GETTING TO A BREATH OF FRESH AIR

India is the world's fastest growing major economy. But it also holds the dubious distinction of having the most polluted air in the world. In the last few years, the Delhi-NCR region has emerged as the biggest battleground of the crisis particularly during the winter months when farmers begin burning crop stubble in neighboring states. But increasingly, the discourse on air pollution has moved beyond New Delhi. The World Health Organization (WHO) has listed 14 Indian cities among the 20 most polluted in the world in terms of PM2.5 levels. A Lancet study found that roughly 1.24 million people died in 2017 from air pollution in India. It is now widely acknowledged that poor air quality is a challenge for most Indian cities, with many exceeding the National Ambient Air Quality Standards.

Given the magnitude and urgency of this issue, India's National Clean Air Programme (NCAP) is a timely and important step. Several cities are now drafting clean air action plans. Forward looking corporations are supporting ambient air quality improvement and taking voluntary action to curtail emissions from their operations.

But the sheer scale of the challenge can make progress difficult. India continues to grow and urbanize rapidly. Any efforts to curb air pollution must take into account increasing vehicular emissions, large-scale construction, industrial activity as well as other related causal factors. The technical and administrative capacity of government departments as well as collaboration amongst them to enforce policies will play a key role in the efforts to control air pollution. There is limited availability of air quality data. In addition, multiple sources of air pollution must be accounted for.

If policies to curb air pollution were successfully implemented, India would benefit from a stronger economy as well as better public health. A 2016 World Bank report estimates that diseases associated with outdoor and household air pollution may have cost India as much as 8.5% of its GDP in 2013. This is why tackling India's air pollution requires a holistic, proactive approach that attacks the roots of the crisis. Shakti is fully cognizant of the urgent need to meet this challenge. **In collaboration with key partners, Shakti is catalyzing action to advance better air quality management in cities across India.**

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Making air quality data more robust and accessible

A challenge that needs to be overcome is the limited availability of air quality data required to design effective interventions. A number of Indian cities are still outside the ambit of air quality monitoring, whereas other cities (like New Delhi) have a disproportionately high number of real-time air quality monitoring stations. In this context, increasing the availability of air quality data and making it accessible for all is an important step.

Regulatory grade monitors are expensive to purchase and require skilled staff to operate. On account of such issues, the coverage of regulatory grade monitors in India is very sparse given the size of the country. As a result, air quality information is available in very limited pockets and one is not able to determine the levels of ambient air quality in large parts of the country.

Fortunately, low-cost sensors with acceptable levels of accuracy are now available. Shakti is helping to close the information gap by funding the establishment of two independent low-cost ambient air quality monitoring networks, which will provide real-time measurement of PM 2.5. Combined, the two networks will comprise 250 low-cost monitors in more than 50 cities and towns. These monitors are being deployed, after testing and calibration, mostly in cities where the government-owned monitors are either few or none. They will provide real time and credible air quality data that can help enhance public awareness of the rising

250 real time, low-cost air quality monitors in over 50 Indian cities

levels of air pollution as well as inform policies for better air quality management. Real time data from these monitors will be publicly hosted on custom, web-based dashboards.

Towards a cleaner and more efficient brick sector

Despite the availability of cleaner technologies, the majority of bricks in India are produced from polluting kilns using antiquated technology, which are a significant source of GHG and black carbon emissions. With the construction sector booming, the demand for bricks will increase significantly. This is why Shakti is working towards making brick kilns cleaner and resource efficient through better policy and technology solutions.

In 2017, efforts enabled by Shakti contributed to the development of draft emission standards for brick kilns prepared by the Ministry of Environment, Forest and Climate Change. The standards will be applicable to brick kilns across the country. They are more stringent than the existing standards and require brick kilns to transition to cleaner technologies such as zig-zag technology.

