AMITY UNIVERSITY
GURUGRAM

STRATEGIC RECOMMENDATIONS
AND SOLUTIONS ON

AIR POLLUTION

CAUSES, MITIGATION & STRATEGIC PLANNING





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CONSORTIUM FOR
AIR POLLUTION
CONTROL

AMITY CENTER
FOR AIR POLLUTION
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AIR POLLUTION – AN EXISTENTIAL CRISIS

In spite of significant progress made in improving air quality, 92% of the world's population still lives in places where air quality much exceeds the WHO guidelines. According to WHO 2018 Report, an estimated 7 million deaths, i.e. 11.6 per cent of all global deaths, were caused due to pollution.

India with 14 out of 15 most polluted cities of the world has a gigantic task of monitoring and mitigating air pollution. Air Quality of Delhi and NCR region has been a matter of grave concern for the last few years. Alarms were raised when AQI touched 999 in the month of October 2016. The problem was further compounded with crop residue (Pallari) burning by farmers of the NCR region and nearby states.

It should be noted that New York/ New Jersey, London and Munich were as polluted or even worse than Delhi during 1950s till 1970s. But the timely interventions by the policy makers, planners and the government in the form of strategic policies and actions resulted in mitigating air pollution in these mega cities.

Drastic steps like Odd-Even Vehicles on alternate days have been introduced in Delhi. The coal-based power plants have also been targeted as they contributed heavily towards the presence of particulate matter in air. The National Green Tribunal (NGT) has also came down heavily on construction agencies as construction activities in and around Delhi were also identified as a major source of pollution. However, all these measures are still falling short of drastically reducing the particulate matter in the Delhi-NCR region. AQI still remains above 200 during most part of the year while the global standards require it to be below 20. We need to wage a war on Air Pollution if we have to achieve blue sky for our people and drastically bring down the Particulate Matter in air to the levels mandated by WHO.

In this respect we need to learn from successful Clean Air Programmes of Singapore, New York, London, Norway, and lately China. They attained compliance to global standards of Air Quality while continuing impressive industrial growth!

> **“The war against Air Pollution has to be an ongoing 365 days a year exercise. It cannot be an issue which only gets the spotlight for a few weeks at a time”**

The present Government has accorded its top priority to mitigate the Air Pollution disaster. It commissioned the National Clean Air Program (NCAP 2019) in January 2019 aimed at cutting down air pollution by 30% from the levels of 2017 in the next five years, i.e. by 2024.

With India sitting on an Air Pollution disaster, the present Government has accorded its top priority to tackle this monstrous problem, and commissioned the National Clean Air Program, NCAP 2019, in January 2019, that aims at cutting down air pollution by 30% from the levels of 2017 in next five years, i.e. by 2024.
It is with a sense of utmost urgency that Amity University Haryana convened an ***International Symposium on Air pollution – Causes, Mitigation and Strategic Planning on 20th September 2019*** to bring together renowned experts from US, Norway and India, policy makers and practitioners to brainstorm and come out with valuable recommendations and concrete action plan to mitigate air pollution and suggest valuable and implementable strategic options to the authorities that would result in a quantum reduction in AQI in the most polluted cities of India, including Delhi and its NCR satellite towns of Gurgaon, Faridabad and Ghaziabad.

MAJOR SOURCES OF AIR POLLUTION

According to the US Environmental Protection Agency (EPA), criteria pollutants are the particulate matters such as PM1, PM2.5 and PM10; photochemical oxidants; and ground level ozone, carbon-monoxide, sulphur-oxides, nitrogen-oxides and lead. These pollutants are responsible for causing serious health and environmental hazards such as, smog, acid rain, and property damage etc. These are termed as criteria pollutants because as per the Clean Air Act, 1963, US EPA sets National Ambient Air Quality Standards based on the human health-based and/or environmentally-based criteria. The sources and effects of criteria pollutants are given in Table 1.

Much of the air quality research has focused on the levels of fine particulate matter known as PM2.5 and PM10. These microscopic particles are 20 times smaller than the width of a human hair and are the most damaging to human health. They can be metals, organic compounds or the by-products of combustion from crop residue and biomass burning, emissions of coal-fired power stations, dust from construction and demolition activities, mining and stone crushing, hot-mix plants, pollutants from cement and steel plants, dust storms from arid regions, vehicular emissions, DG sets and industries as shown in (Figure 1).

Figure 1

TABLE 1 : CRITERIA POLLUTANTS AND THEIR EFFECTS (CPCB)

Criteria Pollutants	Emission Sources		Major Effects	
	Natural Sources	Anthropogenic Sources	Health Effects	Environmental Effects
Sulfur Dioxide (SO_2)	Volcanic emissions	Burning of fossil fuels, metal smelting, petroleum refining etc.	Respiratory problems, heart and lung disorders, visual impairment	Acid rain
Nitrogen Dioxide (NO_2)	Lightning, forest fires etc.	Burning of fossil fuels, biomass and high temperature combustion processes	Pulmonary disorders, increased susceptibility to respiratory infections	Precursor of ozone formation in troposphere, aerosol formation
Particulate Matter (PM)	Wind blown dust, pollen spores, photo-chemically produced particles	Vehicular emissions, industrial combustion processes, commercial and residential combustion, construction Industries	Respiratory problems, liver fibrosis,lung / liver cancer, heart stroke, bone problems	Visibility reduction
Carbon Monoxide (CO)	Animal metabolism, forest fires, volcanic activity	Burning of carbonaceus fuels, emission from IC engines	Anoxemia leading to various Cardio vascular problems.Infants, pregnant women, and elderly people are at higher risk	
Ozone (O_3)	Present in stratosphere at 10-50 km height	Hydrocarbons and NOx upon reacting with sunlight results in O_3 formation	Respiratory problems, asthma, bronchitis etc.	O3 in upper troposphere causes green house effects, harmful effects on plants as it interferes in photo synthesis and results in death of plant tissues since it assists in the formation of Peroxyacetyl Nitate (PAN)
Lead (Pb)		Metal processing plants, waste incineration, automobile exhausts, lead-acid batteries, industrial effluents etc.	Serious effects on central nervous system since it is absorbed rapidly in blood stream, anemia, toxic for soft tissues and bones.	

