

THE RISING GLOBAL WARMING AND THE EARTH PLANET

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ABSTRACT

Global warming presents the gravest threat to life on Earth in all of human history. The planet is warming to a degree beyond what many species can handle, altering or eliminating habitat, reducing food sources, causing drought and other species-harming severe weather events, and even directly killing species that simply can't stand the heat. In fact, scientists predict that if we keep going along our current greenhouse gas emissions trajectory, climate change will cause more than a third of the Earth's animal and plant species to face extinction by 2050 — and up to 70 percent by the end of the century. Such a catastrophic loss would irreversibly diminish biodiversity, severely disrupt ecosystems, and cause immense hardship for human societies worldwide.

I INTRODUCTION

Global warming is the steady and continuous rise in the level of earth temperature. Our earth surface is becoming hotter day by day just because of some unnoticeable habits of human beings all across the world. Global warming has become the most worrying threat for the earth's atmosphere as it is reducing the life possibilities on the earth day by day through a continuous and steady declining process. Before planning the solutions of the global warming, we must think about the causes and effects of it on the atmosphere in order to get sure that we are in right direction of getting full relief from this issue. The continuous warming of the earth surface is the increasing emission of CO₂ in the environment. However, the increasing level of CO₂ is caused due to many reasons like deforestation, use of coal, oil, gas, burning of fossil fuels, burning of gasoline for transportation, unnecessary use of electricity, etc which in turn causes rise in earth temperature. Again it becomes the reason of rising sea level, occurrence of flooding, storms, cyclone, ozone layer damage, changing weather patterns, fear of epidemic diseases, lack of food, death, etc. We cannot blame any single entity for this as each and every human being is responsible for the increasing threat of global warming which can be solved only by the global awareness and kind efforts of everyone.

Global warming, the gradual heating of Earth's surface, oceans and atmosphere, is caused by human activity, primarily the burning of fossil fuels that pump carbon dioxide (CO₂), methane and other greenhouse gases into the atmosphere.

Temperatures measured on land and at sea for more than a century show that Earth's globally averaged surface temperature is rising. Since 1970, global surface temperature rose at an average rate of about 0.17°C (around 0.3° Fahrenheit) per decade—more than twice as fast as the 0.07°C per decade increase observed for the entire

period of recorded observations (1880-2015). The average global temperature for 2016 was 0.94°C (1.69°F) above the 20th century average of 13.9°C (57.0°F), surpassing the previous record warmth of 2015 by 0.04°C (0.07°F).

II INCREASE IN AVERAGE TEMPERATURES AND TEMPERATURE EXTREME

One of the most immediate and obvious effects of global warming is the increase in temperatures around the world. The average global temperature has increased by about 1.4 degrees Fahrenheit (0.8 degrees Celsius) over the past 100 years, according to the National Oceanic and Atmospheric Administration (NOAA). Since record keeping began in 1895, the hottest year on record worldwide was 2016, according to NOAA and NASA data. That year Earth's surface temperature was 1.78 degrees F (0.99 degrees C) warmer than the average across the entire 20th century. Before 2016, 2015 was the warmest year on record, globally. And before 2015? Yep, 2014. In fact, 16 of the 17 warmest years on record have happened since 2001, according to NASA. For the contiguous United States and Alaska, 2016 was the second-warmest year on record and the 20th consecutive year that the annual average surface temperature exceeded the 122-year average since record keeping began, according to NOAA.

➤ Extreme weather events

Extreme weather is another effect of global warming. While experiencing some of the hottest summers on record, much of the United States has also been experiencing colder-than-normal winters. Changes in climate can cause the polar jet stream — the boundary between the cold North Pole air and the warm equatorial air — to migrate south, bringing with it cold, Arctic air. This is why some states can have a sudden cold snap or colder-than-normal winter, even during the long-term trend of global warming, Werne explained. "Climate is, by definition, the long-term average of weather, over many years. One cold (or warm) year or season has little to do with overall climate. It is when those cold (or warm) years become more and more regular that we start to recognize it as a change in climate rather than simply an anomalous year of weather," he said.

Global warming may also lead to extreme weather other than cold or heat extremes. For example, hurricane formations will change. Though this is still a subject of active scientific research, current computer models of the atmosphere indicate that hurricanes are more likely to become less frequent on a global basis, though the hurricanes that do form may be more intense.

