

What it Means to Take the Long View on Air Pollution in Delhi?





(UEinfo) was founded in 2007 with the vision to be a repository of information, research, and analysis related to air pollution. There is a need to scale-up research applications to the secondary and the tertiary cities which are following in the footsteps of the expanding mega-cities. Advances in information technology, open-data resources, and networking, offers a tremendous opportunity to establish such tools, to help city managers, regulators, academia, and citizen groups to develop a coordinated approach for integrated air quality management for a city.

UEinfo has four objectives: (1) sharing knowledge on air pollution (2) science-based air quality analysis (3) advocacy and awareness raising on air quality management and (4) building partnerships among local, national, and international airheads.

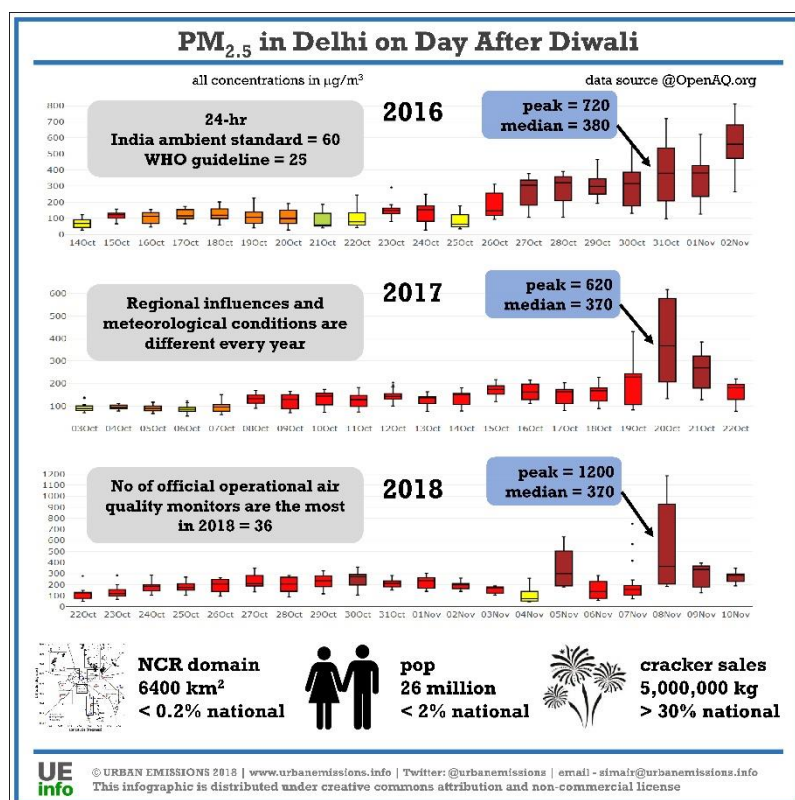
This paper is an illustrated version of an op-ed published in the WIRE in Nov 2016 with the same title @ <https://thewire.in/environment/delhi-parking-fee-brick-kilns> (last accessed February 2021)

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Real policy is not defensive short-term emergency measures but something proactive spanning multiple years, and acting fast, local and through multiple agencies¹

Every Diwali, a billion people in India wake up to the news of smog-ridden cities in the aftermath of celebratory fireworks. And much like the hangover after a night of drinking, we promise ourselves, *never again!*; that *moderation will be the key next time around!*, etc. Yet, we once again find ourselves in a similar (if [worse](#))² situation. And in 2016 again, a year after three infants [challenged](#)³ the Supreme Court to curb air pollution from firecrackers (one of the families has since migrated away from Delhi), we are faced with yet another hangover.



For the first time, more than 1,800 schools [have been closed](#)⁴ in the national capital region in response to high pollution levels originating from a complex mix of emissions: from the Diwali fireworks burning, stubble burning in Indo-Gangetic

¹ This is an illustrated version of an op-ed published in the WIRE in November 2016. While the article is 5 years old, the storyline is still relevant at the time of preparing this working paper. Main article is available @ <https://thewire.in/environment/delhi-parking-fee-brick-kilns>

² PM 2.5 levels over north India sky-rocketed to over 29 times the WHO standards this Diwali, surpassing the previous year as well @ <https://thewire.in/environment/diwi-air-north-india>

³ Three toddlers came knocking on the Supreme Court's door on Tuesday, demanding the highest court of the land act immediately against Delhi's spiralling pollution graph, especially the oncoming season of firecrackers @ <https://www.thehindu.com/news/national/three-toddlers-move-sc-against-delhis-peaking-pollution-graph/article7703036.ece>

⁴ Delhi Closes Over 1,800 Schools in Response to Dangerous Smog
@ <https://www.nytimes.com/2016/11/05/world/asia/delhi-closes-over-1800-schools-in-response-to-dangerous-smog.html>

states, wintertime meteorological changes and the ever-present urban emissions (vehicles, cooking, lighting, waste burning, industries and power plants). Starting with a bang during Diwali, the situation usually deteriorates [till the height of winter](#)⁵.

The question that usually follows is what we can do *now*. The short answer: literally *nothing*. Perhaps stay indoors with air filters (for those who can afford them) or, better yet, vote with your feet and move away. There is nothing that one can do in two or three weeks short of [clamping down](#)⁶ on every industry and power plant, banning vehicles from all streets and avoiding all fires for burning – for warmth or to rid of waste.

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How Do We Improve Delhi's Graded Responsibility Action Plan for Better Air Quality?

