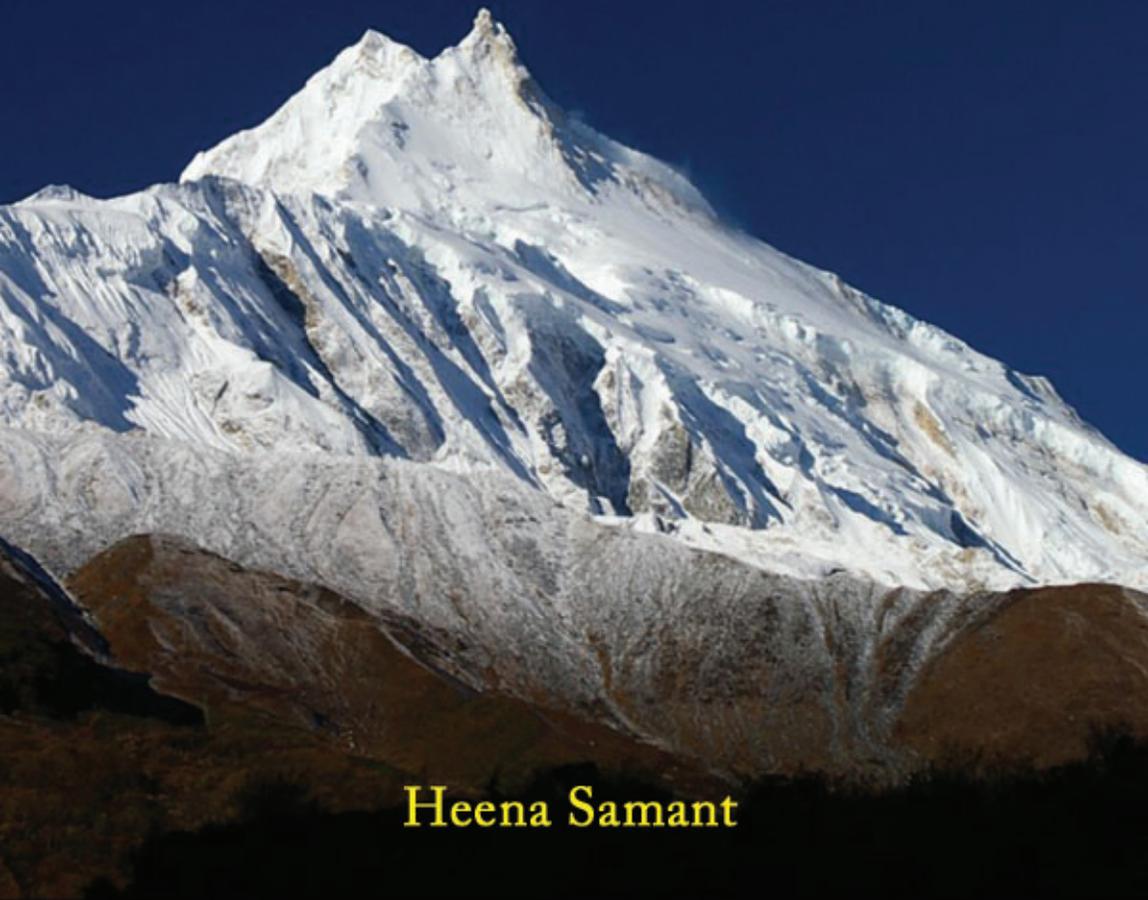


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Climate Change in The Himalayas

Its Impact on India's National Security



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Climate Change in The Himalayas

Its Impact on India's National Security

Abstract

Human-induced climate change has led to unprecedented changes in the Arctic and Antarctic regions. Similarly, the Himalayan and its surrounding mountain ranges, also known as the 'Third Pole' is experiencing drastic changes due to global warming. These mountain ranges are the source of some of the most important rivers in Asia. They provide freshwater for millions of people living in the countries that form a part of these mountain ranges, including India. The Third Pole consists of a large number of glaciers, which are melting rapidly as a result of atmospheric warming, the impact of which is predicted to be disastrous. The rapid melting of the glaciers in the Himalayas may impact food, water, and energy security of India, which may result in further security challenges, thus threatening the national security of the country. India under its National Action Plan on Climate Change (NAPCC) has launched the National Mission for Sustaining Himalayan Ecosystems (NMSHE) to assess the health status of the Himalayan ecosystem. While these are some excellent initiatives taken by the government, there is a need to also focus on establishing a strong institutional regional mechanism to minimize the ongoing change and to include the security implications of climate change in its national security strategy.