"And even if they become less frequent globally, hurricanes could still become more frequent in some particular areas," said atmospheric scientist Adam Sobel, author of "Storm Surge: Hurricane Sandy, Our Changing Climate, and Extreme Weather of the Past and Future" (HarperWave, 2014). "Additionally, scientists are confident that hurricanes will become more intense due to climate change." This is because hurricanes get their energy from the temperature difference between the warm tropical ocean and the cold upper atmosphere. Global warming increases that temperature difference.

"Since the most damage by far comes from the most intense hurricanes — such as typhoon Haiyan in the Philippines in 2013 — this means that hurricanes could become overall more destructive," said Sobel, a Columbia University professor in the departments of Earth and Environmental Sciences, and Applied Physics and Applied Mathematics. (Hurricanes are called typhoons in the western North Pacific, and they're called cyclones in the South Pacific and Indian oceans.)

Lightening is another weather feature that is being affected by global warming. According to a 2014 study, a 50 percent increase in the number of lightning strikes within the United States is expected by 2100 if global temperatures continue to rise. The researchers of the study found a 12 percent increase in lightning activity for every 1.8 degree F (1 degree C) of warming in the atmosphere.

NOAA established the U.S. Climate Extremes Index (CEI) in 1996 to track extreme weather events. The number of extreme weather events that are among the most unusual in the historical record, according to the CEI, has been rising over the last four decades.

Scientists project that extreme weather events, such as heat waves, droughts, blizzards and rainstorms will continue to occur more often and with greater intensity due to global warming, according to Climate Central. Climate models forecast that global warming will cause climate patterns worldwide to experience significant changes. These changes will likely include major shifts in wind patterns, annual precipitation and seasonal temperatures variations.

In addition, because high levels of greenhouse gases are likely to remain in the atmosphere for many years, these changes are expected to last for several decades or longer, according to the U.S. Environmental Protection Agency (EPA). In the northeastern United States, for example, climate change is likely to bring increased annual rainfall, while in the Pacific Northwest, summer rainfall is expected to decrease, the EPA said.

➤ **Ice melt**

One of the primary manifestations of climate change so far is melt. North America, Europe and Asia have all seen a trend toward less snow cover between 1960 and 2015, according to 2016 research published in the journal Current Climate Change Reports. According to the National Snow and Ice Data Center, there is now 10 percent less permafrost, or permanently frozen ground, in the Northern Hemisphere than there was in the early 1900s. The thawing of permafrost can cause landslides and other sudden land collapses. It can also release long-buried microbes, as in a 2016 case when a cache of buried reindeer carcasses thawed and caused an outbreak of anthrax. One of the most dramatic effects of global warming is the reduction in Arctic sea ice. Sea ice hit record-low extents in both the fall and winter of 2015 and 2016, meaning that at the time when the ice is supposed to be at its peak, it was lagging. The melt means there is less thick sea ice that persists for multiple years. That means less heat is reflected back into the atmosphere by the shiny surface of the ice and more is absorbed by the comparatively darker ocean, creating a feedback loop that causes even more melt, according to NASA's Operation IceBridge.

Glacial retreat, too, is an obvious effect of global warming. Only 25 glaciers bigger than 25 acres are now found in Montana's Glacier National Park, where about 150 glaciers were once found, according to the U.S. Geological Survey. A similar trend is seen in glacial areas worldwide. According to a 2016 study in the journal *Nature Geoscience*, there is a 99 percent likelihood that this rapid retreat is due to human-caused climate change. Some glaciers retreated up to 15 times as much as they would have without global warming, those researchers found.

