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RESEARCH ARTICLE OPEN ACCESS

Dust Emission Due To Stone Crushing Activities in Kondhwa Region (Pune)

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ABSTRACT
Construction industry might be a major industry on the planet as around a large portion of the populace rely upon the advancement enterprises straightforwardly or in a roundabout way. It's a spine all things considered for top-level augmentation in the nation economy. Be that as it may, the impact of crushing units, construction activities or other such exercises are major testing faces for all areas like India, Pakistan, Bangladesh, China, Canada. While past research primarily manages the wellsprings of residue, wellbeing suggestions and control measures, practically zero has been done to investigate the conduct of those who are at risk for its administration. The contaminated air, water or commotion poison generally blends in the human day by day and influences the animal additionally sways on the condition and biological system. The contamination of air are PM_{10}, $PM_{2.5}$, SO_x, NO_x, unstable synthetic compound contamination power has reached an elevated level. The aftereffects of this examination uncovered that work's and individuals who are working in the construction sector are the first cuts of people uncovering consistently medical issues like respiratory issues, liver, malignancy, inability, hypertension, inconvenience, rest unsettling influence, and other cardiovascular unfriendly impacts.
The aggregate crushing industries are responsible for heavy dust emission in the selected research area. The dust falling in the area was found more than expectations which impairs visibility and hence increases risk of accidents on road. The dust fall in the Katraj area was recorded in this research work.
Keywords: Dust, Dust fall, Crushing Industries, Dust pollution control.

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I. INTRODUCTION

The construction sector could be a major sector for every nation's development. All the residents legitimately or by implication associated within this sector as it's the most well-spring of about 30% of source of income of the populace inside the world. About half of the inexhaustible and non-sustainable assets used in the construction sector make the lodging industry less economical in the world.[1] Assessing the assets which are being used in construction of structures are as follows:
i) Vitality 45% to 50%
ii) Water 50%
iii) Materials used in building and street (by mass) 60%
iv) Farming area utilizes 80%,
v) Timber item utilizes 60% out of which 90% use as a hardwood.

It obviously shows that this industry might be a major industry inside the world but since certain negative impacts of construction activities on the environment have been severely disliked by the specialists of this sector. [2, 3]

Particulates (dust) are created from different exercises of building destinations unearthing, boring, mass material transportation, loading and unloading; outside material storage, cement and mortar making; cut and fill activities; and development of equipment and yet not constrained to. These significant exercises have critical effects on the current Environment. Dust contamination can cause various medical problems among construction laborers and lots of studies have restricted this issue. Also, protection, consolation and the morale of employees is suffering from dust pollution. Dust additionally makes issues with the area and is considered to be a nuisance.[4] Numerous construction methodology, such as penetrating and granulating, can create an elevated level of particulates which will be breathed in into the lung, and therefore bring about physical diseases.[5,6] Cities where the contamination level is high into alarm on these

nations and wish to have practical experience in this effect of construction and decide certain answer for construction sway. During this time if changes in the act of development then there will be relief of Construction contamination. [7]
Typically, there are three most important sorts of dust determined on Construction sites [8].

Table 1: Types of construction dust

Type of Dust	Application	Causes
Silica	Silica-containing materials, like concrete, mortar and sandstone	it can cause silicosis, COPD and lung cancer
Wood	Softwood, hardwood and wood- based materials, like plywood and MDF	Can cause COPD and asthma. Hardwood dust can cause nasal cancer.
Mixed/lower toxicity	Materials that contain very little or no silica, like gypsum, marble and limestone	Can cause COPD, mixed dust pneumoconiosis and more minor changes in lung function

Source: https://www.kelvinpowertools.com/blog

Air quality is affected by particulate matter formed due to activities like transportation, construction, production and agriculture. Mainly, phototoxicity of cement dirt has been stated by Pierce(1910), Bonhe(1963), and Darley (1966). In recent years, SreeRangasamy&Jambulingam (1973) mentioned reductions in the grain yield of maize crops and SreeRangasamy et al. (1973) observed modifications in the composition and frequency of plant ecotypes in a cement dust-polluted area.