As per the TERI – ARAI Source Apportionment Study, 2016 for Delhi-NCR region, the various sources of air pollution have been identified as in Figure 2.

Dust and Construction accounts for 38-41% of PM2.5 as well as PM10 while Vehicular Pollution is estimated as 15-17% during summer and 24-28% during winter.

The data however is silent on the peaks of air pollution due to biomass, stubble burning that creates Gas Chamber Effect during winter as well summer.

“We need to develop much better emission inventories, sensor networks and forecasting models to be able to identify the sources and impact locations of air pollution in a much more refined manner.”

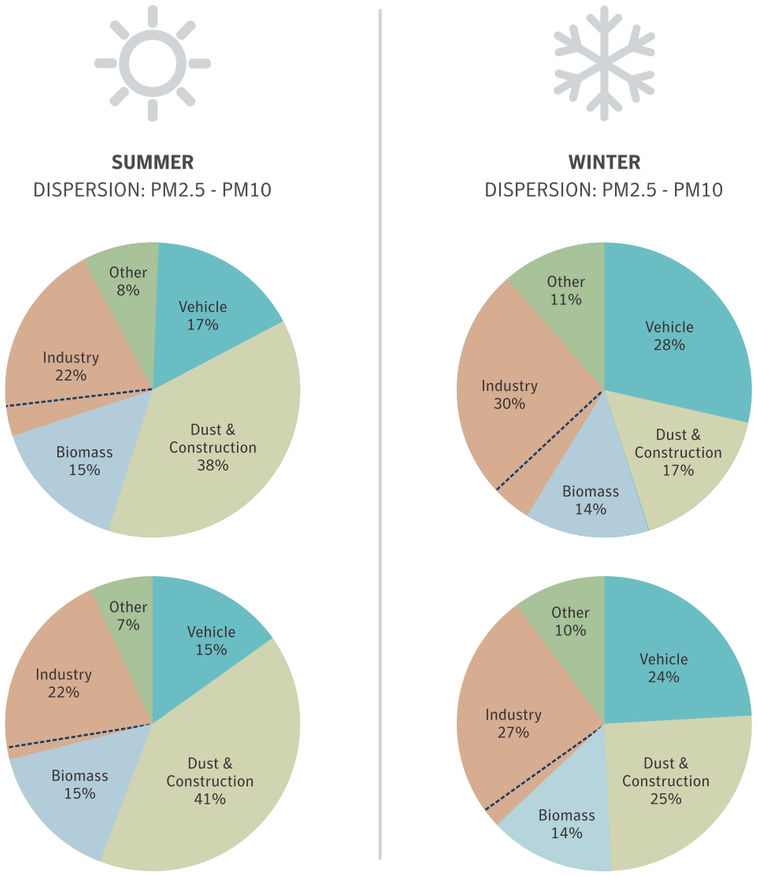


Figure 2: Source Contributions in PM2.5 and PM10 in Delhi (TERI-ARAI Source Apportionment Study), 2016

As per the CEEW analysis 2019, Transport is the single largest contributor to PM2.5 in Air Pollution in Delhi (17.9-39.2%), while Road Dust is the largest contributor to PM10 (35.6-65.9%).

The different studies however show a wide variation in results as shown in Figure 3. The wide variation in the estimates is primarily due to variations in study region chosen and differences in data collection methods and analysis.

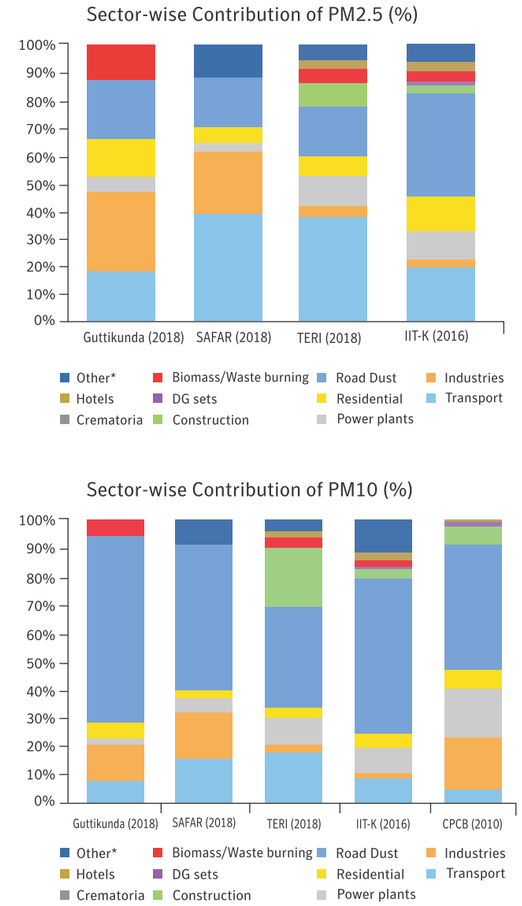


Figure 3: Air Pollution Source Inventory as per CEEW Analysis 2019

LEARNING FROM INTERNATIONAL EXPERIENCE - **CHINA, SINGAPORE AND LONDON**

The success stories of Beijing, London and Singapore offer a great learning experience for us in India to wage a war against Air Pollution. These case studies are highlighted to demonstrate what government and public partnerships can achieve with clear policy insights and effective implementation strategies.

2013 EASTERN CHINA SMOG: **“WAR ON POLLUTION”- A SUCCESS STORY**

During the past four decades, China has adopted many laws, regulations, and standards addressing environmental protection. But these were unable to significantly cut Air Pollution that began to assume monstrous proportions as China’s industrial output skyrocketed. Implementation of the environmental protection laws used to be weak.

On March 4, 2014, the Chinese Premier, Li Keqiang, declared at the National People's Congress, “We will resolutely declare war against pollution as we declared war against poverty.” (As per the story in New York times dated March 12, 2018).

Four years after that declaration, the data shows that cities have cut concentrations of fine particulates in air by an average 32%!