In Bihar, Shakti has been engaging with stakeholders in the brick sector since 2012. Since then, our support has helped over 1,500 of the 7,000 brick kilns in the state upgrade to cleaner technologies. We have also contributed to the increase

in the number of fly ash brick kilns in the state from 10 in 2012 to 150 today. But one of the most important outcomes of this engagement has been the announcement of an order by the Bihar State Pollution Control Board in 2016, which required brick kilns in Patna and the surrounding areas to upgrade to cleaner technologies. This is a key development—a first for any State Pollution Control Board to ask brick-makers to move away from traditionally used technologies. Several initiatives supported by Shakti contributed to the technical evidence that shaped this order.

Air quality modeling : The Air Pollution Knowledge Assessment (APnA) program

With rapid urbanization and migration, major metropolitan cities as well as tier-2 cities are witnessing a rise in population, infrastructure needs and energy needs. This in turn is increasing pollution levels and worsening the quality of air. There have been attempts to quantify the impact of air pollution and its sources for metropolitan cites like Delhi, Chennai, and Mumbai. But there is little data available for other Tier 1 and 2 cities.

To remedy this information gap, the Shakti-supported Air Pollution Knowledge Assessment (APnA) city program is creating a baseline of air pollution related information for 50 Indian cities, which can lead to an estimate of pollution source contributions—this is a necessary starting point for city governments and stakeholders to chart out strategies for better air quality. For most of the cities in this study, this is the first time an emissions inventory has been developed, followed by a dispersion modeling exercise to assess the particulate pollution trends and identify source contributions. Therefore, this is a valuable reference point for city governments and stakeholders.

Assessments have already been carried out for 20 cities—Patna, Raipur, Ranchi, Bhubaneswar, Kanpur, Agra, Varanasi, Dehradun, Chandigarh, Amritsar, Ludhiana, Jaipur, Nagpur, Pune, Indore, Bhopal, Bengaluru, Kochi, Coimbatore, Chennai. Similar assessments are currently underway for another 30 cities.

The APnA program is creating a baseline of air pollution related information for 50 Indian cities—a starting point to estimate pollution source contributions.

## More stringent standards for thermal power plants

Thermal power plants contribute significantly to emissions in India and can lead to severe health and environmental impacts. In cognizance of this, the Ministry of Environment, Forest and Climate Change released emission standards for thermal power plants, which aim to reduce particulate matter, SO2 and NOx emissions as well as water use. While the standards are a welcome step, they need to be effectively enforced in order to see results. In the light of this important development, Shakti supported a comprehensive cost-benefit analysis of the emission standards, which assessed the cost of compliance to the standards as well as the benefits in terms of avoided human impacts.

The analysis was a step forward in advancing the case for implementing more stringent emission standards. Now, our partners are engaging with thermal power plants in a few states with significant thermal generation capacity to provide technical assistance and advice to comply with the new emission standards.

Correcting the divergence between diesel and petrol pricing

Due to differences in the taxes that are levied on diesel and petrol, a price distortion between the two fuels persists making diesel a substantially cheaper fuel. This has inclined consumer behaviour towards diesel vehicles, which are excessively polluting as compared to petrol vehicles. But this trend is gradually changing. India's move to gradually deregulate diesel prices is reducing the demand for diesel vehicles. This is expected to take a further hit with the roll-out of BS-VI emission standards in 2020. To understand the price distortion between petrol and diesel, Shakti supported studies to examine the pathways for reducing the price difference between the two fuels as well as to curb the growing consumption of diesel as a polluting fuel. These studies are contributing to the discourse on solutions to correct the divergence between diesel and petrol prices in India.
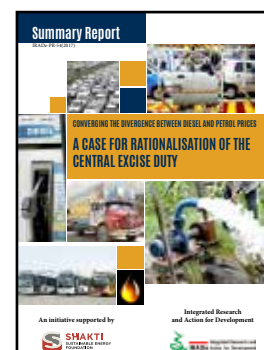
Clean air action plans for cities

