Black Carbon Emissions

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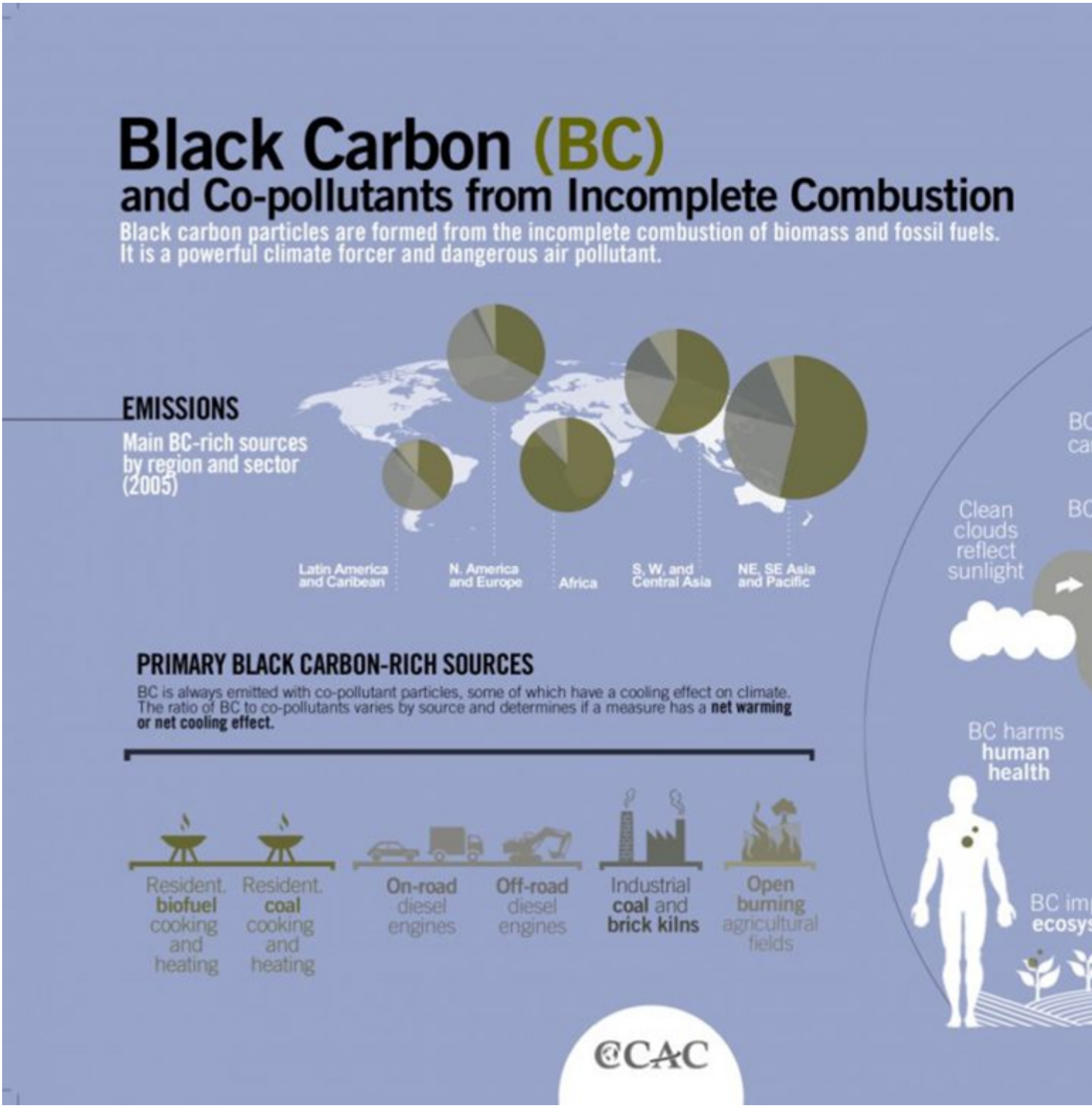
Why is in news? The need to curb black carbon emissions

At the **COP26 climate talks in Glasgow** in November 2021, India pledged to **achieve net-zero emissions by 2070** , positioning itself as a frontrunner in the race to carbon neutrality.

