

Out of Tackling Asia's Air Crisis Breath

Asia's extraordinary economic growth since the Second World War has come at an enormous price to the environment, and above all, on its air.

For this cover package, Associate Managing Editor John Delury and Editorial Board member Peter Hayes assembled an international team of experts to look at the challenges posed. In particular, we sought to look at both the science and the policy-making behind the problems.

A short package of essays on an issue of this complexity cannot hope to be comprehensive, but we do aim to highlight key issues and how they might be addressed. One major conclusion is that air pollution in Asia is a problem that cries out for regional cooperation, precisely because it is transboundary in nature, as numerous authors in this cover package point out.

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Delhi's Air Pollution: A Failure of Democratic Governance

By Aseem Prakash
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New Delhi's air pollution problems are legendary, and like those of other major cities, they are tied in part to increasing urbanization. In India's case, though, many of the solutions are evident and available, but failure of democratic governance are creating obstacles to dealing with problems the electorate actually wants solved, write Aseem Prakash and Nives Dolšak. Until leaders develop the political will to tackle air pollution, the problems won't go away.

THE WORLD IS becoming increasingly urbanized. About half of the world's 8 billion people reside in urban areas.¹ By 2050, this number will rise to about 7 billion, accounting for two-thirds of the global population. Agglomeration economies incentivize firms to locate in urban areas while the urban-rural wealth gap coupled with the lack of employment opportunities in rural areas, lead villagers to flock to cities.

There is much to celebrate about urbanization. Yet the continued, almost unchecked, pace of urbanization poses serious policy challenges. Air pollution is among these critical problems. The World Health Organization (WHO) notes that 80 percent of urban residents experience air pollution levels exceeding WHO guidelines.² Urban living is also energy-intensive. People often need to travel long distances for work, but do not have access to public transportation. Consequently, they rely on personal transportation. It is not surprising that vehicular air pollution has emerged as the key factor contributing to poor urban air quality.

Along with air pollution, the increasing number of personal vehicles contribute to other policy problems. For example, traffic jams in urban areas are legendary. In Mexico City, an average commuter spends 219 hours a year stuck in traffic. Similar stories can be told of Bangkok, Jakarta, Bucharest, Istanbul, Rio de Janeiro and Beijing.

Air pollution problems reflect governance failure because cities' transportation infrastructure has not kept pace with their growing populations. But cities alone are not to be blamed for their poor air quality. Winds might carry air pollution from sources outside a city's administrative con-

¹ ourworldindata.org/urbanization#share-of-population-in-urban-areas

² www.who.int/health-topics/air-pollution#tab=tab_1

³ www.zmescience.com/ecology/environmental-issues/about-29-of-san-franciscos-pollution-comes-from-china-42334/

⁴ whizzherald.com/top-10-most-polluted-cities-in-the-world-2019/

⁵ *ibid.*

⁶ www.urbanemissions.info/blog-pieces/whats-polluting-delhis-air/

⁷ www.motorindiaonline.in/buses/delhi-transport-corporation-dtc/

⁸ www.tribuneindia.com/news/nation/number-of-registered-vehicles-in-delhi-crosses-1-crore-mark/417394.html

⁹ www.onlinelibrary.wiley.com/doi/10.1111/rego.12225

¹⁰ www.theguardian.com/cities/2017/feb/15/delhi-deadly-dust-how-construction-sites-choking-city

¹¹ pubs.acs.org/doi/full/10.1021/acscentsci.9b00009

trol. Take the example of Seoul, which receives transboundary pollution from China. During the pre-monsoon summer months, Singapore's air quality deteriorates due to forest fires in Indonesia and Malaysia. About 29 percent of San Francisco's air pollution can be traced to China.³ Thus, urban air pollution does not necessarily reflect governance failure at the city level; it could reflect governance problems at the national or even international level.

INTERNAL GOVERNANCE FAILURES

Indian cities face profound air pollution problems. According to the Lancet Commission, in 2015, there were about 6.5 million premature deaths globally due to air pollution.⁴ India alone accounted for 1.81 million of those deaths. It has 9 of the 10 most polluted cities in the world.⁵ New Delhi, India's capital, ranks sixth on this list.

