



**HOW DO
WE FIGHT THIS
POLLUTION ?**



**CHANGE IS
IN THE AIR**

**WITH CLEAN GAS,
JAHANPANA**

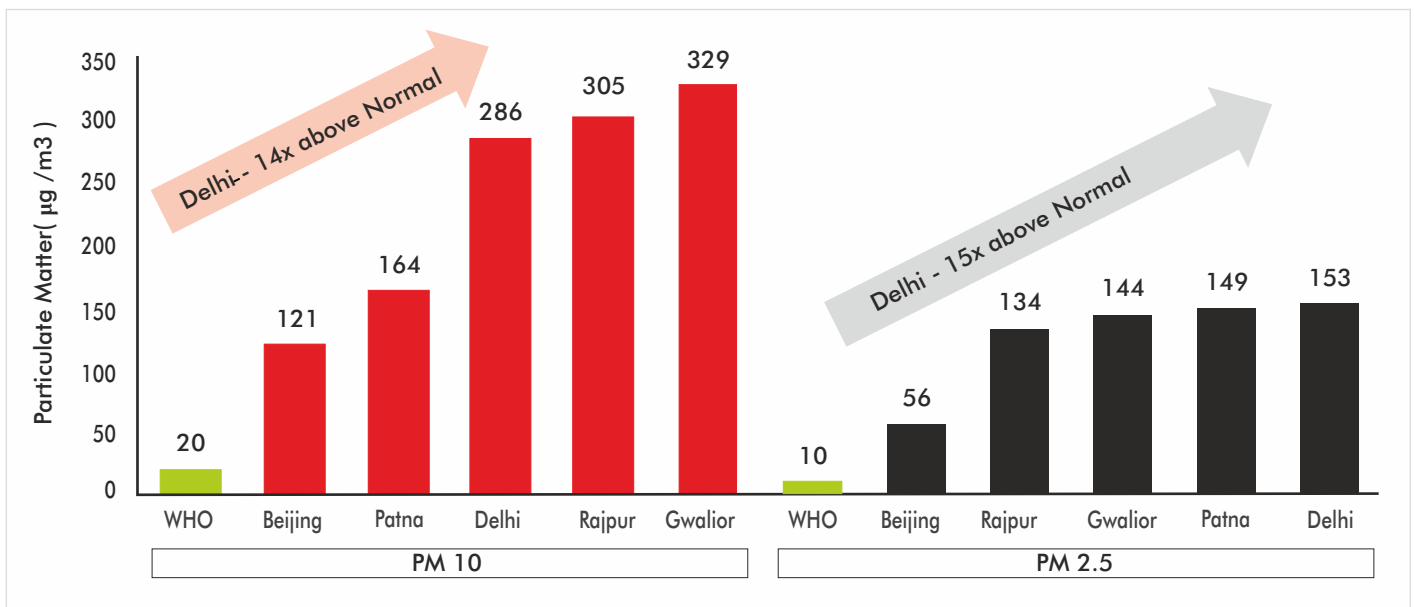
Failing a generation

Bhanwari Devi's 18 month old baby, Vaishnavi, gasped for breath throughout the night. As she coughed out all she had, her parents fought waves of panic, taking turns to keep their hands on her tiny ribs, feeling it move up and down. The movement was assuring, but the violent fits of coughing that sent her tiny lungs gasping for air, was not. Somewhere else in Delhi, 11 year old Aryamaan quit playing football; spending more than 20 minutes has left him gasping for breath. Elsewhere, in the virtual world, parents on WhatsApp discuss face mask options for their children.

The winter of 2016 in Delhi saw the pollution index of particulate matter (PM 2.5/10), i.e., pollutants that enter the lungs, reach 800 micrograms per cubic metre. This was more than 30x the level that was fit for human consumption. Delhi was once again infamous as a capital. As commoners wedged themselves into an air of combustion, everyone gasped in disbelief, and, for some air.

A lethal normal?

