

Table S1. Description of the different emission scenarios in Eclipse V5a

Scenario	Acronym	Description
Baseline – current legislation	CLE	Considers current and planned environmental laws with known delays and failures and their full enforcement in the future taken into account
Maximum technically feasible reductions	MTFR	The most optimistic scenario as it assumes a stringent policy requiring usage of best available technology for all set of economic activities producing emissions. The emissions are reduced by 60 to 80% within a few decades
Mitigation Scenario - Short-Lived climate pollutants	SLCP	A more realistic scenario that assumes the enforcement of climate-related policies for curbing down future anthropogenic emissions
Climate Scenario	2 degrees, CLE	Similar to the CLE scenario following a 2 degree Celsius threshold demand

Table S2: RegCM simulated sectoral 2015/2000 AOD ratio over different sub regions

	ENE	IND	RES	TRA	AOD _{anthro}
NI	1.59	2.04	2.89	2.88	2.03
IGP	1.46	0.98	1.27	1.79	1.29
CI	1.47	1.48	1.89	2.39	1.58
NEI	1.30	1.31	1.80	2.65	1.40
WI	1.39	1.50	2.15	2.16	1.65
PI	1.47	1.97	2.46	3.07	1.78

Table S3: Detailed description on the five Indian megacities in India considered for this study

No.	Megacity	Description
1	Delhi	Delhi, the political capital of India, in addition to being the largest city in India is one of the most densely populated cities in the world, with 16.31 million population and a population density of 11320 km ⁻² (Census-India, 2012). Delhi is leading the list of 13 worst polluted Indian cities, which are counted among the world's top 20 such cities. It is also the largest commercial centre in North India with several small scale industries around it with high production of textiles, sports, leather goods and light engineering products. The number of registered vehicles increased from 0.18 in 1971 to 9.7 million in 2016 over Delhi.
2	Kolkata	Kolkata, the capital of the state West Bengal, is the third most populous city and was placed one among the most polluted cities of the world with a population density of 7480 km ⁻² (Census-India, 2012). Despite being an important industrial centre with recent advancements in heavy engineering, coal mining, and power generation, Kolkata experiences more severe air pollution issues mainly due to less availability of open space for diffusion of air pollutants.
3	Mumbai	Mumbai is the financial and commercial capital of India with expansion in food processing and textile units, foundry production and vehicular population. It is also accompanied by high population of 18.41 million with a population density of 19652 km ⁻² (Census-India, 2012).
4	Bengaluru	Bengaluru (formerly Bangalore), the “Silicon Valley” of India, is one of the bustling metropolis. Along with the exponential growth in population in the city over the recent decades with population density of 4381 km ⁻² (Census-India, 2012), huge number of IT companies, educational institutes established base in the city. The unplanned growth in the city resulted to hike in air pollution over recent decades.
5	Chennai	Chennai, the capital of Tamil Nadu and an important port city, is one of the four metropolitan cities of India with number of inhabitants exceeding 10 million. Along with trading and shipping, the automobile industry, medical tourism, textile and petrochemical industry lay the economic base of the city.