Introduction

Human induced climate change is altering the cryosphere of the earth. Rising temperatures have led to the melting of ice in the Arctic and Antarctic which are also known as the North and the South Poles. There is, however, a “Third Pole” on earth which many do not know about. The Third Pole is a vast region which comprises of the Himalayas and its adjacent mountain ranges which includes the Hindu-Kush Range, Karakoram Range, and the Tibetan Plateau in Asia. The region constitutes the largest area of frozen water after the North and the South Poles and are the source of freshwater for billions of people inhabiting the region. Ten most important rivers of Asia originate from these mountain ranges which include the Ganges, the Brahmaputra, the Indus, the Karnali, the Koshi, the Mekong, the Yangtze, the Yellow, the Irrawaddy, and the Salween.¹ These high mountains surround the countries of Afghanistan, Pakistan, India, Nepal, Bhutan, China, Myanmar, and Bangladesh.²



Fig 1. Map of the Third Pole **Source- Klean Industries**³

The objective of this paper is to draw the attention of the readers towards the cryospheric changes taking place in the Himalayas and its adjacent mountain ranges due to climate change. These mountain ranges are considered to be most vulnerable and sensitive towards the rising temperatures and are the most forbidding environments on the planet.⁴ Despite the fact that these high mountains contain the largest amount of freshwater outside the two poles, they have not got the attention that is required to get a deeper understanding of what is happening within the region. However, since past few years this scenario seems to have changed and the quest to know more about the region has gained momentum. This, nevertheless, is not enough. In order to save this global asset from the impact of climate change, a worldwide effort is required.

Climate Change in the Himalayas

The cryosphere is a term which collectively describes those parts of the earth where water is found in its frozen state.⁵ It consists of glaciers, snow, permafrost, river and lake ice, sea ice, ice sheets, and ice shelves.⁶ These components help in maintaining the earth's climate system and support the livelihoods of people around the world.⁷ The High Mountains of the earth, in general, consists of cryospheric components like glaciers, snow, and permafrost because of their high altitude.⁸ These elements of the cryosphere are also found in the high mountains of the Third Pole. This paper specifically focuses on the melting of the glaciers in and around the Himalayas as a result of climate change. It is estimated that the total number of glaciers that are present in the region are around 54,000.⁹ These glaciers provide freshwater which helps to sustain the lives of hundreds of millions of people living in the hills and mountains of this region and also to those that reside in the downstream areas of the river basins that originate from these mountain ranges.¹⁰ This is why the Himalayas and the other mountains adjoining it are also known as the "Water Towers" of Asia.¹¹ The existence of these glaciers are in danger because of global warming.



Fig 2. Himalayas-Karakoram Glaciers **Source- WIRED**¹²

Melting of the Himalayan Glaciers

Glacial retreat in the Himalayan region is not a new phenomenon. However, what is alarming is the rate at which they have been found to be retreating in the past few decades. Various recent studies have pointed towards the fact that the rate at which these glaciers are melting has doubled predominantly because of the rise in temperatures.¹³ Studies also conclude that the high altitude areas are more sensitive to global warming which means that the higher the elevation, the greater the warming there is.¹⁴

The Findings

A remote research station was opened up by the Chinese authorities on the Qinghai-Tibet Plateau in 1958.¹⁵ This station has been used by the Chinese researchers to study the impact of climate change on the glaciers in and around the Tibetan plateau.¹⁶ The findings reported by them are alarming and disturbing.¹⁷ According to these Chinese researchers, the temperature has increased by 1.5 degrees Celsius in the area, which is more than double than the global average.¹⁸ This has led to the disappearance of 500 smaller glaciers and the bigger glaciers are shrinking rapidly.¹⁹ Other important findings are that the rate at which these glaciers have been melting

has doubled in the past decade and a large number of smaller glaciers are expected to disappear in the next twenty to thirty years.²⁰



Fig 3. This is a panoramic view of the West Rongbuk glacier which is located in the Himalaya of Southern Tibet. The first picture was taken in 1921 by Major E.O. Wheeler and the second picture was taken by David Breashers in 2009.