When pollution is bad, we have to be more informed about the problem in advance and promote programs that avoid, improve, shift – just the way fuel is burnt in the city.



That said, there are in fact measures that we can take over a medium to longer timeframe, especially if done with thought and sincerity, and that could begin to have an impact before Diwali in 2017.

An [earlier article](#)⁷ spoke about the myths and the myopia of policymakers. Now, let's take the long view, exemplified by the question: what is it that we can do to really make a difference in the coming years? These are real solutions that are not gimmicks and some of them are straightforward (which should not be confused for easy) and, more importantly, need some time to manifest their results over subsequent months and years. It is a basic human right to breathe clean air, so let's discuss where we can start.

⁵ Air Pollution in Delhi - Winter Time Highs and Blame Games

@ <http://urbanemissions.blogspot.com/2012/11/pollution-in-delhi-winter-time-highs.html>

⁶ Explained: What is GRAP, Delhi-NCR's action plan as air pollution increases?

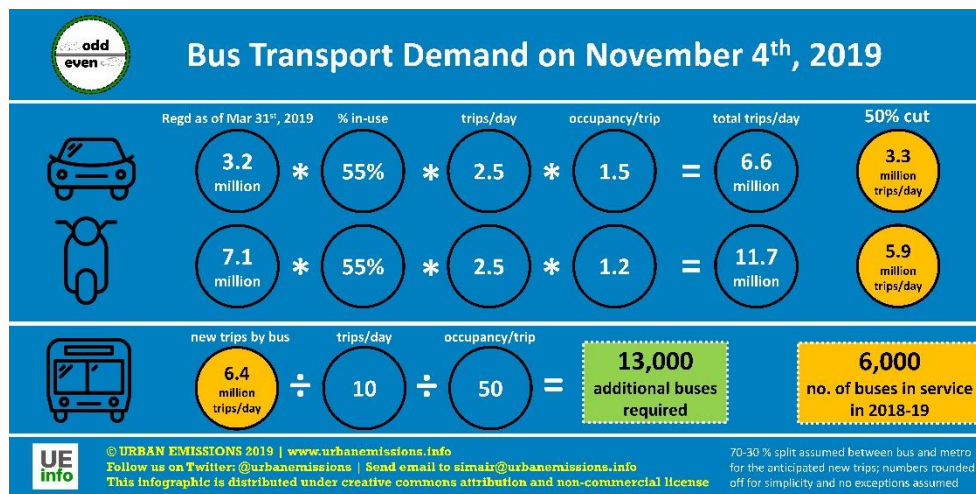
@ <https://indianexpress.com/article/explained/explained-what-is-grap-delhi-ncrs-action-plan-as-air-pollution-increases-6719746/>

⁷ Why Delhi's Plan for Air Filters at Traffic Intersections is a Red Herring

@ <https://thewire.in/environment/air-filters-delhi-pollution>

1. Public transportation *has* to improve

Not notionally but in quality and quantity. Delhi needs at least [15,000](#)⁸ operational buses to support a clean, safe and reliable transport network. If we want car- and motorcycle-owners to abandon their vehicles and share a ride, then the city need to *provide* that opportunity. The Delhi Transport Corporation has a fleet of less than 6,000, and many of these are not in continuous operation because of constant breakdowns and repairs. The fleet until just size before the 2010 Commonwealth Games was 4,000.



To compare, the total number of registered vehicles in 2010 was 6.75 million; at the end of 2015, it was [8.8 million](#)⁹. Over [5.65 lakh new vehicles](#)¹⁰ enter the city every day. A recent report suggested that the city is [not able](#)¹¹ to provide more depot space – the principal reason for not expanding the fleet. If officials are serious about curbing passenger-travel demand and demotorising the streets (which will also reduce road dust resuspension), then the city needs a significant boost in the number of buses. The depot capacity needs to be increased with rest areas for the operators and better maintenance services; integrated intelligent transport systems have to be introduced; incentives and discounts have to be provided for long-term passes; and an aggressive campaign needs to be launched to get people away from personal vehicles.

⁸ How Delhi Knew What To Do To Fix Its Air Pollution in 1997 – But Didn't Act
@ <https://thewire.in/culture/delhi-pollution-1997-buses>