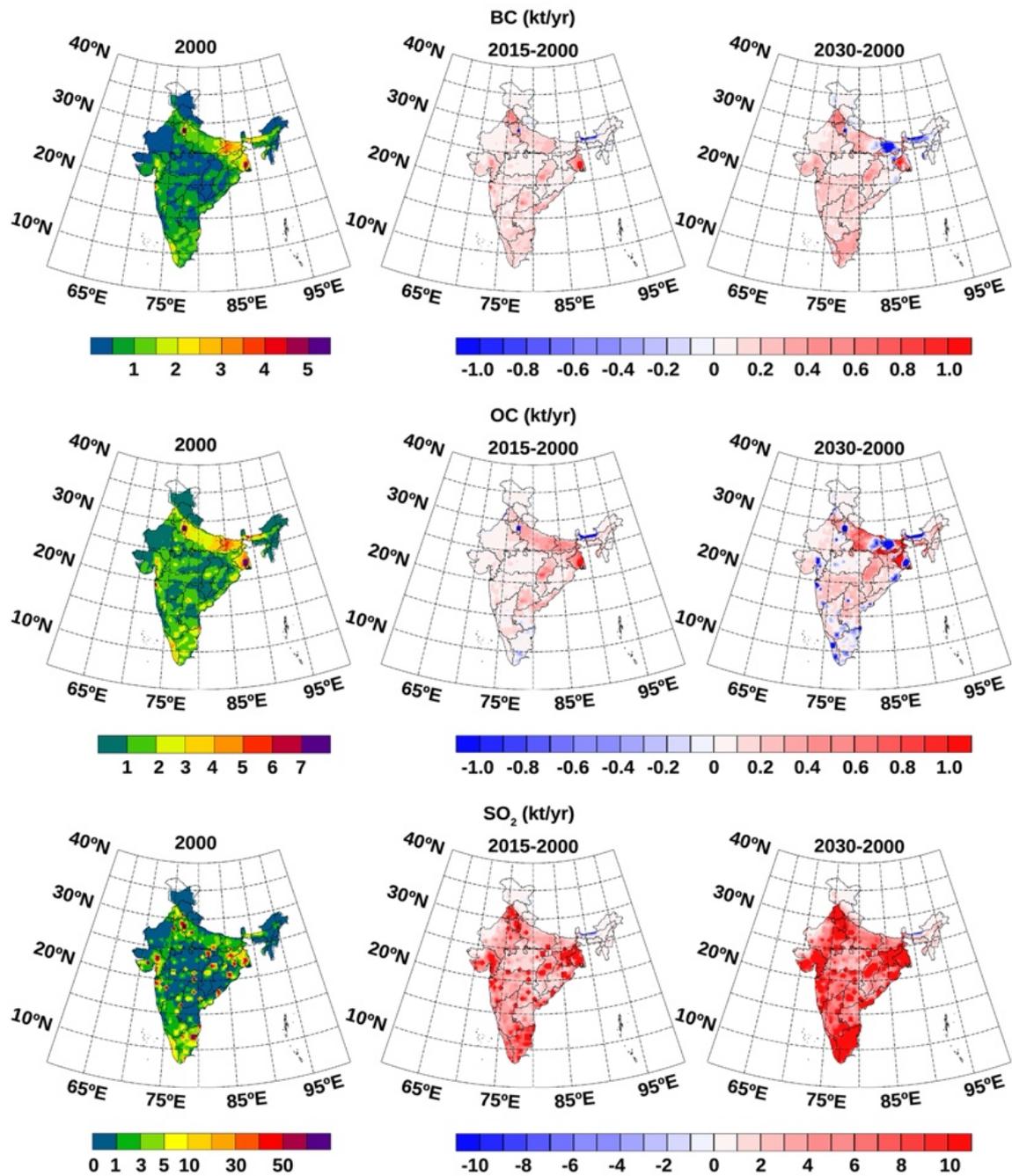


Fig S1. Annual average anthropogenic BC, OC and SO₂ emissions in 2000 and relative changes in 2015, 2030 (kt/yr) from ECLIPSE emission inventory.

