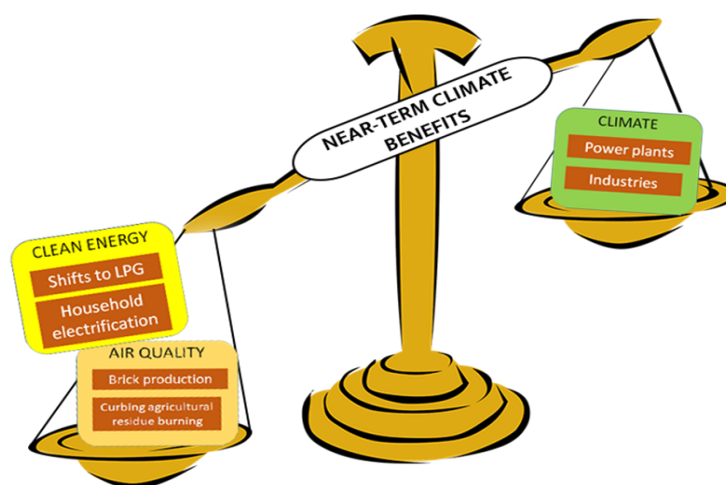


## Clean energy and air quality programs can deliver greater climate benefits in the near-term

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### Key highlights:

- Assessed climate co-benefits of air quality and clean energy policies using multiple metrics.
- In the next 1–2 decades (using GWP20), emission reduction potentials of warming SLCFs exceed those of CO<sub>2</sub>, which is not evident on longer timescales.
- Current climate policies in the electricity generation and transport sectors reduce cooling SLCFs (SO<sub>2</sub> and NO<sub>x</sub>) with negligible influence on warming SLCFs.
- Largest climate benefits accrue from residential clean energy policy and air pollution regulation curbing traditional brick production and agricultural residue burning emissions, which primarily reduce warming SLCFs (specifically BC).
- Integrating these interventions into national climate policies can strengthen both climate action and sustainability.

### Summary:

We use an approach combining emission reduction potential (ERP) calculations with multi-metric evaluation of climate co-benefits by projecting emissions from 2015 to 2030 under two mitigation scenarios. Our projections incorporate currently declared national programmes of climate, air quality and clean energy interventions. We compare these projections against a reference scenario with policies fixed at 2015 levels. Potential climate impacts are evaluated in terms of carbon dioxide equivalents (CO<sub>2</sub>e) using multiple climate metrics. We have used GWP20 and GWP100 (owing to its numerical equivalence to GTP4016) as representative of near-term impacts, and GTP100 reflecting the long-term impacts. Figure 1a shows the net ERPs for CO<sub>2</sub>, wSLCFs and cSLCFs from the ongoing national programmes in India. A net negative ERP indicates a decrease in CO<sub>2</sub>e emissions, whereas a net positive ERP indicates an increase in CO<sub>2</sub>e. The reduction in wSLCFs is double that of CO<sub>2</sub> in the very near term (GWP20) and half that of

of CO<sub>2</sub> in the near term (GWP100). Current climate programmes contributed up to 80% of total CO<sub>2</sub> reductions, however, they mostly show net positive ERPs for SLCFs because of negligible reductions in wSLCFs along with significant reductions in cSLCFs. In particular, limiting to current climate programmes alone leads to warming on the very short-term (GWP20) when considering both SLCFs and CO<sub>2</sub> (Fig. 3), having implications for exacerbating heat-wave occurrences. By contrast, clean energy programmes show negligible CO<sub>2</sub>

reductions, but have net negative ERPs dominated by reductions in wSLCFs. Specifically, the cumulative net negative SLCF ERP from residential, brick production and agricultural residue-burning sectors is equivalent to approximately 20 to 65% of the total CO<sub>2</sub> ERP (Figure 1b). Further, we find that among wSLCF species, BC emission reduction contributes the largest CO<sub>2</sub>e emission reductions, as a result of its predominance in emissions from traditional residential cooking, brick production technologies and open burning.

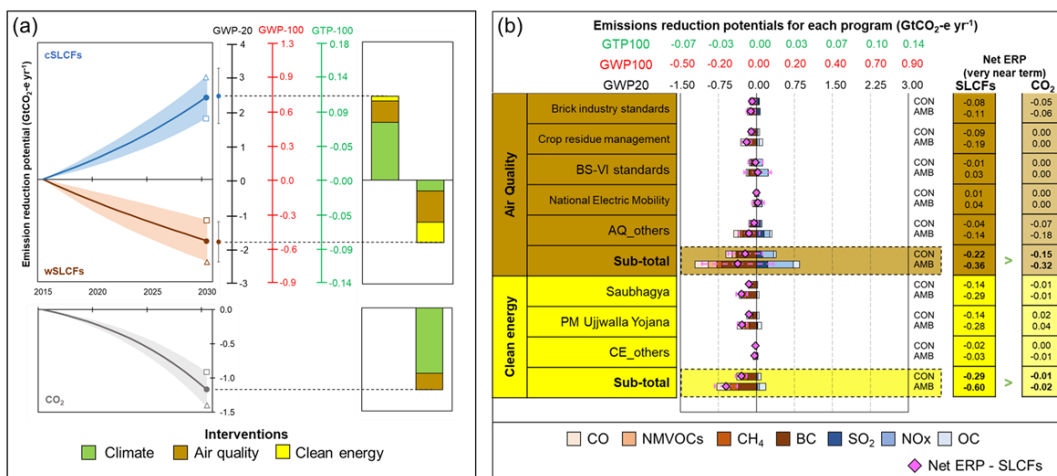


Figure 1. Climate benefits from SLCF mitigation. a) Evolution of emissions reduction potentials from 2015 to 2030 in GtCO<sub>2</sub>e yr<sup>-1</sup>, for impacts in the near term (using GWP20 and GWP100) and long term (using GTP100). b) Program-wise reduction potential under conservative and ambitious scenarios with respect to reference in 2030.

### Major findings :

- While ongoing programmes and policies have the potential to deliver substantial CO<sub>2</sub>e reductions of wSLCFs in the near term, targeted and improved efficacies of programme is required to achieve crucial compensation for cSLCF offsets, which potentially unmask warming.
- Programs with the most potential to deliver climate co-benefits include Pradhan Mantri Ujjwala Yojana, Saubhagya scheme, curb on agricultural residue burning and brick emission standards. These programs can be brought into the reporting requirements as per sections B and D in chapter III of the MPGs.
- The identified programs must be linked to the corresponding line departments (for example, water, agriculture, health, forestry, energy, industries, habitat, health, roads, tourism and other region-specific sectors) of the state climate change cell. Effective monitoring and evaluation of identified programs primarily involves identifying the key indicators of progress for each programme and their subsequent reporting to the climate change cell for review at regular intervals.

## Research Article

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