



IMPLICATIONS OF CLIMATE CHANGE IN THE HIMALAYAN REGION AND ITS IMPACT ON INDIAN SECURITY

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ABSTRACT

The world's third largest freshwater stores are in the Himalayan glaciers. The potential loss of this water resource from climate change in 21st century has serious impact on environment and India's national security as well. Sometimes known as "The Third Pole", the Himalayan glaciers contain the world's third largest store of freshwater after the Antarctic and Arctic. Since the ecology of the region is so finely balanced, with glacier runoff providing a regular pattern of melt water into the region's largest rivers and acting as a backup supply of water in the event of monsoon failure. Even minor climate changes can have a devastating environmental effect on the life blood of more than 25% (1.3 billion People) of the world's population. This source is not inexhaustible and with accelerated melting of Himalayan glaciers the water shortages in the long run would be the cause interstate and intrastate conflicts as millions of lives would be at stake in the region. Sea levels threaten to rise higher than previously anticipated. And water supplies are increasingly at risk from both melting glaciers and extreme climate events, such as droughts and floods. These changes threaten not only the climate, but also security and stability of India. The melting of Himalayan glacier due to climate change also poses a complex security challenge in the form of forced migration and resource based conflicts. Thus, the melting of Himalayan glacier due to climate change poses a systemic challenge to India's national security. Therefore, it is necessary to understand how India and its neighbours viewed climate change and its impact. What is the impact of Climate Change on water resources and livelihoods in the greater Himalayas rising temperatures lead to less precipitation in the form of snow? Does climate change and melting of glaciers create security problems for India? Will it become a critical driver in our relations with the neighbouring countries? Will there be implications of climate change for internal security? The scope of this paper is to understand the geopolitical dimensions of climate change and its implications for India's national security.

Key Words: Glacial Recession, Rising Sea Levels, Extreme Weather, Changing the Dynamics of Conflicts, Ethnic invasion and civil war.

INTRODUCTION

Climate change poses a systemic challenge to India's national security. Its consequences are being increasingly viewed as the foremost problem of the 21st century. It challenges at national, regional and global levels are enormously demanding and interconnected and have obvious implications in terms of human security. Climate change has added to the uncertainty and disputes surrounding distribution of dwindling natural resources like water, land and food grains, and loss of biodiversity, collapse of ecosystems and frequent disasters and migration amongst the vulnerable strata of society. Security analysts and academicians have warned for some time now that climate change threatens water and food security, the allocation of resources, and coastal populations, threats which in turn could increase forced migration, raise tensions and trigger conflict.¹ In order to assess the role of climate related factors, particularly in the context of Himalayan regions and to

provide greater clarity about the potential sources of instability and conflict in the future.

2. GEOGRAPHY OF HIMALAYA AND ITS GLACIERS:

Himalaya is forming a broad continuous arc for nearly 2600 km (1600mile) along the northern fringes of the Indian subcontinent, from the bend of the Indus River in the Northwest to Brahmaputra River in the East. The Himalayas range, averaging 320 to 400 km (200-250 mile) in width, rises sharply from the Gangetic Plain. North of this mountain belt lies the Tibetan Plateau (Qing Zang Gaoyuan).The Himalayas forms the earth's highest mountain region, containing 9 of the 10 highest peaks in the world.

Before the introduction of machines in the warfare Himalaya was playing the role of natural guard to protect our Northern Frontiers. The period from mechanised warfare to till date, more or less, it played its important role to secure our borders. But the further

role is changing. It may cause grievous conflict between different surrounding countries along with major powers of the world for its God gifted resource of drinking water. Till now it was producing sufficient water for its surrounding countries but as for the population of these countries are increasing the need of himalayan water is also increasing. And in the contrast, due to global warming and other various causes the water of Himalayan Rivers are coming down.