According to the Ministry of New and Renewable Energy, India had **installed a renewable energy capacity of over 180 GW by 2023** and is expected to **meet its target of 500 GW by 2030**.

While carbon dioxide mitigation strategies will yield benefits in the long term, they need to go hand-in-hand with efforts that provide short-term relief.

Black Carbon:



Black carbon is the dark, **sooty material emitted alongside other pollutants** when biomass and fossil fuels are not fully combusted.

Black Carbon (BC) is a **short-lived pollutant** that is the **second-largest contributor** to warming the planet behind carbon dioxide (CO2).

Unlike other greenhouse gas emissions, **BC is quickly washed out and can be eliminated from the atmosphere** if emissions stop.

Unlike historical carbon emissions it is also a localised source with greater local impact.

Black carbon is a **kind of an aerosol**.

General Impacts: Among aerosols (such as brown carbon, sulphates), Black Carbon has been recognized as the **second most important anthropogenic agent** for climate change and the primary marker to understand the adverse effects caused by air pollution.

Black carbon absorbs solar energy, it warms the atmosphere. When it falls to earth with precipitation, it darkens the surface of snow and ice, reducing their albedo (the reflecting power of a surface), warming the snow, and hastening melting.

It gets **emitted from gas and diesel engines, coal-fired power plants, and other sources** that burn fossil fuel. It comprises a **significant portion of particulate matter** or PM, which is an air pollutant.

Most black carbon emissions in India arise from **burning biomass**, such as cow dung or straw, in traditional cookstoves.

Studies have found a direct link between exposure to black carbon and a **higher risk of heart disease**, **birth complications, and premature death**.

According to a 2016 study, the **residential sector contributes 47% of India's total black carbon emissions**. Industries contribute a further 22%, diesel vehicles 17%, open burning 12%, and other sources 2%.

Decarbonisation efforts in the industry and transport sectors in the past decade have yielded reductions in black carbon emissions, but the residential sector remains a challenge.

Various measures taken by the Govt:

Pradhan Mantri Ujjwala Yojana: Under this initiative, the government is promoting use of cleaner household cooking fuels.

BS VI Emission Norms: Leapfrogging from BS-IV to BS-VI norms for fuel and vehicles from 1st April, 2020.

Introducing Cleaner Fuels: Introduction of cleaner / alternate fuels like gaseous fuel (CNG, LPG etc.), ethanol blending.

SATAT Scheme: A new initiative, "Sustainable Alternative Towards Affordable Transportation (SATAT), has been launched to set up 5000 Compressed Bio-Gas (CBG) production plants and make CBG available in the market for use.

Managing Crop Residue: Agricultural machines and equipment for in-situ crop residue management in Punjab, Haryana, Uttar Pradesh and NCT of Delhi are promoted under the Central Sector Scheme on **Promoting Agricultural Mechanization for in-situ Crop Residue Management** with 50% subsidy to individual farmers and 80% subsidy to the establishment of Custom Hiring Centres.

National Clean Air Programme: The Central Government is implementing the National Clean Air Programme as a long-term, time-bound, national-level strategy to tackle the air pollution problem across the country in a comprehensive manner.

City specific Clean Air Action Plans: The Central Pollution Control Board (CPCB) has identified 131 cities based on ambient air quality levels exceeding national ambient air quality standards, and cities with a million plus population. City specific Clean Air Action Plans have been prepared and rolled out for implementation in these cities.

FAME Scheme: Faster Adoption and Manufacturing of Electric Vehicles (FAME) phase-2 scheme has been rolled out.

Pradhan Mantri Ujjwala Yojana:

In May 2016, the Government of India said the Pradhan Mantri Ujjwala Yojana (PMUY) would **provide free liquefied petroleum gas (LPG) connections to households below the poverty line**.

The primary objective was to **make clean cooking fuel available to rural and poor households** and reduce their dependence on traditional cooking fuels.

The PMUY has established infrastructure to go with LPG connections, including free gas stoves, deposits for LPG cylinders, and a distribution network.