Source- Yale Environment 360²¹

An excellent research article which was published in the US's *Science Advances* magazine in June 2019 reported similar findings. According to the report, the glaciers across the Himalayas have lost significant ice over the past 40 years with the average rate of ice loss being twice as speedy in the 21st century as compared to the end of 20th century.²²

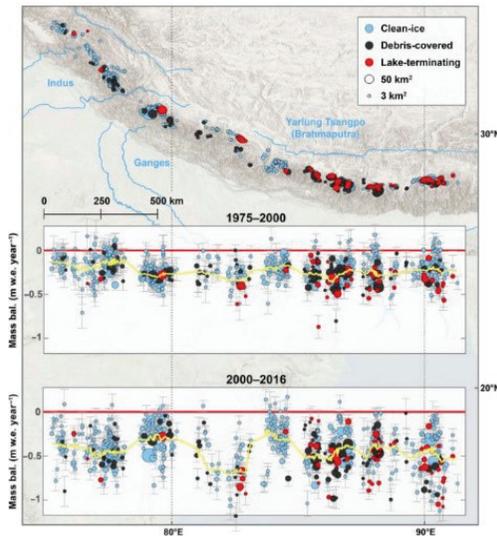


Fig 4. Ice mass change for each glacier and in each time period of the Himalayas. **Source- ars TECHNICA²³**

What is unique about this report is the method that was used by the authors to determine the ice mass changes across the Himalayan range. They used recent advances in digital elevation model (DEM) extraction methods from declassified KH-9 Hexagon film and ASTER stereo imagery to analyze the trends in ice loss for around 650 larger glaciers for two different time periods of 1975-2000 and 2000-2016 along a 2000-km stretch from Spiti Lahaul to Bhutan.²⁴ They took declassified Cold War-era US spy satellite images and created an automated system to turn these images into 3D models and compared them with modern satellite images for the study.²⁵ The researchers concluded that the total ice mass decreased to 87% in 2000 from what was there in 1975, and further to 72% in 2016 and the region lost around 10 inches of ice each year from 1975 to 2000 and about 20 inches of ice each year from 2000 to 2016.²⁶ The study also indicates that the primary reason for the rapid melting of ice in the 21st century is the rise in temperatures.²⁷



Fig 5. Photograph taken on December 20, 1975, by a Cold-War era spy satellite and was used to create this 3D model image of the Himalayan landscape.

Source- Science News²⁸

A comparison of satellite images taken in 1975 and 2007 of the same region along the border of Nepal and India are given in Fig 6 and Fig 7.