The Himalayas have the largest concentration of glaciers outside the polar caps. The world's third largest freshwater stores are in the Himalayan glaciers. That is why; they are called the "Water Towers of Asia."² The Himalayas lie to the north of the Indian subcontinent and to the south of the central Asian high plateau. They are bound by the Indus on the west slope of Mt Nanga Parbat (near Gilgit), and in the west, by river Jaizhug Qu on the eastern slope of Mt Namjubarwa. The Geological Survey of India claims that the Himalayan glaciers occupy about 17 per cent of the total mountainous range (Vohra 1978)³ (as compared to 2.2% in the Swiss Alps), while an additional 30 to 40 per cent area has seasonal snow cover.

In the whole of the Himalayan range, independent geologists claim that there are 18,065 small and big glaciers with a total area of 34,659.62 km² and a total ice volume of 3,734.4796 km³. The major clusters of glaciers are around the 10 Himalayan peaks and massifs: Nanga Parbat (Gilgit), the Nanda Devi group in Garhwal, the Dhaulagiri massif, the Everest-Makalu group, the Kanchenjunga, the Kula Kangri area, and Namche Bazaar. The Indian Himalayan glaciers are broadly divided into three-river basins of the Indus, Ganga and Barahmaputra. The Indus basin has the largest number of glaciers (3,538), followed by the Ganga basin (1,020) and the Barahmaputra (662). The principal glaciers are: Siachen 72 km; Gangotri 26 km; Zemu 26 km; Milam 19 km and Kedarnath 14.5 km.⁴

Table 1: A Status of the Glacier Inventory of Indus Basin⁵

Basins	Numbers of Glaciers	Glacierised Area(Km2)	Ice Volume (Km3)
Jhelum	133	94.0	3.0
Satluj	224	420.0	23.0
Others	3398	33382.0	-
Total	3755	33896.0	26.0

Source: Kaul et al. 1999

Table 1.2: A Status of the Glacier Inventory of Ganga-Brahmaputra Basins⁶

Basins	Numbers of Glaciers	Glacierised Area(Km2)	Ice Volume (Km3)
Bhagirathi	238	755.0	67.0
Tista	449	706.0	40.0
Brahmaputra	161	223.0	10.0
Others	640	2378.0	-
Total	1488	4062.0	117.0

Source: Kaul et al. 1999

The Himalayan glaciers feed seven of Asia's great rivers: the Ganga, Indus, Barahmaputra, Salween, Mekong, Yangtze and Huang Ho- ensuring a year-round water supply to hundreds of millions of people in the Indian subcontinent. But, due to climate change, about 70 per cent of glaciers are retreating at a startling rate in the Himalayas. The Kathmandu based UN Organisation-International Centre for Integrated Mountain Development (ICIMOD) has found that global warming is having serious impact on the amount of snow and ice in the Himalaya. It has serious implications for downstream water availability as up to 50 percent of the average annual flows in the rivers are contributed by snow and glacial melting. ICIMOD (2009)⁷ clearly pointed out that the warming in the Himalaya has been much more than the global average- for example, 0.6 degrees Celsius per decade in Nepal, compared to the global average of 0.74 degree Celsius (IPCC 2007a).⁸ The climate change is real and happening now and it is causing a serious impact on fragile ecosystems like glaciers. Seventy per cent of the world's freshwater are frozen in glaciers. Glacier melt buffers other ecosystems against climate variability. Very often, it provides the only source of water for humans and the biodiversity during dry seasons.

The potential loss of this water resource from climate change in 21st century has serious impact on environment and India's national security as well. Sometimes known as "The Third Pole", the Himalayan glaciers contain the world's third largest store of freshwater after the Antarctic and Arctic. Since the ecology of the region is so finely balanced, with glacier runoff providing a regular pattern of melt water into the region's largest rivers and acting as a backup supply of water in the event of monsoon failure. Even minor climate changes can have a devastating environmental effect on the life blood of more than 25% of the world's population. This source is not inexhaustible and with accelerated melting of Himalayan glaciers the water shortages in the long run would be the cause interstate and intrastate conflicts as millions of lives would be at stake in the Region.⁹ Sea levels threaten to rise higher than previously anticipated. And water supplies are increasingly at risk from both melting glaciers and extreme climate events, such as droughts and floods. The melting of Himalayan glacier due to climate change also poses a complex security challenge in the form of forced migration and resource based conflicts. Thus, the melting of Himalayan glacier due to climate change poses a systemic challenge to India's security and stability as well.

