



Pathways towards clean air in India

Pallav Purohit (1), Markus Amann (1), Gregor Kiesewetter (1), Peter Rafaj (1), Vaibhav Chaturvedi (2), Hem Dholakia (2), Poonam Nagarkoti (2), Zbigniew Klimont (1), Jens Borcken-Kleefeld (1), Adriana Gomez-Sanabria (1), Wolfgang Schöpp (1), and Robert Sander (1)

(1) International Institute for Applied Systems Analysis (IIASA), Air Quality & Greenhouse Gases (AIR) Program, Laxenburg, Austria (purohit@iiasa.ac.at), (2) Council on Energy, Environment and Water (CEEW), New Delhi, India

The fast economic and population growth in India's urban areas and the limited control of pollution are causing public health problems and significant environmental degradation, including air, water, land and greenhouse gases, which undermines the potential for sustainable socioeconomic development of the country, particularly with impacts on the poor. To improve air quality and enhance economic and social development, the Government of India has issued a National Ambient Air Quality Standard (NAAQS) for annual average PM_{2.5} concentrations of 40 $\mu\text{g}/\text{m}^3$. However, this standard is widely exceeded, and according to the World Health Organisation (WHO), India was home to 13 out of the 15 most polluted cities worldwide in terms of PM_{2.5} concentrations in 2016. This study explores pathways towards achieving the NAAQS in India in the context of the dynamics of social and economic development up to 2050.

For this purpose, we employ two well-established scientific modelling tools that explore the socio-economic drivers of pollution (the GCAM model), in particular, energy consumption, and the GAINS model that explores effective policy interventions to reduce population exposure and health impacts. We estimate that in 2015 more than half of the Indian population, i.e. about 670 million people, was exposed to ambient PM_{2.5} concentrations that do not comply with India's NAAQS, and less than 1% enjoyed air quality conforming with the global WHO guideline value of 10 $\mu\text{g}/\text{m}^3$. Without further political action, this figure is not expected to improve.

While the existing emission control measures are effectively decoupling the trends of air pollutant emissions from economic growth, their impacts on ambient air quality are not directly visible since they are compensated by the rapid expansion of economic activities. The analysis reveals that advanced technical emission controls can deliver air quality improvements in India, but will not be sufficient to achieve the NAAQS everywhere. However, a package of development and decarbonization measures that are usually taken for other policy priorities can deliver significant co-benefits on air quality and achieve compliance with NAAQS for the vast majority of the population.