How did China get there? In the months before the Premier's speech, the country released a national air quality action plan that required all urban areas to reduce concentrations of fine particulate matter by at least 10 percent. The Beijing area was required to reduce pollution by 25 percent, and the city set aside an astounding $120 billion for that purpose.

China also prohibited new coal-fired power plants in the country's most polluted regions, including the Beijing area. Existing plants were told to reduce their emissions. If they didn't, coal was replaced with natural gas. Large cities, including Beijing, Shanghai and Guangzhou, restricted the number of cars on the road. The country also reduced its iron and steel-making capacity and shut down coal mines. Some of the actions went from aggressive to extraordinary.

The good news is that Beijing, which used to be one of the world's most polluted cities in top 20, in 2013, is now out of the list of top 200 worst polluted cities of the word. Beijing now is able to provide its inhabitants air quality of PM2.5 at 42.6 µg/m3.

It is imperative that nothing less than waging a war against Air Pollution shall work for India too.

SINGAPORE CASE STUDY: **CLEANING AIR POLLUTION IN A GENERATION**

Singapore has a total land area of some 682.3 sq km and a population which grew from about 1.64 million in 1960 to over 4.13 million today. After separation from Malaysia in 1965, Singapore had to embark relentlessly on an industrialization and urbanization process, both for economic and political survival, and at the same time work towards giving its citizens a “quality life”. Apart from local sources of pollutants, Singapore has had in more recent times to deal with the trans-boundary haze pollution from Indonesia. Singapore has also to cooperate with international efforts in addressing global concerns relating to the depletion of the ozone layer through greenhouse gases and global warming due to climate change. Singapore is today a sophisticated urban, industrialized city state.

Singapore's success story began with the political will to curb air pollution at the beginning of Singapore's development cycle. The industrialization and urbanization in the 1960s, conceived Singapore as a clean and green city. Perhaps no other Prime Minister in the world had initiated a tree planting campaign as the then Prime Minister did in 1963.

But for the early vision, Singapore would have been turned into a bleak, blighted, smoky and polluted city as some of the industrialized, urban cities are in the world today. It may be observed that while much of its natural fauna were bulldozed to make way for development, it was subsequently substituted with cultivated greenery to make it a Garden City. Today, the Garden City serves as a carbon sink to reduce carbon dioxide. Indeed, one of the recommendations in the Draft Singapore Green Plan 2012 on "Clean Air" is "to require industries to plant trees to mitigate their CO_2 emissions”.

LEARNING FROM INTERNATIONAL EXPERIENCE - **CHINA, SINGAPORE AND LONDON**

1952 LONDON SMOG DISASTER: **DESPERATE TIMES CALL FOR DESPERATE MEASURES**

With the Industrial Revolution, Britain became the workshop of the world. The UK's coal consumption increased from around 10 million tons a year in 1800 to almost 200 million tons in 1950. A smoke haze enveloped cities like Glasgow, Leeds, London and Manchester. It blocked out the sun, blackening buildings, increasing the severity of fog, and damaging people's health.

Coal smoke was linked to very high death rates from respiratory diseases such as bronchitis, killing between 800,000 and 1.4 million people in the period of 1840-1900.

While laws were there, however, there were serious flaws in early smoke control laws like the local acts of the 1840s, the Public Health Act of 1875, and the Public Health (Smoke Abatement) Act of 1926.

An ambiguous "best practicable means" clause for smoke abatement - This did not encourage use of the latest technology - but simply the apparatus industrialists were prepared to pay for.

Insignificant fines - Legislation imposed low fines on offenders, effectively providing Britain's industrialists with a licence to pollute.

Exemptions - Failure to regulate emissions from fireplaces in homes, major polluters of city air, was perhaps the biggest flaw. They could have reduced smoke significantly by burning fossil fuels in closed stoves.

Smoke pollution was not viewed in a wholly negative light. There were no votes to be had in clearing the skies. The public's affection for the traditional blazing hearth was a major obstacle to smoke control. Governments were unwilling to upset the electorate by passing legislation that interfered with freedom to enjoy this popular British institution.

The 1952 London smog disaster is thought to have claimed as many as 12,000 lives. However, it was the catalyst for comprehensive air pollution controls in Britain. Following this tragedy the government passed the Clean Air Act of 1956. This for the first time regulated both domestic and industrial smoke emissions. The legislation included powers to establish smokeless zones, and provided subsidies to householders to convert to cleaner fuels (smokeless solid fuel, gas and electricity). It took around 3 decades, and another Clean Air Act in 1968 to deal with slow-moving local authorities, before smoke control programs were finally completed. By the 1980s the skies had cleared - improving health and quality of life in the cities of the world's first industrial nation. Alongside with strict compliance to Air Quality regulations, no areas on the roadside were left without pavements or green. Further the city roads were planned for free flow of traffic, making one way traffic at many and implementing Intelligent Traffic System for efficient traffic flow. London today breaths with AQI of 30 and below for most of the year.

AMITY'S INITIATIVES TO FIND SOLUTIONS FOR THE AIR POLLUTION PROBLEM

At Amity University Gurugram (AUG), recognizing the emergent need for strategic interventions based on scientific research on Air Pollution and its impact on human and environmental health, established a Centre for Air Quality and Human Health in 2016. This Centre has been supported by a multi-disciplinary and multi-institutional ***Climate Research Laboratory (CRL)*** facility at AUG and the **Amity Air Quality Monitoring Station (AAQMS),** a MAPAN (Modeling of Air Pollution And Networking (MAPAN) system, an overshoot of SAFAR (System of Air-Quality Forecasting and Research), established in collaboration with the Indian Institute of Tropical Meteorology (IITM-MoES), Pune. AUG conducted air quality studies during the Odd-Even Phase-I (January 2016) and Phase-II (April 2016) and found significant improvement in AQI in Delhi.

Air quality studies have also been carried out by AUH during dust storms and festive periods, and significant results related to Particulate Matter (primary aerosols) and Gas Constituents (secondary aerosols) over Panchgaon (a rural station, 50 km away from Delhi) have been published.