3. IMPACT MECHANISMS OF CLIMATE CHANGE:

As global warming continues to increase the atmosphere temperature, it will lead to a continuous shift of zero temperature line (snow line) toward higher altitude. Thus glaciers will receive more liquid

precipitation and less monsoonal solid precipitation. Shift in snowline will result in lesser input to glacier mass balance during summer periods. Therefore, higher atmosphere temperature and more liquid precipitation at higher altitude in the Himalayas will lead to rapid retreat of glaciers and downstream flooding in the coming future (Hasnain 2002, Kadota *et al.* 1993).¹⁰ The Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) clearly established that warming of the climate system was ‘unequivocal’ and if the annual emission of Greenhouse gases remains are today’s levels, by 2050 it will be 550 parts per million.¹¹ This means a potentially catastrophic mean global temperature increase of 5 degree Celsius. Global warming is causing Himalayan glaciers to rapidly retreat, threatening to cause water shortage for hundreds of millions of people who rely on glacier-dependent rivers in China, India and Nepal. A global conservation group-World Wildlife Fund for Nature (WWF) warned in its report that the greatest concentration of ice on the planet are now receding at an average rate of 10 to 15 meters (33 feet) per year.¹² The rapid melting of Himalayan glaciers will first increase the volume of water in the rivers and seas, causing widespread flooding and then droughts as river run dry. The depletion of Himalayan glaciers has various effects on Himalayan region. In the coming years the speedy melting of glacier may cause floods in Himalayan River’s resulting destruction of agriculture, lands and human installations in this region. There would be more dengue, more malaria, and more diarrhoea.¹³

The Inter-Governmental Panel on Climate Change (IPCC) also established that the range of global average surface warming over the period of this century vary from 0.3°C to 6.4°C. The corresponding average rise in sea levels ranges from 0.18m to 0.59m, excluding the impact of dynamic changes in the ice flow.¹⁴ In Southern Asia, the mean annual increase in temperature by the end of the century is projected to be around 3.8°C in the Tibetan plateau and 3.3°C in South Asia.¹⁵

While there is still an ongoing debate over the pace at which the temperature is expected to rise over the coming century, potential mechanisms by which the change will affect the region are clear. These are: the changes to subcontinent’s river systems that flow from the Tibetan plateau to the Indian Ocean, and, rising sea

levels and their impact on river-deltas and low-lying islands.¹⁶ In addition, a third mechanism pertinent to the this study: extreme weather—cyclones, droughts, floods etc., that do not exclusively result from global warming but are both vitiated by it and complicate our response to the disasters it causes.

3.1-Himalayan Glacial Recession:

The impact of global warming is perhaps already upon the Himalayas. Himalayan glaciers have been in a state of general retreat since 1850 and recent publications (Dyurgerov and Meier 2005) ¹⁷ confirm that, for many, the rate of retreat is accelerating. On the Tibetan Plateau, the glacial area has decreased by 4.5% over the last twenty years and by 7% over the last forty years (CNCCC 2007)¹⁸ indicating an increased retreat rate. Glacier retreat in the Himalayas results from “precipitation decrease in combination with temperature increase. The glacier shrinkage will speed up if the climatic warming and drying continues” (Ren *et al.* 2003).¹⁹The 30.2 km-long Gangotri Glacier is receding rapidly: the rate of retreat in the last three decades has been found to be more than three times the rate during the earlier 200 years or so. The average rate of recession has been computed by comparing the snout position on 1985 toposheet map and the 2001 panchromatic satellite imagery and the result shows that average recession for this period is about 23 m/yr.²⁰ The enhanced rate of glacial retreat is attributed to the increased anthropogenic contribution to the climate on account of greenhouse gas emissions contributing to global warming.