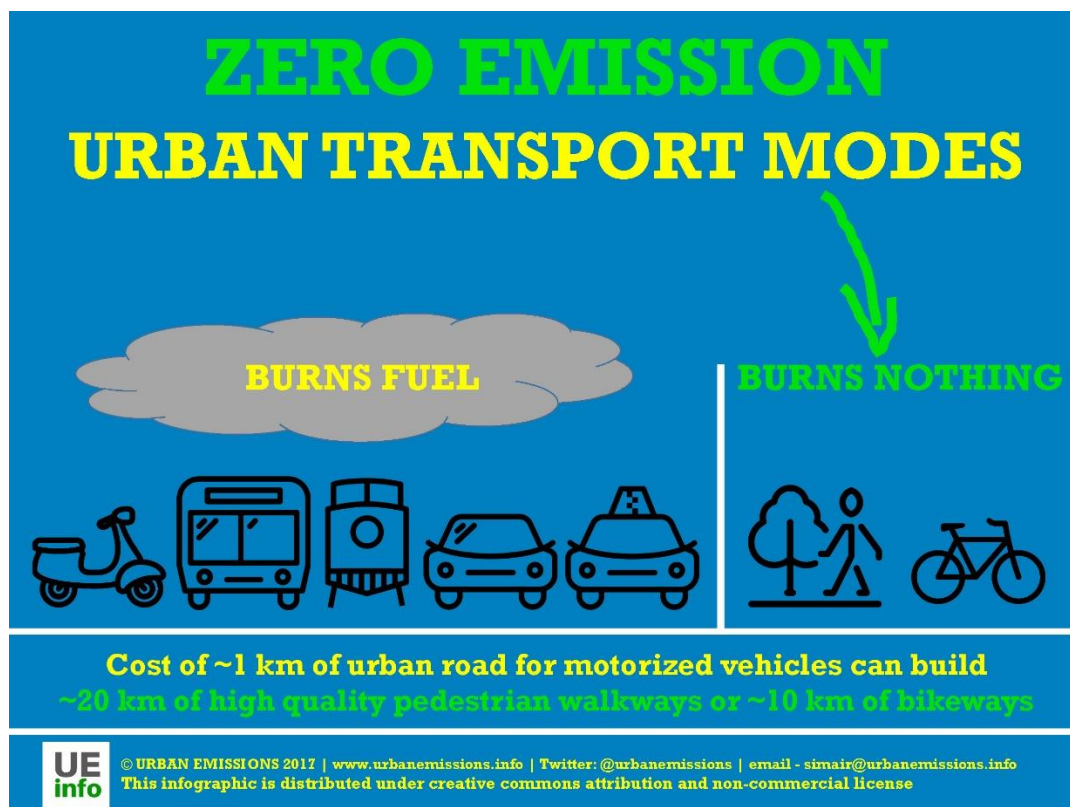
⁹ Delhi Statistical Handbook
@ http://des.delhigovt.nic.in/wps/wcm/connect/doi_t_des/DES/Our+Services/Statistical+Hand+Book

¹⁰ 5.7 lakh vehicles enter Delhi daily, equal to number of vehicles registered in a year
@ <https://www.hindustantimes.com/delhi/5-7-lakh-vehicles-enter-delhi-daily-equal-to-number-of-vehicles-registered-in-a-year/story-oYdVmxjFFrI5QamvoH4SJM.html>

¹¹ Public Transport not ready for green fight
@ <https://timesofindia.indiatimes.com/city/delhi/Public-transport-not-ready-for-green-fight/articleshow/55019802.cms>

2. Support cycling and biking

The non-motorised transport profile in India is such that it is the poor that walk and the rich that use vehicles. This is a generalisation but also largely true. Accordingly, the political will to fund roads and flyovers outweighs that to maintain good quality pavements. This is very unfortunate because, with [a functioning system](#)¹², people from all walks will be able to cycle and walk recreationally.

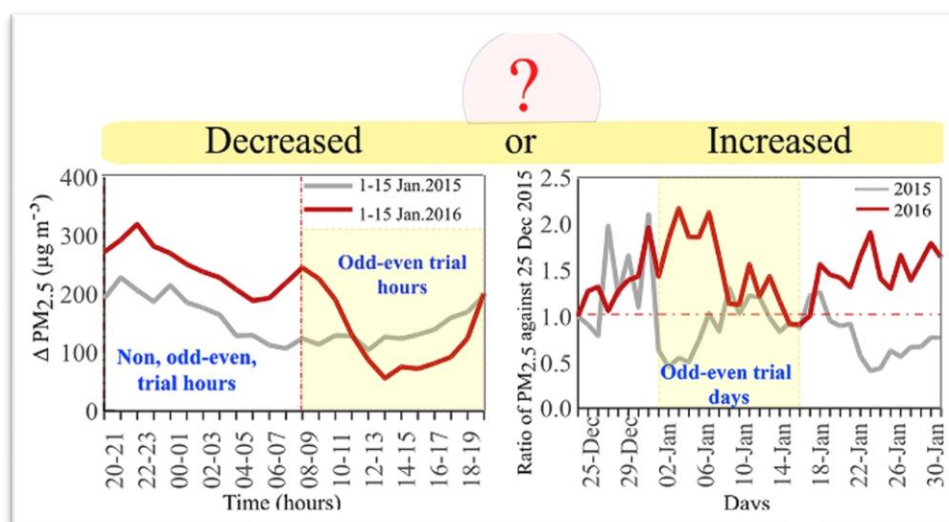


¹² Street Films @ <http://www.streetfilms.org>

3. Link parking fee with air quality index

Upon the National Green Tribunal's (NGT's) order, the city [banned](#)¹³ the registration of diesel-engine-powered vehicles (for some time) and introduced an additional sales tax on diesel vehicles at the time of registration. Both the measures are applicable for newer vehicles only. The NGT also introduced an additional [environmental tax](#)¹⁴ for heavy-duty trucks entering the city; this does not include vehicles registered in Delhi and not crossing the border. The city also experimented with the [odd-even concept](#)¹⁵ (twice, for two weeks each time, with a number of exemptions) – which in turn is very dependent on a vigilant traffic police to be completely successful.

[Click on the image for article link](#)



These measures were introduced and tested for one reason: to discourage the use of personal transport. However, one measure that could be applicable for old/new vehicles, petrol/diesel/gas engines and all engine sizes is the parking fee. Delhi [has the lowest parking fees](#)¹⁶ (often Rs 10-20 per hour) in the world. What if, the parking fees were increased tenfold – especially during the days of high air pollution? Take the malls, for example: every car parked there has to go through a toll booth and, without excuse, has to pay.

