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ACCELERATED MELTING OF GLACIERS AND ITS IMPACT ON BIOSPHERE

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ABSTRACT

The process of glaciers melting is normal, but amount of glacier that has melted must be replaced by mere snow. This process is not happening almost everywhere in the world. Global warming has increased average temperatures worldwide, making more glacier ice to melt than in previous years. Falling snow is not able to cope with the melted snow. Glaciers today are melting faster than normal. On an average 20% to 40% loss of glaciers is recorded globally in the last two decades of time. This results not only in the diminishing of the size of glaciers, but is also a grave threat to the populations that depend on them for survival. Most of the impacts of rapidly melting glaciers are already being felt in many places across the globe. The nature of earth's atmosphere is becoming even more unpredictable and hence a cause of attention. This in turn brings out a variation in the biological system essentially by posing a threat to the habitats. There will be a considerable increase in the water level of oceans and seas as a result of melting of glaciers. This will engulf land at the coastal areas and some low lying countries may even become submerged. Inundation causes shift in ecosystem and change of species composition.

KEYWORDS:*glaciers melting, climate, temperature, ice, Rivers, floods*

INTRODUCTION

Glaciers are formed in the coldest parts of the earth, either at ground level or high up in the mountains. They are formed by snow depending on the climate and temperature. This snow keeps on freezing and thawing and finally gets converted into ice. As more snow gets converted into ice, the weight and size of the glacier keeps increasing. The melting of glaciers is a normal process. Whenever there is a rise in temperature the upper layers of the glaciers begin melting. Ice glaciers either break off into smaller icebergs and melt directly into the sea, or melt on land and From Rivers that will empty into the sea .The melting glacier will be replaced by more snow, and this process continues. A problem here occurs when the snow replenishing it is less than the melted water. This is exactly what is happening with most of the glaciers around the world today, gradually reducing the size of the glacier, at the same increasing the sea water level.

INCIDENCES OF GLACIER MELTING

In several parts of the world, incidences of rapid melting of glaciers are reported. According to the World Glacier Monitoring Service Reports, thinning and decrease in the size of glaciers is observed in all places of the globe. Glaciers in Switzerland, Australia, Italy and France have retreated to a large extent .Mont Blanc Glacier has retreated b y 4,600 ft in five years of time (2000 – 2005) and the largest glacier in France, the Mer de Glace by 1 km in a span of 130 years (1870 – 2000). In the Glacier National Park in Montana (U.S.), the eponymous glaciers are diminishing rapidly (10). The larger glaciers are now approximately a third of their former size when first studied in 1850 and numerous smaller glaciers have disappeared

completely. About 73% of the glacier cover is lost in the park (from 1950 – 1003), amounting to an area of 99 km sq. Gannett Glacier in the Rocky Mountains, South of Canada is lost over 50% of its volume since 1920. In Alaska 99% of the glaciers are retreated out of 2000 glaciers observed. A similar observation is made in the Andes of Argentina and Chile and more predominantly in Patagonia on the southern tip of the continent. Tropical glaciers are located between the Tropic of Cancer and the Tropic of Capricorn, in the region that lies 23^0 26' 22" north or south of the equator.

Tropical glaciers are smaller than those found elsewhere and are the most likely glaciers to show rapid response to changing climate patterns. A small temperature increase of only a few degrees can have almost immediate and adverse impact on tropical glaciers.

Kilimanjaro, at 5,895 m (19,341 ft), is the highest peak in Africa. Since 1912 the glacier cover on the summit of Kilimanjaro has apparently retreated 75%, and the volume of glacial ice is now 80% less than it was a century ago due to both retreat and thinning (8).

The 7 km^2 (2.7 sq mi) ice cap on Puncak Jaya is the largest on the island of New Guinea, and has retreated from one larger mass into several smaller glacial bodies since 1936. The Himalayas and other mountain chains of Central Asia support large regions that are glaciated. These glaciers provide critical water supplies to arid countries such as Mongolia, Western China, Pakistan, Afghanistan and India. As is true with other glaciers worldwide, the glaciers of Asia are experiencing a rapid decline in mass. The loss of these glaciers would have tremendous impact on the ecosystem of the region.