In the next decades the melting of the Himalayan glaciers could lead to several problems. Several Asian rivers receive huge amounts of their waters from these glaciers. Regarding an accelerated glacial melt the Ganges for example could be subjected to increasing seasonal influences. This means that the availability of freshwater will change, which has an effect on irrigation and thereby food production for e.g. in the Indo-Ganges area.

As the earth’s temperature continues to rise, mountain glaciers are melting throughout the world. Nowhere is this of more concern than in Asia. It is the ice melt from glaciers in the Himalayas and on the Tibetan plateau that sustain the major rivers of India and China, and the irrigation systems that depend on

Table 3: Impact of Climate Change on Ongoing Conflicts in the Indian Subcontinent

<i>Conflict System & Impact Mechanism</i>	<i>Glacial Recession</i>	<i>Rising Sea Level</i>	<i>Extreme Weather</i>	<i>Net Assessment</i>
Jammu & Kashmir	High	-	Medium	Risk of war, motivated in part by the quest for Water Resources
India-China border	High	-	Medium	Risk of natural disasters in India, worsening India-China Relations
Bangladesh ‘Ethnic Invasion’	High	High	High	Risk of mass migration into India
Pakistani separatism	High	Medium	Medium	Risk of existential crisis in Pakistan and Ethnic Conflict
Sri Lankan civil war	-	High	Medium	Risk of mass migration, and of Ethnic Conflict
Nepal civil war	High	-	High	Risk of natural disasters and mass migration into India due to social Unrest

them, during the dry season. "Indeed, the projected melting of the glaciers on which these two countries depend presents the most massive threat to food security humanity has ever faced," says Lester R Brown, environmentalist and president of the Earth Policy Institute, a non-profit research organisation based out of Washington DC.²¹ Lester R. Brown also warned that the way Indian glaciers were melting because of climate change, the Ganga may turn into a "mausmi nadi" before the turn of this century as its origin - the Gangotri glacier - was shrinking at an alarming speed.²²

According to Remote Sensing Observation, it is estimated that above 90% of the glaciers are receding. This is also substantiated by some ground based monitoring. Some glaciers are expanding, particularly in the Karakorum, or at least the terminus positions are advancing. The Indian Space Research Organisation's Space Applications Centre (SAC) using data from the Indian Remote Sensing satellite (IRS) has observed that the major Himalayan glaciers have shrunk by 21% in the last 40 years.²³ The glaciers of the Himalayan region are under a big environmental threat. Recent studies prove clearly the fact that the glaciers are melting away. One concludes that with a 2°C increase by 2050, 35% of the present glaciers will disappear and runoff will increase, peaking between 2030 and 2050 (Qin, 2002).²⁴ In 2008 a Chinese research team verified for approximately 20 glaciers in the Himalayan highlands that they had lost roughly more than five percent of their area during the recent 45 years.²⁵ The satellite pictures show that the famous or rather infamous for being the world's highest battlefield Siachin glacier which is 70 Km long and 5-10 km wide is shrinking rapidly and showing increasing number of blue lakes within its expanse.²⁶ One of the world's biggest watersheds is the third pole "The Tibet Plateau"; on which depends more than 25% of the world's population, which feeds more than 10 rivers that flow out of it.²⁷ This source is not inexhaustible and with accelerated melting of Himalayan glaciers the water shortages in the long run would be the cause internal and external tensions as millions of lives would be at stake. Both the food and water scarcity issues in these parts have the potential to cause cascading ripple effects all over the globe. The melting of glaciers and global warming would completely change the methods of logistics support to the forces in Siachin and other higher reaches of India.

The shortfall in the agriculture produce that is bound to be the result would affect not only the respective country but the entire globe. In addition to the glacial melt the rapidly melting Arctic ice and permafrost, is also a cause for concern. The increasing levels of sea is driving the anxiety levels of coastal populace and smaller island nations like Maldives are already looking at the prospect of searching for an alternate country to live.

