

Mission ZAP: Zero Air Pollution Across India

-Dr R Subramanian

Air pollution is a major problem plaguing our nation. It is not just a Delhi problem or an urban problem but even the residents of Bengaluru are exposed to outdoor fine particulate mass levels far above the World Health Organization guidelines. The crores of households cooking with wood, dung, and charcoal are routinely exposed to hazardous indoor air pollution, which eventually escapes the house and contributes to outdoor air pollution. The National Clean Air Programme (NCAP) has made significant financial allotments to reduce PM10, and many cities seem to have made progress. However, we are witnessing stories about unhealthy and hazardous air pollution. In fact, I was recently travelling from Chandigarh to New Delhi by the very comfortable and fast Vande Bharat Express and saw many farms on fire. Stubble burning had already started, and the nearby villages looked hazy. So, the title of this article may strike you as wishful thinking.

But I remain optimistic, and I will tell you why. We know the major sources of air pollution (it is not just stubble burning!), and we already have or soon will have access to cleaner alternatives, which will not only ensure we breathe clean air but also yield near-term climate co-benefits by eliminating climate-warming black carbon emissions.

Zero vehicular tailpipe emissions: The transport sector, particularly diesel trucks and cars, contributes 30%–60% of PM2.5 emissions and over 80% of NOx emissions in many non-attainment cities across India (see <https://ei.cstep.in/>). But the electric vehicle revolution is real and happening, and it will eliminate tailpipe emissions of PM2.5 and NOx as electric vehicles replace diesel vehicles. Lakhs of electric two-wheelers have been purchased over the past year. The Government of India has taken several measures to strengthen the electric transport infrastructure. While the PM eBus Sewa Scheme helps cities buy electric buses, the recently launched Prime Minister Electric Drive Revolution in Innovative Vehicle Enhancement (PM E-Drive) scheme will enable the uptake of two-wheelers, three-wheelers, ambulances, and trucks with zero tailpipe emissions by providing purchase subsidies and financing the necessary charging infrastructure.

Zero air pollution from cooking: Many households in rural areas and even in some urban pockets burn wood and other solid biofuels because they are inexpensive. But burning solid biofuels generates significant indoor air pollution, exposing especially women and children to harmful toxins that damage their health and stunt child development. The Pradhan Mantri Ujjwala Yojana (PMUY) scheme has provided essentially emission-free liquified petroleum gas (LPG) connections to most Indian households, but PMUY-subsidised LPG can still be unaffordable compared with freely available solid biofuels. As a result, many households resort to ‘stacking’, i.e. using both LPG and solid biofuel stoves, which almost negates the health benefits of LPG. According to the findings of the Multi-Country Household Air Pollution Intervention Network (HAPIN) Randomized Controlled Trial (2021), providing free LPG will prevent households from burning polluting solid biofuels. This shift to LPG could eliminate household air pollution and reduce the household contribution to outdoor air pollution, which is significant across India. Another study by Gould et al. (2024) also shows that the climate and health benefits far outweigh the subsidy costs of making LPG

realistically affordable for PMUY recipients, and carbon credits could further reduce those costs. Bio-compressed natural gas (bio-CNG), generated from food waste, agricultural waste, etc., can also be a viable alternative to LPG, as highlighted by [Shri Ashish Tiwari](#), Secretary of the Uttar Pradesh Department of Environment, Forest, and Climate Change, at the India Clean Air Summit (ICAS) 2024. Many restaurants in Indore have now converted entirely to gas-fired cooking. Gas-fired tandoors have been demonstrated successfully in eateries and restaurants in Lucknow city. Even in the Golden Temple langar, gas-fired cooking is used to prepare the meals.

Zero-emission power backups: Diesel generators are widely used for power backup across India. In Bengaluru, they were estimated to contribute 11% of the primary PM2.5 emission load and 37% of the NOx emissions in 2019. Similar numbers have been estimated for other cities across India. Rooftop solar systems with battery backups can be a clean alternative to polluting diesel generators. The Pradhan Mantri Surya Ghar: Muft Bijli Yojana is a major investment (INR 75,000 crore) in zero-emission solar power generation. In fact, the Chandigarh estate office even sent notices to 4,000 houses stating that they need to follow a rooftop solar mandate! Though batteries are not currently subsidised, adding battery backups to rooftop solar systems would ensure renewable energy during power outages (furthering progress towards India's Nationally Determined Contribution [NDC] goals for greenhouse gases) and potentially eliminate the need for polluting diesel generator backups. A pilot rooftop photovoltaic-based EV charging system successfully running at the Bangalore Electricity Supply Company Limited (BESCOM) office in Bengaluru for a few years has demonstrated a green alternative for charging electric vehicles.

Zero-emission processing of agriculture stubble and city waste: Farmers need to be incentivised to avoid stubble burning by prompt farm clearing that either mulches the stubble (in-situ stubble processing) or processes it into pellets (ex-situ stubble management) for brick kilns and thermal power plants. Startups in India and other countries already convert paddy straw into useful products; recently, a colleague even found toothbrushes made from paddy waste! Food and agricultural waste can also be converted to bio-CNG, turning an air pollution problem into an air pollution solution. [Shri Pushyamitra Bhargav](#), Mayor of Indore, spoke at ICAS 2024 about how Indore became the cleanest city in India and almost entirely eliminated open waste burning. We should all be like Jholadhaari Indoris and work towards Swachh Bharat, as dreamt by Mahatma Gandhi.

Let us work together towards 'Mission Zero Air Pollution' and make clean air a reality for all Indians.