

# Gangotri Glacier

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The Gangotri Glacier is one of the largest glaciers in the Himalayas and is one of the primary sources of the sacred river Ganga.

- It is located in the Uttarakashi District, Uttarakhand and has an estimated volume of over 27 cubic km.
- The glacier is about 30 km long and approximately 2 – 4 km wide.
- The glacier is surrounded by the mountain peaks of the Gangotri Group that includes peaks such as Meru, Shivling, Thalay Sagar, Chaukhamba, etc.
- The glacier originates in a cirque below Chaukhamba. Its terminus or end-point (or snout) is a place called Gomukh or Gaumukh (meaning cow's mouth since it is said to resemble a cow's mouth).
- The Gangotri glacier is also a Hindu pilgrimage site.

Read more on [glaciers](#) in the linked article.

## Gangotri Glacier Melting

A study conducted by scientists at the Wadia Institute of Himalayan Geology (WIHG) in Dehradun revealed that [black carbon](#) deposits have been found on the Himalayan glaciers for the first time. This was based on data collected from two observatories with aerosol monitors that were set up near Gangotri glacier in 2016. The presence of black carbon can hasten glacier melting and this has serious implications for the people living downstream and the larger population as well because of the dependency on the Himalayan rivers in the northern states.

After greenhouse gases, black carbon is the second major cause for glacier melting.

### Why are glaciers melting?

- Since the early 20th century, many glaciers around the world have been rapidly melting. The chief reason behind this is anthropogenic activities. Industrialization, emissions of GHGs, are causing rise in global temperatures which lead to glaciers melting.
- The retreat of Himalayan glaciers mean that they are melting faster than ice formation every year.
- The short-term and immediate effect of glacial melting is flooding in many northern Indian states. The Chamoli flash floods of 2021 and the Kedarnath tragedy of 2013 (both in Uttarakhand) can be attributed to continued glacial melt in the Himalayan region. Such large-scale flooding can cause havoc to the lives of people living in the region and also damage the environment and infrastructure.
- The long-term effect of glacial melting would be severe challenges to the water security of the region and by extension, almost half the country. The Gangotri glacier is the chief source of the river Ganga. In the summer season, the glacier feeds the Bhagirathi river, which is Ganga's source stream. About 800 million people depend in part on seasonal runoff from Himalayan glaciers for irrigation, hydropower and drinking water. Retreating glaciers can cause havoc to the lives of people in the long run because of the associated concerns of water scarcity.

In short, melting of Himalayan glaciers can have the following adverse consequences:

1. Increased flooding
2. Frequent extreme weather events
3. Reduced agricultural yields (since global warming causes glaciers to melt in the spring itself with decreased water availability in the summers when crops need more water)
4. Changes in energy production (downstream, the volume of water in dams may impact the production of hydroelectricity)

### Rate of Retreat of Gangotri Glacier

The Gangotri glacier has been retreating since 1780 but, this has quickened since 1971. From 1996 to 1999 alone, the glacier retreated 76 metres. The rate of retreat of the Gangotri glacier is 22m per year.

The following image gives the rate of glacier retreat of the Gangotri glacier.