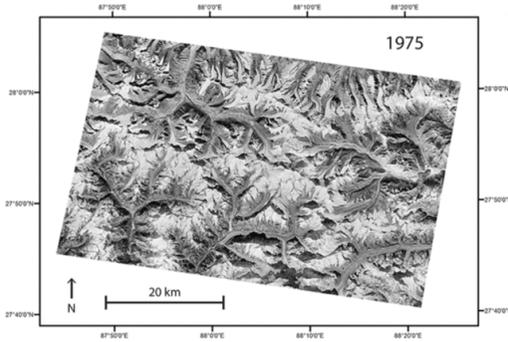


Fig 6. Source- inside climate news²⁹

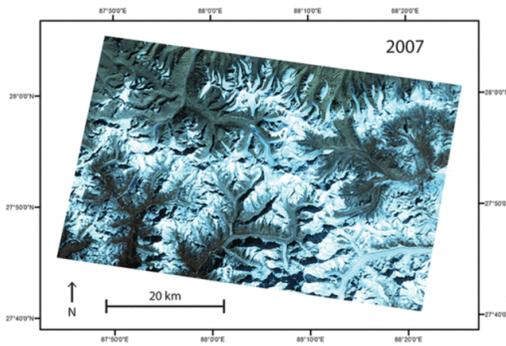


Fig 7. Source- inside climate news.³⁰

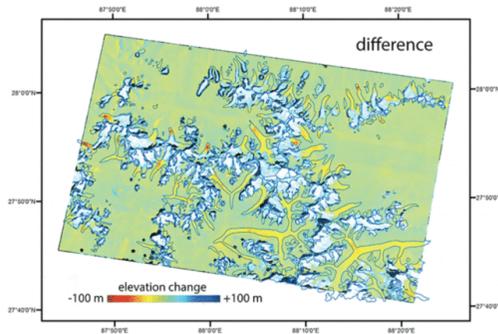
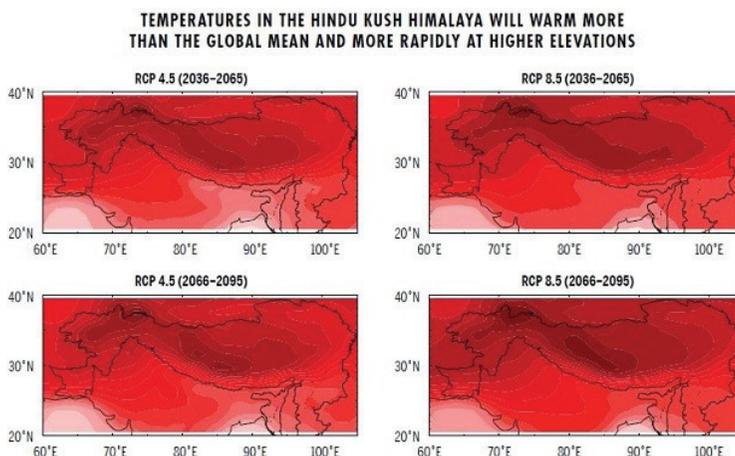


Figure 8 reveals changes in the elevation of the above region's glaciers along the border between India and Nepal. **Source- inside climate news³¹**

In order to see the change in 3D please visit the site given in the end note number 29.

As mentioned above, the crux of the problem is that the temperature at the higher altitudes increases more as compared to the increase in average temperature worldwide. This phenomenon which is also known as elevation-dependent warming has been observed widely at the Third Pole.³² It was perceived that the Hindu Kush Himalaya Region experienced warming from 1901 to 1940, cooling from 1940 to 1970, and again warming since then to the present.³³ It has been predicted that even if global warming is restricted at 1.5 degrees Celsius as per the 2015 Paris Climate Agreement, the region will be at least 0.3 degrees warmer and northwest Himalaya and Karakoram ranges will see a warming of 0.7 degrees.³⁴

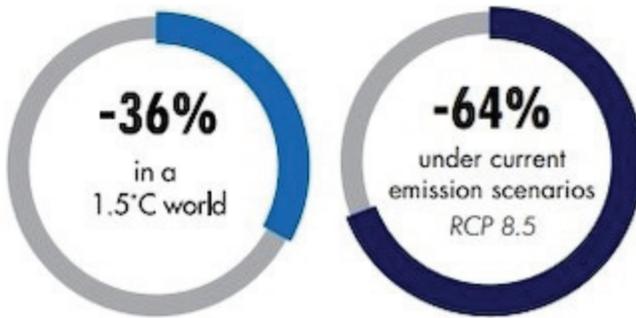


Source- THE EXPRESS TRIBUNE³⁵

This increased warming of the region will have disastrous impact on the glaciers that form a part of these high Mountain of Asia. There is no doubt about the fact that, these glaciers are retreating rapidly and it is projected that there will be even greater ice mass loss throughout the 21st century as the temperatures are expected to rise further.³⁶ It is estimated that even if the world is able to maintain

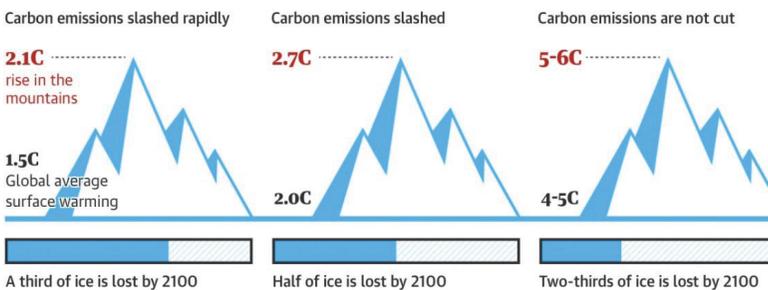
the global average temperature of 1.5 degrees Celsius, the Hindu-Kush Himalaya Region is going to lose 36% of its glaciers by the end of 21st century.³⁷ Additionally, if the emissions are not limited, that is, if the world continues with business as usual attitude, then the region could lose up to two-thirds of its glaciers.³⁸