¹³ SC lifts ban on sale of diesel cars in Delhi, imposes 1% green cess

@ <https://www.livemint.com/Industry/yHP6xg0RfW8hT4OxP5tywN/SC-lifts-diesel-car-registration-ban-in-Delhi-NCR-with-rider.html>

¹⁴ Trucks Entering Delhi Will Have to Pay 'Green Tax' From Nov 1

@ <https://www.ndtv.com/delhi-news/trucks-entering-delhi-will-have-to-pay-green-tax-from-nov-1-supreme-court-1231267>

¹⁵ Odd-even programme is no long-term solution to pollution - It can only be the beginning of the search for one @ <https://indianexpress.com/article/opinion/columns/delhi-odd-even-phase-2-air-pollution-arvind-kejriwal-2790837>

¹⁶ Parking policy for clean air and liveable cities @ <https://www.cseindia.org/tag/parking-policy>

A fee-structure can be displayed outside the malls' parking lots with that days' air quality index (AQI). If the AQI is under 50 (green – very rare in Delhi), then parking is free. And as the AQI climbs, so does the fee. If the value is 500, then parking rate could just as well be Rs 500 per hour. Consider it a charge for spending time in the air-conditioned mall! Similarly, for those parking illegally, the towing fees should be increased further.

India Air Quality Index Nomenclature

AQI CATEGORY, POLLUTANTS AND HEALTH BREAKPOINTS

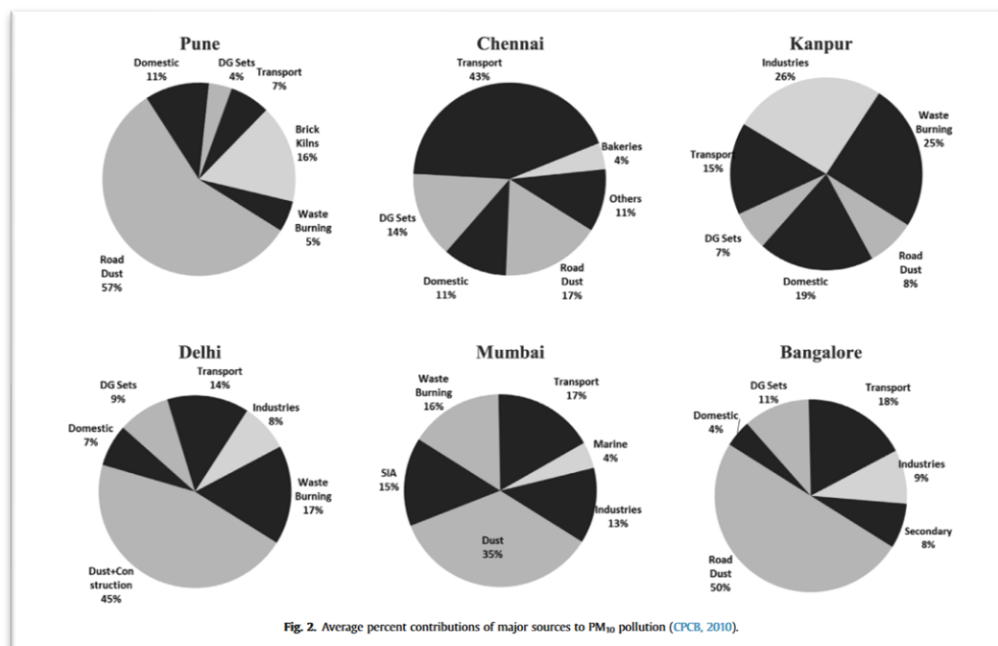
AQI Category (Range)	PM ₁₀ (24hr)	PM _{2.5} (24hr)	NO ₂ (24hr)	O ₃ (8hr)	CO (8hr)	SO ₂ (24hr)	NH ₃ (24hr)	Pb (24hr)
Good (0–50)	0–50	0–30	0–40	0–50	0–1.0	0–40	0–200	0–0.5
Satisfactory (51–100)	51–100	31–60	41–80	51–100	1.1–2.0	41–80	201–400	0.5–1.0
Moderately polluted (101–200)	101–250	61–90	81–180	101–168	2.1–10	81–380	401–800	1.1–2.0
Poor (201–300)	251–350	91–120	181–280	169–208	10–17	381–800	801–1200	2.1–3.0
Very poor (301–400)	351–430	121–250	281–400	209–748	17–34	801–1600	1200–1800	3.1–3.5
Severe (401–500)	430+	250+	400+	748+	34+	1600+	1800+	3.5+

4. Pave and maintain the roads

Much has been said about the contribution of dust to $PM_{2.5}$ and PM_{10} concentrations. Geographically, Delhi is next to an arid and dusty land (specifically, the Thar desert) and there is no way of avoiding the incursion of dust. This is a bigger problem when the roads are not paved and there is a constant inflow of dust from the *sides* of the roads. There are also innumerable ditches that are a result of other agencies' works (telephone, cable, sewage, water, etc.) that are often left unfixed after completion of work. If the city works to maintain roads and pavements, it can make a huge difference.



[Click on the image for article link](#)



5. Use cleaner fuel in all vehicles

This is one intervention that has been addressed regularly, from the conversion of public transport buses, three-wheelers and a significant portion of four-wheelers to operate on compressed natural gas (CNG) – to mandating all the taxis run on CNG, and up until the introduction of Bharat-IV emissions and the introduction fuel norms in 2012.

