Black Carbon and Glacier Melting

Why in News

The report titled **"Glaciers of the Himalayas: Climate Change, Black Carbon and Regional Resilience"** says that the **glaciers** are melting faster than the global average ice mass. However, the strong policy on **black carbon** can sharply cut glacier melt.

> The research report is **released by the World Bank** and covers the **Himalaya, Karakoram**, and **Hindu Kush (HKHK)** mountain ranges.

Black Carbon

- Black carbon is **a kind of an aerosol.**
  > An **aerosol** is a suspension of fine solid particles or liquid droplets in the air.
- Among aerosols (such as brown carbon, sulphates), Black Carbon (BC) 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.**
- 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.

HKHK Mountain Region:

- HKHK Region **spans eight countries**; Afghanistan, Pakistan, India, Nepal, China, Bhutan, Bangladesh and Myanmar and also **has some of the world's tallest mountains including Mt. Everest and K2.**
- HKHK Glaciers **feed into river systems** including Ganga, Yangtze, Irrawaddy, and Mekong.
  > The water that runs down from glaciers **feeds the agriculture**, on which nearly 2 billion people are dependent upon.
- HKHK Region, also known as the **third pole**, along with China's Tien Shan Mountains holds most ice outside the North and the South Pole.

Key Points

- **About Black Carbon:**
  BC is a **short-lived pollutant** that is the **second-largest contributor to warming the planet behind carbon dioxide (CO_2).**
    - 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.**
- **Source of Black Carbon in Himalayan Region:**
  Industry (primarily brick kilns) and **residential burning of solid fuel** together account for 45-66% of regional anthropogenic (man-made) BC deposition, followed by **on-road diesel fuels** (7-18%) and **open burning** (less than 3% in all seasons) in the region.
- **Impact of Deposits of BC:**
  It **acts in two ways** hastening the pace of glacier melt:
    - By decreasing surface reflectance of sunlight.
    - By raising the air temperature.
- **Rate of De-glaciation:**
    - The rate of retreat of HKHK glaciers is **estimated to be 0.3 metres per year in the west to 1.0 metre per year** in the east.
    - Full implementation of **current policies to mitigate BC can achieve a 23% reduction** but **enacting new policies** and incorporating them through regional cooperation among countries can achieve enhanced benefits.
      National Mission on Sustaining Himalayan Ecosystem (NMSHE) is one such policy adopted in India. It is one of the eight missions under the **National Action Plan on Climate Change (NAPCC).**
    - **BC deposits can be sharply reduced** through new, currently feasible policies **by an additional 50%** from current levels.
- **Impact of Glacier Melt:**
    - Glacier melt **produces flash floods, landslips, soil erosion, and glacial lake outburst floods (GLOF).**
    - In the short run, the higher volumes of melt water **could replace receding groundwater downstream.** But in the long run, decreased water availability would **aggravate water shortage.**

- **Measures to be Taken:**

  In the Himalayas, **reducing black carbon emissions from cookstoves, diesel engines, and open burning** would have the greatest impact and could significantly **reduce radiative forcing** and help to maintain a greater portion of Himalayan glacier systems.

  Radiative forcing is a measure of the change in energy balance as a result of a change in a forcing agent (e.g., greenhouse gases, aerosol, cloud, and surface albedo) to affect the global energy balance and contribute to climate change.
- **Steps to be Taken by Regional Governments:**
  - Review the **policies on water management**, with an emphasis on basin-based regulation and use of price signals (value of a particular action) for efficiency.
  - Careful **planning and use of hydropower** to reflect changes in water flows and availability.
  - Increasing the **efficiency of brick kilns** through proven technologies.
  - There must also be greater **knowledge sharing** in the region.

Source: TH