The glaciers on the Tibetan plateau are the source of Asia's biggest rivers, including the Brahmaputra, the Indus, the Sutlej and several of the northern tributaries of the Ganges that irrigate the subcontinent. Geopolitically the source of most of these rivers, except the main Ganges, lies in China. On the other hand, the melting of the Himalayan glaciers as a result of the rise in the earth's temperature will first increase the drainage through the major river systems into the ocean, followed by reduction in their volumes once the glaciers begin to disappear. It is projected that some of the mightiest Himalayan Rivers might end up as seasonal, monsoon-fed rivers like those in southern India. Towards the southern tip of India, the problem of Lakshadweep island losing land mass is yet another cause for concern. Serious security repercussions of such occurrences are obvious. For example the reduced seasonal flow of Indus River water is fast becoming a hotspot of concern between India and Pakistan.

3.2-Rising Sea Levels:

India is definitely a country facing huge challenges, especially due its rapid demographic development. But also with respect to the environmental context as the outcomes of human economic activity cannot be limited in a singular region. In other words, there will be further obstacles with regards to prospective development caused by global warming. West Bengal, for instance, is a region that is somewhat situated above sea level. In addition, the neighbouring country of Bangladesh will also be affected by rising sea level in the ongoing 21st century. The Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) clearly established that warming of the climate system was 'unequivocal' and if the annual emission of Greenhouse gases remains at today's levels, by 2050 it will be 550 parts per million. This means a potentially catastrophic mean global temperature increase of 5 degree Celsius. The United Nations' Intergovernmental Panel on Climate Change (IPCC) estimates that sea-level will rise 9 to 88 cm by the year of 2100 with a 50 per cent probability of sea-level rising to 45 cm.²⁸ That would imply seas rising and submerging half of Bangladesh. Glaciers would melt, leading first to floods and then droughts as river run dry. There would be more dengue, more malaria, and more diarrhoea.²⁹

The rise in global sea levels—due to the melting of polar ice caps and glaciers around the world—is expected to result in the submergence of low lying areas: including river deltas, coastlines and small islands. These places highly populated regional cities like Karachi, Dhaka, Mumbai, Kochi and Mangalore at risk. The entire country of Maldives could disappear under the Indian Ocean by the middle of the century. In addition, the coastline could advance inland across several heavily populated parts of Bangladesh, Sri Lanka, Myanmar and Pakistan (as indeed, several parts of India). A gradual loss of land in the Ganga-Brahmaputra

Delta due to the rising sea is displacing migrants in large numbers leading to illegal migration- yet another area of concern.

The potential for large-scale migrations of people – both within countries and across borders – has been described as ‘perhaps the most worrisome problems associated with rising temperatures and sea levels which could easily trigger major security concerns and spike regional tension.’³⁰ On the other hand the local politicians got an opportunity to strengthen their vote banks by sympathizing with these so called migrants for their short term gains ignoring the long term damage that would be caused to the already poverty stricken country. Indian Governments during their successive tenures also turned a blind eye to this brewing up problem which ultimately was eating up into its resources, employment opportunities, health, literacy and above all acting as the gravest internal security threat.

3.3-Extreme Weather and Water Resources:

In addition, climate change risks worsening the impact of natural disasters like cyclones, floods and droughts that affect the subcontinent. This could take several forms: increasing the intensity of cyclones or floods, changing the geographical area where these occur, occurring at increased frequencies and, in general, complicating adaptation efforts. For instance, a cyclone of record strength striking a river delta that is itself deluged as a result of glacial recession would transform the disaster into a much more complicated one.

