Issues From India And Potential Project Seed (India)

A Japan-India Collaboration to Combat Stubble Burning in Punjab

National Productivity Council

Presented By:
National Productivity Council, Delhi

About National Productivity Council (NPC)

Registered Society in 1958, an Autonomous, Tri-partite, under DPIIT, Ministry of Commerce & Industry.

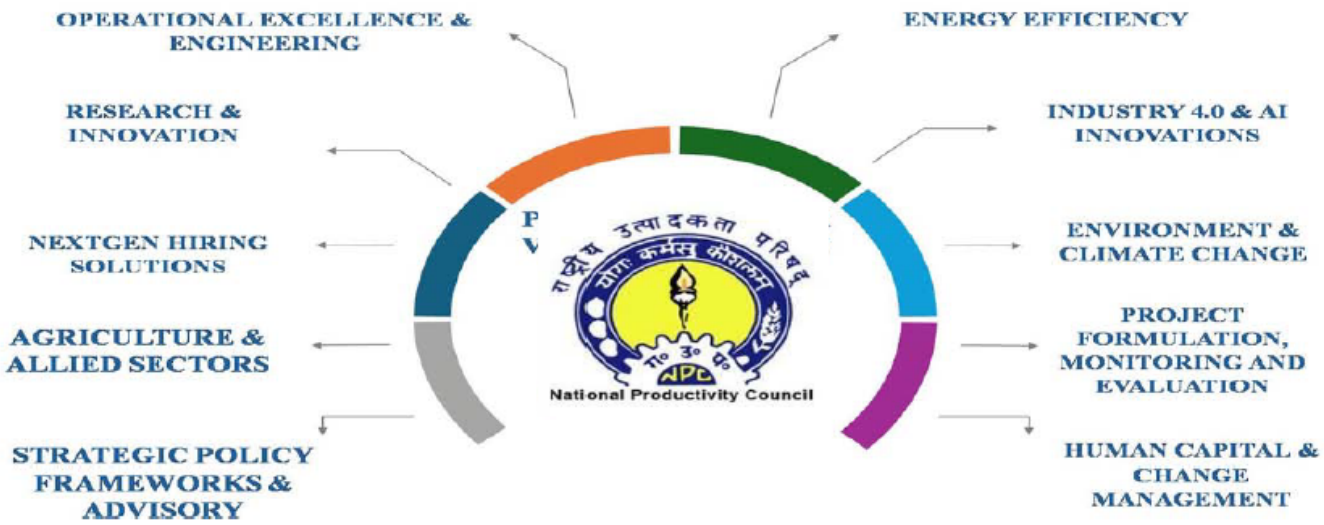
Hon'ble Minister of Commerce & Industry is the President of the Governing Council (GC). Secretary, DPIIT is the Chairman of the Governing Body (GB). DG, NPC is appointed by the Govt. of India

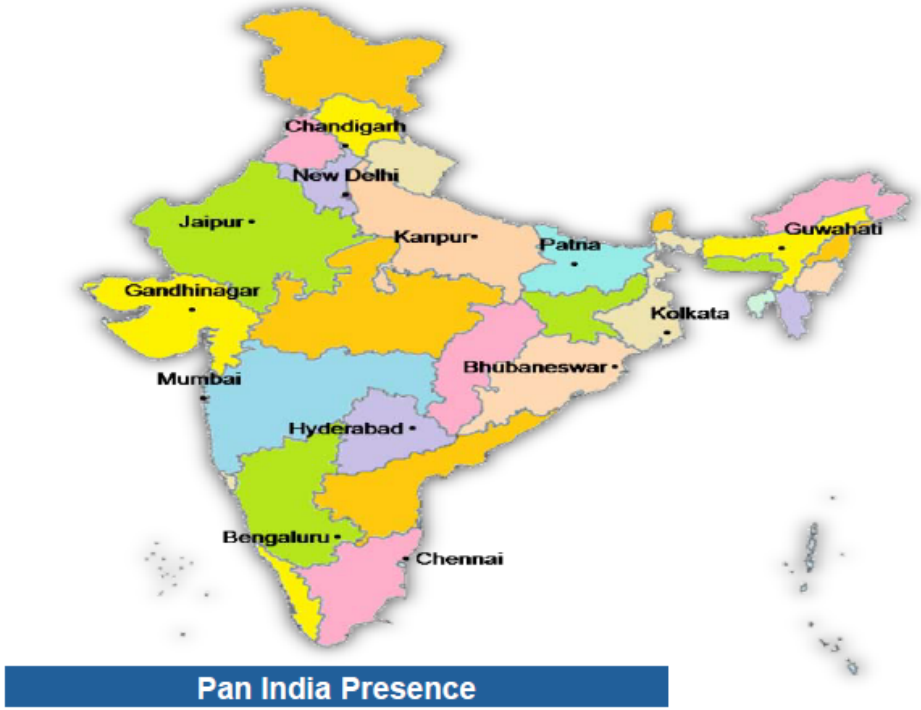
NPC has mandate to promote productivity across sectors for a socio-economically stronger India.

NPC represents Govt. of India in Asian Productivity Organization (APO), Tokyo.

HQ at New Delhi, 12 Regional directorates and 24 independent Local Productivity Councils (LPCs) virtually covering all states

AREAS OF EXPERTISE





Pan India Presence

National initiatives on air pollution control in India

NCAP objectives

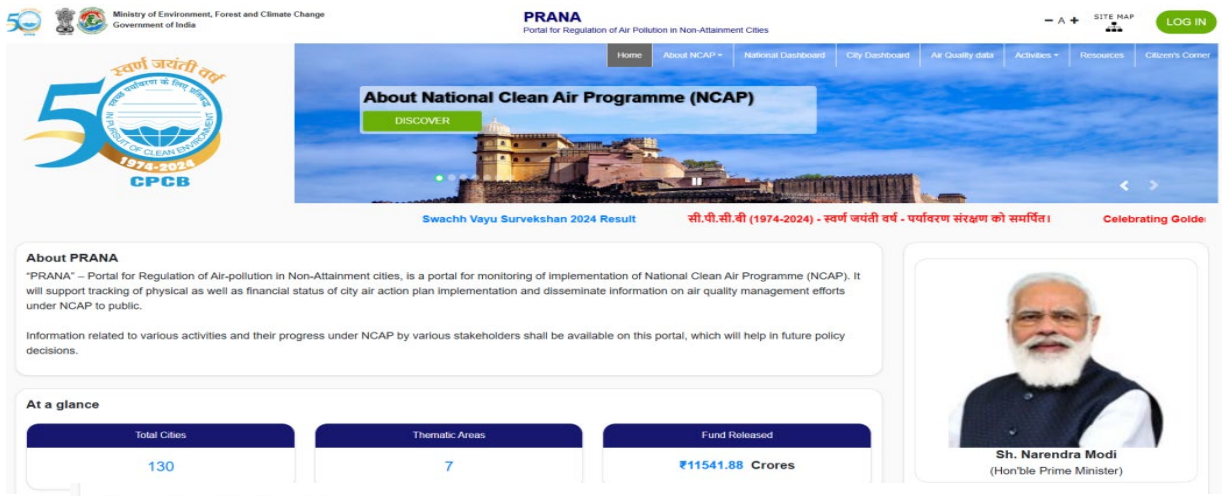
•Ensure **stringent implementation of mitigation measures** for prevention, control and abatement of air pollution.

