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Environmental setting with EIA for detection of air quality monitoring and noise level monitoring around cement plants in nearest IMD-SIDHI Region (M.P.)

[1] Anoop Singh Gaharwal, [2] Naveen Gaurav, [3] A P Singh, [4] Hira Singh Gariya, [5] Bhoora

[1,] Environmental Officer Jaypee Sidhi Cement Plant JP Vihar, Sidhi, M.P.

[2, 4, 5] Department of Biotechnology, S G R R P G College Dehradun, U.K.

[3] Department of Botany Govt. P.G. Science College, Rewa, M.P.

Abstract

The description of the environmental setting also referred to as baseline, existing, background or affected environment is an integral part of an environmental impact study. There are two major purposes of describing the environmental setting of the proposed project area in an impact study, namely to assess existing environmental quality, as well as the environmental impacts of the alternatives being studied, including the no-action or no-project alternative and to identify environmentally significant factors or geo-graphical areas that could preclude the development of a given alternative. Additional purposes of describing the setting include to provide sufficient information so that decision makers and reviewers unfamiliar with the general location can develop an understanding of the project need, as well as the environmental characteristics of the study area. In EIA the term 'impacts' is used instead of effect of activities and environment is broadly interpreted for physical, biological and social aspects. Environmental Management is the process of utilizing optimum present resources both natural and man-made, so that impacts on environment can be minimized satisfying human needs.

Keywords: Environmental setting, environmental impact study, environmental quality, reviewers unfamiliar, study area, EIA, Environmental Management, physical, biological, social aspects

Introduction

Environmental impact assessments (EIA) can be defined as the systematic evaluation & identification of the potential impacts of proposed programs, plans, projects, or legislative actions relative to the biological, chemical, physical, socio-economic and cultural, components of the total environment are defined in Environmental impact assessments. The main aim of the EIA is to encourage the consideration of the environment in planning and decision-making (Canter, 1996) [4].

EIA is used as a decision aid tool rather than decision making tool. Improvement in training for practitioners, best practice guidance and continuing research have all been proposed by Jay *et.al.*, (2007) [10].

The concept of resource management and environmental protection has frequently been given due attention and interlinked in all facts of life. These methods provide moment for public to live in perfect cooperation with nature on continuous basis. Nevertheless, increasing pace of urbanization, changing life styles, infrastructure development and industrialization have caused tremendous environmental pollution and degradation (Chopra *et.al.,* 1993) [5], Environmental Impact Assessment (EIA) is as a legal tool for upcoming development activities by the Environment Protection Agency (Biswas 1996) [2].

"Environmental Impact Assessment (EIA) is a systematic process that examines the environmental consequences of development actions, in advance." (Glasson *et.al.*, 1994) [8].

Environmental Impact Assessment (EIA) is an efficient method for preserving natural resources and protecting the environment. It involves individual assessments of (Morris and Therivel, 2001) [13]. It is thus anticipatory, participatory, and systematic in nature and relies on multidisciplinary input (Glasson *et.al.*, 1994) [8]. This make, EIA a management tool to be linked closely to examine the effects of project providing impact on environment in its entire life cycle. (Wood, 1995) [14]. It also ensures integration of environmental concerns in decision making (Feldmann, 1998) [6].

3. Material & Methods

Meteorology data have been obtained from the IMD-Sidhi, which is the nearest IMD station to the project site. The data collected from IMD, Sidhi includes wind speed, wind direction (recorded in sixteen directions), temperature, relative humidity, atmospheric pressure, rainfall over a period of last two years. The monthly maximum, minimum and average for all the parameters collected except wind speed and direction. The predominant wind directions during the study period are west to east and east and northwest. The year may broadly divided into following season winter season (December to February), Pre-monsoon season (March to May-Summer), Monsoon season (June to September), Post monsoon season (October to November-Winter).