In the Wakhan Corridor of Afghanistan 28 of 30 glaciers examined retreated significantly during the 1976 – 2003 period, the average retreat was 11 meters per year (6). In examining 612 glaciers in China between 1950 and 1970, 53% of the glaciers studied were retreating. After 1990, 95% of these glaciers were measured to be retreating, indicating that retreat of these glaciers was becoming more widespread. Glaciers in the Mount Everest region of the Himalayas are all in a state of retreat.The Rongbuk Glacier, draining the north side of Mount Everest into Tibet, has been retreating 20 m (66 ft) per year. In the Khumbu region of Nepal along the front of the main Himalaya of 15 glaciers examined from 1976 – 2007 all retreated significantly, average retreat was 28 m per year. In India the Gangotri Glacier, retreated 34 m, (112 ft) per year between 1970 and 1996, and has averaged a loss of 30 m (98 ft) per year since 2000. For the Indian Himalaya retreat ranged from 19 meters per year for 17 glaciers all retreating. In Sikkim 26 glaciers examined were retreating at an average rate of 13.02 m per year from 1976 – 2005. "Temperatures are rising four times faster than elsewhere in China, and the Tibetan glaciers are retreating at a higher speed than in any other part of the world. In the short term, this will cause lakes to expand and bring floods and mudflows. Between 1984 and 2005, the North Cascade glaciers lost an average of more than 12.5 m in thickness and between 20% and 40% of their volume.

Glaciologists researching the North Cascades glaciers have found that 47 monitored glaciers are receding and that four glaciers – Spider Glacier, Lewis Glacier (pictured), Milk Lake Glacier and David Glacier – have disappeared completely since 1985.

EFFECTS OF GLACIER MELTING

The melting of ice glaciers at much faster rate than expected has got serious negative effects on the earth and its life supporting systems.

1. Habitat Loss:-

While many species are likely to be affected by changes in stream flow and sea level associated with glacier melting, animals that dwell on or near glaciers may be pushed towards extinction by the disappearance of their icy habitats. For example, the tiny ice worm spends its entire life on ice, roaming over glaciers at night, feeding on glacial algae, but disintegrates if the temperature increases to 5^0C. Climate change has already led to the loss of an entire ecosystem on the crumbling ice shelves of the Arctic. Ice Shelf off Ellesmere Island in Canada broke into two. This 3000 year old lake supported a rare ecosystem where microscopic marine organisms near the bottom of the lake lived in harmony with their freshwater brethren in the brackish surface waters. By 2002, 96% of this unique low-salinity habitat had been lost.

Even animals that do not live directly on glaciers can be severely affected by their disappearance like Kittlitz's murrelet, a small diving seabird that forages for food almost exclusively in areas where glacial melt water enters the ocean. Even farther away from the melting glaciers themselves, coral reefs will be affected by rising sea level. Corals require light for photosynthesis to survive. When light diminishes as sea level rises, corals living at this limiting depth will be lost. This has consequences on the associated marine life, and the human communities that rely on these reefs for subsistence.

2. Changes in community species:-

Penguins: Melting ice and permafrost has led to newly available land that has become colonizes by plant, animal and microbial communities. Adelies are reducing in number and abandoning certain nesting sites while Chinstrap penguins (Pygoscelis antarctica) are taking their place. Gentoo penguins (Pygoscelis papua) have also started to nest on the peninsula in recent years, Studies of the bones and remains found in abandoned colonies indicates that prior to 1950, no Gentoo penguins nested in these sites at all.

Krill: The Antarctica Peninsula, a key breeding ground for the krill, is one of the places in the world where there has been the greatest rise in temperatures due to global warming. Krill feed on the algae found under the surface of the sea-ice. With the decrease in the ice cover algal populations are declined leading to the drop of krill numbers by 80% in a span of 30 years (1970-2000). The decline in krill may in turn account for the decline in the numbers of some penguin species which feed on krill. There is commercial implication as well as scientific ones. The Southern Ocean is a valuable fisheries resource; many of the species caught feed on krill. This decline in krill will also make it more difficult for the great baleen whales to sustain their populations.