•**Augment** and evolve effective and proficient ambient **air quality monitoring network** across the country.

•Augment **public awareness and capacity-building** measures

Thematic Areas

- Air Quality Data
- Waste and Biomass - Dumping and Burning
- Industries
- Vehicles
- Road Dust and Construction & Demolition
- Public Outreach
- Capacity Building, Monitoring Network and Source Apportionment



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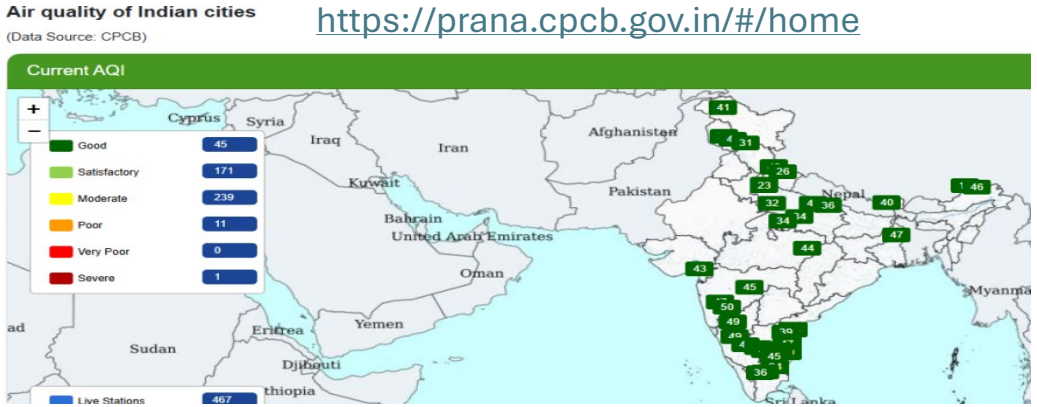
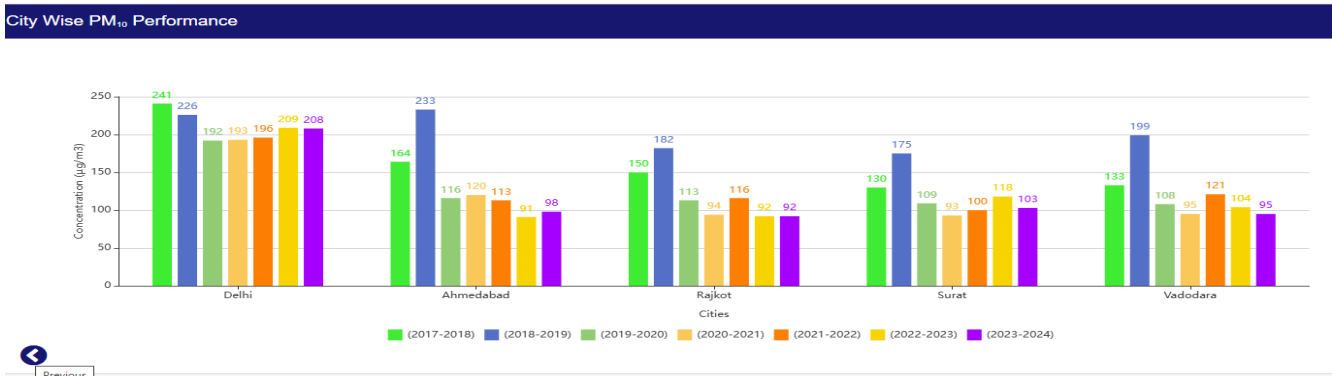




Status of Air Quality

Out of 130 identified cities, **decrease in PM10** Concentration has been observed in **95 cities** during 2023-24 as compared to levels during FY 2017-18.

Work undertaken by NPC India & UNEP under ACAP

Objective & scope of NPC's study

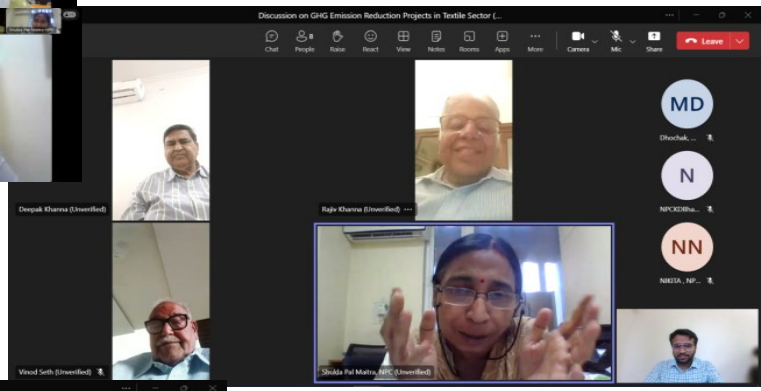
•To increase understanding on the **potential application** of the Joint Crediting Mechanism (JCM) to support implementation of integrated Climate and Clean Air mitigation measures in India.