A deeper look into the air India breathes, not just in Delhi, pretty much sums up at least one aspect of India's disastrous air standard. As the statistics below sums up, we have convincingly over taken China on the wrong grounds.

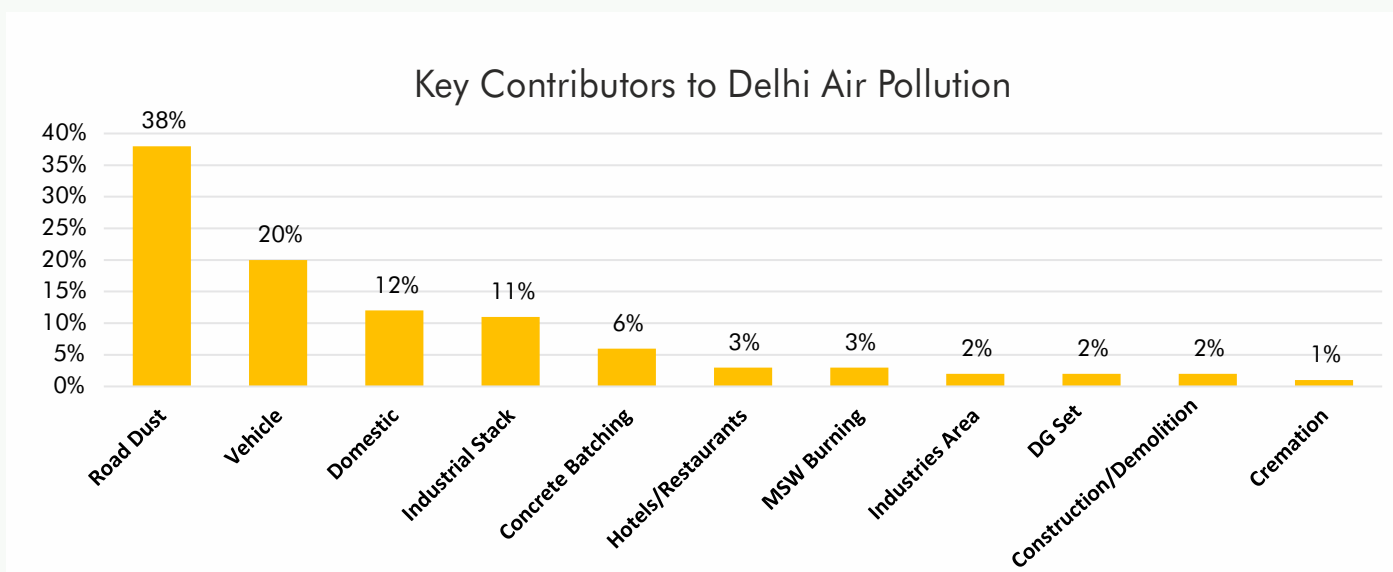


There is clear consensus that emergency medical conditions, heart attacks and strokes rise dramatically when particulate concentrations are high. Corroborating the obvious, India's Environment minister then Prakash Javdekar in 2015 told the Parliament "... an international study released recently has claimed that foul air is killing up to 80 people a day in Delhi". Recent data from the W.H.O.'s Global Burden of Disease project indicates that the number of premature deaths related to air pollution in India has caught up with the number in China, and is now surpassing it. The worst-hit are the very old, who are susceptible to heart disease and stroke, and the very young, whose lungs are taxed so badly by polluted air that they cannot develop normally.

We have brought upon ourselves a dire and ruinous environment and hopefully, this is a reference point for changing sensibilities.