The new [Auto Fuel Policy](#), proposed to standardise Bharat-VI emissions and fuel standards, kicks in in 2020. In the past, refineries and manufacturing companies have complied and adapted to the changes every time a [new standard](#)¹⁷ was passed. We can only assume that, in 2020, the automobile emissions will be that much lesser with the cleanest fuel possible today: the Bharat VI. This is a leapfrog effort and we have to wait for the adaption to trickle down to roads.

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Table ES-1. Summary of world-class policies that are adopted (●) or under development (○) in Transport Task Group (TTG) countries as of March 2017.*

Country or Region	Tailpipe emissions		Fuel economy		Fuel quality		Green freight program
	LDV	HDV	LDV	HDV	Gasoline	Diesel	
Australia	○	○	○		○	●	○
Brazil	○	○	●			●	●
Canada	●	●	●	●	●	●	●
China	●	○	●	●○	●	●	●
European Union	●	●	●○	○	●	●	●
Germany	[see EU]						●
India	●	●	●	○	●	●	○
Italy	[see EU]						●
Japan	●	●	●	●	●	●	●
Mexico	○	○	●○		○	●	●
Russia					●	●	
United Kingdom	[see EU]						●
United States	●	●	●	●	●	●	●

Number of TTG countries with world-class standards by status. TTG includes a total of 37 countries; 12 participate directly, and 25 participate indirectly through the EU.

Adopted (●)	33	32	35	4	34	37	34
Development (○)	3	4	30	30	2	–	2

*The count of TTG-participating countries includes individual countries that are members of the European Union. Tailpipe emissions and fuel quality standards are indicated only if world class. Fuel economy standards and green freight programs are not differentiated according to stringency.

¹⁷ Fuel and vehicle standards in India @ <https://dieselnet.com/standards/in>

6. Improve garbage collection

Why is this so hard? Garbage burning was banned a long time ago, but it continues to happen every day and everywhere. We also have very little understanding of how much is burnt. This is one sector that is completely under municipal control. We know that we need to collect and process garbage; we have an army of unrecognised people and ragpickers doing this for us. Why not pour in more resources, increase the number of garbage pickup trucks, integrate the collection and segregation process, legalise and provide benefits to ragpickers, and set up a system where every kilogram of waste is picked up?

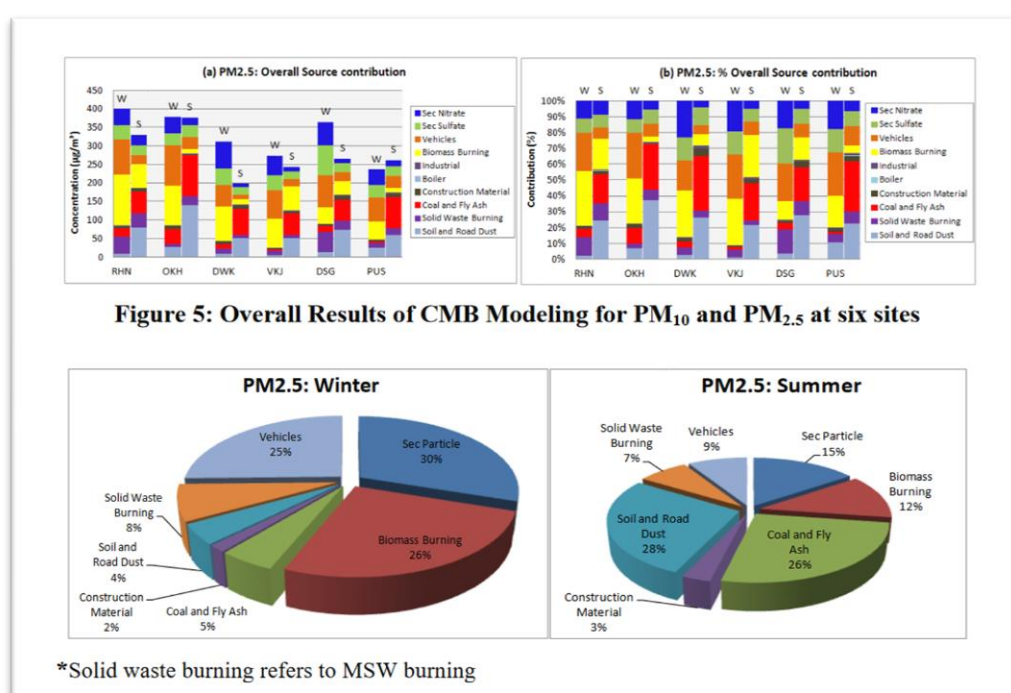


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7. The city needs heating solutions

The burning of garbage, along with coal, wood and almost anything else, more than quadruples in incidence when the winter temperatures approach their nadir (between late November and late February). The need for heat is the highest among those living in the open, including workers at construction sites, markets, small kiosks, guards and people living in slums. We worry about Diwali, a two- or three-day affair; about the stubble burning in the north, a two- or three-week affair. However, the need for heat is a three- or four-month affair for the entire capital region (and beyond) – a daily, local emission source in a time of low inversion.