The methodology adopted for monitoring surface observation is as per the standard method given in Bureau of Indian Standards (IS: 8829) and Indian Meteorological Department (IMD). Work zone ambient air monitoring is carried out on monthly basis at mine site to cover the areas of Blasting, Drilling, Loading, Transportation (Haul road) operations. Dustfall is also measured for one month in every season excluding the monsoon season. In addition to this, the ambient air quality should be monitored at nearby villages. Air Quality comprises of observing the concentrations of SPM (Suspended Particulate Matter), Respirable Dust Fraction (<10µ size), Sulphur Di-oxide, Oxides of Nitrogen and CO levels and free dustfall by gravity. The procedure of sampling and analysis is as per the IS 5182 and its relevant parts, while the standards for comparison is taken as the limits prescribed by CPCB.

Air Quality
Air Quality Survey Methodology
Sampling Location Selection

The monitoring network design for air quality surveillance programme is based on the following consideration:

- Synoptic scale meterological conditions
- Study area topography
- Represtatives of regional background air quality for obtain baseline status and,
- Represtatives of likely impact areas

The analysis of Air samples were made as per standard methods given in Central Pollution Control Board (CPCB) (IS: 5184) and American Public Health Association (APHA, 1995) [1]. The sampling protocol was as per CPCB and/or MoEF guidelines as applicable.

Air Sampling Location

AAQM stations were set up at eight different location. The environmental setting around each monitoring station of sampling duration for TSPM, PM_{10}, SO_2, NOx is 08 hourly continuous samples per day and CO is sampled for 4 hours continuous thrice a day. This is to comparison with the current revised standards methods mentioned in the MoEF gazette notification (16th November, 2009). Dust samplers of Envirotech instruments were used for monitoring PM_{10} (<10 micron), and gaseous pollutant like SO_2 and NOx. Charcol filled glass tubes have been used for collecting the samples of carbon monoxide and the CO levels were analyzed through Gas Chromotgaphy techniques.

Sampling and Analytical Techniques: TSPM, RPM, SO_2, NOx and CO

The fine dust (>10 micron) forming the respirable fraction passes the cyclone and is retained by the filter paper. The TSPM is estimated by summing up the SPM and RPM fractions collected separately as above. A tapping is provided on the suction side of the blower to provide suction for sampling air through a set impinger. Samplers of gases are drawn at a flow rate of 0.2 Liters per Minute (LPM). TSPM and RPM have been estimated by Gravimetric method (IS: 5182, Part-IV), Modified west & Geake method (IS: 5182, Part-II, 1969) has been adapted for estimation of SO_2, Jacob-Hochheiser method (IS-5182, Part-VI, 1975) has been adopted for the estimation of NOx. Charcol filled glass tubes have been used for collecting the samples of carbon monoxide. The CO levels were analyzed through Gas Chromotgaphy techniques.

Locations of Ambient Air Quality Monitoring Stations

Sites Code	Name of the Station	Distance (km)	Direction	Environment Setting
		W.R.T. Jaypee Sidhi Cement Plant		
AAQ1	Study site	-		Core zone for cement plant
AAQ2	Govindgarh Village	5.6	NNW	Residential / Rural zone
AAQ3	Hinauti Village	3.4	SW	Residential / Rural zone
AAQ4	Suhila Village	3.8	S	Residential / Rural zone
AAQ5	Dhaurhara Village	1.5	E	Residential / Rural zone
AAQ6	Baghwar Village	4.4	E	Residential / Rural zone
AAQ7	Gorahatola Village	3.4	ENE	Residential / Rural zone
AAQ8	Sarada Village	1.0	SSW	Residential / Rural zone

Dust Fall Measurement

Dust fall was measured 08 locations using dust fall jars. The dust fall jar was installed at all AAQ Locations and monitoring out for one month in each season. The jar was filled with 2.5 liter of water. The water in the jar was mixed with copper sulphate solution (0.02 N solutions) to prevent any growth of algae. A funnel having a diameter of 206 mm was attached to the top of the jar on which dust falls and slides into the jar. The water level in the jar is constantly maintained in such way that the 2.5 liter of water is retained. After one month the water is analyzed for pH, calculated by using the following formula.

Factor=$127.35x10^4/d^{2,}$ Factor=$127.35x10^4/(206)^2$=29.998

Where d=diameter of funnel i.e. 206 mm in present case. The factor is multiplied to the mg of dust collected to get the dust deposition in mg/m^2.