3. Global Warming becomes a cyclic phenomenon:-

Temperatures across the global have gone upward, helping the cause of ice glaciers melting faster than required. In certain places across the world small ice glaciers have totally vanished, exposing the earth below.Ice glaciers are able to deflect almost 80% heat of the sun, absorbing approximately 20% heat. This figure gets reversed when sunlight falls on earth, 80% is absorbed and only 20% is deflected back. This in turn helps in increasing global temperatures.

4. Water shortage and consequences:-

Seventy percent of the world's fresh water is frozen in glaciers, which buffer ecosystem against climate variability by releasing water during dry seasons or years. In tropical areas, glaciers melt year-round, contributing continuously to stream flow and often providing the only source of water for humans and wild life during dry parts of the year. Freshwater is already a limiting resource for much of the planet, and in the next thirty years population growth is likely to far exceed any potential increases in available water.

The Himalayan glaciers that feed seven of the great rivers of Asia (the Ganga, Indus, Brahmaputra, Salween, Mekong, Yangtze and Huang He) and ensure a year-round water supply to 2 billion people are retreating at a startlingly fast rate. In the Ganga, the loss of glacier-melt water would reduce July-September flows by two-thirds, causing water shortages for five hundred million people and 37% of India's irrigated land.

5. Flooding:-

Rapid melting of glaciers can lead to flooding of rivers and to the formation of glacial-melt water lakes, which may pose an even more serious threat. Continued melting or calving of ice chunks into lakes can cause catastrophic glacial lake outburst floods. In 1985, such a flood at the Dig Tosh (Langmoche) Lake in Nepal killed several people and destroyed bridges, houses, arable land, and a nearly completed hydropower plant. A recent UNEP study found that glacial lakes in Nepal and Bhutan are in immediate danger of overflowing as a result of climate change.

6. Rise in sea level :-

Average global sea level rose by 1-2 mm per year during 1900s and is projected to continue rising, with an estimated contribution of 0.2-0.4 mm per year from melting glaciers.Sea-level rise will affect coastal regions throughout the world, causing flooding, erosion, and saltwater intrusion into aquifers and freshwater habitats. A global sea level rise of 1 m would inundate 80% of the Maldives, displace 24 million people in Bangladesh, India and Indonesia, and completely eliminate the Sunderbans, the world's largest mangrove forest.

7. Return of contaminants to ecosystems:-

Although persistent organic pollutants (POPs) such as PCBs and DDT are widely banned today, they were used extensively in the middle of the last century. These long lived pollutants are transported in the air from their source to cooler areas where they condense and are deposited in glacial ice. Until recently, these compounds had remained trapped in the ice, but rapid melting has begun to release them back into the environment .For example, in one Canadian lake, glacial-melt water is the source of 50-97% of the various POPs entering the lake.

8. Shortage of Electricity (Hydroelectric):-

There are many places across the planet that depends solely on the constant flow of water from melting glaciers for the production of electricity. Once this flow of water is reduced or stops, the production of electricity will stop too. Absolutely no

nation can do without electricity, and will force such places to adopt different sources to produce electricity, most of them that will pollute the earth, and possibly even help increase global warming.

CONCLUSION:

Worldwide, accelerating glacier loss provides independent and startling evidence that global warming is occurring. Based on scenarios of projected damage to ecosystems and human communities; WWF seeks to limit global warming to a maximum of 2^0c over pre-industrial levels. Although a warming of 1-2^0c will clearly threaten human health, water supplies and vulnerable ecosystems, a warming of at least 1^0c appears unavoidable. It is therefore imperative that emissions of the main heat-trapping gas, carbon dioxide(co_2), are to be reduced, in order to avoid exceeding this 2^0c threshold.

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