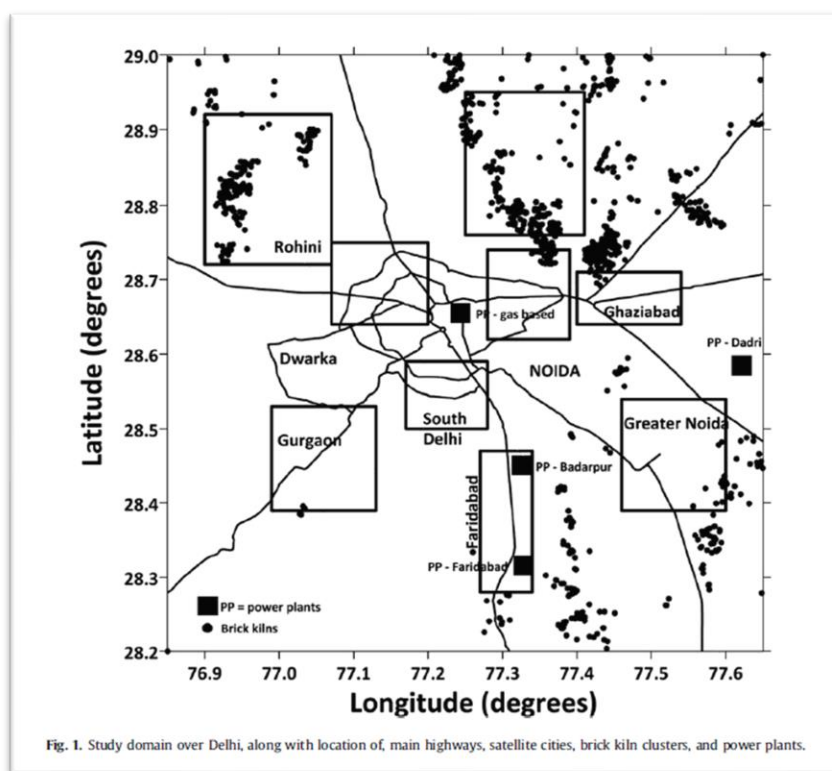
According to [a study commissioned by the Delhi Pollution Control Committee](#)¹⁸ in 2015, burning biomass contributes twice as much to wintertime pollution as to that in summertime – and that this is completely linked to the heating demand. This is not an easy source to address since it is, in reality, also a social justice and economic issue. At the same time, it needs immediate attention.

¹⁸ Comprehensive Study on Air Pollution and Green House Gases (GHGs) in Delhi 2015
@ <https://cerca.iitd.ac.in/uploads/Reports/1576211826iitk.pdf>

8. Adoption of cleaner technology for industries

These industries include food processing, textiles, leather works, wood processing, pharmaceuticals, plastics and paints and metal processing – using a mix of [coal, oil, gas and electricity](#)¹⁹. With an increase in the reliability of grid electricity and [performance ratings](#)²⁰ issued by the Bureau of Energy Efficiency, emissions from these industries can be managed. However, a large chunk of industrial emissions also come from brick kilns. Administratively, there are no brick kilns in Delhi. In the late 1990s, when CNG was being introduced in Delhi, a parallel ordinance was passed to relocate all brick kilns away from Delhi.

[Click on the image for article link](#)



They crossed the border but the pollution never went away. There are at least a 1,000 brick kilns within a 50-km radius of the city. These are seasonal kilns that start their operations post-monsoon (in October) and go on till May. The bricks are burnt using the same old way: by shoving a mix of agricultural residue, coal, heavy oil (like tar) and, at times, wood into the brick stacks and rotating the piles every 10 to 14 days. All of them have a 50-foot stack that disperses pollution to farther distances, which means the 200 stacks in and around Ghaziabad are polluting the air somewhere in Delhi.

¹⁹ Annual Survey of Industries, MOSPI @ <http://mospi.nic.in/annual-survey-industries>

²⁰ Performance, Achieve, and Trade scheme, BEE India @ <https://beeindia.gov.in/content/pat-3>