II. LITERATURE REVIEW

National ambient air quality standards-incorporates PM_{10} and $PM_{2.5}$ the possibility of the advancement of principles is to gracefully a sound for protecting general wellbeing from unfavorable impacts of air contaminants, to take out or decrease presentation to unsafe air poisons, and direct national/neighborhood experts for contamination control choices. CPCB changed and advised in 2009,the National ambient air quality standards.(https://www.cpcb.nic.in) for 12 parameters viz. carbon monoxide gas(CO), nitrogen dioxide(NO_2), sulfur dioxide(SO_2), particulate (PM) of yet 2.5 microns size ($PM_{2.5}$), PM of however 10 microns size (PM_{10}), ozone (O_3), lead (Pb), Ammonia (NH_3),benzo (a) Pyrene (Bap), Benzene (C_6H_6), Arsenic (As), and Nickel. The initial eight parameters incorporate PM(PM_{10} and $PM_{2.5}$), have present moment (1/8/24hours) and yearly measures(with the exception of CO and O_3) and rest four parameters have just yearly gauges.[15]

Construction residue can genuinely harm the soundness of construction laborers and whenever uncovered for expanded occasions can inevitably even murder them. Around 22,000 to 52,000 people for each year are kicking the bucket on account of breathing in dirtier air in the USA alone- the majority of whom are construction laborers. In Great Britain, more than 500 construction laborers are accepted to bite the dust per annum from carcinoma. America and Europe have sanctioned standards to relieve the outcomes of residue. In India, however, there are a few guidelines simply like the Factories Act.1948, Mines Act.1952, Metalliferous Mines guideline,1961, and Building and other construction Workers (Regulation of Employment and condition of services) Act.1996 and rules , they determine a lot higher restrictions of particulate and silica dust which are destructive to construction laborers. Also, these cut off points are infrequently forced. The standards co-ordinated towards construction water removal, plastic packs, r smoke discharged from fireplace of concrete plants are acceptable, yet regularly present just on paper inconsistently executed.[16]

Construction exercises that add to air contamination include: land clearing, activity of diesel motors, destruction, consuming, and working with harmful materials. All building destinations create significant levels of residue (commonly from solid, concrete, wood, stone, silica) and this can convey enormous separations over an extensive stretch of time. Construction dust is delegated PM_{10} - particulate issue under 10 microns in breadth, undetectable to the unaided eye. Research has demonstrated that PM_{10}enters profoundly into the lungs and causes a wide scope of medical issues including respiratory sickness, asthma, bronchitis and even malignancy. Another significant wellspring of PM_{10} on building locales originates from the diesel motor debilitating vehicles and overwhelming gear. This is known as diesel particulate issue (DPM) and comprises residue, sulfates and silicates, all of which promptly consolidate with different poisons in the climate, expanding the wellbeing dangers of molecule inward breath. Diesel is additionally liable for

outflows of carbon monoxide, hydrocarbons, nitrogen oxides and carbon dioxide. Poisonous fumes from oils, pastes, thinners, paints, treated woods, plastics, cleaners and different risky synthetic substances that are generally utilized on building locales, likewise add to air contamination.[17]

Damage from poisonous dusts, together with that aming from cement kilns, is nicely recognized (Pierce,1910). But, limestone dust of little, if any direct toxicity. It may have an effect on plant leaves by means of interference of stomatal features (Ricks & Williams,1974). By modifying the prevalence of foliar disorder (Manning, 1971) or with the aid of altering the optical properties of the leaves, as mentioned underneath. In one case limestone dust has been pronounced to regulate the increased styles and community composition of oak forest (Brandt & Rhoades 1972). Limestone dust might also affect the optical properties of leaves. Utility of various white dusts has been investigated for the motive of reducing the transpiration/photosynthesis ratio of vegetation through the manner of increasing their albedo (Serginer,1967; Abou Khaled et al.,1970).

III. METHODOLOGY

The dust fall was determined by glass beaker method at certain altitude. The area nearby Katraj, Pune was selected as study area which is surrounded by many crushing units. The stone crushing activities emits huge dust in the area.

The study area is the southernmost part of Pune city. Study was conducted at Yewalewadi. Yewalewadi is situated around 2 kms from Khadi Machine Chouk next to Sinhagad Academy of Engineering Kondwa. The study stations were selected based on few parameters like wind directions, altitude, exposure to crushing units etc.
The study stations were selected as follows:

A. Yewalewadi (Glass Beaker ID A1 & A2)
B. Khadi Machine Chouk (Glass Beaker ID B1 & B2)
C. Wadachiwadi (Glass Beaker ID C1 & C2)
D. Trinity College (Glass Beaker ID D1 & D2)

The dustfalls were recorded at all the stations by Glass Beaker method. Two glass beakers were placed at all the stations for 6 to 7 weeks. The method was chosen from the study of Saha and Padhy. Their research paper published on Shorearobusta and Madhucaindica foliage in Lalpahari forest was referred for the dust fall computation [24].

The Cylindrical Glass Beakers were cleaned and dried before placing at the study stations. The initial weight of the glassbeakers was recorded and then placed at the study station for a certain period of time. After a certain duration of open exposure of glass beakers, they are removed and final weight was recorded. The dust fall was calculated by deducting initial weights from final weights of respective glass beakers. The dust fall was noted as PM mass in grams. The determined dust fall was measured in g/m^2.day

$$Dustfall\ Measurement = \frac{Mmass(g)x\ 1}{\pi r^2 x\ 24}$$

In the above stated formula M mass(g) is the weight of dust collected in the glass beaker, (πr^2) is the top cross sectional area of the beaker mouth in m^2, 1 denotes one day duration of the glass beaker exposure, the area of opening of the cylindrical glass beakeris (diameter 6cm & height 10cm)
The dust was determined for 6 to 7 weeks in which temperature changes from low to high. As the temperature changes and increases day by day the dustfall increased.