Noise Level Monitoring Method

The night noise levels have been monitored during 10 PM to 6 AM and day noise levels during 6 AM to 10 PM at all the selected sites covered in ten kilometer radius of the study area. Noise level was monitored at 8 locations in the study area on 12 hour basis and equivalent noise levels should be submitted. The data of ambient noise levels for day & night were recorded in around cement plant, using precision noise level meter (Make-High tech/Cygnet) baseline technology, India. Modeling exercise has been carried out in order to estimate noise level at various location due to cement plant along with associated facilities. Noise levels were measured at 2 m distance from source of noise around the plant environment. Noise and vibration generated by the blasting of limestone were also measured at a distance of about 100 m.

4. Results

The cement plant is located at Majhgawan village, Rampur Naiken Tehsil, Sidhi District of Madhya Pradesh. The study area/cement plant falls is situated at Latitude 24º 19' 35" N and Longitude 81º 19' 08" E and at an elevation of about 325-m above Mean Sea Level (MSL). The adjoining captive limestone revenue mines i.e. Majhigawan, Budguwana and Hinauti limestone mines within the 10 km radius of the cement plant. The cement plant is located at about 24-km

(aerial) from Rewa in southern direction. The Environmental setting within 10 km of the cement plant is given in Table 4.1.
Toposheet representing location map of the study area covering land use/land cover, reserve forests, wildlife sanctuaries, national park etc within 10 km of the study site.
Jaypee Sidhi Cement Plant has come into operation in year 2009. The plant is pyro-processing technology with Make- L&T- Separate Line Calciner (SLC) Rotary kiln, Coolex cooler modified duoflex low NOx burner with capacity 6-stages low pressure cyclones preheater. The cement production process is based on dry process. Production capacity of Cement plant is 2.0 million Cement, 1.5 million Clinker tonne per annum & 35 MW Captive Power Plant.

Table 4.1: Baseline Data of Environment Setting

Sr. No.	Particulars	Details
1	**Location**	
	Village	Majhgawan
	Longitude	81° 19' 08" E
	Latitude	24° 19' 35" N
	State	Madhya Pradesh
	District	Sidhi
	Tehsil	Rampur Naikin
2	Elevation above MSL	326 m
3	Climatic Conditions of Sidhi (IMD Sidhi)	
	Rainfall	1132.7 mm
	Mean wind speed	3.9 kmph
	Predominant wind direction	W,SW,N
	Temperature	Max:37.4 °C Min:8.0 °C
	Relative Humidity	Max:68% Min:42%
4	Nearest major city with 2,00,000 population	25 kilometer (Rewa)
5	Nearest City	25 kilometer (Rewa)
6	Nearest Airport	150 kilometer away i.e. Khajuraho
7	Nearest Railway station	24 kilometer away i.e. Rewa (NW, aerial)
8	National Highways	NH-7 (24 kilometer, NW) NH-75 (2.3 kilometer, E)
9	Reserved Forests	0.2 kilometer (Govindgarh Reserved forest) 9.0 kilometer (Bardaila reserved forest) 8.8 kilometer (Shikarganj reserved forest)
10	Wildlife Sanctuaries	The Son Gharihal sanctuary is situated at District Sidhi and distance about 8.3 km,
11	Industries (radius of 10 km)	Budguna LS Mines, Hinauti, Majhigawan,
12	Nearest Ponds/Lake	7.5 kilometer away (Bansagar reservoir) 6.2 kilometer away (Govindgarh Lake)
13	Nearest River	9.6 kilometer (Son River)
14	Nearest Hill Ranges	320-685 MSL (Govindgarh)
15	Villages within 1 kilometer radius surrounding the project	Dhaurhara, Karijhar, Majhgawan,
16	Type of Soil	Silty
17	Irrigation Facilities in 10 kilometer radius	Irrigation are done by borewells and Canal from Son river
18	Seismic Zone	II^{nd} Zone, (Part-1) IS-1893 2002

Table 4.2: NOx Emission Factors and Concentrations

Process/Kiln Type	Type of Control	NOx Emission Factor (kg/ tonne of clinker)	NOx concentration (mg/Nm3)
Pre-Heater/Pre-Calciner kilns	None	0.4-4.0	200-2000
	SNCR	0.4-0.8	200-400
Pre-Heater kilns	None	1.3-5. 5	650-2550
Long dry kilns	None	3.1-5. 8	1550-2650