Shakti supported technical assistance towards the development and the notification of a key action plan to curb air pollution in New Delhi—the Graded Response Action Plan (GRAP) designed to implement anti-pollution measures based on categories of pollution levels. Support is currently being extended for the effective implementation of these plans. Last year, when pollution levels spiked during the winter season reaching 'very poor' levels, several emergency response measures recommended by the GRAP were enforced. The Badarpur thermal power plant was shut down, and polluting brick kilns were banned. Stricter action was taken on waste burning and construction.
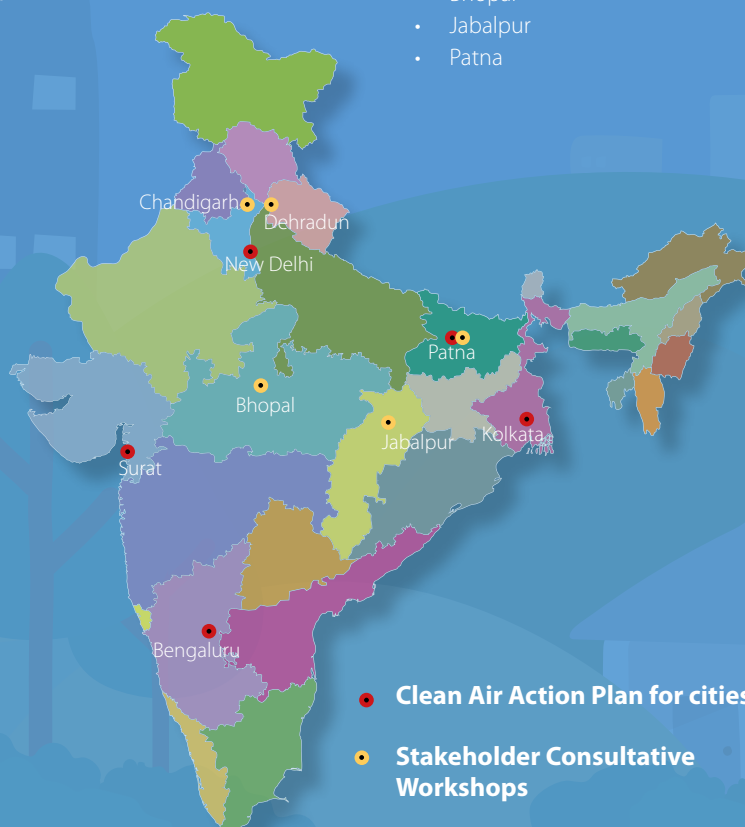
Going beyond the Delhi-NCR region, Shakti is supporting the development of clean air action plans for the following cities:

- Kolkata Metropolitan Region
- Patna
- Bengaluru
- Surat

Bridging the knowledge gap at the city level

Shakti is helping to bridge the knowledge gap on air quality management in areas outside the Delhi-NCR region. In 2017, during the peak pollution season in the Indo-Gangetic plain, Shakti facilitated a comprehensive knowledge sharing programme for state-level stakeholders in Bihar, Jharkhand and Uttar Pradesh to identify challenges as well as areas of collaboration. With the burden of air pollution growing and as the pace of urbanization increases, action at the city level is critical as well. Shakti is working to strengthen and prioritize efforts to address air pollution by facilitating the exchange of information on the current status of air pollution in the cities and states, as well as possible policy solutions. So far, stakeholder consultations have been held in:

- Dehradun
- Chandigarh tri-city area
- Bhopal
- Jabalpur
- Patna

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- **Clean Air Action Plan for cities**
- **Stakeholder Consultative Workshops**

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- **Asian Development Research Institute**
- **CEED India Development Pvt. Ltd.**
- **Centre for Science and Environment**
- **Centre for Study of Science, Technology and Policy**
- **Clean Air Initiative for Asian Cities Center Inc.**
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- **Skymet Weather Services Pvt. Ltd.**
- **Urban Emissions Pvt. Ltd.**
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