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Supplementary Information for

Outdoor air pollution in India is not only an urban problem

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Supplementary Information Text

Figure S1 shows a map of India divided into six regions. Figure S2 shows the urban and non-urban classification based on: (a) VIIRS nighttime light; and (b) the combined data of census and Global Human Settlement Layer built-up over India. The census and Global Human Settlement Layer built-up data at 1 km grid is classified into 4 categories – urban agreement, urban people only, built-up land only, rural extent, and uninhabited areas (1, 2). The urban agreement and urban people only have been categorized as 'urban' and rural extent and uninhabited areas as 'non-urban' in Figure S2. Figure S3 shows the aerosol optical depth (AOD) (a measure relatable to the surface $PM_{2.5}$ levels, see **method**) obtained from three different satellites as a function of the month of the year for 2015. Irrespective of the satellite, the AOD is similar for urban and non-urban areas for each of the months of the year. The Moderate Resolution Imaging Spectroradiometer (MODIS) instrument on two different satellite buses sampling at different times of the day gives essentially the same AODs. The Multi-angle Imaging Spectroradiometer (MISR) instrument suggests lower AOD compared to the MODIS. These differences have been discussed elsewhere (3) as primarily due to differences in the algorithm used to retrieve aerosol products and the specific available data.

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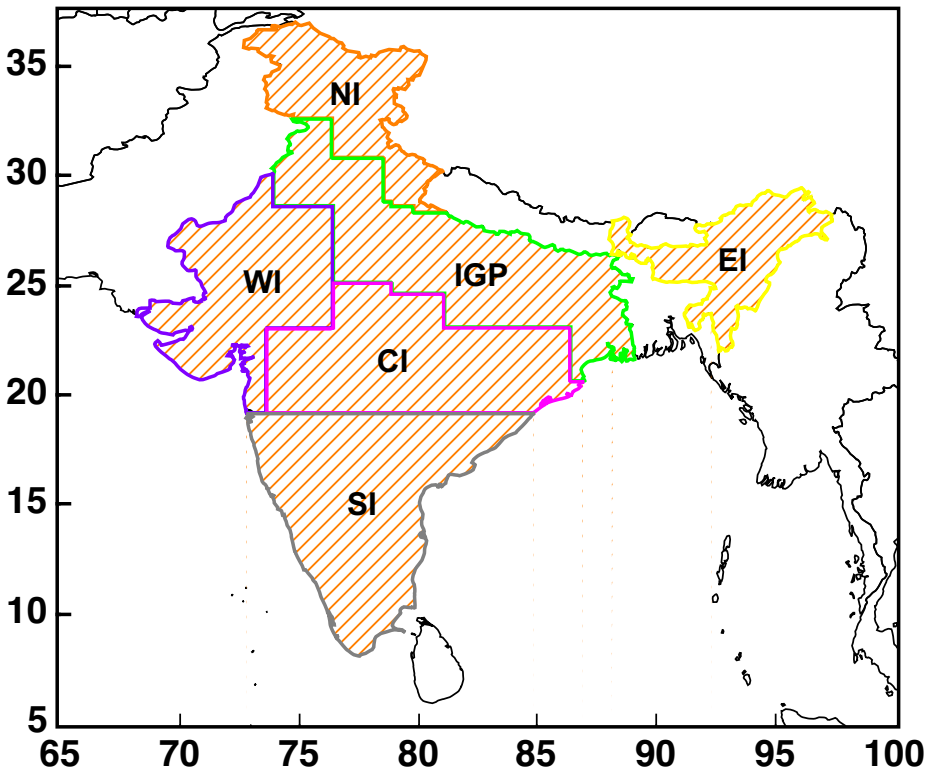

Fig. S1. A map of India divided into six regions based on meteorology and variation of aerosols (adapted from David et al.(4)). NI = Northern India; IGP = Indo-Gangetic Plain; EI = Eastern India; WI = Western India; CI = Central India; and SI = Southern India.