Table 4.3: SO_2 Emission Factors and Concentrations

Process/ kiln type	Type of Control	Oxides of sulphur emission factor (kg/ tonne of clinker)	Oxides of Sulphur Concentration (mg/Nm3)
Pre-heater kilns and PH/ Pre-Calciner Kilns	None	BDL-0.50	BDL-150
Long dry kilns	None	4.9	2450
	Dry Scrubbers	< 0.80	< 400
	Activated coke	< 0.1	< 50

Table 4.4: Major Pollution control Equipments & Stack Attached (Source-JAL)

Sr. No	Pollution Control Devices attached with	Pollution Control Devices installed	Make	Stack Height above ground (m)	Stack Dia(m)
1	Lime Stone Crusher Stack	Bag filter	Baltec	32	0.75

2	Raw Mill / Kiln Stack	Bag house	Alstom	110	4.20
3	Cooler Stack	ESP	Alstom	52	4.20
4	Cement Mill Stack	Bag house	Thermax	52	1.70
5	Coal Mill	Bag house	Alstom	74	1.68
6	C.P.P.	ESP	Thermax	84	3.20
7	Packer	Bag filter	Alstom	35	0.80
8	All transfer point at raw material handling	Bag filter	Alstom	Point source emission limit-50mg/Nm^3	

Table 4.5: Expected Noise Levels at Cement Plant

Sr. No.	Location	Noise Levels dB(A)	Place of Monitoring
Cement Plant			
1	Limestone Crusher	76-80	Operators Cabin
2	Raw Meal Bins	86-100	Ambient Noise
3	Raw Mill –I	86-100	3 m from Equipment
4	Raw Mill – II Fan	85-100	3 m from Equipment
5	Kiln String Fan	76-96	3 m from Equipment
6	Calciner String Fan	76-96	2 m from Equipment
7	Coal Mill Main Motor	82-88	1 m from Equipment
8	Coal Mill Fan	85-90	1 m from Equipment
9	Coal Mill Blower Room	85-90	2 m from Equipment
10	Compressor House	82-105	2 m from Equipment
11	Pump House	85-89	3 m from Equipment
12	Kiln Main Motor Area	85-90	3 m from Equipment
13	Cooler ESP Fan	85-90	3 m from Equipment
14	Cooler Area	85-90	1 m from Equipment
15	Cement Mill	85-90	1 m from Equipment
16	Cement Mill ESP Fan	85-90	1 m from Equipment
17	Packers 1 and 2	75-80	Workers Exposure

Table 4.6: Summary of Ambient Air Quality Results-Year-2010 All Observed Unit In (Mg/M^3)

Sr. No.	Code No.	Location Name	SPM	PM_{10}	SO_2	NOx	CO
1	AAQ1	Study site	340.0	77.3	14.7	16.4	426
			±8.84	±2.01	±0.38	±0.43	±11.08
2	AAQ2	Govindgarh Village	293.8	50.3	13.9	15.7	364
			±2.94	±1.01	±0.31	±0.35	±8.01
3	AAQ3	Hinauti Village	329.9	47.7	13.1	14.8	355
			±8.25	±0.76	±0.21	±0.24	±6.39
4	AAQ4	Suhila Village	315.4	36.4	11.4	13.7	304
			±5.05	±0.36	±0.11	±0.14	±3.05
5	AAQ5	Dhaurhara Village	325.6	49.5	13.5	15.3	336
			±7.81	±0.89	±0.24	±0.28	±5.38
6	AAQ6	Baghwar Village	312.4	53.8	14.1	15.9	378
			±4.37	±1.29	±0.34	±0.38	±9.07
7	AAQ7	Gorahatola Village	318.8	55.6	14.4	16.1	404
			±5.74	±1.39	±0.36	±0.40	±10.10
8	AAQ8	Sarada Village	319.5	42.5	12.6	14.5	323
			±7.03	±0.60	±0.18	±0.20	±4.52
Minimum			293.8	36.4	11.4	13.7	304.0
			±2.94	±0.36	±0.11	±0.14	±3.04
Maximum			340.0	77.3	14.7	16.4	426.0
			±8.84	±2.01	±0.38	±0.43	±11.08
Average			319.4	51.6	13.5	15.3	361.3
			±6.39	±1.14	±0.27	±0.31	±7.23