Key culprits

It's a melee of factors, but the key identifiable culprits are: road dust, vehicular pollution, power generation & firewood and other fuels used for cooking and heating. IIT Kanpur has helped segregate all the identifiable determinants as follows



Source: IIT Kanpur Study on Sources of Delhi Air Pollution

While the malefactors are many, the transportation and power sectors exacerbate the problem in most Indian cities. For reasons of economy and not propriety, Diesel is a chief perpetrator of increase in particulate matter. Diesel exhaust is a group 1 carcinogen, which causes lung cancer and has a positive association with bladder cancer. It also contains several substances that are listed individually as human carcinogens. Indian roads still permit CV vintages from the 90s whose carbon footprint of benzene, carbon monoxide (CO), lead aerosol, NOX, PM and sulfur oxide clog the air and our lungs. Not surprisingly, this is one of the reasons for high pollution in the NCR and elsewhere in the country. This is stifling, but, change is in the air. Literally.

The panacea? Gassing it with regulatory changes

Natural Gases are relatively a very clean source of fuel. Why so?

Natural gases produce significantly lower carbon monoxide, nitrogen oxide (NOX), and particulate matter (PM) emissions thanks to their lower carbon content, completely sulphur free content and cleaner combustible properties. Compressed Natural Gas (CNG) emits a PM of 0.01 which is well under the EURO IV emission regulations of 0.02 and this has the potential to play a major role in reducing dependence on liquid fuels for the transportation sector. The major benefits of CNG over liquid fuels are: (a) lower emissions of pollutants and particulate matter, (b) prevention of adulteration or pilferage and (c) competitive economics at market prices.

... Usage gaining traction

CNG has increasingly gained traction in the recent past across NCR, Mumbai and Gujarat led by:

- Regulatory diktat from judicial bodies
- Favourable government policies such as priority-allocation of domestic gas
- Beneficial taxation structure compared to liquid fuels and
- Beneficial economics for end-consumers.

Regulatory diktat

The Supreme Court of India as India's pollution controller in chief in 1998 passed a landmark directive coercing the conversion of Delhi's public transportation system from Diesel to cleaner CNG fuel. The switch to CNG showed significant results, at least initially. A 2004 World Bank study said: "One of the largest CNG programmes has helped to reduce the number of premature deaths annually – at least 3,629 in Delhi." Alongside, the National Green Tribunal has played a critical role in enforcing a slew of regulatory orders shouldering the burden of pollution control. This includes banning of registration of diesel SUVs and high-end vehicles (engine capacity of over 2000 cc), hiking the environment compensatory charges on commercial vehicles by 100 per cent, not allowing any vehicle registered in 2005 or prior years to enter Delhi and ordering all taxis in Delhi to switch to CNG by March 1, 2016. These are just a few examples among many, but the regulatory interventions have laid the foundation of building a much needed CNG infrastructure in India and creating the supply side of the industry, which has abetted conversions and strong demand for CNG vehicles.

Change in emission norms

India is on a path of unprecedented tightening of its emission standards and these are among the most stringent developments witnessed across the world. Indian Automobiles will shift to BS-IV in April 2017, followed by a direct shift to BS-VI (skipping BS-V all-together) from April 2020. The shift from BS- 3 to BS- 4 will save emissions by as much as 30% from current levels (CO, HC & NOx). However the PM would reduce significantly by 80%.

EMISSION NORMS FOR HEAVY DIESEL VEHICLES				
Norms	CO (g/kmhr)	HC (g/kmhr)	NOX (g/kmhr)	PM(g/kmhr)
1991 norms	14	14	18	-
1996 norms	11.2	11.2	14.4	-
India Stage 2000 norms	4.5	4.5	8	0.36
Bharat Stage II	4	4	7	0.15
Bharat Stage III	2.1	2.1	5	0.1
Bharat Stage IV	1.5	1.5	3.5	0.02

Beneficial economics

Using Natural Gas as fuel is not only environmentally beneficial but also economically so. The savings are depicted in the table below –

Delhi				
Fuel	Mileage/litre or Kg	Retail Price (Rs/litre or Kg)	Cost per Km	Costlier than CNG by
Petrol	14	71.3	5.1	2.81x
Diesel	20	59.1	3.0	1.63x
CNG	21	38.0	1.8	