New Delhi's air pollution reflects both internal and regional governance failures. The causes for the two tend to be different, and so are the governance solutions. Pollution levels vary across months due to its geography and meteorological factors. Within its administrative boundaries, the major sources of PM_{2.5} air pollution are: vehicular (30 percent), industrial (20 percent), open waste burning (20 percent) and road dust (15 percent).⁶ As with many other cities worldwide, Delhi's citizens rely predominantly on road-based transportation. In the last two decades, authorities have sought to curb vehicular pollution in several ways; for example, the city boasts an excellent train system, the Delhi Metro. India also has adopted fuel standards on par with Euro VI standards. In response to a public interest petition, the Supreme Court of India ordered Delhi's bus fleet to switch from diesel to compressed natural gas (CNG). Consequently, the Delhi Transportation Corporation, which runs public buses, manages the world's largest CNG bus fleet.⁷

Yet vehicular pollution is getting worse due to the increasing population that continues to rely on road-based transportation. For context, Delhi's 2019 population stands at about 20 million, up from about 16.7 million in 2011. There are over 10 million registered vehicles (up from 1.8 million in 1990 and 3.8 million in 2000).⁸ Electric cars and hybrids are virtually absent, and these vehicles tend to run on gasoline or diesel. The Delhi government has discouraged vehicle use via policies such as odd-even road rationing (cars with odd-numbered license plates drive on Monday, Wednesday and Friday while those with even-numbered cars drive on Tuesday, Thursday, and Saturday).⁹ But such policies have not been effective. One reason is that the odd-even rule exempts women drivers and two-wheelers, with the latter accounting for the majority of vehicles. Thus, the symbolic half steps to address pollution problems show the absence of political will to solve a thorny local air pollution issue.

Delhi is also experiencing a construction boom in the office, retail, and residential sectors. This also creates air pollution, because the government seldom enforces rules for controlling dust such as by regular spraying of water and installation of barriers around construction sites.¹⁰

Episodic instances of landfill fires also contribute to the air pollution problem. The Delhi government officially shut the garbage dumps in 2009, yet around 80 percent of the 10,000 metric tons of waste generated daily finds its way to these dumps.¹¹ Methane generated by organic waste builds up, leading to fires that generate toxic fumes.

STUBBLE BURNING AND TRANS-BOUNDARY POLLUTION PROBLEMS

In addition to local sources of pollution, Delhi's air quality is worsened by pollution from outside its administrative boundaries. These include



Crawling with pollution: Thick smog seen as traffic move at the office peak hours in New Delhi. The Indian capital, with an estimated population of more than 17 million, is named as one of the most polluted cities in the world by the World Health Organization.

Photo: EPA/Harish Tyagi

coal power plants, there are 13 with a capacity of 11,000 MW within a 300 km radius of the city.¹² Delhi's construction boom requires bricks that are supplied by coal-fired kilns located in neighboring states. Indeed, the brick kiln industry is among the top five consumers of coal in India. The most severe air pollution problems emerge in the months of October and November due to the burning of paddy stubble in the neighboring states of Punjab, Haryana, and to some extent, Uttar Pradesh.

Punjab and Haryana are India's breadbaskets, and have played a key role in India's Green Revolution. In the 1950s and the 1960s, India faced chronic food shortages and relied on food aid. Scholars such as Garret Harding even suggested cutting off food aid because developing countries such as India were facing a Malthusian overpopulation problem. Harding wanted the Western world to adopt "lifeboat ethics," because

if it allowed too many on the lifeboat via food aid, the boat would sink.¹³

But from the 1970s, Indian farmers, particularly in Punjab and Haryana, adopted the green revolution technologies that transformed India into a food surplus country. As agricultural land is the most important asset of farmers, they seek maximum returns from it. This means they plant valuable crops with high returns as well as use their land for multiple crops annually. Farmers could keep their land fallow to regenerate, but the easy availability of fertilizers makes it economically advantageous for farmers not to do so. Punjab farmers, therefore, seek to plant both a monsoon crop (paddy, which becomes rice after its husk is removed) and a winter (wheat) crop.

