Concentration of Black Carbon on Gangotri Glacier

Why in News

According to a research done by the **Wadia Institute of Himalayan Geology**, the **concentration of black carbon on Gangotri glacier has almost doubled in the past few years** primarily because of agricultural burning and forest fires.

- Scientists have been monitoring black carbon through two weather stations on way to **Gangotri glaciers -** namely Chirbasa station at a height of 3,600 m, and **Bhojbasa** station at a height of 3,800 m - for the last few years.
- Wadia Institute of Himalayan Geology (WIHG) is an **autonomous institution under the Department of Science & Technology.** It is headquartered in Dehradun (Uttrakhand).

Gangotri Glacier

- It is the **largest glacier in Uttarakhand** and is one of the **sources of Ganges** (Bhagirathi).
- The Gangotri glacier originates at the northern slope of **Chaukhamba range** of peaks in **Garhwal Himalayas.**
- Gangotri is not a single valley glacier, but a **combination of several other glaciers.**

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.

Key Findings

- **Seasonal Variation**
    - The concentration of the black carbon increases in summer months due to varied factors. Scientists have found a range of black carbon up to 4.62 micrograms per cubic metre.
    - In the non-summer months, the concentration comes down to about 2 micrograms per cubic metre.
- **Reasons for Increase in Black Carbon Concentration in Summer Season**
    - Period from April to June shows remarkable increase in black carbon concentration primarily due to direct and indirect activities related to **tourism.**
    - Also, forest fires contribute to increasing black carbon concentration. According to the Forest Survey of India, the forest fire activity is generally reported in Uttarakhand from February to June, with a peak in fire incidences in May and June.
        - Besides man made, other reasons for forest fires in the state include lightning, friction of falling rocks and monkeys accidentally throwing stones that create sparks leading to forest fires.
        - Over 44,554 hectares of forest area has been damaged in forest fires in Uttarakhand since its formation in 2000.
    - The lowest black carbon concentration has been recorded during August followed by December, likely due to the absence of tourist activities and forest fire incidences during these months.
- **Local Sources of Black Carbon**
    - Forest fires, domestic and commercial fuel wood burning, seasonal burning of crop residue and developmental activities.
    - Pollution from local, regional and global sources that accumulate over the Himalayan region and increase the concentration of black carbon.
- **Possible Impact**
    - Black materials absorb more light and emit infra-red radiation which increases the temperature. So, when there is an increase in black carbon in the higher Himalayas, it will contribute to faster melting of the Himalayan glaciers.
    - In the longer run, the changes in the atmospheric composition of the high Himalayan will affect the weather pattern (such as rain and snow precipitation patterns), and accordingly natural resources and socio-economic activities of Himalayan communities.

Way Forward

The Black Carbon (BC) aerosols contribute significantly towards global warming due to its light-absorbing nature. Their presence in the eco-sensitive zone, such as the Himalayan glacier valleys, is a matter of serious concern and needs to be meticulously monitored.

Source: PIB