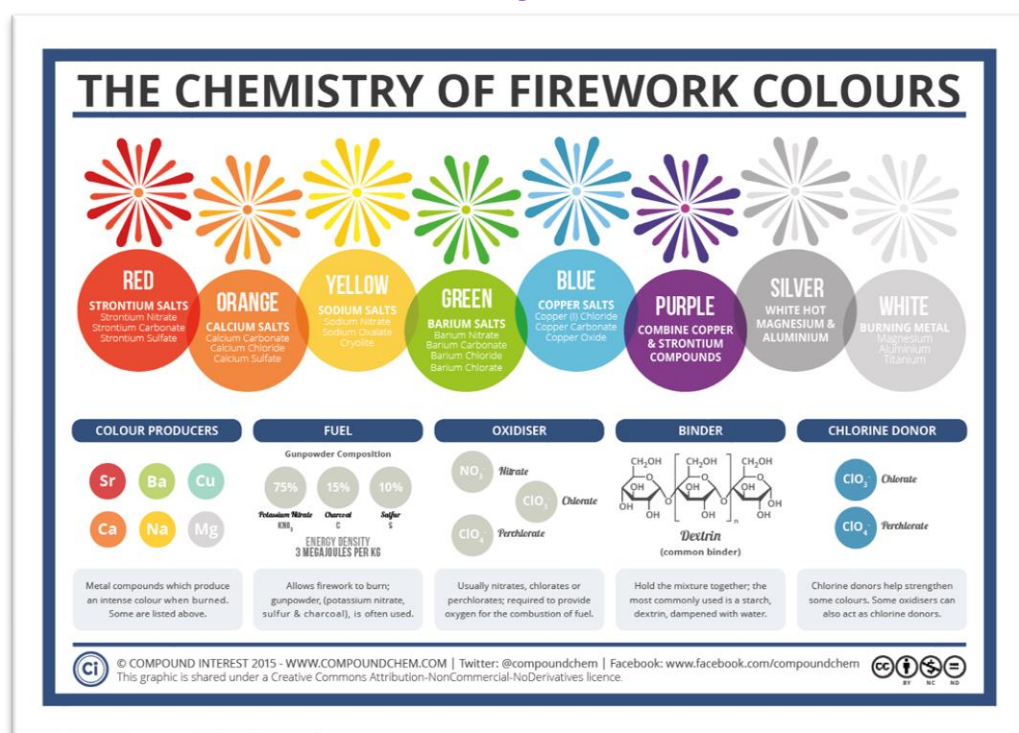


With some concerted efforts, however, these kilns can be less polluting. [Newer kiln technologies](#) that require smaller infrastructural changes to adapt to are being piloted and scaled up in Asia and which can provide significant benefits in terms fuel savings, emission reductions and lesser contributions to ambient air pollution from the sector. The city of Patna is looking to retrofit a cluster of 75 kilns with zig-zag firing technology; similar programmes need to be replicated in other cities. (For starters: There are 700 potter families in Kumhar Gram in west Delhi, operating small-scale kilns every day and manufacturing earthenware for a living. Most of the Diwali lamps sold in Delhi come from here.)

9. A no-cracker Diwali

Even if the festival is for three days at best, the exposure levels when the crackers burn are one of the highest during the season. A campaign to ban the burning of crackers cannot start a week before the festival nor on the eve of the festival, asking people to restrain themselves. This campaign needs to happen all year long and needs to be well-planned. It needs to raise awareness about the health impacts of burning crackers and has to represent a political will to ban the sale of crackers everywhere in the state and apprehend any illegal importers from other states.

[Click on the image for article link](#)



In October 2015, the [Supreme Court quashed](#)²¹ a plea made by the three toddlers to ban the bursting of crackers during Diwali. The court said it “cannot stop people from bursting crackers”. Can the state then ban the sale of crackers? Or can it replace their uncontrolled sale with a permit system, just like for liquor, and introduce a significant environment tax to discourage people from buying them?

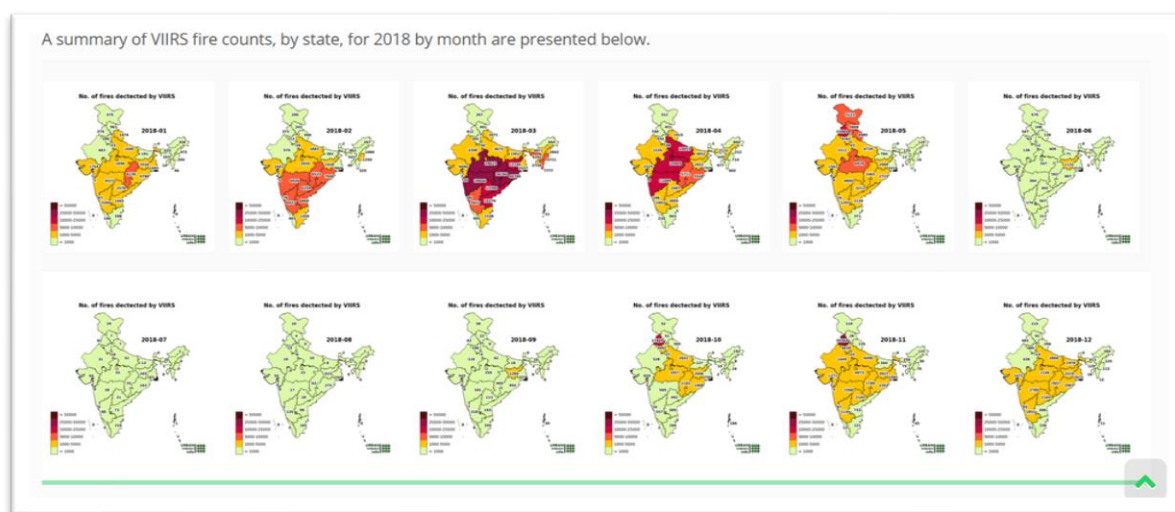
²¹ Can't ban firecracker bursting on Diwali, says Supreme Court

@ <https://www.thehindu.com/news/national/sc-says-no-to-firecracker-ban-on-diwali/article7813627.ece>

10. Find a solution for stubble burning

This is another seasonal problem. The burnings are intense for 15 or 20 days in the Indo-Gangetic states, spewing a mix of aerosols (including black carbon and organic carbon) and gases (carbon monoxide, volatile organic compounds and nitrogen oxides, ozone, etc.). These episodes have the potential to tilt the average AQI from the typical unhealthy to hazardous.