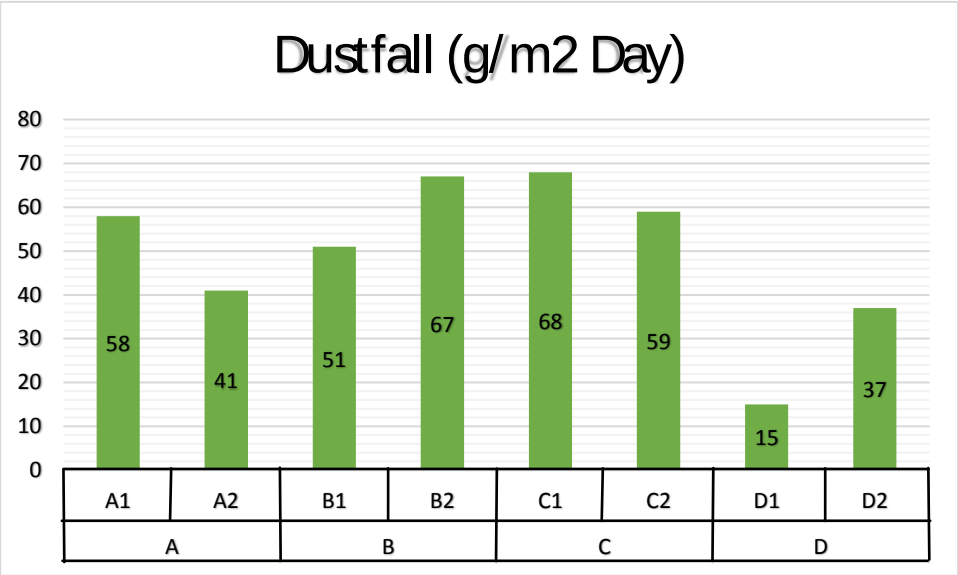
IV. RESULTS AND DISCUSSION

The dustfall was determined for all the stations. The analysis of data given in Table No.1.
It shows the dustfall quantity of study stations for the duration of 24 hours. The highest dustfall was found at station no C as it is located near the crushering zone.

Table No.1: Dustfall Measurement in(g/m^2 day (in 24 Hours) on stations

Station ID.	Glass Beaker ID	Weight of empty Beaker (g)	Weight of Beaker with Dust (g)	Weight of Dust Fall in (g)	Dustfall (g/m^2 Day)
A	A1	330.23	332.86	2.63	58
	A2	330.12	331.98	1.86	41
B	B1	330.25	332.56	2.31	51
	B2	333.1	336.12	3.02	67
C	C1	331.12	334.19	3.07	**68**
	C2	332.32	335.01	2.69	**59**
D	D1	331.5	332.16	0.66	15

	D2	330.15	331.84	1.69	37



Graph No. 01- *shows*Dustfall g/m^2 Day

After the daily collection of dustfalls for several weeks, the dustfall data on a weekly basis is calculated. The dustfall over a period of seven week is given the Table No. 2. The average weekly dustfall is mentioned in the last column of the Table No. 2 which indicates the heavy dust fall in the area.

Table No.2: Measurement of Dustfall (g/m^2 day) for seven weeks

Station ID.	Weekly Dustfall (g / m^2 Week)							Average weekly Dustfall (g/m^2 WEEK)
	Week Number (Starting from Summer to Rainy)							
	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	
A	280.5	278.26	275.84	289.15	284.52	281.12	215.12	272.07
	285.2	286.1	278.1	289.26	281.68	286.29	221.12	275.39
B	260.6	265.26	260.72	286.15	281.26	284.21	199.23	262.49
	245.26	252.23	253.25	278.15	271.69	279.38	186.23	252.31
C	357.8	356.22	358.43	395.12	360.15	326.12	260.15	344.85
	353.68	358.12	359.15	369.16	359.12	362.2	265.12	346.65
D	165.8	158.36	159	180.12	165.12	158.6	110.12	156.73
	171.8	170.1	168.12	159.15	149.58	145.12	114.12	153.99

V. CONCLUSION

The aggregate crushing activities near the South Katraj region are responsible for huge dust falls in the study area. The dustfall was computed more than expected in the study area as the highest dustfall was found to be an average of 346.65 g/m^2 per week. The recordeddustfall shows the adverse effect of stone crushing activities in the study area.

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