



COAL DUST : ENVIRONMENT

NEWS: In Odisha, coal dust is clogging leaves and blocking carbon uptake

WHAT'S IN THE NEWS?

A recent study highlights that coal dust from Jharsuguda's open-cast mines reduces vegetation's carbon absorption, increasing CO₂ emissions and contributing to climate change. Using satellite data and fieldwork, researchers identified dust-related disruptions and proposed mitigation strategies.

Historical Context of Coal Mining in Jharsuguda

- **Discovery of Coal Deposits (1900)** – Found during the railway construction by Bengal Nagpur Railway under British rule.
- **First Coal Mine (1909)** – The region's first coal mine started operations.
- **Present-Day Production** – Jharsuguda now produces over **15 million tonnes of coal annually**, contributing significantly to India's energy needs.
- **India's Global Ranking** – India is the **2nd largest producer and consumer of coal** after China.

Coal: Composition, Uses, and Importance

- **Composition** – A flammable sedimentary rock composed mainly of **carbon**, along with **hydrogen, sulfur, oxygen, and nitrogen**.
- **Primary Uses:**
 - **Thermal Power Generation** – Major source of electricity in India.
 - **Iron & Steel Industry** – Used in the smelting of iron ore.
 - **Other Uses** – In cement production, brick kilns, and chemical industries.
- **Nickname: "Black Gold"** due to its economic importance.

Types of Coal in India

Based on Carbon Content & Formation Order

Type	Carbon Content	Characteristics	Locations
Peat	~40%	Least developed, high moisture content	Northeast India



Type	Carbon Content	Characteristics	Locations
Lignite	40-60%	Low quality, brown in color, high moisture	Neyveli (Tamil Nadu)
Bituminous	60-80%	Soft coal, widely used in India	Jharkhand, West Bengal, Odisha
Anthracite	80-90%	Hardest, highest carbon content	Reasi (Jammu & Kashmir)

Based on Usage

- **Coking Coal** – High carbon, low sulfur, forms **coke** (used in iron & steel industry).
- **Non-Coking Coal** – High sulfur, used in **thermal power plants** for electricity generation.

Based on Origin

1. **Gondwana Coal (250 million years old)** – Found in **Peninsular India** (Damodar, Godavari, Mahanadi, and Sone valleys).
 - **Major Coalfields:**
 - **Jharia (Jharkhand)** – India's largest coalfield.
 - **Raniganj (West Bengal)**
 - **Singrauli (Madhya Pradesh)**
 - **Korba (Chhattisgarh)**
 - **Talcher (Odisha)**
 - **Singareni (Telangana)**
2. **Tertiary Coal (15-60 million years old)** – Found in **Northeast India** (Assam, Meghalaya, Arunachal Pradesh, Nagaland).

Impact of Coal Dust on Vegetation

Open-Cast Mining: A Major Contributor to Dust Pollution

- In Jharsuguda, **most coal mines are open-cast**, meaning surface layers of soil and rock are removed to access coal.



- While cost-effective, this mining method releases **large amounts of dust particles** into the air.

How Coal Dust Affects Vegetation?

1. **Deposition on Leaves** – Dust settles on plant leaves, blocking light penetration.
2. **Clogging of Stomata** – Tiny pores (stomata) on leaves, essential for gas exchange, get blocked.
3. **Reduction in Photosynthesis** –
 - Reduced CO₂ intake lowers **carbon absorption** capacity.
 - Oxygen and water vapor exchange is disrupted.
4. **Temperature Regulation Issues** –
 - Plants struggle to regulate internal temperature.
 - Leads to water stress, making them prone to diseases.
5. **Decrease in Carbon Sequestration** –
 - Research shows carbon absorption drops by **2-3 grams per square meter of leaf area**.
 - Results in increased CO₂ **emissions**, worsening **global warming**.

Research Methodology: Satellite-Based Analysis

Institutions Conducting the Study

- University of Southampton (UK)
- NIT Rourkela (India)

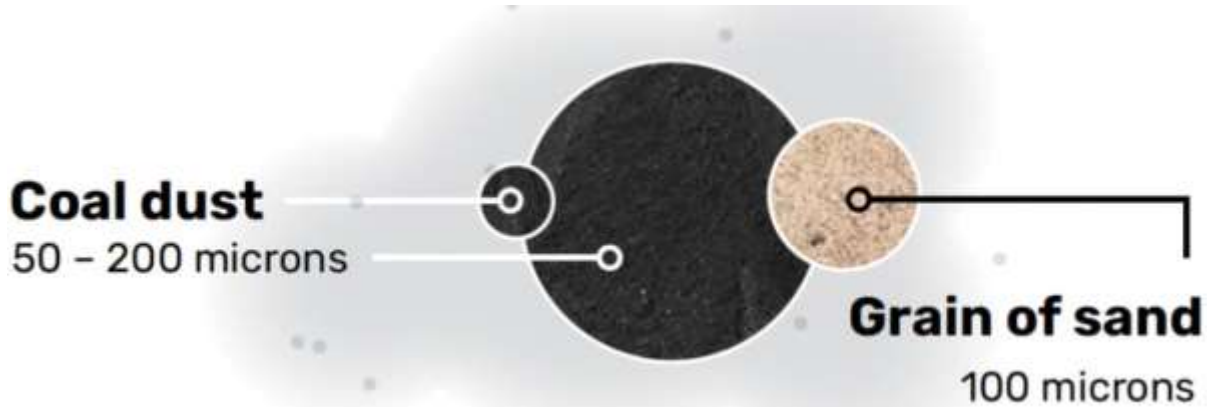
Satellites Used

Satellite	Organization	Purpose
Landsat-8 & Landsat-9	NASA & US Geological Survey	High-resolution Earth observation
Sentinel-2	European Space Agency (ESA)	Monitoring vegetation health
Planet Scope	Planet Labs	High-frequency imaging of coal mines

How Satellite Data Helps?



- Satellites capture **light reflections** from plant leaves.
- Dust accumulation **alters the reflected light patterns**, helping researchers measure dust levels.



Solutions to Mitigate Dust Pollution

Monitoring and Identification

- Use of **satellite-based methods** to track and identify high dust pollution zones.

Pollution Control Measures

- **Water Sprays** – Regular spraying of water near mines to suppress dust.
- **Dust Barriers** – Planting **green belts** or erecting physical barriers around mining sites.
- **Advanced Air Filters** – Use of **electrostatic precipitators** to trap airborne particles.
- **Regulatory Measures** – Stricter **environmental regulations** and pollution control norms.

Conclusion

Coal mining in Jharsuguda, while crucial for India's energy needs, has significant **environmental costs**. Dust pollution from open-cast mining **reduces plant photosynthesis, disrupts local ecosystems, and contributes to climate change**. Using **satellite-based monitoring** and implementing **dust control measures** are essential for sustainable mining practices.

Source: <https://www.thehindu.com/sci-tech/energy-and-environment/in-odisha-coal-dust-is-clogging-leaves-and-blocking-carbon-uptake/article69142777.ece>