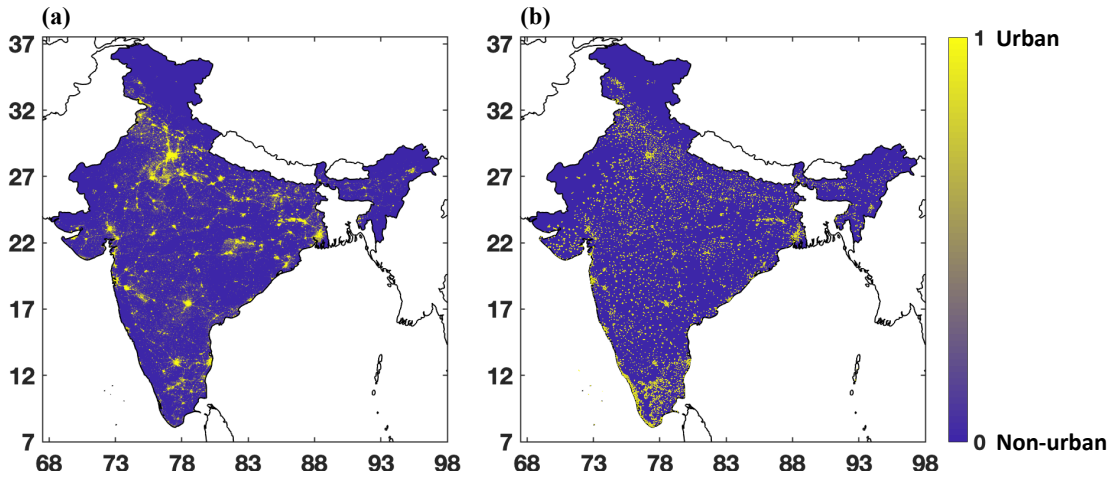

Fig. S2. The urban and non-urban classification based on (a) VIIRS nighttime light and (b) the combined data of census and Global Human Settlement Layer built-up data at ~1 km resolution over India.

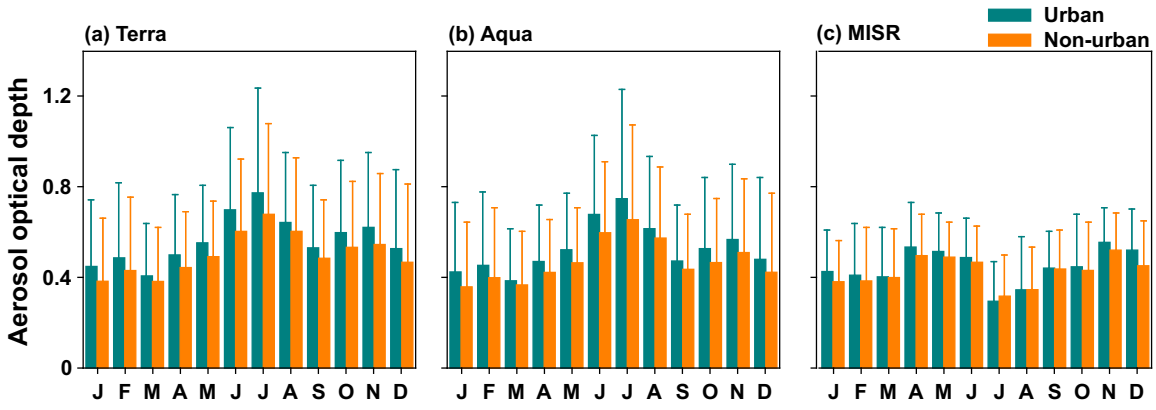

Fig. S3. Monthly variation in aerosol optical depth over urban and non-urban regions in India as observed by (a) Terra, (b) Aqua, and (c) MISR instruments for 2015.

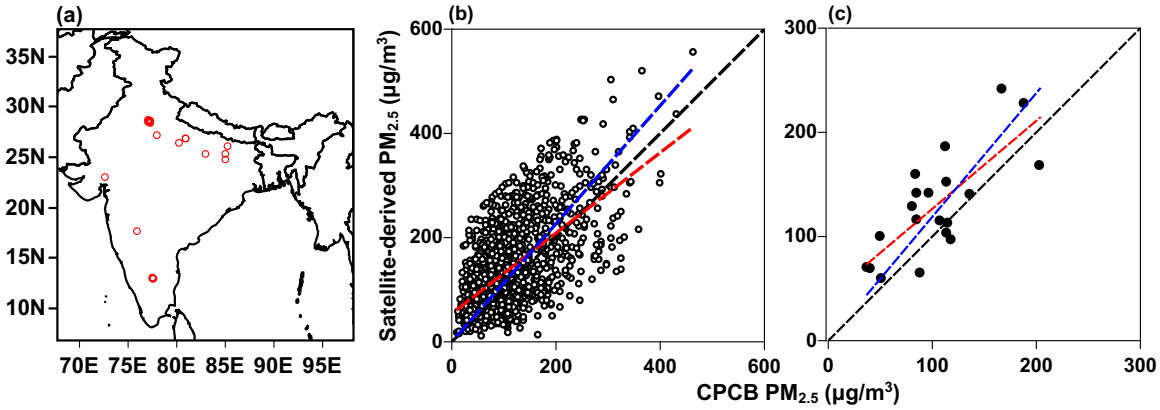

Fig. S4. (a) The location of the Central Pollution Control Board (CPCB) monitoring sites; (b) a comparison of the daily satellite-derived $PM_{2.5}$ with the CPCB observations for 2015; and (c) a comparison of the annual satellite-derived $PM_{2.5}$ with the CPCB observations for 2015. The linear regression line is shown in red. The regression line with zero intercept is shown in blue. The black dashed line corresponds to slope = 1.