The programme has thus, been able to play a vital role in reducing black carbon emissions, as it offers a cleaner alternative to traditional fuel consumption.

The programme has **provided connections to over 10 crore households as of January 2024**.

Shortcomings and Challenges:

However, in 2022-2023, **25% of all PMUY beneficiaries** — 2.69 crore people — **availed either zero LPG refill or only one LPG refill**, according to RTI data, meaning they **still relied entirely on traditional biomass for cooking**.

Low Refill Rates and Energy Consumption: In August 2023 that the **average PMUY beneficiary household consumes only 3.5-4 LPG cylinders per year** instead of the **six or seven** a regular non-PMUY household uses. This means up to **half of all the energy needs of a PMUY beneficiary household are still met by traditional fuels,** which have high black carbon emissions.

Health impacts: A shortage of LPG and higher usage of traditional fuels also affect women and children disproportionately.

They are more **prone to higher levels of indoor air pollution**, causing many health issues and leading to premature deaths.

Affordability of LPG: Despite the increase in subsidies (subsidy to ?300 from ?200), the **cost of LPG cylinders remains high for many PMUY beneficiaries**. This affordability challenge discourages households from consistently purchasing and using LPG cylinders, especially when traditional biomass alternatives are perceived as "free."

Temporary Subsidies: While the government has **announced temporary price reductions to address affordability** concerns, the sustainability of such subsidies remains uncertain. Temporary measures may not provide long-term solutions to ensure consistent access to clean cooking fuel for beneficiaries.

Low Refill Rates: Low refill rates persist among PMUY beneficiaries, indicating a gap between initial LPG connections provided and sustained usage.

Last-Mile Connectivity: Remote rural areas face challenges in accessing LPG due to inadequate last-mile connectivity in the distribution network. This results in continued reliance on traditional biomass fuels, **perpetuating indoor air pollution and health risks.**

Alternative Fuel Solutions: Local production of **coal-bed methane (CBM) gas** presents a potential solution to address the lack of last-mile connectivity and **provide cleaner cooking fuel alternatives**. Composting biomass to

produce CBM gas could offer a sustainable and accessible solution at the village level, reducing dependence on traditional biomass fuels.

Rural Empowerment: Empowering local communities, such as Panchayats, to take initiatives in clean cooking fuel production and distribution can promote self-sufficiency and sustainability while addressing rural energy needs.

Measures to resolve the challenges:

Launch comprehensive awareness campaigns to educate PMUY beneficiaries about the health and environmental benefits of using LPG over traditional biomass fuels.

Implement sustainable subsidy structures that ensure long-term affordability of LPG cylinders for PMUY beneficiaries. **Explore innovative subsidy mechanisms**, such as targeted subsidies based on income levels or usage patterns, to address affordability concerns effectively.

Introduce **incentives or rewards for PMUY beneficiaries** who **consistently use and refill their LPG cylinders**. This could encourage regular usage and reduce the gap between LPG connections and actual adoption.

Invest **in improving last-mile connectivity and distribution networks** in remote rural areas to ensure seamless access to LPG cylinders for all PMUY beneficiaries.

Encourage the **adoption of alternative fuel solutions** such as Bio gas production through community-based initiatives. **Provide support and incentives** for the establishment of Bio gas production facilities at the village level, empowering local communities to produce and access clean cooking fuel.

Foster partnerships between government agencies, private sector stakeholders, and non-profit organizations to address the multifaceted challenges associated with clean cooking fuel adoption.

Establish **robust monitoring and evaluation mechanisms** to track the progress of PMUY implementation and measure the impact of interventions.

Way ahead:

As India navigates its responsibilities on the global stage towards long-term decarbonisation, there is an urgent need to act.

Prioritising black carbon reduction through initiatives such as the PMUY scheme can help India become a global leader in addressing regional health concerns and help meet its Sustainability Development Goal of providing affordable clean energy to everyone and contributing to global climate mitigation.

Recent estimates have indicated that mitigating residential emissions will avoid more than 6.1 lakh deaths per year from indoor exposure to air pollution.