[Click on the image for article link](#)

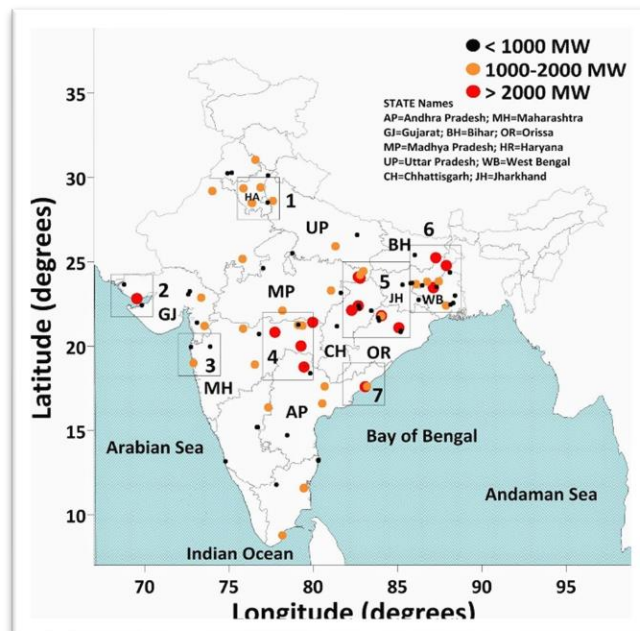


We know that stubble burning will happen and yet we wait for the harvest season to begin and then point fingers at Punjab and Haryana for the consequent haze. This cannot be controlled *after* it starts. This has to be stopped at the roots – even before the farmers start to think about it. This is not an easy task and needs cooperation between the agricultural departments of Delhi, Punjab, Haryana and Uttar Pradesh, apart from an awareness program aimed at farmers on the harmful consequences of this aged custom. There also needs to be an incentive program for farmers that addresses their concerns and reasons for stubble burning; and an incentive program and technical support for the industries that can collect the stubble and burn it in a controlled environment.

11. Clean power generation

The power plants within Delhi's administrative boundaries run on natural gas but the power plants [tasked with supplying](#)²² for the growing demand run on coal, most of them within 200 km of the city (in Haryana and Uttar Pradesh). During shortages, this demand is supplemented by diesel generator sets, often seen next to the telecom towers, malls, cinema halls, big apartment complexes, institutions, and kiosks. In December 2015, [new emission regulations](#)²³ were passed for all coal-fired thermal power plants, tightening the standards for particulate matter and introducing standards for sulphur dioxide, nitrogen oxides and mercury emissions. The deadline for compliance was set for December 2017.

[Click on the image for article link](#)



If this happens, we can expect a [minimum 50% drop](#)²⁴ in the total emissions from the plants and the associated ambient air pollution. However, a new lobby, led by the Central Electrical Authority, has been trying to [push this deadline](#)²⁵. As long as power-generation is dominated by coal and diesel, any delay in full implementation of the new multi-pollutant emission standards at power plants will only prolong our fight for breathing clean air in India.

²² Delhi Load Dispatch Centre @ <http://www.delhisldc.org/Redirect.aspx?Loc=0804>

²³ Environment Ministry Notifies Stricter Standards for Coal Based Thermal Power Plants to Minimise Pollution @ <https://pib.gov.in/newsite/PrintRelease.aspx?relid=133726>

²⁴ India coal fired power plants @ <https://urbanemissions.info/emissions-in-india-coal-fired-power-plants>

²⁵ India Wavers on Emissions as Power Plants Balk at Price Tag @ <https://www.bloomberg.com/news/articles/2016-11-02/india-wavers-on-emissions-goal-as-power-plants-balk-at-price-tag>

12. Enforce construction debris norms

Delhi and many other cities in India are like massive construction sites, and the accompanying dust levels are very high. Though we have all the right norms in place – such as, for example, that sites should be covered with a tarpaulin sheet to prevent the spread of dust – in practice, these norms are [often violated](#)²⁶. The trucks carrying debris from construction sites are often not covered either. This leads to fallen debris on the roads and furthers resuspension when other vehicles pass by.



²⁶ No respite in sight from dust in Gurgaon @ <https://www.hindustantimes.com/delhi/no-respite-in-sight-from-dust-in-gurgaon/story-uXnAPdKMVKjgQ2Y0u64LKK.html>

13. Address governance issues

Every time there is an episode of high pollution, we are looking for someone to blame. In November 2016, we are looking at Punjab and Haryana and their inability to control stubble-burning. At the same time, Delhi didn't take any serious measures to control the sale of Diwali crackers and didn't have any measures in place to counter the effects of local emission sources. Multiple agencies are [responsible for different sectors](#)²⁷ to address concerns and mitigate emissions. In practice, this means that no single agency is willing to take responsibility to address the root causes of air pollution as a whole. Enforcement is negligible.

It is difficult but not impossible. This requires a commitment that needs to cross over the usual electoral cycles, needs parties and governments to work together and is not something that one party, one agency or one civil-society group can achieve in isolation. It has to be a joint effort to improve the life of every person. For this, we need an independent body with teeth to clamp down on offending actors across states. And unless we start now and find ways to address air pollution in the long term, we will

be unsuccessful in having any meaningful impact in the coming years. Real policy is not [short term emergency measures](#)²⁸ that are defensive in nature.



We need a proactive policy spanning multiple years, and we need to act fast, local and through multiple agencies across multiple political parties to take the long view on air pollution in Delhi.

²⁷ Delhi air pollution: identifying perpetrators and fixing responsibility. Air pollution in Delhi is a result of a complex mix of anthropogenic and natural sources @ <https://www.downtoearth.org.in/news/air/delhi-air-pollution-identifying-perpetrators-and-fixing-responsibility-56240>

²⁸ Graded Response Action Plan for NCR Delhi @ <https://cpcb.nic.in/graded-response-action-plan-for-delhi-ncr/>



www.urbanemissions.info