INTERNATIONAL SYMPOSIUM ON AIR POLLUTION
20TH SEPTEMBER, 2019

The Symposium was addressed by Prof. Kirk Smith from UC Berkeley who shared the Nobel Prize for Peace with IPCC; Prof. Arthur Frank from Drexel University; Dr. Alena Bartonova from Norwegian Institute for Air Research; Dr. Mrutyunjay Mohapatra, Director-General Meteorology, Government of India; Prof. Mukesh Khare of IIT Delhi; Prof. Krishnamurthi Kannan, Chief Scientist & Head, NEERI, Nagpur; Dr. Gufran Beig, Project Director, SAFAR, IITM Pune; Dr. Sumit Sharma from TERI; Prof. Poonam Kakkar, Chief Scientist, ITR, Lucknow; Prof. Ramesh Chandra, Former Vice-Chancellor, BU & Director, ACBR, DU; Dr. S.K. Tyagi and Prof. Sanjeev Agarwal, Former Additional Directors, CPCB, New Delhi; Dr. Sachchidananda Singh, Principal Scientist, CSIR-NPL, Delhi; Dr. S.K. Goyal, Sr. Principal Scientist & Head, CSIR - NEERI, Delhi Zonal Centre; Dr. Abhijeet Chatterjee from Bose Institute, Kolkata; Dr. Rajiv Kumar Mishra from Delhi Technological University; Prof. PCS Devara Director ACOAST; Maj. Gen. PK Sharma, Director ALS; Prof. AK Yadav Director, ASAS; Prof. Arvind Chhabra, Director, ASCI; Prof. S.N. Sridhara, Director, ASET; Prof. Atul Thakur, Director, ACNT; Dr. Kushagra Rajendra, Head, ASEES; Prof. P.B. Sharma, Vice Chancellor, Amity University Haryana; and Prof. Qamar Rahman, Dean, Research at Amity University Lucknow campus. The International Symposium was presided by Hon'ble Chancellor of Amity University Haryana - Dr. Aseem Chauhan.

WORKSHOP CONDUCTED BY DR. SRIKANTH S. NADADUR (2015)
Dr. Srikanth S. Nadadur, Programme Director, National Institute of Environmental Health Sciences, at NIH, NC, USA, visited AUH, Manesar on 27th October, 2015, and delivered a talk titled "Air Pollution and Your Health: What Science is telling us?" Dr. Nadadur emphasised that urban air pollution at the current level plays a deleterious role on human health.

EXPERT TALK BY PROF. KIRK R. SMITH (2015)
AUG hosted Prof. Kirk R. Smith, a leading Environmental Scientist from the University of California, visited AUH on November 6th, 2015. Dr. Smith delivered a talk on "Household air pollution in India: What is the problem and where are we going?"

INTERNATIONAL CONFERENCE ON CLEAN AIR AND HUMAN HEALTH (SEP 2016)
Amity University Gurgaon in collaboration with National Institute of Environmental Health Sciences (NIEHS), New York University (NYU), US-Environmental Protection Agency (US-EPA) and John Hopkins University (JHU) organized a symposium on "Air Quality and Health Issues: The Global Experiences", on November 7th, 2016, specifically focusing on both the Indian and Global Scenario.

ODD-EVEN PHASE I (29TH DEC 2015-20TH JAN 2016)
During the implementation of the Delhi Government`s policy of Road-Space-Rationing (Odd-Even), Amity University Gurugram (AUG) monitored, from the day one, its efficacy by making systematic high-resolution particulate matter (PM1, PM2.5 and PM10) and spectral variation of black carbon (BC) aerosol mass concentration measurements in conjunction with concurrent solar and local meteorological measurements in its campus. While Phase I monitoring was done using climate research laboratory (CRL) facility housed at AUG, in the Phase II, CRL monitoring station and a portable PM2.5 monitoring instrument (Air Beam) were employed for making multi-site measurements over specific locations in the Delhi NCR during 13 April - 2 May 2016, covering a few days pre- and post-scheme for comparison of air pollution levels.

CONSORTIUM FOR AIR POLLUTION CONTROL
Amity University Haryana has set up a Consortium For Air Pollution Control that has a mandate to bring public and governing bodies together to achieve clean air for all.

- Amity University Gurugram sent a survey team to meet farmers in Punjab, Haryana and other areas to educate farmer groups on the ill effects of stubble burning.
- Worked actively on trends on air pollution to brief weather agencies on appropriate timings for cloud seeding.
- Monitored traffic patterns to mitigate vehicular pollution.
- Working with legal professionals to work on a Clean Air Act.
- All Amity Institutes are instigating a citizens movement to curb air pollution.
- Working on forecasting models with leading institutes by establishment of a Consortium for Air Pollution Control.

AMITY GURUGRAM AIR QUALITY MONITORING FACILITY

Amity Air Quality Monitoring Station (AAQMS) at Amity University Gurugram

Rack-mounted PM, Gas Analyzers and Calibration Units inside the AAQMS

INDUSTRY-SPECIFIC STRATEGIC RECOMMENDATIONS OF AMITY UNIVERSITY

The committee set up the time-frame to address specific recommendations, and identified agencies to which these recommendations need to be made for effective and timely implementation.

Listed in the next pages are the salient observations and strategic recommendations made to address different sources of air pollution.

VEHICULAR EMISSION

SALIENT OBSERVATIONS

- Indian auto manufacturers produced a record 29.1 million motor vehicles in 2017/18 (Apr-Mar) including 4.01 million passenger vehicles. India was the largest manufacturer of three-wheelers (1.02 million units) and seventh largest commercial vehicle (0.66 million units) manufacturer in 2018 while India's two-wheeler manufacturers rolled out 23.1 million units during 2017/18.
- The auto industry provides direct or indirect employment to over 13 million people.
- India has a total of 21,00,23,289 (as on 31.03. 2015) registered vehicles, out of which, Delhi has a total of 10.9 million registered vehicles.
- Further, Delhi has a massive movement of vehicles from outside, as per CSE report 2015, a total number of commercial light and heavy-duty trucks entering and leaving Delhi each day were estimated at 115,945.
- As Per TERI Study 2016, the Vehicular Pollution contributes to 17-28 % of PM2.5 and 15-24% of PM10.
- The vehicles entering and leaving Delhi contribute to about 30% of total particulate matter load, in addition to 22% of NOx load.
- As such, the strategic actions for cutting Vehicular Pollution in Delhi have to have a 2-prong strategy, reducing vehicular pollution from old vehicles in Delhi and from the vehicles entering and leaving Delhi.