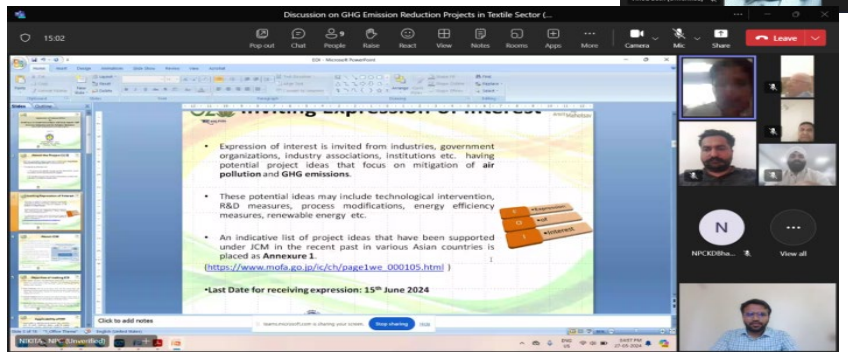
•Conduct stock-taking/mapping air quality mitigation measures with climate co-benefits for various climate finance opportunities in India (with **focus on industries**)

•**Mapping key stakeholders**(including government agencies, private sector, etc)

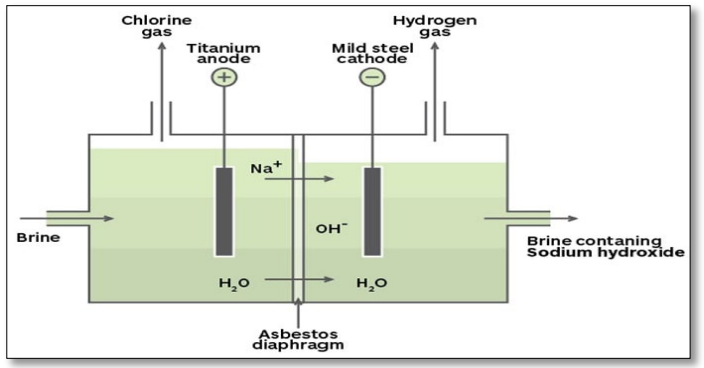
•**Identify** ongoing activities/interventions, **priority areas, sector** interventions addressing air pollution, with potential co-benefits for climate action

•Organize **national consultation/meetings** in India to introduce and increase awareness on the co-benefits approach for air pollution and climate change, JCM scheme and identify potential entry points/interests for JCM scheme





Industrial Sectors identified: Leveraging opportunities for Japanese Technologies



1. Chlor alkali Sector

2. Iron & steel Sector

3. Textile Sector

4. Pulp & paper Sector

5. Cement Sector

6. Fertilizer Sector

Indirect Interaction

- Chemical Sector
- Foundry Sector
- Refractory
- Coke Oven
- Glass Industry
- Plastic Industry
- Aluminium Sector
- Pharmaceutical

Key priorities identified for Japanese technological contributions (1/2)

Chlor Alkali Sector

1. **Energy Efficiency**:
   - Need for improved boiler efficiency.
   - Adoption of energy-efficient membrane technologies.
   - Focus on advanced technologies to reduce energy in caustic lye evaporation and chlorine emission control.
2. **Pollution Control**:
   - Enhanced handling and storage systems for chlorine.
   - Improved brine sludge management, including storage and disposal.
3. **Resource Utilization**:
   - Using hydrogen (byproduct) as fuel, requiring purification to 99.9% purity.
   - Emphasis on optimizing membrane life and utilizing waste heat recovery in processes like HCl furnaces and caustic evaporation.

Iron and Steel Sector

1. **De-carbonization**:
   - Transitioning coal-based DRI plants to alternatives like syngas, biogas, or green hydrogen.
   - Identification of alternative reducing agents to replace carbon-based materials.
2. **Air Pollution Control**:
   - Waste heat recovery in sponge iron plants, though technical limitations hinder adoption.
   - Encouragement for efficient motor usage and installation of variable frequency drives (VFDs) to improve energy management.
3. **Technological Gaps**:
   - Modernization of small and medium capacity DRI plants to gas-based configurations.
   - Upgrade to energy-efficient compressors and refractory linings for better heat control.