Table 4.7: Summary of Ambient Air Quality Results-Year-2011 All Observed Unit In (Mg/M^3)

Sr. No.	Code No.	Location Name	SPM	PM_{10}	SO_2	NOx	CO
1	AAQ1	Study site	350.0	70.3	13.8	15.5	366
			±9.10	±1.83	±0.36	±0.40	±9.52
2	AAQ2	Govindgarh Village	293.8	51.2	12.6	13.9	321
			±2.94	±1.02	±0.28	±0.31	±6.42
3	AAQ3	Hinauti Village	319.9	45.4	10.7	11.9	319
			±8.00	±0.45	±0.15	±0.17	±5.74

4	AAQ4	Suhila Village	305.4	46.2	10.5	11.5	274
			±4.89	±0.65	±0.11	±0.12	±2.74
5	AAQ5	Dhaurhara Village	305.6	50.7	11.9	12.9	309
			±5.50	±0.91	±0.21	±0.23	±4.94
6	AAQ6	Baghwar Village	302.4	53.7	12.9	14.1	345
			±4.23	±1.29	±0.31	±0.34	±8.28
7	AAQ7	Gorahatola Village	308.8	57.1	13.1	14.7	349
			±6.18	±1.43	±0.33	±0.37	±8.73
8	AAQ8	Sarada Village	309.5	49.8	11.1	12.7	296
			±6.81	±0.80	±0.18	±0.20	±4.14
Minimum			293.8	45.4	10.5	11.5	274.0
			±2.94	±0.45	±0.11	±0.12	±2.74
Maximum			350.0	70.3	13.8	15.5	366.0
			±9.10	±1.83	±0.36	±0.40	±9.52
Average			311.9	53.1	12.1	13.4	322.4
			±7.49	±1.17	±0.24	±0.27	±7.09

Table 4.8: Summary of Dustfall Result in Surrounding Area Year-2010-2011

S. No.	Location	Direction	Dust fall (mg/m²/day)
1	Study site	-	224±6.05
2	Govindgarh Village	NNW	136±1.50
3	Hinauti Village	SW	148±2.22
4	Suhila Village	S	165±3.63
5	Dhaurhara Village	E	150±2.66
6	Baghwar Village	E	155±3.10
7	Gorahatola Village	ENE	167±3.84
8	Sarada Village	SSW	210±5.04

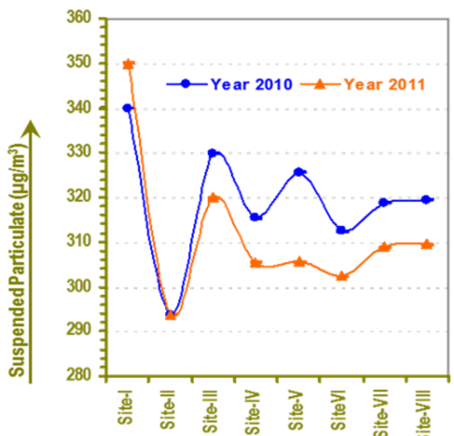

Fig.4.6 &4.7a Line Diagram Showing Suspended Particulate Matter (SPM) for the year 2010 & 2011