TARGET & TIMEFRAME
Reduce Vehicular Pollution by 70% by 2022 and 100% by 2024

AGENCY RESPONSIBLE
- Ministry of Petroleum
- State Transport Department
- NHAI

PANEL RECOMMENDATIONS

PASSENGER CARS, TWO AND THREE WHEELERS

For addressing air pollution from passenger vehicles, the Committee made the following recommendations:

1. Phasing out of Petrol and Diesel Vehicles - Induct 30% Electric Passenger Cars by 2021, 60% by 2024 and retrofitting the remaining 40% Petrol/ Diesel Cars by EV Kits.
2. All 2 Wheelers, Auto Rickshaws and Taxi Cabs to be EVs from 2020.
3. Improve fuel quality for Passenger Cars and Commercial Vehicles, Mandatory BS VI standard fuel for all new vehicles from 2020.
4. Induct 500 Electric and 500 CNG AC Buses for Public Transport in 2020.
5. Complete Delhi Metro Phase IV on fast track.
6. A thorough review of Traffic plan of Delhi is recommended to reduce bottlenecks and congestion. Identify no traffic areas /zones, one-way traffic roads and earmark Parking places.
7. Improve Footpath to make Pedestrian movement.
8. Reduce traffic lights and create signal free corridors.
9. Implement ITS (Intelligent Transportation System) for effective traffic management.
10. Make fast tag compulsory for all vehicles for toll plazas in NCR region from Jan 2020.

COMMERCIAL VEHICLES

The committee felt that there is an urgent need for improvement of commercial vehicles. The committee made the following recommendations:

1. Vehicles older than 10 years should be phased out from January 2020.
2. Vehicles younger than 10 years should either run on CNG or be converted to EV.

DEVELOPMENT OF HIGH EFFICIENCY BATTERIES

For addressing air pollution from passenger vehicles, the committee made the following recommendations:

1. A renewed thrust towards developing high efficiency batteries that will work and sustain in extreme weather conditions across India.
2. In addition, development of charging station network across the country, both in cities as well as in villages.

CROP RESIDUE (STUBBLE)/ BIOMASS BURNING

SALIENT OBSERVATIONS

- At present large volumes of wastes are being burnt in the agriculture fields despite ban on crop residue burning. Crop residue burning is identified as a major source of degradation of Air Quality in Delhi and NCR during October-November and April-May each year. Every year Punjab rice farms collectively burn about 44 to 51 metric tonnes of left over plant debris during October-November.
- AQI has been seen to shoot up to saturation level of measuring instruments during crop burning in October-November and also in April-May each year creating a near Gas Chamber like situation in Delhi and NCR regions.