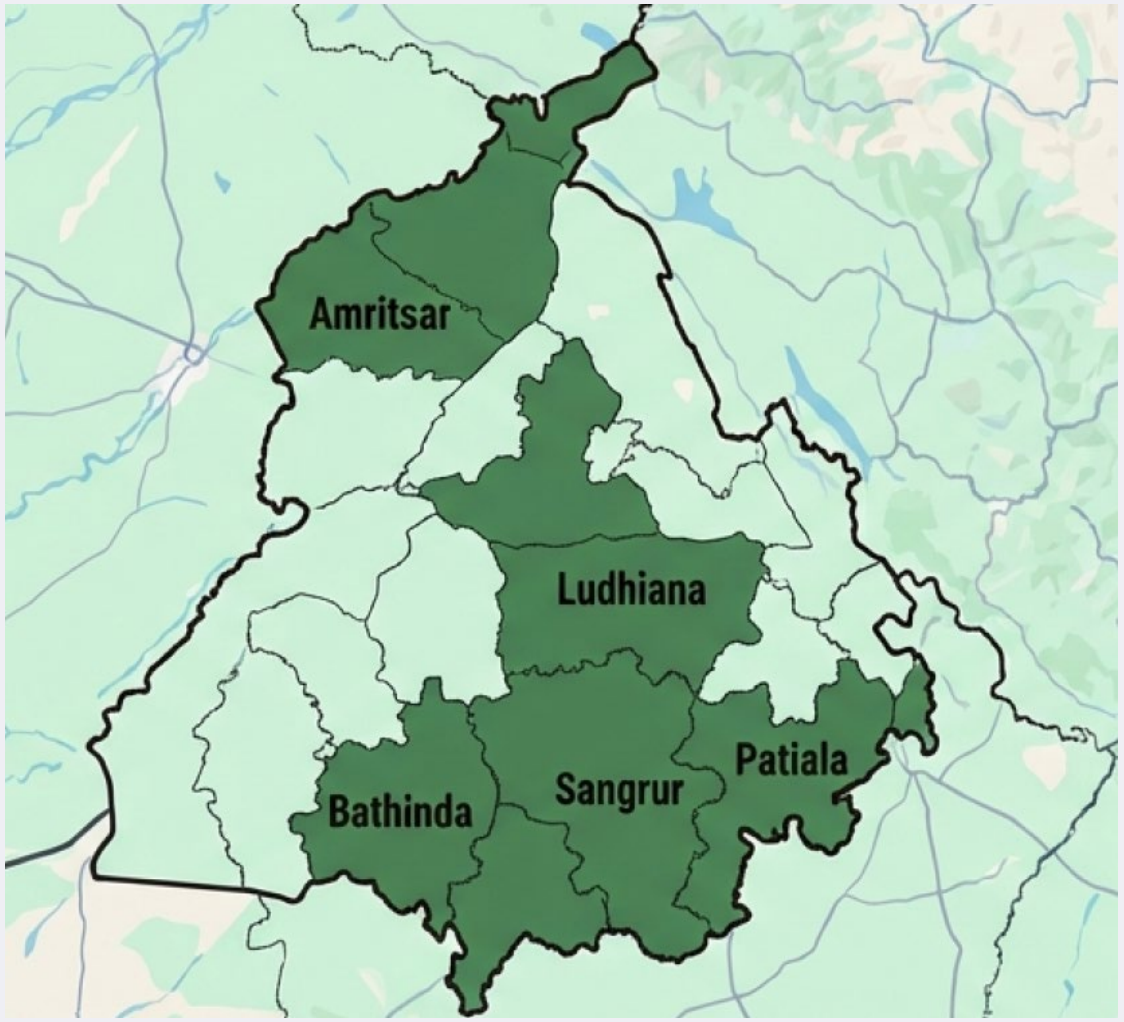
Cement Sector

1. **Energy Optimization**:
   - High reliance on coal and petroleum coke, with emphasis on using alternative fuels.
   - Energy efficiency improvements by reducing electrical and thermal energy per ton of cement.
2. **Environmental Impact**:
   - Key focus on reducing particulate and CO_2 emissions from raw material processing.
   - Adoption of carbon capture, utilization, and storage (CCUS) technology, though capital costs and retrofitting challenges exist.
3. **Process Improvements**:
   - Enhanced waste heat recovery and integration of renewable energy for transport logistics.

Key priorities identified for Japanese technological contributions (2/2)

Pulp and Paper Sector	Fertilizer Sector	Textile Sector
1. Resource Efficiency: o Utilization of biomass residues, black liquor, and effluent for energy. o Development of biochemicals and biopolymers from industry byproducts like cellulose and lignin. **2. Waste Management**: o Solutions for lime sludge and boiler fly ash as inputs for fertilizers and building materials. o Technologies for disposal of non-paper waste and ETP sludge, with a push for value-added products from waste. **3. Pollution Control**: o Reduction of gaseous pollutants in flue gas and wastewater treatment concentrate management.	**1. Energy and Emission Reduction**: o High energy demand for ammonia production, with an initiative to reduce natural gas use by 7-8% by 2030. o Shift towards green ammonia from renewable energy sources to mitigate greenhouse gas emissions. **2. Modernization Challenges**: o Old urea plants face issues like high energy consumption and environmental compliance due to outdated equipment. o Limited capital and technological expertise for conversion to green hydrogen systems. **3. Operational Constraints**: o Dependency on natural gas, impacting both costs and emissions, with a focus on improving efficiency of existing plants.	**1.Energy Efficiency**: oImplementation of lean practices to minimize specific energy consumption, targeting a reduction from the current level of 25-30 kWh/kg of fabric. **2.Waste Management**: oAddressing textile waste generation through improved recycling and resource recovery methods. **3.Sustainability Initiatives**: oExploring sustainable practices and greener production technologies to align with global standards.

Potential of Pilot JCM project using rice straw solid fuel production



Target Districts: Amritsar, Ludhiana, Patiala, Sangrur, and Bathinda

1. Punjab: Agriculture at the Heart of India
2. The Stubble Burning Crisis & Health Impacts
3. Briquette Technology: Turning Waste to Fuel
4. Industrial Applications & Market Demand
5. Environmental & Economic Transformation
6. Proposed Pilot Project Model

Punjab: Agriculture at the Heart of India

1. https://url-shortener.me/B7DE
2. https://url-shortener.me/B7DV
3. https://url-shortener.me/B7E5

31-32 Million:

Total Population (2025-2026 Estimate)

~27%:

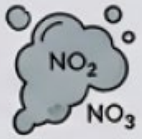
Workforce directly dependent on farming

12-13 MT:

Annual Rice Production

The Burning Challenge

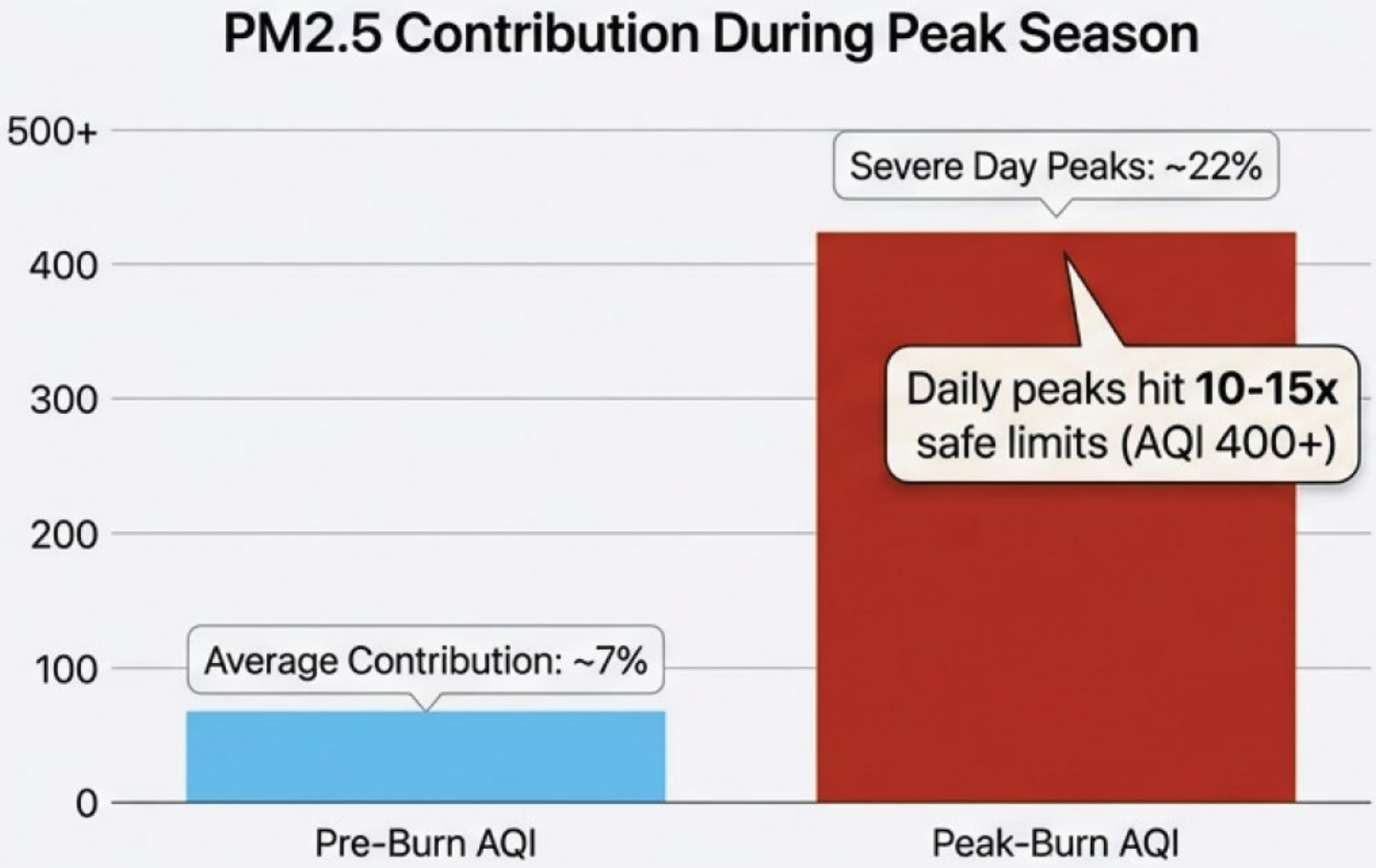
19-20 Million Tonnes of rice straw generated annually.