Mumbai				
Fuel	Mileage/litre or Kg	Retail Price (Rs/litre or Kg)	Cost per Km	Costlier than CNG by
Petrol	14	77.6	5.5	2.68x
Diesel	20	64.8	3.2	1.57x
CNG	21	43.4	2.1	

Priority sector allocation of domestic gas

Up till now low cost domestic gas has been going to several industries such as ceramics and petrochemicals which are polluting the environment either through their end products or due to the process involved, thus, negating the benefits of natural gas. But since Aug 2014, the Govt via the Ministry of Petroleum has started treating City Gas Distribution as a priority sector. The Ministry has asked GAIL to cut the supply of domestic gas to these industries and provide it to the CGD companies for CNG and domestic PNG requirements. Currently, the domestic gas supply in India is around 90mmscmd and the demand from CGD companies is around 18mmscmd. With several new residential developments in North and West India providing for piped gases, we see strong annuity based demand for city gas distribution companies and this policy would ensure continuous supply of low cost domestic gas to these companies.

Increasing quantum of Gas availability

The demand for natural gas in India is around 378 mmscmd whereas the supply (including domestic and LNG imports) is only 150mmscmd – a gross deficit of around 228mmscmd, or 60% of demand. One reason behind this is the limited regasification infrastructure available in India. The situation is expected to improve in the coming years due to increase in the regasification capacities and discovery of small and marginal blocks. Regasification capacity in India is currently at 30mtpa and this is set to almost double by FY 2021 led by the expansion of existing terminals (e.g. Petronet, Dabhol) and addition of new terminals (GSPC Mundra, Swan Energy, GAIL FSRU). This would decrease the deficit of natural gas in India and enable users plan for gas as the feed stock vs other sources of combustion.

Scrapage policy – a probable reality

Medium and Heavy Commercial Vehicles (trucks and buses) constitute just 2.5% of total fleet of 4 wheelers in India, but contribute to 60% of pollution caused by automobiles in India. Moreover, older vehicles, typically > 10 years of age and pre-BS/ BS I compliant, contribute to only 15% of total fleet but pollute 10-12 times more than a new vehicle. Pollutants released from automobiles could reduce drastically if government were to introduce scrapage scheme to facilitate exit of older vehicles and encourage purchase of new vehicles with engines compatible with cleaner emission norms (BS IV or better). The Government of India has already released a concept paper which recommends modernization of vehicles bought on or before 31st March 2005. The total potential vehicles to be replaced with this definition are roughly 28 million and would have significant impact on overall pollution levels.

Limited additions to thermal power beyond 2017

As per the National Draft Electricity Plan Report 2016, India will install only 50,000mw of power under the thermal route till FY 2022. These do not relate to any new plants and refer to the capacities in which work has already started. Post FY 2022, the draft policy has actually mentioned that they are not likely to encourage addition of thermal power in India. As renewable energies continue to break the barriers of affordability, and gasification infrastructure come in, there is a probability that a significant portion of India's future requirements are met from sources that are not as polluting as they are today.

A combination of increased emphasis by Courts/Regulators, conducive government policies and beneficial economics for alternate cleaner fuels has the potential to drastically reduce CO2 emissions in India.

Whom will this benefit?

As the regulators enforce whatever they have envisaged, Vaishnavi, Aryamaan and their friends will grow up over the next few years with relatively cleaner air. Also benefiting from this structural change, will be the companies across the Gas value chain. This includes companies engaged in the regasification of imported gas, infrastructure for gas transportation to different markets and finally distribution for end customer applications. Companies offering various services to the above universe of gas companies would also stand to benefit from rising gas

The Government of India has shown remarkable leadership in de-carbonizing the environment. The mission 2022 to set up renewable capacities of 175,000mw is one among the many steps being taken to improve the adoption of non-polluting gases. The Government's efforts in widening the net of LPG cylinder availability is an important endeavour as usage of firewood is a significant polluter in rural areas. However a lot of scope of improvement remains – for instance stricter enforcement against usage of Furnace Oil in Delhi. Furnace Oil is a polluter of the highest degree and is banned for usage in the region but users flout norms and continue to use it. Government policies are directed towards minimizing pollution from coal at all stages (from mining to burning) through extensive use of technology and the thrust in renewable energies should soon move from just an obligatory purchase to an standalone decision as they continue to get cheaper viz-a-viz conventional coal fired power.