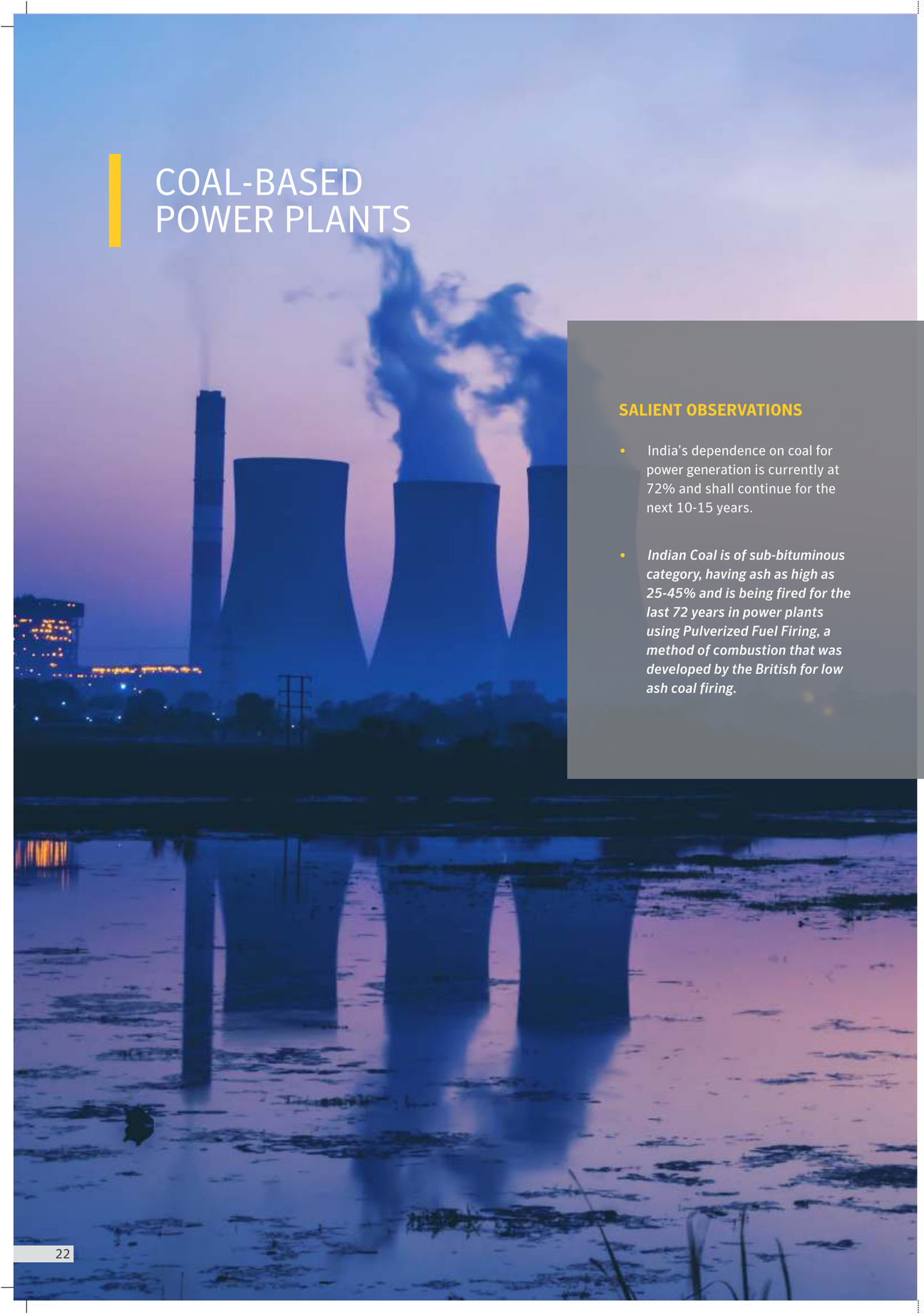
PANEL RECOMMENDS

1. Establish Rural Industries and Startups to promote usage of Crop Residue as Fodder for Animals, Bedding Material for Cattle, Making Bio-fertilizer, Paper and card board Production, Making Producer Gas, Making Mud Bricks as Composite Material, and Making Briquettes as fuel for use in Chullas (mud stoves) in rural areas.
2. As crop burning creates interstate and transboundary movement of air pollution, it is highly recommended to establish an Inter-State Pollution Control Agency to effectively monitor and control crop burning. This is all the more important in the case of Delhi, Haryana, Punjab, UP and Rajasthan.
3. Devise a system of purchasing the crop residue from farmers such as by establishing ***Rural Biomass (Crop Residue, Cow dung, Green Waste etc) Corporation*** to promote Bio-parks that shall house Startups and local area-based Innovation Incubators.
4. Provide harvesters that can remove stubble on lease model across the states of Punjab and Haryana for small farmers.

TARGET & TIMEFRAME
Reduce crop residue burning to 60% by 2022 and 100% by 2024

AGENCY RESPONSIBLE
- Enforcement Agencies
- Department of Agriculture
- Department of Renewable Energy

COAL-BASED POWER PLANTS



SALIENT OBSERVATIONS

- India's dependence on coal for power generation is currently at 72% and shall continue for the next 10-15 years.
- ***Indian Coal is of sub-bituminous category, having ash as high as 25-45% and is being fired for the last 72 years in power plants using Pulverized Fuel Firing, a method of combustion that was developed by the British for low ash coal firing.***
- ***Coal-based power plants are significant source of air pollution. Delhi Air pollution from Coal and fly Ash contributes around 37% of PM10 and 26% of PM2.5 as per IIT Kanpur October 2018 Study on Delhi Pollution.***
- Solution does not lie in closing Thermal Power Plants but to invest in Coal beneficiation and import of good quality coal for mixing with Indian Coal.

PANEL RECOMMENDS FOLLOWING STRATEGIC INTERVENTIONS

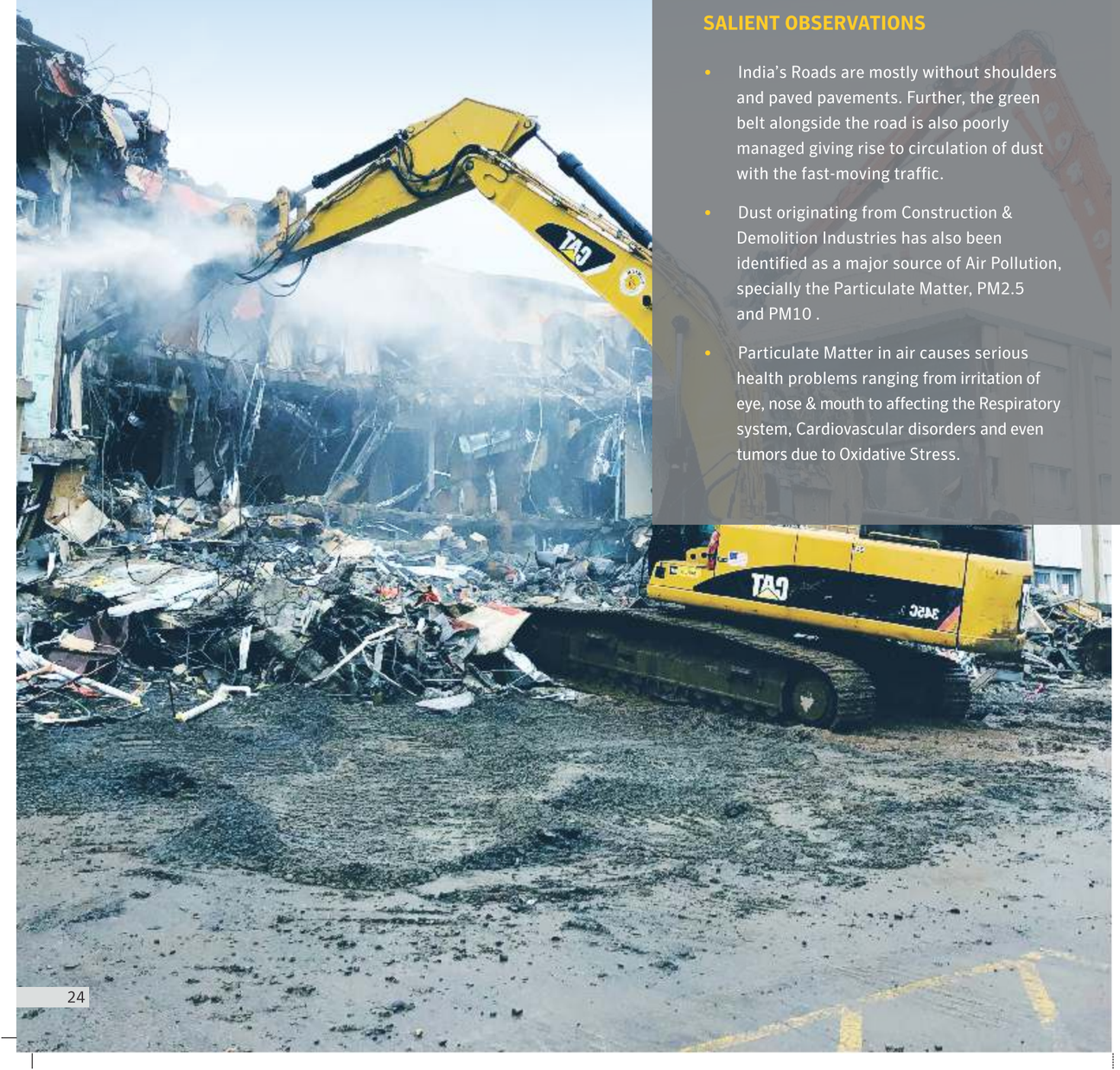
1. Promote Renewable Energy for Power Sector, increase from current 83 GW to 260 GW by 2024.
2. Reduce usage of low-grade, high ash content coal by 30% by 2021 and 40% by 2024. Import of good quality coal be promoted as a policy and coal beneficiation at pithead should be augmented.
3. Government should fund research to evolve technologies and systems for effective burning of Indian High Ash Coal in power plants.
4. Removal of sulfur from coal before combustion, or of the sulfur oxide after combustion but before it enters the stack.
5. Replace coal with gas/ solar if emission standards for clean air are not met in coal-based powerplants close to mega and metro cities.
6. Development of innovative ESPs / technologies to filter Power Plant and Industrial Boiler particulate matter.