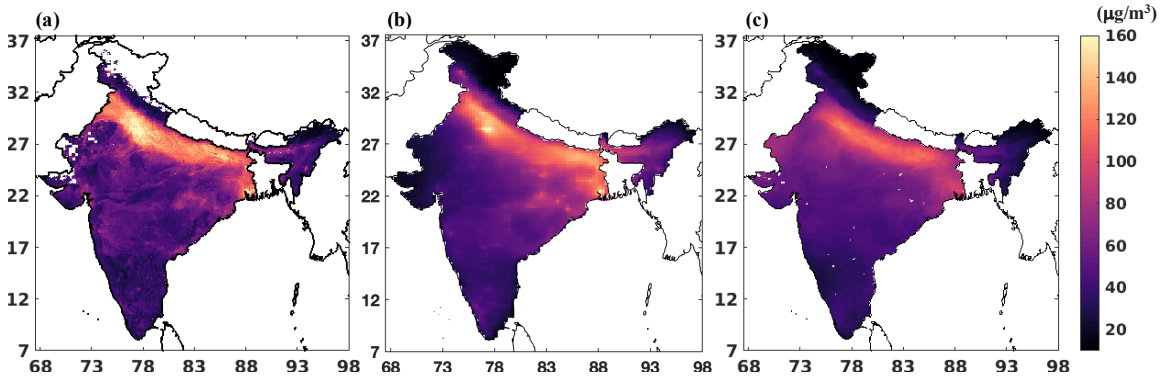

Fig. S5. Spatial variation in annual mean satellite-derived $PM_{2.5}$ from (a) this work at 4.63 km×4.63 km, (b) GEOS-Chem at 0.25°×0.3125° resolution, and (c) Hammer et al. (5) at 0.01°×0.01° resolution.

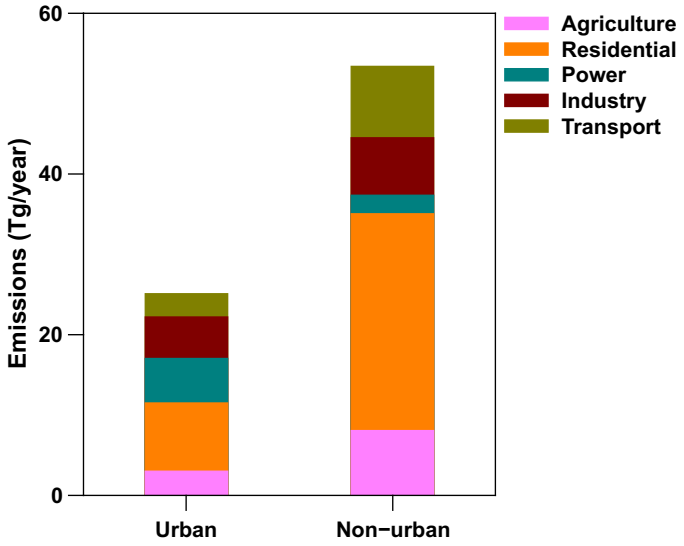

Fig. S6. The emissions in the urban and non-urban regions from agriculture, residential, power, industry, and transport sectors calculated from the emission inventories in the model. This shows that a large fraction of the non-urban regions is polluted to their own emissions.

Table T1. Studies on $PM_{2.5}$ concentrations in rural regions in India for the period 2010-2016.

Location	Period of study	Mean $PM_{2.5}$ concentration (μg/m3)	Reference
Patiala, Punjab	10/2011-09/2012	~21-330 (daytime) ~28-400 (nighttime)	(6)
Agra, Uttar Pradesh	11/2010-02/2011	91.2 ± 17.3	(7)
Agra, Uttar Pradesh	04/2010-06/2010	90.2 ± 7.21	(8)
Rajim, Chattisgarh	10/2011-11/2011	200 ± 127	(9)
Ranga Reddy, Telangana	06/2015-05/2016	30	(10)
Mahabubnagar, Andhra Pradesh	07/2011-11/2011	50.0 ± 10.0	(11)

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