A combination of these events will give fillip to gas consumption and the enablers of the same. We like 4 companies in this space – Petronet LNG, Indraprastha Gas, GAIL and Deep Industries. Financials apart, these companies would be catalysts towards India's move to a greener economy.

The below table shows contribution made by an investor by investing in a share of these companies -

Name of the company	Carbon Dioxide Emission Saved (in Kg/Share)
Petronet LNG	10
Indraprastha Gas	3
GAIL	11
Deep Industries	10
Total CO2 Emission Saved (in Kg/Share)	34
Assuming a discount of 20% due to overlap	7
Net CO2 Emission Saved (in Kg/Share)	27

Note: Detailed calculation shown in annexure.

Unifi's Strategy in Green Fund

A holistic approach to address the problem of air pollution and global warming will have significant implications for quite a few listed stocks. Non-conventional sources of fuel and newer sources of energy like Natural Gas are expected to be significant beneficiaries of changing industry dynamics. Unifi expects Gas demand to accelerate over the next 5 years and apart from the social positives, this offers an economic opportunity as well. The Unifi Green fund will seek to invest in such opportunities that have a double bottom line effect – environmental & financial. While environmental impact is key, our focus on financials, growth and valuations are unwavering and similar to how we manage our other mid-cap strategies.

In the annexure to this document, we have calculated an estimate of the carbon dioxide saved by each of our investee companies in the Gas space.

Annexure: Calculation of Carbon Dioxide Emissions Saved

Companies	Petronet LNG	Indraprastra	GAIL	Deep Ind
Gas Volume (in Million Kgs per annum)-(A)	16,556	914	30,660	667
CO2 emission (in Kgs) (per Kg of Gas)-(B)	2.75	2.75	2.75	2.75
Total CO2 emission from Gas (in Million Kgs) C = (A*B)	45,530	2,514	84,315	1,834
Equivalent diesel required per annum (In Million litre)-(D)	19,868	1,097	36,792	800
CO2 emission (in Kgs) per litre of diesel-(E)	2.68	2.68	2.68	2.68
Total CO2 emission from Diesel (in Million Kgs) F = (D * E)	53,245	2,940	98,603	2,145
Net CO2 emission saved (Million Kgs) (F minus C)	7,715	426	14,288	311
No. of shares (in Million)	750	140	1,268	32
CO2 emission saved (Kg/share)	10	3	11	10

Note: The above calculation are verified by our Natural Gas Consultant - Mr. KP Roy (brief profile shared below)*.

Assumptions

- 1.The calculation for each company is worked on standalone basis. Hence there could be an overlap in savings of CO2 from gas volume processed by each of these companies. An assumption of 20% overlap discount in calculation of total CO2 saved per Share is made.
- 2.Assumed similar gas composition (Percentage of Methane in Gas) for all companies.
- 3.Assumed that entire gas volume substitutes diesel. However it can be used as substitution for other fuels like gasoline, furnace oil etc.

*Brief profile of Mr. KP Roy

Mr. KP Roy is the ex-Executive Director of GAIL (1985-2007) where he was responsible for all the areas of GAIL's operation such as sourcing, city gas opportunities, exploration & production, etc. During his tenure in GAIL, was deputed to Petronet LNG Ltd (1997-2003), to import LNG and set up their regasification terminals. Currently, he is designated as a senior consultant to various private Gas companies across the value chain. He is also a faculty member at International Institute of Technology & Management (IITM) New Delhi.