The panel was of the view that the solution does not lie in closing Thermal Power Plants in a panic but to invest in improving coal quality and technology for efficient combustion and effective remediation, like ESPs, Scrubbers etc.

TARGET & TIMEFRAME
Reduce Coal based Power Plant Pollution by 60% by 2024.
(As against 20-30% reduction by 2024 as per NCAP)

AGENCY RESPONSIBLE
- Department of Coal
- Department of Renewable Energy
- NTPC
- Power Utility Companies

DUST FROM CONSTRUCTION AND DEMOLITION (C&D) ACTIVITY & OTHER SOURCES



SALIENT OBSERVATIONS

- India's Roads are mostly without shoulders and paved pavements. Further, the green belt alongside the road is also poorly managed giving rise to circulation of dust with the fast-moving traffic.
- Dust originating from Construction & Demolition Industries has also been identified as a major source of Air Pollution, specially the Particulate Matter, PM2.5 and PM10 .
- Particulate Matter in air causes serious health problems ranging from irritation of eye, nose & mouth to affecting the Respiratory system, Cardiovascular disorders and even tumors due to Oxidative Stress.
- The larger heavier particles of PM settle out of the air quickly and are hazard to the operators of plant and equipment (on-site) and to those in the immediate vicinity (off-site).
- The finer particles (usually invisible) are transported further can cause health hazards (off-site).

PANEL RECOMMENDS FOLLOWING STRATEGIC INTERVENTIONS

1 Training / Awareness program of personnel involved in C&D industries

2 Development and Effective Implementation of SOPs for DUST mitigation in C & D operations

3 Enforcing strict c ompliance to National Ambient Air Quality Standards (NAAQS).

4 Use of treated waste water (preferably) in Sprinklers for Dust Suppression.

5 Implementation of effective Residual waste disposal measures.

6 Making Dust Barriers at C&D sites mandatory.

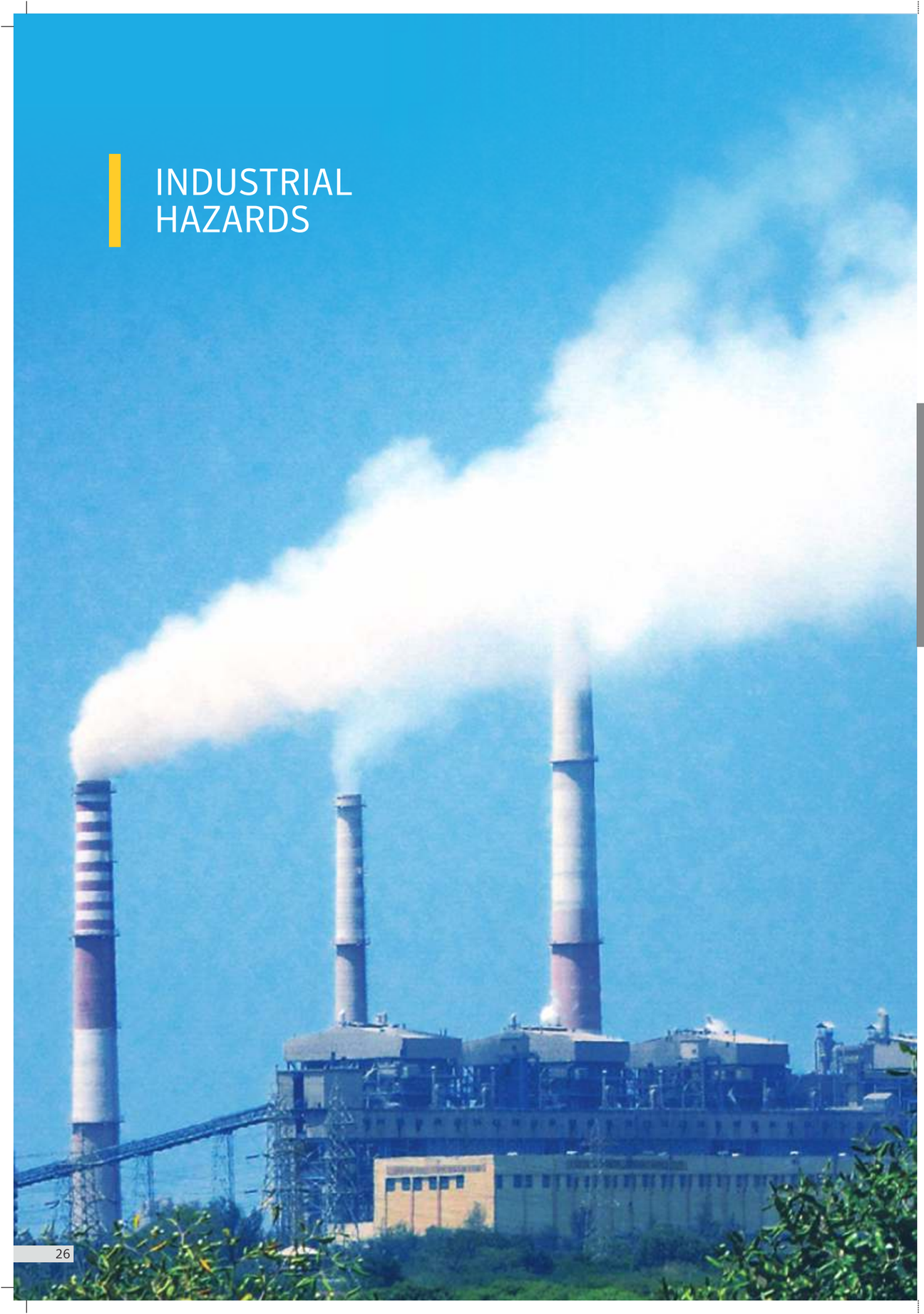
7 Protecting the Site Work Force with dust masks and protective gears.