The impact of climate change on water resources and livelihoods in the greater Himalayas is very worrisome. Gradual shift of the snowline due to progressive increase in atmospheric air temperature and release of the water from snow and ice melting makes the water level constant in Himalayan Rivers. Rising temperatures lead to less precipitation in the form of snow. This reduces the snow cap and also in a longer-term causes reduction in the size of glaciers. This in turn influences very seriously the discharge of water in the pre monsoon period. The rivers carry less water. More water in summer and less in winter have to be expected. The consequence in the mountains is increased vulnerabilities in the form of flash floods and landslides. Less water in the pre monsoon period will affect the availability of water for irrigation and will affect food security.³¹ Mumbai and the backwaters of Kerala are threatened by rising sea level. Last-mentioned region (backwaters of Kerala) is a huge producer of crops thereby any land loss would have fatal effects on food security in this region.³² It is estimated that the retreat of glaciers will affect the water supply of roughly 750 million people across South Asia and China. According to Wendy Barnaby, editor of *People and Science* magazine, the United Nations issued a warning in February 2009 that climate change harbors the potential

for serious conflicts over water.³³ Therefore; water could become the “energy crisis” in the 21st century.

These scenarios have the potential, to degenerate into an international conflict though the timelines cannot be predicted with any certainty. With worsening of water, land and food situation, and its impact upon the vulnerable populations of weak nations, not only affect the neighbouring states but even the far off countries of the West would face the heat of climate change induced large scale migrations from Bangladesh and Maldives etc. The river sharing agreements between nations is already under tremendous stress, in addition wherever the fault lines exists these stresses are further concentrated forcing countries to approach the World Bank seeking intervention on sharing of river waters.

4. CHANGING THE DYNAMICS OF CONFLICTS:

Global climate change, by its very nature, is a trans-national phenomenon. While its impacts will not respect political frontiers, the sources of climate-related problems and those at risk from them might well be on different sides of national boundaries. This situation is further complicated when the boundaries themselves are unclear, contested or both. As states react to climate change issues in line with their self-interests, asymmetries in risk perceptions. The existence of unresolved inter-state disputes is likely to complicate ongoing conflicts.

The following table interposes the impact mechanisms of climate change against the ongoing conflict dynamics in India as well as in South Asia.³⁴

4.1 Jammu and Kashmir:

General Pervez Musharraf had argued in 1990, that the Kashmir dispute was interdependent on the distribution of the Indus river waters between India and Pakistan, and that “if one were resolved the other wouldn’t exist.”³⁵ He further contended that a fair distribution of the waters, from the Pakistani perspective, is a prerequisite for the resolution of the conflict over Jammu & Kashmir. This view underlines the fact that despite the World Bank-mediated Indus Waters Treaty (IWT) surviving intact over half a century of tensions with India; Pakistani strategists view even the current sharing arrangements as sub-optimum.³⁶ Both the protracted legal tussle between the two countries over the Baglihar dam³⁷—which was largely settled in India’s favour— and proposals to divide Kashmir with rivers as boundaries³⁸ suggest that water is an ever important factor in Pakistan’s strategic calculations. At the same time, Pakistan has been unsuccessful in managing its water resources³⁹ to the satisfaction of all its provinces, with the lower riparian provinces wary of Punjab’s efforts to develop water resources. It is possible to envisage that water deficient Pakistan will continue to adopt the proxy-war strategy in an attempt to secure a more advantageous territorial settlement. It is also possible that it might use its militant

proxies to deter, threaten and sabotage water-management infrastructure in Jammu & Kashmir. As water shortages worsen, Pakistan might notice that their shares of the benefits of the IWT evaporate, making it less costly to target water projects on the Indian side. Even if a bilateral consultative arrangement is in place, it is possible that an act of sabotage would trigger of events leading to another war between the two countries.