Key Insight:
A critically short window between rice harvest and wheat sowing forces the burning of stubble.

Environmental Toll:
Releases PM 2.5, Carbon Monoxide (CO), and NOx.
Destroys soil microbes and N-P-K nutrients.

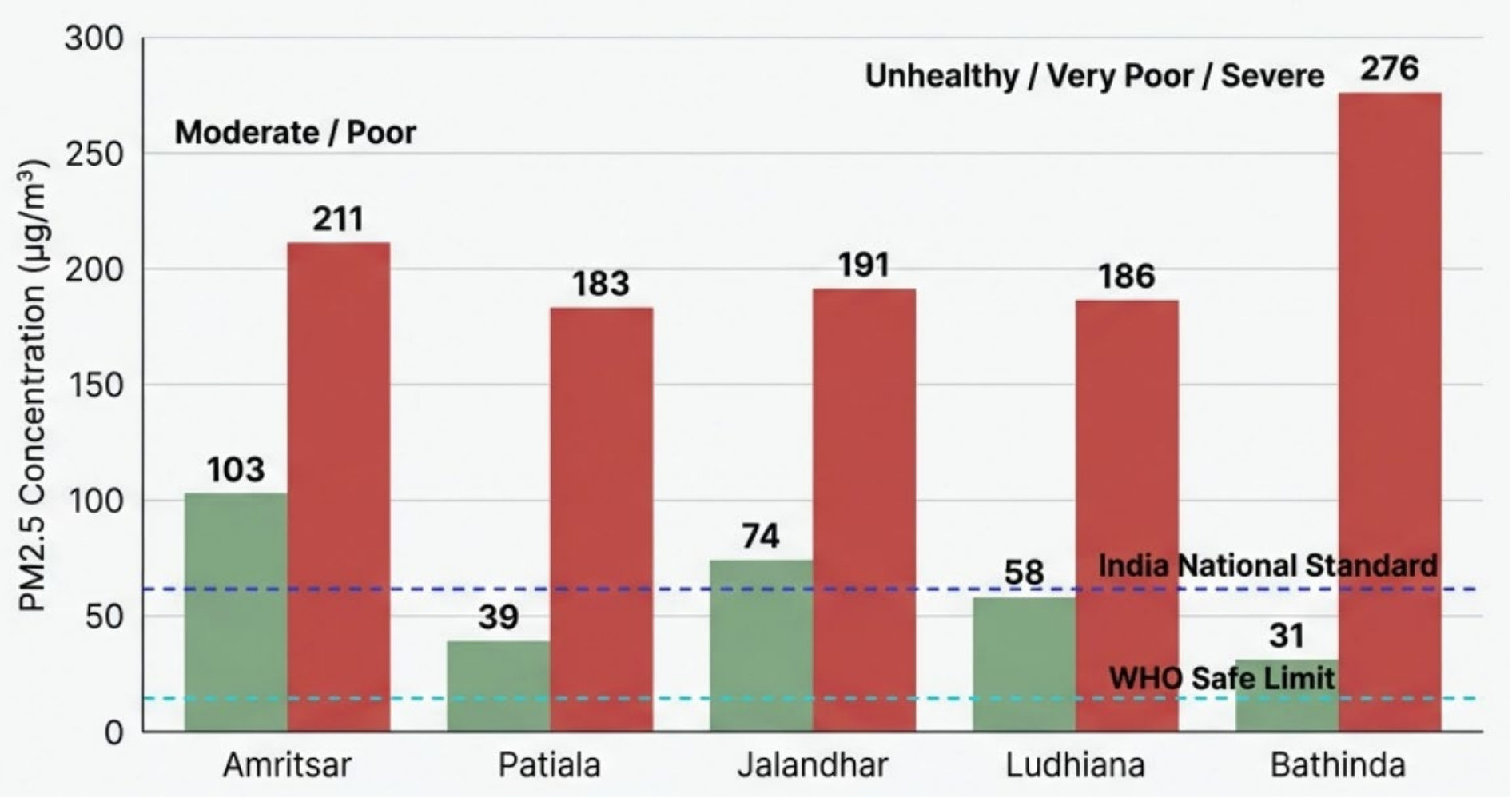
Impact on Air Quality: Delhi-NCR



Conclusion: Without burning, regional air quality improves noticeably in October-November.

Source: https://url-shortener.me/B7EY

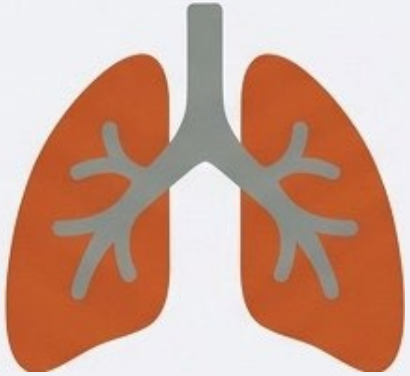
Impact of Stubble Burning on Air Quality in Punjab- Before vs After



Across Punjab cities, PM 2.5 levels increased sharply between September 30 and November 15, indicating severe deterioration in air quality during the stubble burning period.