HKH GLACIER VOLUMES WILL DECLINE SUBSTANTIALLY BY 2100



Source- PreventionWeb³⁹

Even strong action on climate change leaves significant melting of glaciers in the Hindu Kush Himalaya range



Source- Common Dreams⁴⁰

It is true that in order to get a deeper understanding of what is happening within the entire region of Third Pole as a result of climate change, more research and study needs to be carried out

globally. However, there is enough evidence to comprehend that there is something much concerning happening in the region due to global warming.

It is unimaginable to think as to how these changes are going to impact the countries and its people which are a part of these High Mountains and depend heavily on their resources. In India, three of its major rivers namely the Ganges, Brahmaputra, and the Indus originate from the Himalayan Mountains. Many people depend on the water from these rivers to support their agricultural and economic activities.⁴¹ Hence, the retreating of the Himalayan glaciers will have an impact on the ecosystems, human well-being, water availability and food security of the people of India.⁴²

How will the accelerated melting of glaciers in the Himalayas affect India's National Security?

Historically, a nation-state faced security threats from another state which was primarily in the form of military aggression.⁴³ This, however, changed with the end of the Cold War. Post-Cold-war, the concept of security was broadened and new security challenges to a nation-state such as terrorism, drug trafficking, intra-state conflicts, and the impacts of global climate change were identified.⁴⁴ These, are also categorized as Non-traditional security threats. In 2018, various U.S. government agencies which protect the country's security interests established that threats to national security are those which threaten a nation's "political, economic, military, and social systems."⁴⁵ Additionally, if there is any factor that incapacitates a country and negatively affects the people at large, weakens its security.⁴⁶

From a security point of view, climate change acts as a "threat multiplier" for instability in both volatile and stable regions of the world.⁴⁷ This term was first coined by the Military Advisory Board

of the Centre for Naval Analysis (CNA) based in Washington DC in its 2007 report, titled *National Security and the Threat of Climate Change*. This concept describes that climate change has the potential to exacerbate existing tensions and instability leading to various severe conditions across the world within the same time frame.⁴⁸ In 2016, the U.S. Intelligence Council identified different pathways through which climate change will challenge a country's national security interests, which include: threats to the stabilities of countries; heightened social and political tensions; adverse effects on food prices and availability; increased risks to human health; negative impacts on investments and economic competitiveness; and potential climate discontinuities and secondary surprises.⁴⁹ Some of the impacts of global climate change are mean sea level rise, the melting of ice in all the three Polar Regions of the world, frequent recurrence of floods and droughts, increased frequency of extreme weather events, marine life and biodiversity loss, and decline in agricultural productivity.⁵⁰ These impacts threaten the food, energy, and water security which further affects the society at all levels.⁵¹ In the extreme turn of events, the world may be turned into a place full of hunger, poverty, disease, and migration which are considered to be the worst display of climate change impacts and this may lead to conflict among communities and nations.⁵²

Climate change does not recognize borders which means that no country is exempt from its impacts. It is also argued that Developing Countries in particular are vulnerable to the impacts of climate change because of their inadequate means and limited capacities to deal with its effects.⁵³ Therefore, the accelerated melting of glaciers in the Himalayas pose a tough challenge to the countries depended on it for its livelihood and that includes India.

India is also predicted to suffer as a result of the impacts of climate change because:

- Global warming will affect the monsoon season⁵⁴
- The melting of glaciers in the Himalayas will impact the food, energy, and water security of the country⁵⁵
- Sea level rise will lead to coastal erosion⁵⁶
- Surface warming and changes in rainfall pattern will have a huge impact on agriculture of the country⁵⁷
- There will be an impact on human health at large due to resurgence of diseases.⁵⁸

Like any other Himalayan country, India too is dependent on the Himalayas for its vast freshwater reserves. The Himalayan glacier melt contribute up to 45 percent of the total river flow to its three main river systems namely the Ganges, Brahmaputra, and the Indus by seasonally releasing melt water into its tributaries.⁵⁹ Millions of people in the country are dependent on the water from these three rivers for ecosystem services, drinking water availability, food security, agricultural activity, economic activity, and for their overall well-being.