This two-crop strategy worked well for some time. Yet, policy solutions seem to carry the seeds of new policy problems. The green revolution created a strong farming lobby that sought conces-

sions from the government. Citing the high cost of production, farmers demanded subsidized electricity to operate water pumps. Governments often obliged because until recently they owned and operated a substantial share of the electricity generation, transmission, and distribution infrastructure under State Electricity Boards, or SEBs.

The provision of cheap electricity caused two problems. First, the financial health of the SEBs became precarious.¹⁴ Second, cheap electricity incentivized farmers to use high powered water pumps to extract groundwater to irrigate paddy fields, especially in the pre-monsoon dry season. This groundwater mining was unsustainable. As groundwater levels began falling, the long-term future of the agricultural industry was threatened. Consequently, in 2009, the Punjab government enacted the Punjab Preservation of Subsoil Water Act.¹⁵ The objective was to ensure that farmers use the monsoon rains for water-

¹² www.jakson.com/blog/delhis-perennial-winter-smog-causes-and-possible-solutions/

¹³ www.garretthardinsociety.org/articles/art_lifeboat_ethics_case_against_helping_poor.html

¹⁴ www.ukessays.com/essays/economics/privatization-of-the-indian-power-sector-economics-essay.php

¹⁵ [agripb.gov.in/abt_deptt/pdf/Pb preservation of Subsoil Act,2009.pdf](http://agripb.gov.in/abt_deptt/pdf/Pb%20preservation%20of%20Subsoil%20Act,2009.pdf)

¹⁶ timesofindia.indiatimes.com/city/chandigarh/water-table-decline-slowed-by-20cm-post-2009-act-in-punjab/articleshow/59624160.cms

¹⁷ currentnews.in/govt-moves-stop-stubble-burning-go-smoke-punjab-haryana/

ing the paddy fields — paddy is first planted in a nursery and then the sapling is transplanted in the field with standing water. This law prohibited the sowing of paddy in the nursery before May 10 and transplanting the saplings before June 16. This timetable would allow farmers to use rains to transplant the sapling, and for the monsoons to replenish water aquifers.

By some accounts, this law has started to show effects: a study covering 12 districts revealed that the average annual rate of groundwater decline decreased from 0.9 meter during 2000-2009 to 0.7 during 2009-2014.¹⁶ But the law had an unintended effect: it delayed the planting and harvest of paddy. This was problematic for farmers because after harvesting the paddy crop, they need to quickly prepare the same fields to plant the winter wheat crop. Because the planting of the winter crop cannot be pushed forward, the period to harvest the paddy and clear the field of stubble got considerably reduced.

Stubble clearing would be less challenging if farmers could afford to employ a seasonal labor force or machines. During the harvest (and also during sowing) season, this region experiences a labor shortage. Further, most farmers cannot afford to purchase harvesting machines. For reference, there are about 1.8 million farming families in Punjab. However, 1 million of them are small landholders with a farm size of two to five acres.¹⁷ Realistically, these farmers do not have the resources to buy these machines. To clear the post-harvest stubble quickly, farmers rely on a quick and inexpensive method: burn it.

By itself, crop burning would not cause air pollution problems, should the wind blow the smoke away from Delhi. Unfortunately, geography and meteorology work against Delhi. For one, it is landlocked and does not benefit from wind that flows from the ocean to clean its air. Second, while the winds blow from the west during mon-

18 marcellus.in/story/usaids-monsanto-and-the-real-reason-behind-delhis-horrific-smoke-season/

19 infographics.economist.com/2017/DemocracyIndex/

soons, they flow from the north (where Punjab is located) post-monsoon.¹⁸ Thus, paddy harvesting in October-November means that the winds carry the soot and smoke from Punjab to Delhi. Consequently, Delhi's air quality deteriorates severely with the Air Quality Index (in terms of PM_{2.5}) in the range of 700 to 1,000. For perspective, in the United States, the Environmental Protection Agency labels an Air Quality Index reading of over 300 as hazardous.

DEMOCRACY AND WEALTH MAY NOT SOLVE GOVERNANCE FAILURES

India is a well-functioning democracy where citizens could be expected to demand clean air.¹⁹ Further, Delhi is a politically robust city with competitive elections. If democracies tend to have less pollution, Delhi shouldn't have a pollution problem. Delhi is also a wealthy city. Among various Indian states and Union Territories, it has the highest per capita income. If pollution levels decrease as countries prosper — the so-called Environmental Kuznets Curve — here again, Delhi shouldn't have a pollution problem.