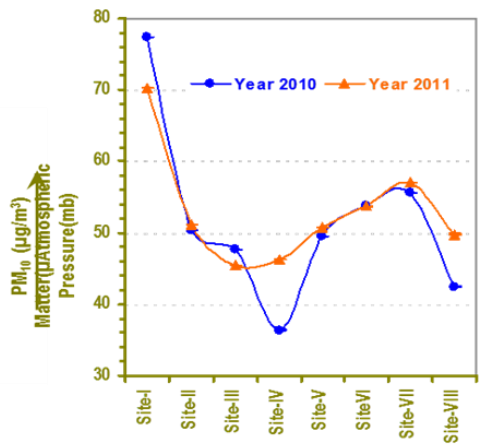

Fig.4.6 &4.7b Line Diagram Showing PM_{10} for the year 2010 & 2011

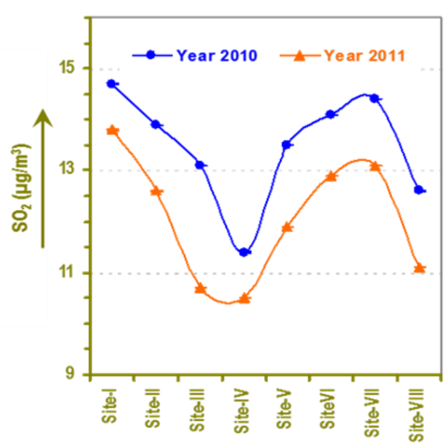

Fig.4.6 &4.7c Line Diagram Showing SO_2 for the year 2010 & 2011

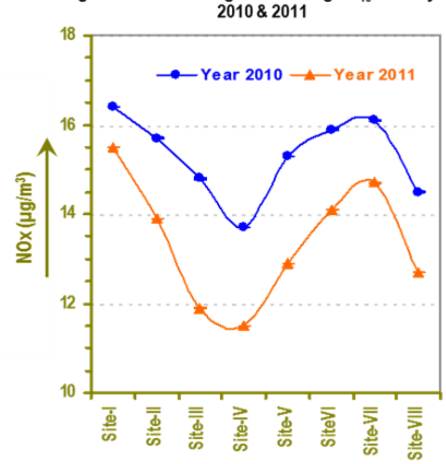

Fig.4.6 &4.7d Line Diagram Showing NOx for the year 2010 & 2011

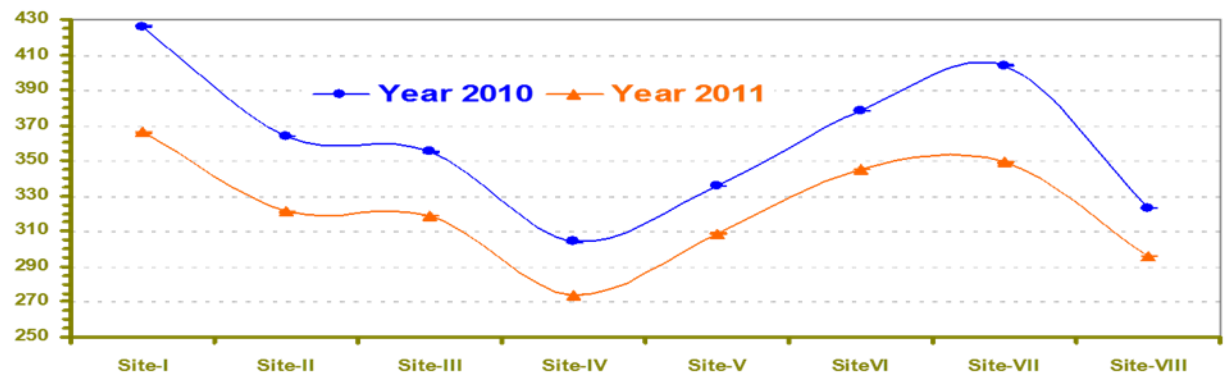

Fig.4.6 &4.7e Line Diagram Showing CO Level for the year 2010 & 2011

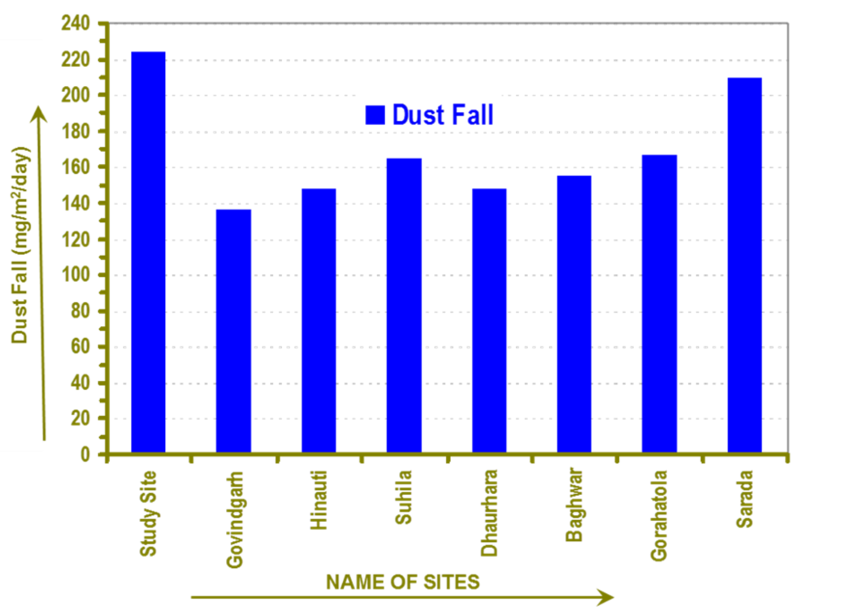

Fig.4.8 Bar Diagram showing Dust fall in different sites for the year 2010-11

The combustion air in the kiln system contains nearly 79% of Nitrogen. NOx is formed during combustion, Nitrogen oxide as NO comprises 90% or more of oxides of Nitrogen emitted from cement kiln stack, and balance of NOx consists of), NOx forms by direct oxidation of atmospheric Nitrogen. At relatively lower temperature (≈ 1200 ^{O}C) in the Calciners, formation of thermal NOx ceases. Any Nitrogen contained in the fuel used can be oxidized to NOx at any of the combustion temperature that exits in the kiln system. Prompt NOx is formed by fuel-derived radicals such as CH and CH_2, reacting with atmospheric N_2 in hydrocarbon flames. NO is then formed by subsequent oxidation. Once HCN and CN are formed, they can also lead to formation of NO. Prompt NOx, formed through such mechanisms, is a minor component of total NOx emissions from a precalcinator kiln system. NOx emission factors and emission concentrations for different types of processes/ kilns.

The results are tabulated in Table 4.2.

Sulphur may occur in small amounts in raw materials for cement manufacturing, and also in fuels, particularly pet-coke. The release of oxides of sulphur is attributed to combustion and counter-current flow of solid materials and hot combustion gases. SO_2 generation is mainly from the readily volatile sulphur compounds, in the form