4.2 Indo- China Border -

In the summer of 2004, a large landslide dammed up the Pareechu River in Tibet creating an artificial lake. By August, Indian authorities downstream feared that the bursting of the 'dam' would result in flooding in populated areas in Himachal Pradesh.⁴⁰ The same month another artificial lake was found on the Tsangpo River, also in Tibet. While the two countries had agreed to share weather information after a similar incident caused a disaster in 2000⁴¹, Chinese authorities were blamed for being tardy in alerting their Indian counterparts. In the event, both countries improved their hydrological and satellite based remote sensing capabilities but not before the Indian armed forces had mobilised for disaster management. Such events have the capacity to exacerbate bilateral tensions, especially if India suffers a major natural disaster either due to lack of warning or worse, by a Chinese act to protect its own interests. With such incidents projected to become more frequent, bilateral relations will be characterized by mutual distrust, making any border settlement extremely difficult. China, as the upper riparian, could also decide to unilaterally divert the waters of the Himalayan rivers—particularly the Brahmaputra⁴²—flowing into India. Such an act could severely affect the livelihoods of the population in Arunachal Pradesh and Assam. Brahma Chellaney warns that a mega-rerouting by China would "constitute a declaration of water war" over India and Bangladesh.⁴³

4.3 Bangladeshi Ethnic invasion -

One of the main reasons India went to war with Pakistan in 1971 was because of the refugee crisis: over 10 million East Pakistanis fled to India to escape the brutal repression of the West Pakistani army. The influx of Bangladeshi migrants since then has already reshaped the ethnic-religious balance in the states adjacent to Bangladesh.⁴⁴ The issue of illegal immigrants has plagued India's relations with Bangladesh. Bangladesh is badly affected by the adverse impacts of climate change as Bangladesh government is not in a position to cope with it due to their poor economic resilience. The illegal migrants provide breeding grounds for terrorism and other forms of class struggles all around causing an adverse impact on security of a vast population of India.

The glacial retreat could cause not just an overflow of rivers within countries, but more significantly, a cross

border overflow into countries that already have a history of tension. The arctic ice melt may open new navigable routes bringing cheers to some but its affect on the coastal populations around the neighbouring countries of India would be terrible. The disappearance of inhabitable land due to rise in sea level even at the scale projected by IPCC would spell trouble for India and its neighbours. India may then see an influx of almost 20 million humans pushing their way towards a safe haven. The resentment against these migrants would come to fore with political and armed movements against them resulting in ethnic conflicts. Subversive elements are being pushed by ISI in the garb of environmental migrants to implement its sinister design of 'Greater Bangladesh'.⁴⁵ It is a challenge for India to manage its borders.

Over the next few decades as water-shortages damage its agriculture-based economy, and rising sea-levels reduce land availability, the Bangladeshi pressure cooker could well explode—triggered by an extreme cyclone, for instance—spilling millions of people into India.

4.4 Pakistan Separatism-

Water shortages and rising sea levels could sharpen Pakistan's inter-provincial fault-lines. Sindh is vulnerable on both counts: its highly populated coastline is threatened by rising sea levels, while its agricultural lands depend on the Indus River for irrigation. A perception that it is being exploited by an insensitive Punjab province—much like in East Pakistan in 1971—could trigger off violent separatism.

Counterinsurgency operations by the Pakistan army could turn into ethnic killings leading to a flow of refugees into adjoining Indian states. Baloch separatists could take advantage of the situation in Sindh to escalate their own insurgency. In the worst case, this could stretch and break the Pakistani army and cause the collapse of the Pakistani state—an event of profound geopolitical consequences.

4.5 Less Agricultural Land and more civil war-

Mass migration into India is also indicated from Sri Lanka and Nepal, where the mechanisms of climate change could add a new dimension to ethnic conflict. Rising sea levels in Sri Lanka's northern and eastern provinces could result in greater pressure on the ethnic Tamil population, leading to a range of conflict scenarios including massive ethnic killings. Similarly, the flooding and drought could exacerbate the ethnic dimension of the Nepalese civil war resulting in mass killings. Extreme weather events—cyclones, flash floods and unrelated natural disasters like earthquakes—could precipitate the refugee crisis. The near certainty is the disappearance of the Maldives under the Indian Ocean. There is no ongoing 'conflict' as such in Maldives, but rising sea levels will cause its population to seek refuge in other countries, including India.