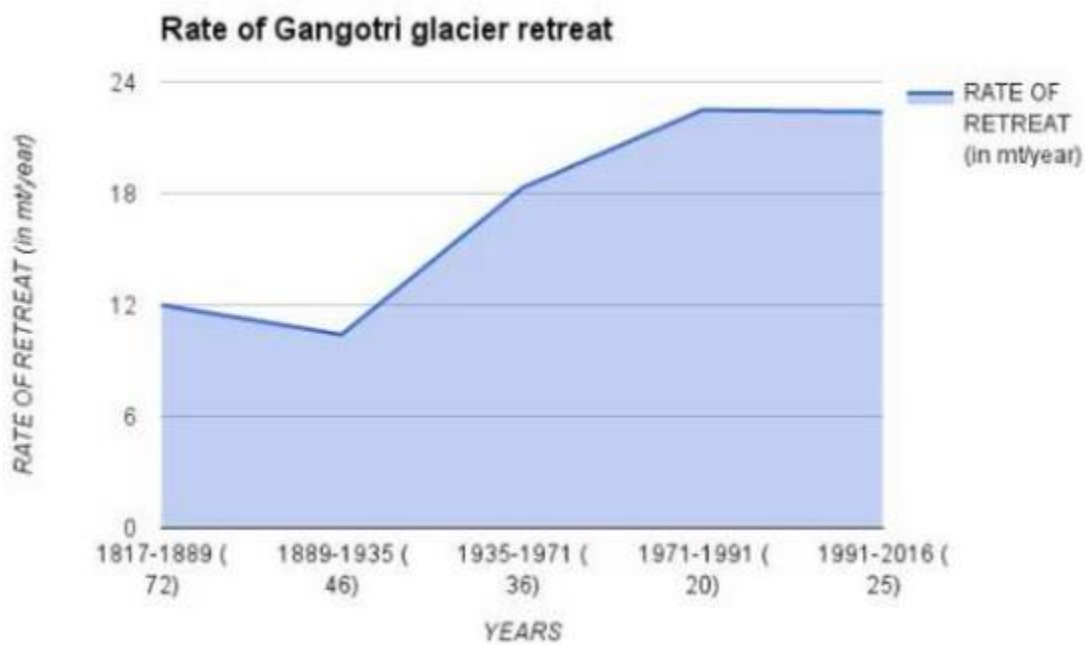


Image source: The Hindu

The next image shows the decreasing volumes of water discharged into the Bhagirathi river during summers.

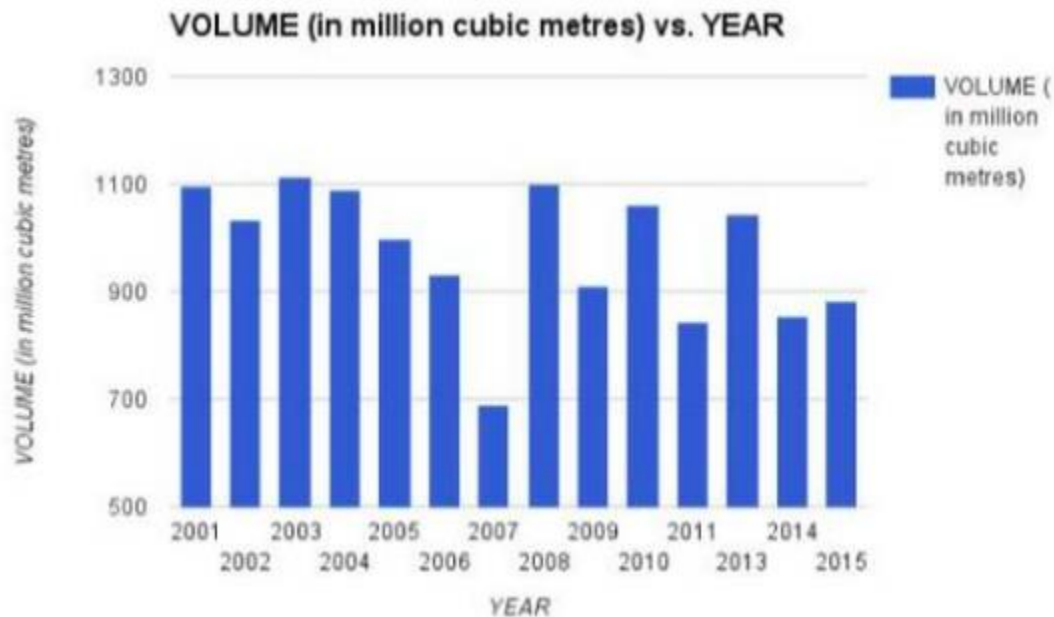


Image source: The Hindu

### Way Forward

It is important to mitigate the impacts of climate change and check the retreat of the Himalayan glaciers since the consequences of glacial retreat are far too undesirable for people and the government to ignore, both in the short and long term. Addressing this issue, however, is not in a single country's hands and there is a need to collaborate with other Himalayan countries and come up with a joint action plan to slow down, and if possible reverse the glacial retreat. This will ensure water and hence food security, preservation of flora and fauna in the glacial regions, and energy security for the people.