of either Sulphide or organic compounds. This takes place at about 300 – 600 ^{O}C in the upper cyclone stages of the preheater system. Sulphur, which is not readily volatile, is liberated at about 900 ^{O}C at the kiln inlet region and is reabsorbed in the lower region of the preheater. Cement manufacturing process has in-built de-sulphurisation mechanism. From the raw materials, lime and alkali react with sulphur compounds and trap it in the clinker. Nearly 70 to 90% of sulphur gets trapped in this way, and only 10 to 30% would appear in the stack gases. The emission factor and concentrations in the flue gas reported by different agencies are represented in the Table 4.3.

High Efficiency Electrostatic Precipitators (ESP) with 4 fields for Clinker Cooler, CPP & High efficiency Bag house for Raw mill & Kiln, Coal mill, Cement mill has already been installed. Bag filters have been installed at all the transfer points for control of fugitive emission at all the transfer points. Dust collected from air pollution control equipment are recycled (100%) in the process. Major Pollution control Equipments & Stack are represented in Table 4.4.

The noise generation from the cement plant can be broadly categorized into two type's viz. Area and Point sources. All the equipment will be designed to comply with the Factories Rules and Stipulations and will not exceed 90 dB (A) at 1-m distance. The likely noise levels of machinery are given a perusal of the above table reveals that the noise levels from all-important equipment vary in the range of 70-105 dB (A). High noise levels [>90 dB (A)] may be recorded near raw meal and cement mills. All this noise generating equipment will be enclosed and continuous presence of workers is not required at this equipment. People working at high noise generating equipment will be provided with earplugs. The results are noted in Table-4.5.