Source: Punjab PM2.S historical data –AQI.in (https://www.aqi.in/climate-change)

The Human Cost: Public Health Under Pressure

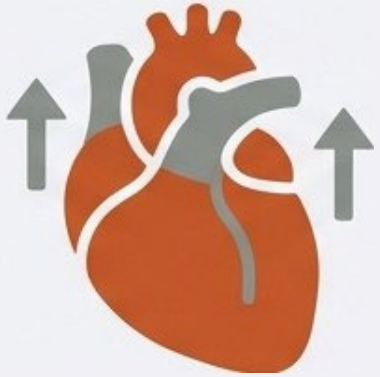


Respiratory Surge

Asthma and bronchitis cases increase ~40% during the burning season.

Vulnerable Groups

Children and the elderly face highest risks, with reduced lung function.



Cardiovascular

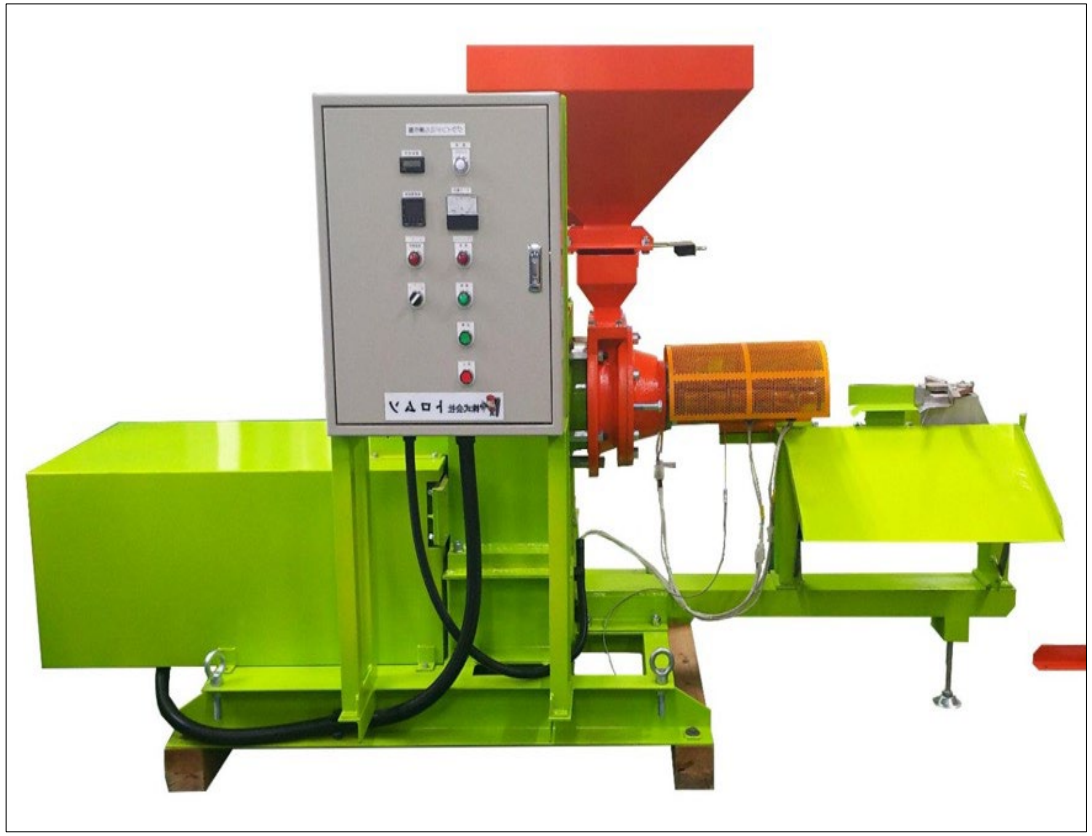
30% rise in hospital admissions for heart-related issues.

Long-term Risks

Increased risks of COPD and premature death, raising healthcare costs for families.

Technology of TROMSO (Briquettes made from rice straw)

This technology developed from Japanese shipbuilding technology has a significantly higher compression rate than other technologies and can crush and solidify rice straw and rice grains under high pressure.

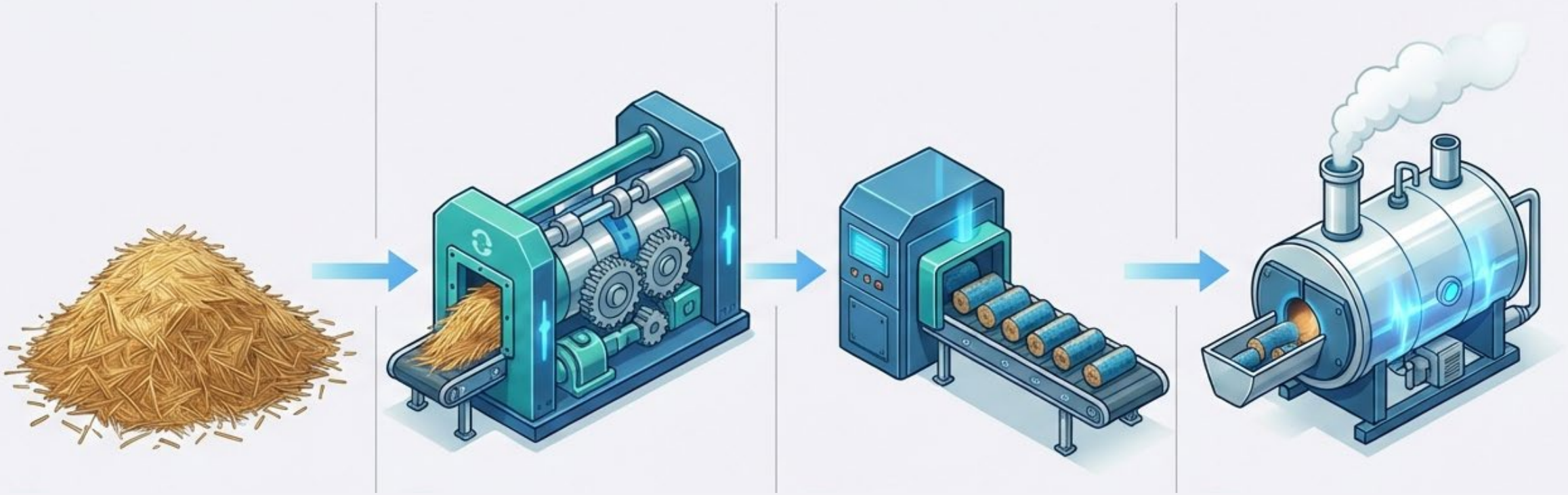


Speed of production:	**Approx. 120kg/h**
Size:	**2500(W)×990(D)×1500(H)**
Weight:	**Approx. 850kg**
Power:	**AC200V 3φ 50/60Hz**
Motor:	**15KW　4P reduction ratio1/15**
Heater:	**1.5KW×3 pcs**

Ex. Briquettes made from rice husks

Ex. Briquettes made from rice straw

The Process of Turning Waste into Energy



1. Collection
Loose straw gathered from fields

2. Compression
High-pressure crushing using Japanese technology. No chemicals or binders used

3. Production
Dense, high-calorie briquettes (~3970 kcal/kg)

4. Result
Clean fuel ready for industrial boilers

Industrial Applications & Market Demand

Creating a **Circular Economy** in Punjab

Textile Mills (Ludhiana)~200+
Steam & Dyeing processes.

