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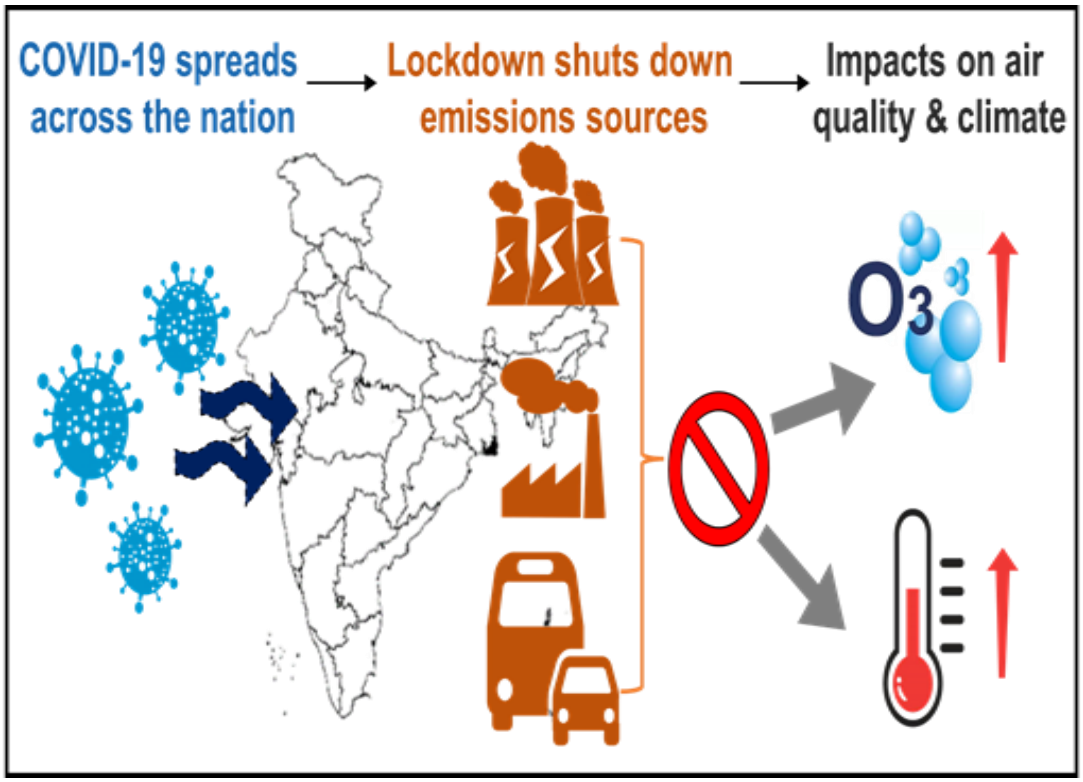
CarbOnaceous AerosoL Emissions, Source apportionment & ClimatE impacts
Understanding scientific complexities related to carbonaceous aerosols focussing on issues underlying their origin and fate, and their role as drivers of regional climate change over India.

Research BRIEFS

Air quality and climate policy learnings from COVID-19 closures of emission sources in India

Kushal Tibrewal and Chandra Venkataraman



Key highlights:

- Analogy between lockdown activity closures & air quality and climate policies.
- Reduced emission ratio of NOx/ NMVOCs coincided with observed increases in O3.
- Additional annual warming rate from larger reductions in SO2 & NOx among pollutants.
- Policies in residential & agricultural sectors must precede those in industry & transport.

Summary:

This study models the evolution of emissions of CO_2 and SLCFs during the COVID-19 lockdown in India (Figure 1). There was unprecedented scale of activity closure in the transport sector, industry, power plants and refineries, while residential and agricultural activities continued to operate. This proved to be a highly unbalanced emissions control scenario where in certain pollutants (CO_2, SO_2, NOx and CO and primary $PM_{2.5}$) saw high reductions (−75%)while the others (BC, CH4, NMVOCs and OC) were limited below −30%. The disproportionate reductions in NOx and NMVOCs

were linked to the observed increases in tropospheric O3 concentrations at various urban regions across India. Further, such disparate controls in cSLCFs and wSLCFs will lead to a net increase in future temperature (estimated using climate metric), adding to the existing rate of warming over the country. While it has been established that policies mitigating an appropriate "basket of pollutants" across multiple sectors would be more effective in delivering simultaneous benefits in air quality and climate, our study goes beyond to provide evidence that the "relative pacing" among these policies in attaining their maximum mitigation potential is also very crucial to prevent counter-productive impacts.