Ambient air quality results for the year 2010 was analysed. The minimum and maximum concentration for TSPM was observed as 293.8±2.94 μg/m^3 and 340.0 ±8.84 μg/m^3. The minimum concentration was observed at Govindgargh and the maximum concentration was observed at Study site. All the results are found to be low and high when compared to the standard limt of 500 μg/m^3 as per NAAQS, 1994. The minimum and maximum concentration for PM_{10} was observed as 36.4±0.36 μg/m^3 and 77.3±0.38 μg/m^3. The minimum concentration was observed at Suhila and the maximum concentration was observed at Study site. All the results are found to be low and high when compared to the standard limit of 100 μg/m^3 as per latest NAAQS, 2009. The minimum and maximum concentration for SO_2 was observed as 11.4±0.11 μg/m^3 and 14.7±0.38 μg/m^3. The minimum concentration was observed at Suhila and the maximum concentration was observed at Study site. All the results are found to be low and high when compared to the standard limt of 80 μg/m^3 as per latest NAAQS, 2009. The minimum and maximum concentration for NOx was observed as 13.7±0.14 μg/m^3 and 16.4±0.43 μg/m^3. The minimum concentration was observed at Suhila and the maximum concentration was observed at Study site. All the results are found to be low and high when compared to the standard limit of 80 μg/m^3 as per latest NAAQS, 2009. The minimum and maximum concentration for CO was observed as 304±3.05 μg/m^3 and 426±11.08 μg/m^3. The minimum concentration was observed at Village Suhila and the maximum concentration was observed at Study site. All the results are found to be low and high when compared to the standard limit of 80 μg/m^3 as per latest NAAQS, 2009. The results are tabulated in Table 4.6.

Ambient air quality results for the year 2011 was analysed. The minimum and maximum concentration for TSPM was observed as 293.8±2.94 μg/m^3 and 350.0±9.10 μg/m^3. The minimum concentration was observed at Govindgarh and the maximum concentration was observed at Study site. All the results are found to be low and high when compared to the standard limit of 500 μg/m^3 as per NAAQS, 1994. The minimum and maximum concentration for PM_{10} was observed as 45.4±0.45 μg/m^3 and 70.3±1.83 μg/m^3. The minimum concentration was observed at Hinauti and the maximum concentration was observed at Study site. All the results are found to be low and high when compared to the standard limit of 100 μg/m^3 as per latest NAAQS, 2009**.** The minimum and maximum concentration for SO_2 was observed as 10.5±0.11 μg/m^3 and 13.8±0.36 μg/m^3. The minimum concentration was observed at Suhila and the maximum concentration was observed at Study site. All the results are found to be low and high when compared to the standard limit of 80 μg/m^3 as per latest NAAQS, 2009**.** The minimum and maximum concentration for NOx was observed as 11.5±0.12 μg/m^3 and 15.5±0.40 μg/m^3. The minimum concentration was observed at Suhila and the maximum concentration was observed at Study site. All the results are found to be low and high when compared to the standard limit of 80 μg/m^3 as per latest NAAQS, 2009. The minimum and maximum concentration for CO was observed as 274.0±2.74 μg/m^3 and 366.0±9.52 μg/m^3. The minimum concentration was observed at Suhila and the maximum concentration was observed at Study site. All the results are found to be low and high when compared to the standard limit of 80 μg/m^3 as per latest NAAQS, 2009. The results are given in Table 4.7.

The minimum & maximum concentration for dustfall was observed in selected sites in the year 2010-11. The minimum dust fall was recorded 148±2.22 mg/m^2/day in village Hinauti while maximum dust fall value was recorded 224±6.05 mg/m^2/day in study site followed by decreasing value recorded in village Sarada village 210±5.04 mg/m^2/day, Gorahatola village 167±3.84 mg/m^2/day. The results are tabulated in Table 4.8.

5. Discussion

In past, the choice of new programs and projects was based on one criterion: economic viability. Today, second, third choice criteria, environmental and social impact, have become a strong yardstick, hence the triple bottom line approach (environmental, social and economic) to project viability (Modak & Biswas, 1999) [12]. The biggest weakness of an EIA process is that there are generally only provisions for legislative compliance and not necessarily that of continuous improvement or even a holistic approach to sustainable operation. There is evidence to support that the current process as it stands is weak in achieving the goals of environmental and biodiversity protection (Buckley, 1995, Macintosh, 2004, Hughes, 1999) [3, 11, 9]. Despite the deficiencies of the EIA process, it is a necessary but insufficient step towards ensuring a commitment towards sustainable development; certainly, the effective execution of an EIA on the part of the proponent can lead to a higher propensity of acceptance of the project both legally and socially (Gibson, 2006b) [7]**,** but further progress towards sustainable development relies on companies going beyond the minimal compliance level and utilising additional tools.

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