GHGs emissions.

Freight is the second main source of GHGs emissions. The main source of the freight sector is in coming road freight (52%), this is because the incoming freight of coal and lime stone uses diesel oil as the fuel and much amount of diesel used compared with other type of freight even though it has a short distance [5]. The outgoing maritime is accounted for 30% of this sector, even though it has very less emission factor, but because of long distance, it cause the higher GHGs emissions. The outgoing road freight is accounted for14% followed by internal freight 4%.

For the energy use sector, the GHGs emissions from this factory are mainly from the combustion of coal for generation of electricity and steam to use in the factory. Coal is the biomass source (renewable source) for the energy generation, thereby, if the factory considers for the CDM project, electricity generation by coal can be calculated for the GHGs emission reduction. There as on is because the factory generates electricity from biomass, which account for carbon neutral source, to use and sell then it can compensate the electricity generation of India sent to the grid [6].

Travelling of people is one of the sources for GHGs emissions due to the use of diesel. The bus used for home-work travelling purpose is the main cause of the

GHGs emission which accounts for 72% for this sector followed by mini bus which is around 25%. The bus has very high specific fuel consumption; thus, it consumes high level of fuel which can lead to emitting high level of GHGs emissions.

This study does not consider the CO_2 from the coal life cycle because the CO_2 can be absorbed. The carbon foot print (CFP) of this factory can be highly around 2.02kg CO_2 eq per kg of cement with the main source of GHGs emissions is from coal combustion, because in the cement factory uses coal as main fuel for producing steam and electricity [7].

In India the highest carbon foot print (CFP) from the cement factory. For example, the CFP of cement production at Brazil was 0.24 kg CO_2 eq per kg of cement, and the CFP of 0.22kgeq CO2per kg of cement is obtained.

V. CONCLUSION

This study estimates the GHGs emissions from a cement factory inIndiain2016-17 season by using the Bilan Carbone method. The activities considered for GHGs emissions estimation are energy use, refrigerant leakage, input material to factory, transportation of goods and people, waste generated and assets owned by the factory. For accurate estimation of GHGs emissions, the emission factors used are supposed to relate to the specific factory and country. However, for some of emission factors are not available and observed to not vary much for different regions, the emission factors from Bilan Carbone tool are used.

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