8 Regular cleaning of City Roads by Municipal Corporation.

TARGET & TIMEFRAME
- Reducing C&D Dust by 60% by 2022 and 100% by 2024
- Paving all Road Pavements with Porous Concrete Blocks

AGENCY RESPONSIBLE
Ministry of Urban Development, State Agencies for Urban Development, NHAI, State PWD, CPWD, CPCB, SPCB.

INDUSTRIAL HAZARDS



SALIENT OBSERVATIONS

- Industries, such as Cement, Brick, Steel, Paint, Plaster of Paris (POP), Granite and Construction & Demolition Industries, also significantly contribute to air pollution.

PANEL RECOMMENDS FOLLOWING STRATEGIC INTERVENTIONS

1 Enforcement of zig-zag brick kiln technology in brick industry.

2 Development of new technologies for cement, steel, paint and POP production to reduce air pollution from these industries.

3 Development of methods for reduced air pollution from Mining and Stone Crushing.

4 Development of new technologies for reduction of Industrial Emissions and Innovative Technologies for utilization of Industrial waste.

TARGET & TIMEFRAME
Reduce Industrial Air Pollution by 30% by 2022 and 60% by 2024

AGENCY RESPONSIBLE
- Ministry of Industries
- Steel Authority of India
- Pollution Control Boards

REFINERIES & TOXIC WASTE MANAGEMENT

SALIENT OBSERVATIONS

- Refineries and toxic industrial waste are the major contributors of air pollution and air pollution-mediated loss of life and reduction in life expectancy
- Current environmental laws require a thorough review as India has emerged as a major hub of oil refineries and toxic waste from refineries and hazardous industries is a major contributor to short lived climate pollutants.

PANEL RECOMMENDATIONS

1. Improved air pollution monitoring network for effective air pollution source tracking and mitigation.
2. Development of efficient combustion methods at industrial level.
3. Implementation of measures such as vapor recovery systems, and using double seals in storage tanks, to reduce emissions from storage depots.
4. Periodical checking and maintenance of the flow systems equipment to curb leakage.

TARGET & TIME FRAME
Reduce Air Pollution from Refineries and by Toxic waste management practices by 60% by 2024

AGENCY RESPONSIBLE
- Ministry of Oil and Gas
- Ministry of Industries (large/mid/small industries)

INDOOR POLLUTION

SALIENT OBSERVATIONS

- In India, there is decrease in life expectancy of 1.7 years due to air pollution, and both outdoor as well as indoor pollution contributes to it.
- Pesticides can be a cause of concern, especially when used indoors, besides their use in agriculture.

PANEL RECOMMENDATIONS

1. Ensure 24X7 electricity across the country.
2. Encourage use of LPG and Electric Induction Stoves in place of biofuel, such as low-grade coal, fire-wood, kerosene etc.
3. The use of Smokeless Stoves using Biomass Briquettes and Community Kitchens using Solar Cookers to be encouraged in rural areas.
4. Rural Entrepreneurs establishing Biogas Plants using cow dung and green waste to be provided financial support.

TARGET & TIMEFRAME
- Reduce Indoor Air Pollution by 60% by 2022 and by 100% by 2024

AGENCY RESPONSIBLE
- Department of Renewable Energy
- Ministry of Broadcasting and Public Relations

OTHER STRATEGIC RECOMMENDATIONS

A NEW CLEAN AIR ACT OF 2020 NEEDED TO SYNTHESIZE THE ISSUES RELATED TO ACCELERATED ECONOMIC DEVELOPMENT ON ONE HAND AND COMPLIANCE TO WHO GUIDELINES FOR AIR QUALITY STANDARDS ON THE OTHER

A CITIZEN MOVEMENT IS URGENTLY NEEDED TO EFFECTIVELY NUDGE PEOPLE'S BEHAVIOR , CREATE A SENSE OF URGENCY AND PARTICIPATION FOR MITIGATING AIR POLLUTION

ARTIFICIAL INTELLIGENCE BASED SCIENTIFIC TOOLS DEVELOPMENT CRITICAL FOR DECISION MAKING

AN INTER-STATE POLLUTION CONTROL AGENCY TO BE SET UP AS A NODAL POINT FOR COORDINATION AMONGST PUNJAB, HARYANA, RAJASTHAN, UTTAR PRADESH & DELHI TO EFFECTIVELY MONITOR & CONTROL STUBBLE BURNING

PERFORM CLOUD SEEDING WHEN AIR QUALITY TOUCHES SEVERE LEVELS

EMPOWER PEOPLE WITH SMART MONITORING OF AIR QUALITY ON MOBILES & WEARABLE DEVICES

WAR AGAINST POLLUTION – 365 DAYS OF THE YEAR

A CONSORTIUM FOR AIR POLLUTION CONTROL THAT HAS A MANDATE TO BRING PUBLIC AND GOVERNING BODIES TOGETHER TO ACHIEVE CLEAN AIR FOR ALL