Much of the literature indicate that the accelerated melting of the Himalayan glaciers will have a short and a long term impact. In the short term there will be a surge in river runoff which means that there will be a temporary increase in water supply in the Himalayan Rivers.⁶⁰ In the long run, the situation may reverse with reduction in the flow of water in the rivers and there will be a point where these rivers could eventually dwindle as much of the glaciers is expected to shrink by the end of the century.⁶¹ These hydrological changes will have profound implications for the Himalayan countries and will also pose serious threat to the security of these nation-states. With increase in glacier melt run off, events like severe flooding, landslide, and avalanche will become more

frequent.⁶² The accelerated melting of the Himalayan glaciers will also lead to the expansion of the glacial lakes which may increase the risk of dangerous glacial lake outburst floods (GLOFS).⁶³ For India, these occurrences will threaten water supplies for millions of people, which will put their livelihoods at risk, and cause damage to infrastructure like the planned and existing hydropower plants that are critical for electricity production.⁶⁴ Eventually, when the glaciers have melted in a large amount, it is possible to have drought like situations in the Himalayan countries which may lead to crop failures and loss of livestock, thus undermining the food security of the people living in these countries.⁶⁵ India is already a water stressed country and the accelerated melting of Himalayan glaciers will worsen the situation. As the rivers will run dry, the existing situation of water shortage in the country could aggravate. This may lead to the climate-induced migration of people in search of better livelihood within the country.⁶⁶ It is also predicted that if there are some people who are unable to migrate, they may have a conflict with other people over food, water, and other necessities.⁶⁷

It is clear from the above discussion that the accelerated melting of the Himalayan glaciers will affect the lives of the people living in the countries that are a part of the Third Pole. This climate-induced aftermath definitely has the potential to become a security challenge as it negatively affects the individuals on a large scale.⁶⁸ Since the melting of glaciers can lead to both floods and droughts scenarios, there is no doubt that they will have an impact on the availability of food, water and energy.⁶⁹ This argument confirms that the rate at which the glaciers in the High Mountains of Asia are melting, poses a security threat to the nation-states of the region. Other factors such as resource competition and livelihood insecurity that may lead to migration of people may cause insecurity and instability within a nation-state.⁷⁰ Thus, it is hard to comprehend that a global asset that was meant to sustain the lives of people inhabiting the region has turned into a threat for the same. What is happening in the

Himalayas and its surrounding areas is a present day scenario and it is imperative for the world to get together to save this critical resource.

India's Initiatives for restoring the Himalayas

India formed a National Action Plan on Climate Change (NAPCC) in 2008 for addressing climate change concerns.⁷¹ One of the missions, which was launched out of several others under this Plan, was the **National Mission for Sustaining Himalayan Ecosystem (NMSHE)**. This mission was approved by the Union Cabinet on 28th February 2014.⁷² The primary objective of this mission is to develop in a time bound manner a sustainable national capacity to continuously assess the health status of the Himalayan Ecosystem.⁷³ This mission will also help to enable policy formulation to assist the Himalayan states to implement sustainable development programs.⁷⁴ The NMSHE is also supposed to address important issues like the Himalayan glaciers and associated hydrological changes, Prediction and management of natural hazards, Biodiversity conservation and protection, Wild life conservation and protection, Traditional Knowledge societies and their livelihood, Planning for sustaining the Himalayan ecosystem.⁷⁵ It is dedicated to safeguard the communities of the Himalayas from the impacts of climate change and the marginalized communities are expected to benefit the most from this mission.⁷⁶ It covers twelve Himalayan states of Jammu and Kashmir, Himachal Pradesh, Uttarakhand, Sikkim, Arunachal Pradesh, Nagaland, Manipur, Mizoram, Tripura, Meghalaya, Assam, and West Bengal.⁷⁷ The Department of Science and Technology, Government of India has been given the responsibility to implement the objectives of this mission.