5. SUGGESTIONS:

Even the best international conventions and agreements mean that climate change and the effects of atmospheric pollution will continue to affect the world during the coming 50 years. The Himalayas and the Tibetan plateau as highly sensitive mountain systems will be particularly affected and will feel the consequences of climate change dramatically. In no mountain region of the world will the effects be as directly linked with livelihood systems as in the Himalayan region. Therefore, we can suggest the following adaptation methods:

1. In general we have to say that poverty, and lack of infrastructure and basic services to the rural population are so important that any adaptation agenda is very close to the traditional development agenda – a sustainable one. We can make the difference between short, medium and long-term measures.
2. Immediately we have to be aware that changing rainfall patterns, melting glaciers and droughts create new vulnerabilities. Early warning systems, risk mapping, creating awareness and capacity development are immediately required. Flood and flash flood risk mitigation, e.g. early warning systems, improved infrastructure (embankments, river training). Adaptation in the mountains also means that we have to learn from the community-adopted and adapted practice: communities have learned to deal with hazards and we cannot expect that governments will be able to intervene everywhere. Often it can only create enabling policy, institutional and financial environments.
3. Watershed development, rain and snow or ice water harvesting and storage are becoming priority issues. This leads to very concrete programmes: how can we reduce the outflow of water when we have too much, to make it available when we need it most. Conservation and management of wetlands are important. We should also scale up interesting regional experience of farm level water harvesting – e.g., water ponds.
4. Hydropower generation, ecotourism, and the conservation and management of biodiversity are unique assets which contribute to strengthening resilience and adaptation. But we should move a step further: climate change and global warming on the one hand and economic development with the growing middle class on the other.
5. A higher percentage of the population is changing their way of living; and there is an increasing awareness among them about the importance and relevance of ecosystem services in the mountains. These services are partly considered as public goods and have no market currently. We have to create awareness for these services and to put a price tag

on them.

6. We might have access also to carbon funds. But let us not forget about the low hanging fruit as well: remittances are four times as important as development cooperation funds in Nepal. Let us devise clever policies to tap these resources. If we have the energy for designing and implementing good policies for the use of remittances, especially targeting rural areas, and we do better foreign aid coordination, then we have already made a good start towards climate change adaptive development.
7. Climate change poses a real threat to the Himalayan region and its large rivers and to the inhabitants of their basins. The challenges ahead are of regional and overarching nature. The countries of the greater Himalayan region need to seek common solutions to common problems. Regional cooperation needs to advance in order to address the ecological, socioeconomic, and cultural implications of climate change in the Himalayas. The international community, including donors, decision-makers, and the private and public sectors, should be involved in regional cooperation ventures. This is of particular importance to achieve sustainable and efficient management of trans-boundary Rivers.

6. CONCLUSION:

The Hindu philosophy of Karma is very apt in this context “Do not aspire for results but act and only then there would be a result”. The relationship between climate change and security is here to stay and it would be narrow-minded on the part of the security establishment to not take cognizance. The political compulsions of public posturing should not deter the establishment towards combating the changing security scenario in their backyard. Failure to recognise the devastating implications of climate change on peace and security could prove to be very costly resulting in the worldwide instability and retarded development not to mention – loss of human life.

Thus, the need of the hour is of a coordinated effort and a collective vision, a vision of a world where we are able to co-exist with nature giving back as much as we take. It is therefore incumbent on individual states to act in their own self-interest: co-operating with other states where possible, but acting unilaterally where necessary. The consequences of global warming would thus be felt much after the “Copenhagen Agreement”, even if all nations were able to rise above their competitive positions and arrive at an agreement. The existing state of affairs does not bode well for the coming decades. Nations would have to come out of rhetorical posturing if human tragedies such as draughts and famines are to be avoided. Climate change impacts and responses are trans-boundary issues.

Therefore, in addition to national discourses on linkage between climate change, mitigation and

adaptation measures and development efforts, regional collaboration is necessary to formulate co-coordinated strategies. Society will also need to improve its adaptation strategies, and level structural inequalities that make adaptation by poor people more difficult.

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