Brick Kilns (~1,500)
Replacing coal for cleaner firing.

Thermal Power (~15)
Co-firing biomass with coal.

Food Processing(~66,000)
Boilers for parboiling rice.

1. https://url-shortener.me/B7ME
2. https://url-shortener.me/B7HU
3. https://url-shortener.me/B7O0
4. https://url-shortener.me/B7M2

Potential of Transforming Rice Husk into Clean Energy

Raw Material Availability

19–20 million tonnes of rice straw **will be generated** annually annually in Punjab.

Briquette Production

This **will yield** 17–18 million tonnes of processed biomass briquettes (Calorific value ~3970 kcal/kg).

Fossil Fuel Displacement

This production **will displace** 10–11 million tonnes of coal annually OR **will replace** 7.1–7.5 billion litres diesel equivalent.

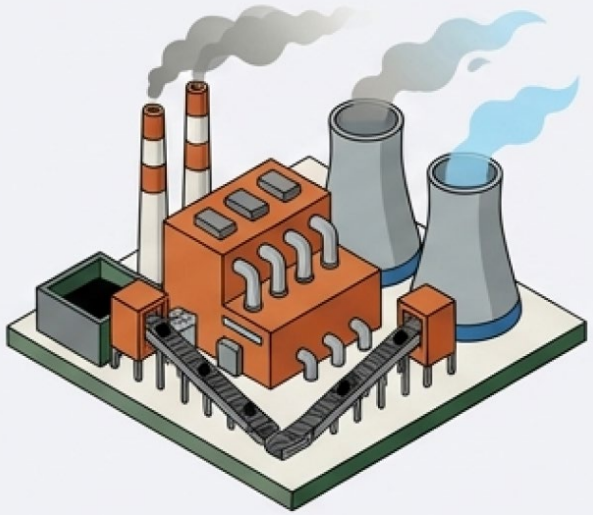
System-Level Impact

Sustainable circular economy creation.

Key Takeaway: Converting Punjab's surplus rice straw into biomass briquettes **will replace** ~30–35% of industrial coal demand and **will offset** ~25–30% of diesel-equivalent fuel use in targeted sectors.

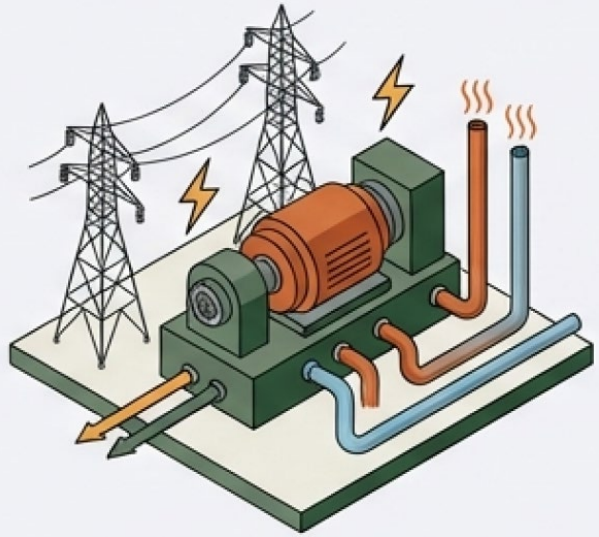
1. https://url-shortener.me/B7DV 2. https://url-shortener.me/B7FM

Maximizing Potential: Advanced Applications



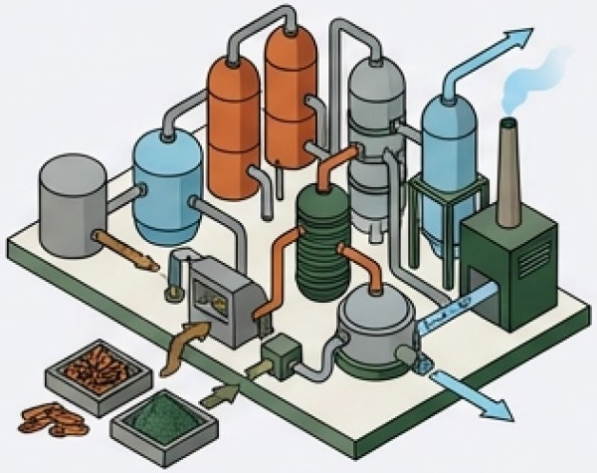
Power Plants

Large scale co-firing with coal to reduce carbon footprint



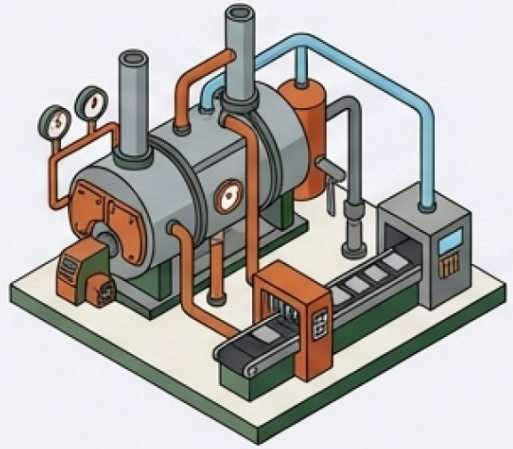
Combined Heat & Power (CHP)