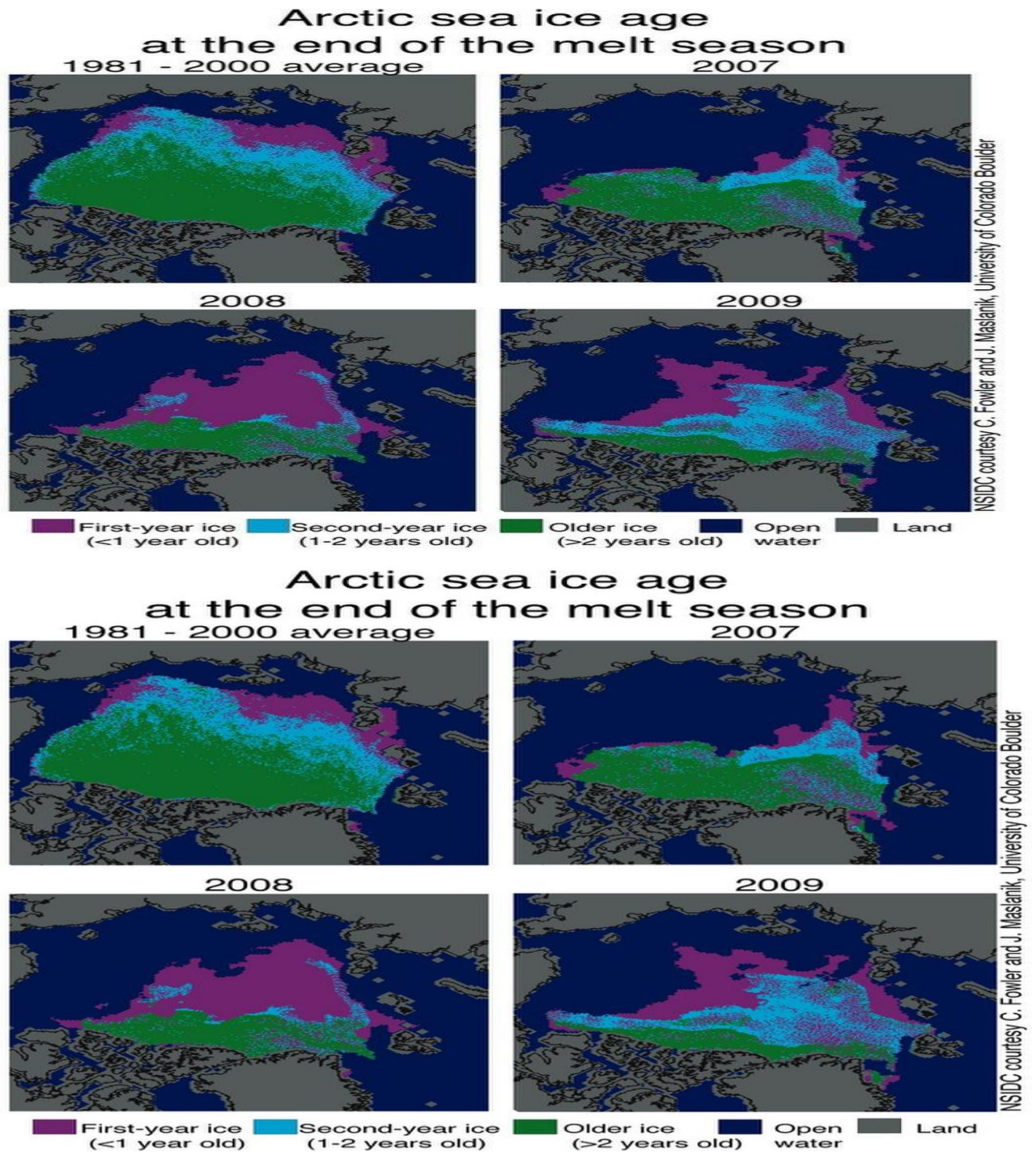
IceBridge project scientist Michael Studinger calls this photo a textbook example of a receding glacier, one that's shrinking in size. The dark, arc-shaped piles are terminal and lateral moraines, jumbled rock piles left behind as the glacier recedes. A small, frozen lake sits at the left-hand terminus of the glacier. Taken in Thomsen Land, northeast Greenland.

➤ **Sea levels and ocean acidification**

In general, as ice melts, sea levels rise. In 2014, the World Meteorological Organization reported that sea-level rise accelerated 0.12 inches (3 millimeters) per year on average worldwide. This is around double the average annual rise of 0.07 in. (1.6 mm) in the 20th century. Melting polar ice in the Arctic and Antarctic regions, coupled with melting ice sheets and glaciers across Greenland, North America, South America, Europe and Asia, are expected to raise sea levels significantly. And humans are mostly to blame: In the IPCC report released on Sept. 27, 2013, climate scientists said they are at least 95 percent certain that humans are to blame for warming oceans, rapidly melting ice and rising sea levels, changes that have been observed since the 1950s. Global sea levels have risen about 8 inches since 1870, according to the EPA, and the rate of increase is expected to accelerate in the coming years. If current trends continue, many coastal areas, where roughly half of the Earth's human population lives, will be inundated. Researchers project that by 2100, average sea levels will be 2.3 feet (.7 meters) higher in New York City, 2.9 feet (0.88 m) higher at Hampton Roads, Virginia, and 3.5 feet (1.06 m) higher at Galveston, Texas, the EPA reports. According to an IPCC report, if greenhouse gas emissions remain unchecked, global sea levels could rise by as much as 3 feet (0.9 meters) by 2100. That estimate is an increase from the estimated 0.9 to 2.7 feet (0.3 to 0.8 meters) that was predicted in the 2007 IPCC report for future sea-level rise. Sea level isn't the only thing changing for the oceans due to global warming. As levels of CO₂ increase, the oceans absorb some of that gas, which increases the acidity of seawater. Werne explains it this way: "When you dissolved CO₂ in water, you get carbonic acid. This is the same exact thing that happens in cans of soda. When you pop the top on a can of Dr Pepper, the pH is 2 — quite acidic." Since the Industrial Revolution began in the early 1700s, the acidity of the oceans has increased about 25 percent, according to the EPA. "This is a problem in the oceans, in large part, because many marine organisms make shells out of calcium carbonate (think corals, oysters), and their shells dissolve in acid solution," said Werne. "So as we add more and more CO₂ to the ocean, it gets more and more acidic, dissolving more and more shells of sea creatures. It goes without saying that this is not good for their health."

