

CONSTRUCTION SECTOR

According to the World Bank, the Indian GDP has progressed from 10th largest in the world during 2012 to 6th largest during 2017 in spite of being the second most populated country in the world. This is associated with large growth in the construction sector during this period. Emissions of the construction sector depend heavily on the area of construction activity. Thus, it is important to estimate the emission of atmospheric pollutants due to the construction activities in the country.

10.1 Estimation of the construction area

It is a difficult task to identify the construction areas in different parts of the country using any reliable data source. We have estimated state-specific construction area using the GSDP and share of construction sector to GSDP of each state during the year 2016. The data of area on active construction sites in the states of Delhi and Gujarat during 2016 were identified by using high-resolution satellite images. The criteria used for demarcating these construction sites is its perimeter, i.e., sites of perimeter of 300 m and above have been taken into account. Further, all the construction sites have been labelled on the basis of the nature of construction. For example, residential, commercial, institutional such as schools, and others. Average construction cost per unit area in these two states during 2016 was calculated (C_a). The construction area ($A_{c,s}$) in each state (S) was estimated using Eq. 28:

$$A_{c,s} = \frac{GDP_s \times GDP_{c,s}}{C_a} \quad (28)$$

where, GDP_s is GSDP of the state (S) during 2016; $GDP_{c,s}$ is the percentage share of construction sector in state(S) GSDP during 2016. C_a was calculated as INR 8,718,000 per acre of construction. The state-specific GDP values were collected from the Reserve Bank of India for the year 2016. Accordingly, the construction area of each state ($A_{c,s}$) was estimated in acre using Eq. 28 (Table 34). This suggests that an estimated 4109 km² area was under construction during 2016.

Table 34 Estimated area under construction in each state during 2016

State/UT	Area under construction (Acre)	State/UT	Area under construction (Acre)	State/UT	Area under construction (Acre)
Andhra Pradesh	48,118	Jharkhand	17,613	Puducherry	3248
Arunachal Pradesh	1773	Karnataka	62,168	Punjab	24,407
Assam	19,244	Kerala	68,366	Rajasthan	55,799
Bihar	33,213	Madhya Pradesh	41,700	Sikkim	836
Chandigarh	1506	Maharashtra	108,024	Tamil Nadu	122,872
Chhattisgarh	20,233	Manipur	2189	Telangana	28,250
Goa	1881	Meghalaya	1273	Uttar Pradesh	112,676
Gujarat	60,746	Mizoram	1793	Uttarakhand	12,102
Haryana	38,318	Nagaland	1300	West Bengal	63,237
Himachal Pradesh	9145	NCT of Delhi	19,365		
Jammu and Kashmir	8780	Odisha	25,174	Total	1,015,349

10.2 Estimation of emissions from construction activities

Emissions of PM₁₀ and PM_{2.5} due to the construction activities were estimated using Eq. 29:

$$EPM = A_{C,S} \times EF_{PM} (12 - R_s) \quad (29)$$

where, E_{PM} is the emission of PM (Mg/acre); EF_{PM} is the emission factor of PM (1.2 Mg/acre/month); and R_s is the number of month in state (S) received total rainfall higher than 100 mm during 2016. According to USBR (2002), PM₁₀ emissions from overburden removal and bulldozing activities during construction activity is 35% of the total PM emission. Again, Muleski et al. (2005) have reported the ratio of PM_{2.5} to PM₁₀ was varied between 0.2 to 0.46 at the construction sites. Based on these, it was assumed that 35% of the PM (E_{PM}) was PM₁₀ and 6% was PM_{2.5}. Estimated PM₁₀ and PM_{2.5} emissions due to construction activities during 2016 were 3291 Gg and 197 Gg, respectively (Table 35).

Table 35 Emissions of pollutants due to construction activities in different states during 2016

State	PM ₁₀ (Gg)	PM _{2.5} (Gg)	State	PM ₁₀ (Gg)	PM _{2.5} (Gg)
Andhra Pradesh	142	9	Manipur	5	0
Arunachal Pradesh	3	0	Meghalaya	3	0
Assam	49	3	Mizoram	4	0
Bihar	98	6	Nagaland	3	0

State	PM ₁₀ (Gg)	PM _{2.5} (Gg)	State	PM ₁₀ (Gg)	PM _{2.5} (Gg)
Chandigarh	6	0	NCT of Delhi	73	4
Chhattisgarh	68	4	Odisha	85	5
Goa	6	0	Puducherry	16	1
Gujarat	230	14	Punjab	103	6
Haryana	145	9	Rajasthan	211	13
Himachal Pradesh	31	2	Sikkim	2	0
Jammu and Kashmir	30	2	Tamil Nadu	413	25
Jharkhand	89	5	Telangana	107	6
Karnataka	131	8	Uttar Pradesh	426	26
Kerala	115	7	Uttarakhand	41	2
Madhya Pradesh	140	8	West Bengal	159	10
Maharashtra	363	22	Total	3291	198