Simultaneous generation of electricity and useful heat



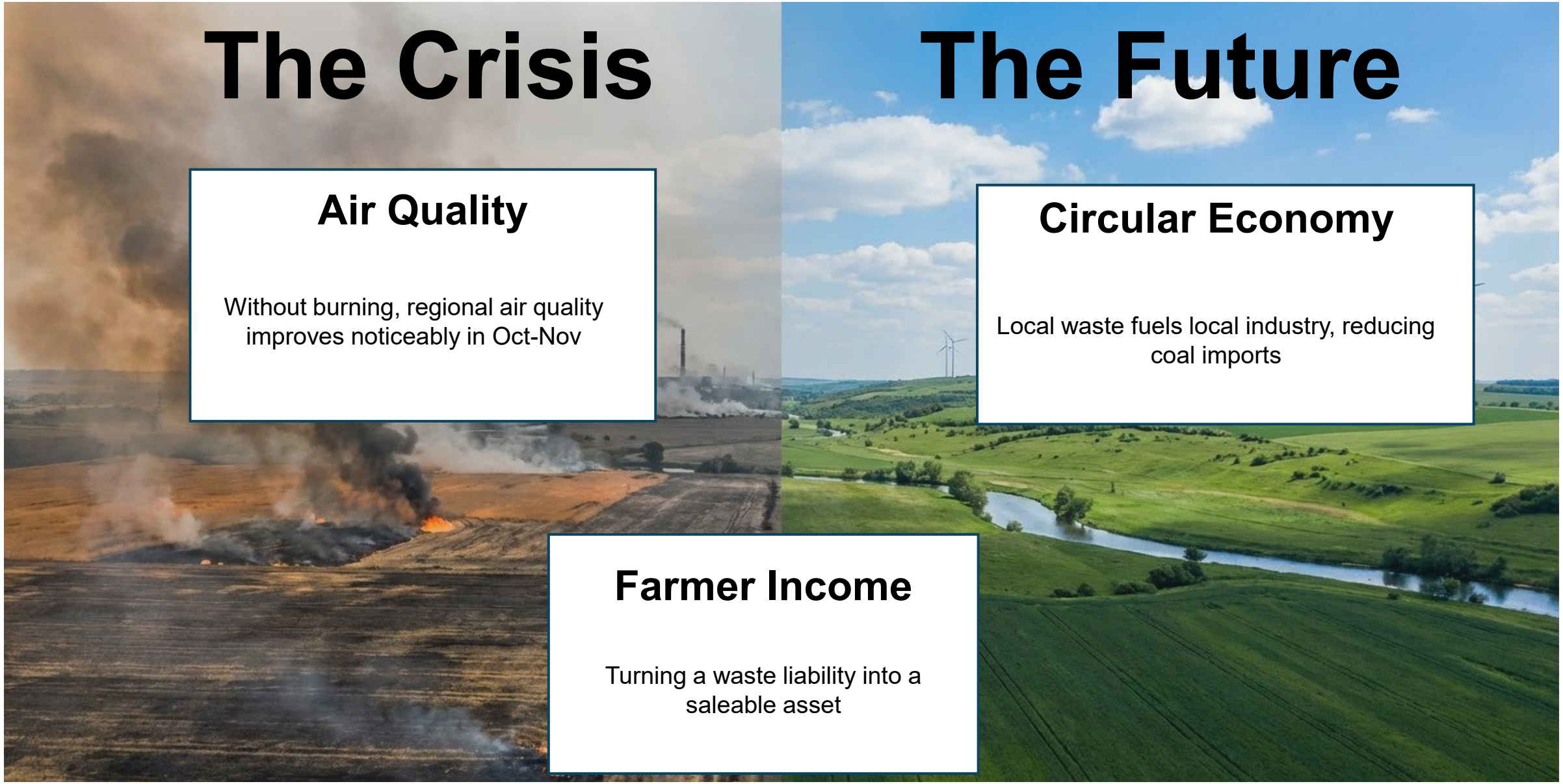
Gasification

Production of clean Syngas for industrial use



Industrial Boilers

Direct fossil fuel replacement in manufacturing



The Crisis

Air Quality

Without burning, regional air quality improves noticeably in Oct-Nov

The Future

Circular Economy

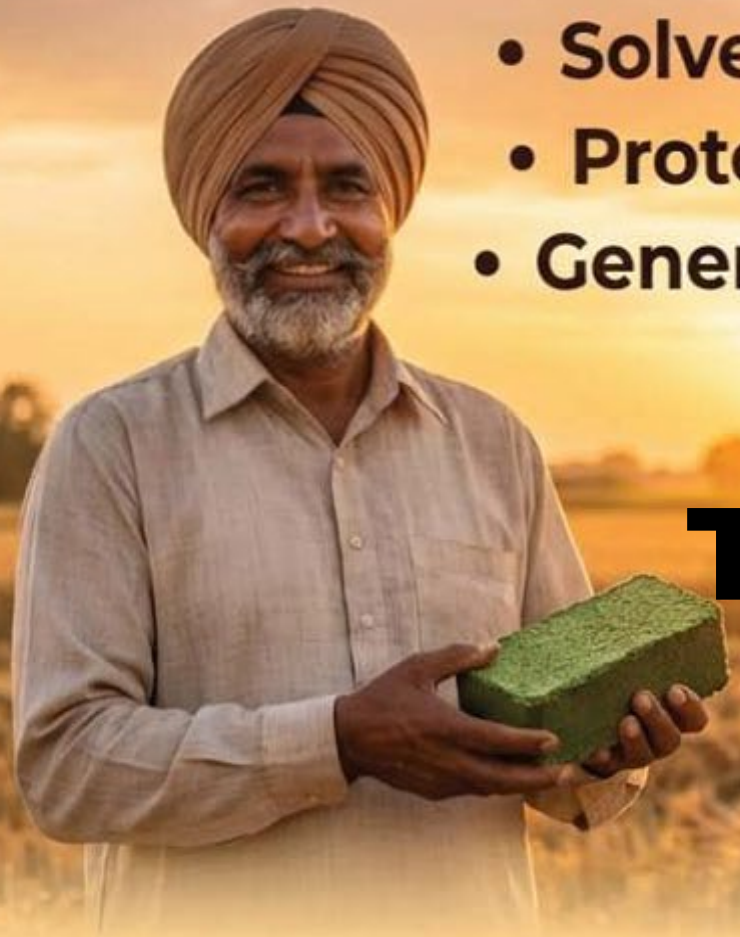
Local waste fuels local industry, reducing coal imports

Farmer Income

Turning a waste liability into a saleable asset

A Cleaner Future for Punjab

- Solves the burning crisis.
- Protects public health.
- Generates economic value.



THANK YOU

Let us move forward with the Pilot Phase.