Why are democracy and affluence not leading Delhi to solve its air pollution problems? After all, India has laws against stubble burning and India's Supreme Court (located in New Delhi) has taken cognizance of the illegal stubble burning. It has summoned the top administrators of various states and asked them for a plan of action. The Indian federal government should support a solution to stubble burning because it is a signatory to the Paris Agreement.

Why is the government unwilling to enforce anti-burning laws even though the Supreme Court would like it to do so? This is where political factors begin to contribute to governance failures.

Democracy can undermine governance if political competition encourages lawbreaking.

Vehicular pollution is getting worse due to the increasing population that continues to rely on road transportation. For context, Delhi's 2019 population stands at about 20 million, up from about 16.7 million in 2011. There are more than 10 million registered vehicles, up from 3.8 million in 2000.

20 www.statista.com/statistics/702739/punjab-legislative-assembly-election-vote-share-by-political-party-india/

21 www.tribuneindia.com/news/punjab/no-option-except-burning-paddy-stubble-bhartiya-kisan-union/481203.html

22 www.washingtonpost.com/news/monkey-cage/wp/2017/11/11/delhis-been-hit-with-toxic-smog-why-its-political/

23 www.indiaenvironmentportal.org.in/content/453619/action-plan-for-biomass-management-report-of-the-task-force-on-biomass-management/

24 www.forbes.com/sites/prakashdolsak/2019/11/02/saving-delhi-from-the-toxic-smog-regulations-have-failed-but-financial-incentives-could-work/#39e778aa1188

25 theprint.in/opinion/terrorise-stubble-burning-problem/14822/

A vibrant democracy leads to intense political competition in Punjab and Haryana.²⁰ This also means that no political party is willing to support the crop burning ban because this will antagonize the farming lobby.²¹

Politics also gets complicated with religion. The majority of farmers in Punjab belong to the Sikh faith. In the 1980s and the 1990s, this region experienced terrorism/insurgency organized along religious lines that took a heavy death toll. Indira Gandhi, the prime minister, was assassinated by her Sikh bodyguard, and massive violence against Sikhs followed in the aftermath. Every government realizes that enforcing a burning ban could quickly become a religious issue and perhaps even rekindle insurgency.²²

PERSUADING FARMERS NOT TO BURN STUBBLE

Most groups seem to agree that stubble burning should stop, governments should not use force to stop crop burning, and the central government should subsidize the purchase of machines such as the rotavator, the so-called Happy Seeder, and the super straw management system.²³ These machines help farmers in different ways. For example, they can allow farmers to plant the wheat crop without removing the stubble, compress the stubble into bundles for easy transport or convert the stubble into bio pellets, which could serve as fuel for industries. Although farmers can't afford to buy these machines individually, they can buy them collectively through well-functioning farmer co-operatives. This is where the policy thrust probably should be focused: provision of governmental funds so that co-operative societies can buy these machines.

We have suggested that the private sector should also step in.²⁴ India's corporate laws stipulate that companies should spend 2 percent of profit on corporate social responsibility (CSR).

Tackling air pollution is certainly a socially important issue. Using CSR funds, companies could adopt villages or blocks of villages to support co-operatives in their purchase of the machines.

The Delhi smog shows that even in a well-functioning, affluent democracy, local or regional pollution problems can be difficult to solve. Democracy and competitive elections, along with identity politics, can lead to governance failures. Even the judiciary seems helpless to enforce the law. While the government certainly could apply coercion, there is no political appetite to do so. Financial incentives are probably the way to solve the stubble burning problem.

Delhi is also a case study for other cities regarding air pollution problems, whether originating within or outside their administrative bodies. A massive investment in public transportation is required so that urban residents do not have to rely on personal vehicles. Similarly, governments need to make sure that cities do not become islands of prosperity, because this creates conflict with the less prosperous rural areas. As one prominent Punjab politician noted: "If smoke from burning crops impacts lungs in Delhi for three weeks, then exhaust from vehicles in Delhi adversely impacts the countryside for 365 days."²⁵ If regional problems require co-operative solutions, this sort of a wealth gap undermines such efforts.

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