As mentioned above, one of the issues that this mission aims to address is to observe changes in glaciers in the Himalayas because of the effects of climate change. In this regard, the National Centre for

Antarctic and Ocean Research (NCAOR), Goa, under the Ministry of Earth Sciences has opened a research station in Himalaya called HIMANSH in 2016.⁷⁸ It is situated at Sutri Dhaka, Chandra Basin, Lahaul-Spiti valley of Himachal Pradesh and it is dedicated to facilitate Himalayan Cryosphere studies in Chandra Basin, to study the dynamics and the rate of change of Himalayan glaciers, and to understand its impact on hydrology and climate.⁷⁹ It has also been acknowledged by the National Centre for Antarctic and Ocean Research (NCAOR) that the Indian Himalayan cryosphere is the least studied because of scarcity of observations, remoteness, extremely challenging field conditions and limited time in a year and it is therefore necessary for a systematic long-term investigations of the Himalayan glaciers to be carried out in order to understand their complex behavior towards the observed and future changes.⁸⁰ Considering this, the NCAOR has adopted seven major glaciers of Chandra Basin, to monitor for long term integrated glaciological studies while operating from the HIMANSH research station.⁸¹ It is estimated that there are 205 glaciers in Chandra basin and NCAOR has been monitoring 43% of the total glacier area of the basin.⁸²

Additionally, NITI Aayog launched five thematic reports on the sustainable development of the Indian Himalayan Region on 23rd August 2018. The themes included: Inventory and Revival of Springs in Himalayas for Water Security, Sustainable Tourism in the Indian Himalayan Region, Transformative Approach to Shifting Cultivation, Strengthening Skill and Entrepreneurship Landscape in Himalayas and Data/Information for Informed Decision Making.⁸³ These reports focused on the significance, the challenges, the ongoing actions, and a future roadmap for the Indian Himalayan Region.⁸⁴

While these are some excellent initiatives, there needs to be a shift in focus on other aspects as well:

- It is important that important issues like Climate change should be included in India's national security agenda. This will give it the much-needed attention in times where the subject is of pressing concern.
- An establishment of a strong specialized institutional mechanism like that of an Arctic Council is urgently required by the countries that are a part of the Third Pole. A greater accomplishment can be achieved if an agreement can be signed among the Himalayan nations for sharing the data of glacier melting and other cryospheric changes that are taking place in the region. Another advantage that can emerge from this type of framework is that the countries can better prepare for the damages that follow climate change. This idea has also been proposed by the International Centre for Integrated Mountain Development (ICIMOD), an intergovernmental institution set up by the eight Himalayan countries to protect the Himalayan ecosystem and to improve the livelihoods of the people of the region.

Conclusion

Climate change is impacting the cryosphere of the Himalayas at an unprecedented rate and will continue to do so even if the global average temperature is maintained at 1.5 degrees Celsius as per the Paris Climate Agreement. This means that the damage has been done and nothing will now help to keep the resources of these High Mountains of Asia from diminishing. The countries and its people living under the shadow of these High Mountains are in danger.

The year 2020 was supposed to be an important year for climate change negotiations with 26th session of the Conference of the Parties (COP 26) to the United Nations Framework Convention on Climate Change (UNFCCC) to be held in Glasgow in November. However, because of the ongoing Covid-19 pandemic, this event

has been postponed and is now scheduled to be held in 2021. Furthermore, all the crucial events that was supposed to take place ahead of this November conference has been delayed. A series of important meetings have also been affected due to the outbreak of the virus – the cancellation of World Ocean Summit that was supposed to be held on March 9th and 10th in Tokyo, Japan and the calling off of CERA week Energy Conference which was scheduled to take place from March 9th to March 13th in Houston. Similarly, the United Nations called off all meetings that were supposed to take place between March and April and a number of climate and biodiversity meetings has also been cancelled or postponed. It is also being anticipated that the Intergovernmental Panel on Climate Change (IPCC) may not be able to submit its sixth assessment report on time due to the ongoing crisis. On a positive note, global emissions seems to have come down since the outbreak according to researchers in New York. However, the decrease in emissions is temporary as most countries would start their processes to revive their economies, which are facing a setback due to the pandemic. With the world coming to a standstill it is difficult to predict where the climate change negotiations are headed. Since the countries are expected to ramp up their economic activities once the pandemic eases, it is important that these negotiations be back on track as soon as possible as the world is not prepared for another disaster.

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