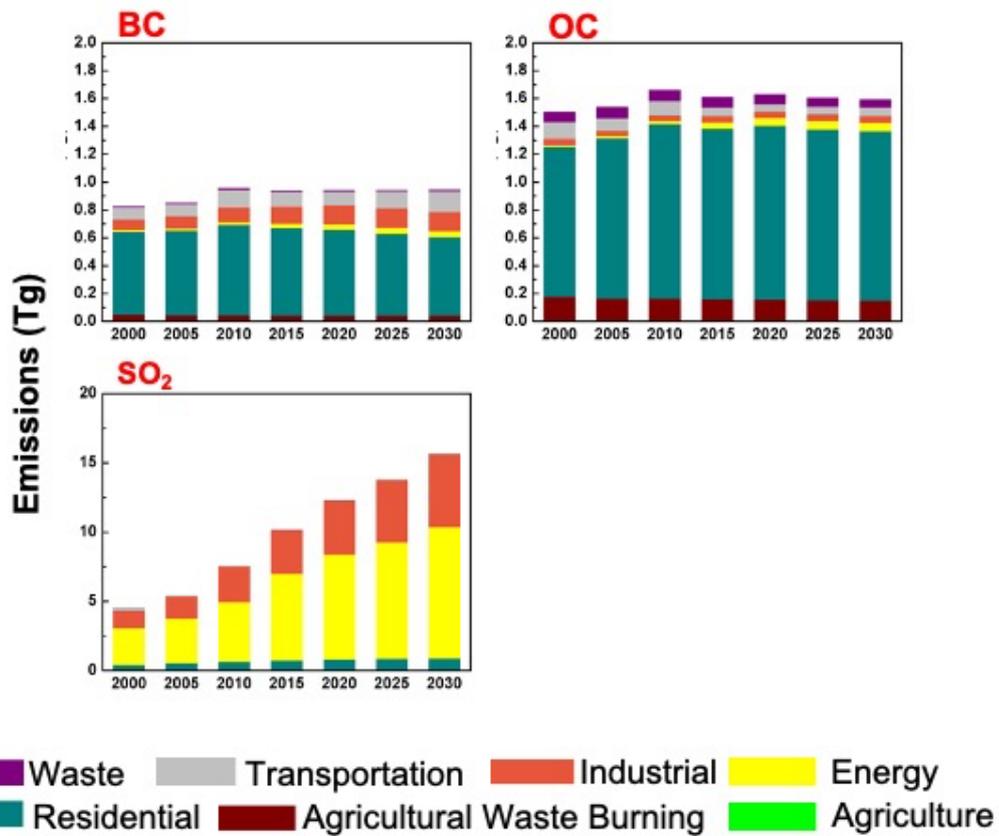


Fig S2. Sectoral contribution to emissions of BC, OC, and SO₂ under baseline scenario of ECLIPSE emission inventory at five year resolution for three decades, 2000-2030.

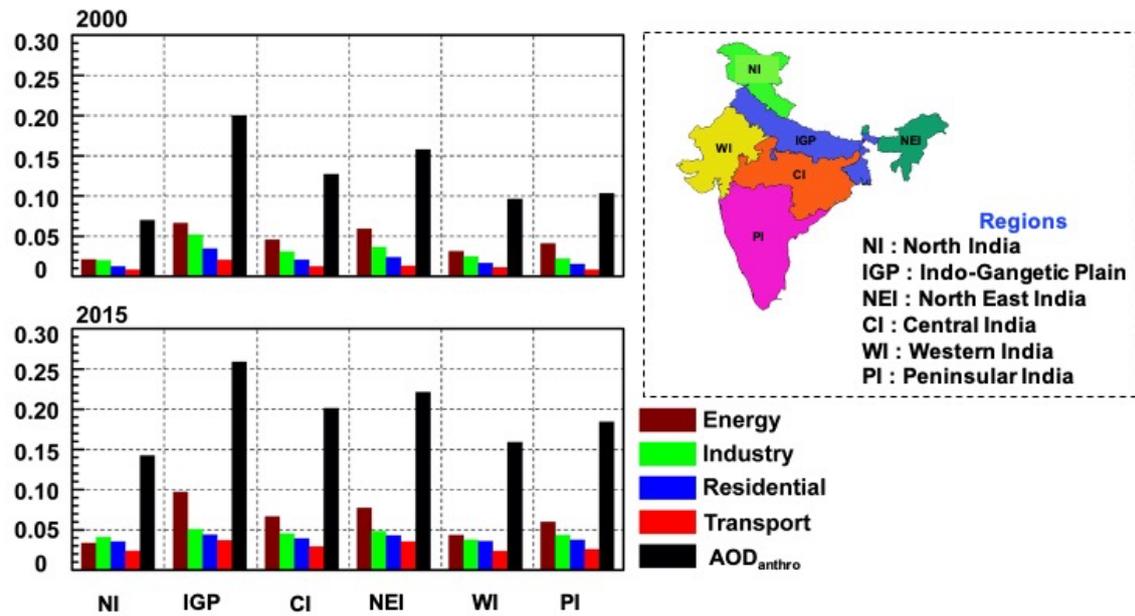


Fig S3. RegCM simulated Anthropogenic Aerosol Optical Depth (AOD_{anthro}) for different sectors: Energy, Industry, Residential and Transport over different sub regions in Indian subcontinent.

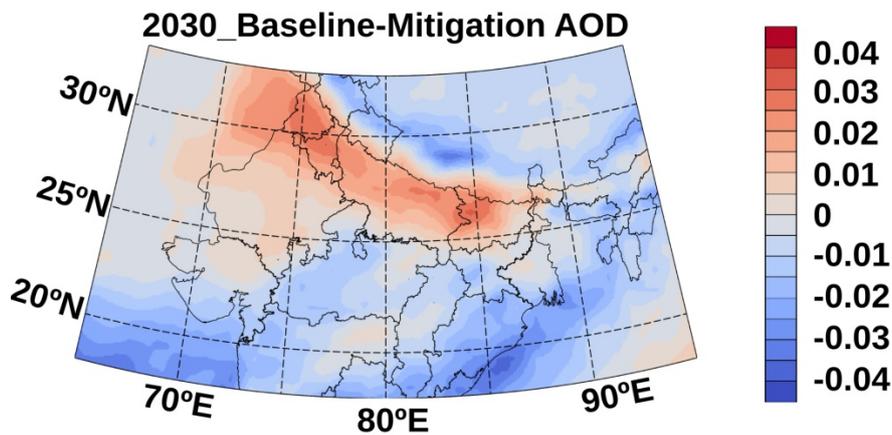


Fig S4. RegCM simulated AOD bias between baseline and mitigation simulations for the year 2030.