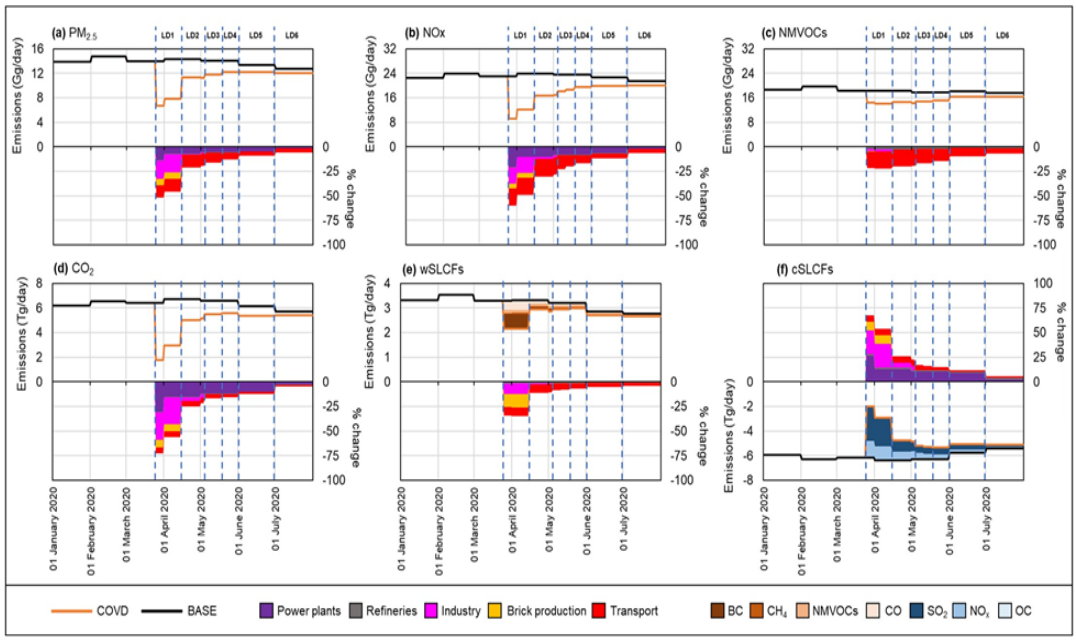


Figure 1: Sectoral emissions evolution and percentage reduction during COVID-19 lockdown periods in India for (a) Primary PM2.5; Ozone precursors: (b) NOx and (c) NMVOCs; Climate forcers: (d) CO2, (e) warming SLCFs (wSLCFs) and (f) cooling SLCFs (cSLCFs).

Major findings :

- While prima facie it appears promising to shut-down anthropogenic activities, unplanned controls can have counterproductive implications on regional air quality and climate.
- Such counter-productive impacts will be felt if, a) policy targets in power plants, industry and transport are strengthened before those in residential, agricultural and brick industry sectors or b) the efficacy in policy implementation in the latter sectors are not monitored.
- Activity closures during lockdown present a unique real-word sensitivity scenario which can be interpreted as a case where in the interventions in certain sectors (for e.g. power plants, industry and transport which were regulated) are implemented at a much higher potential than those in others (for e.g. residential and agricultural sectors which continued to operate as usual).

Research Article

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Contact

Prof. Chandra Venkataraman

National Co-ordinator

(NCAP-COALESCE Project)
Interdisciplinary Programme in Climate Studies

Indian Institute of Technology, Bombay Powai, Mumbai-400076, India

Phone: 91-22-2576-5141

https://ncapcoalesce.iitb.ac.in/

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