If current ocean acidification trends continue, coral reefs are expected to become increasingly rare in areas where they are now common, including most U.S. waters, the EPA reports. In 2016 and 2017, portions of

the Great Barrier Reef in Australia were hit with bleaching, a phenomenon in which coral eject their symbiotic algae. Bleaching is a sign of stress from too-warm waters, unbalanced pH or pollution; coral can recover from bleaching, but back-to-back episodes make recovery less likely.



Arctic sea ice at the end of melt season, 1981-2009

Credit: NSIDC

➤ **Plants and animals**

The effects of global warming on the Earth's ecosystems are expected to be profound and widespread. Many species of plants and animals are already moving their range northward or to higher altitudes as a result of warming temperatures, according to a report from the National Academy of Sciences. "They are not just moving north, they are moving from the equator toward the poles. They are quite simply following the range of comfortable temperatures, which is migrating to the poles as the global average temperature warms," Werne said. Ultimately, he said, this becomes a problem when the rate of climate change velocity (how fast a region changes put into a spatial term) is faster than the rate that many organisms can migrate. Because of this, many animals may not be able to compete in the new climate regime and may go extinct. Additionally, migratory birds and insects are now arriving in their summer feeding and nesting grounds several days or weeks earlier than they did in the 20th century, according to the EPA. Warmer temperatures will also expand the range of many disease-causing pathogens that were once confined to tropical and subtropical areas, killing off plant and animal species that formerly were protected from disease. These and other effects of global warming, if left unchecked, will likely contribute to the disappearance of up to one-half of Earth's plants and one-third of animals from their current range by 2080, according to a 2013 report in the journal *Nature Climate Change*.

III SOCIAL EFFECTS

As dramatic as the effects of climate change are expected to be on the natural world, the projected changes to human society may be even more devastating.

Agricultural systems will likely be dealt a crippling blow. Though growing seasons in some areas will expand, the combined impacts of drought, severe weather, lack of accumulated snowmelt, greater number and diversity of pests, lower groundwater tables and a loss of arable land could cause severe crop failures and livestock shortages worldwide.

North Carolina State University also notes that carbon dioxide is affecting plant growth. Though CO₂ can increase the growth of plants, the plants may become less nutritious.

This loss of food security may, in turn, create havoc in international food markets and could spark famines, food riots, political instability and civil unrest worldwide, according to a number of analyses from sources as diverse as the U.S Department of Defense, the Center for American Progress and the Woodrow Wilson International Center for Scholars.

In addition to less nutritious food, the effect of global warming on human health is also expected to be serious. The American Medical Association has reported an increase in mosquito-borne diseases like malaria and dengue fever, as well as a rise in cases of chronic conditions like asthma, most likely as a direct result of global warming. The 2016 outbreak of Zika virus, a mosquito-borne illness, highlighted the dangers of climate change. The disease causes devastating birth defects in fetuses when pregnant women are infected, and climate change could make higher-latitude areas habitable for the mosquitos that spread the disease, experts said. Longer, hotter summers could also lead to the spread of tick-borne illnesses.

IV CONCLUSION

Ice is melting in both polar ice caps and mountain glaciers. Lakes around the world, including Lake Superior, are warming rapidly — in some cases faster than the surrounding environment. Animals are changing migration patterns and plants are changing the dates of activity," such as trees budding their leaves earlier in the spring and dropping them later in the fall. The rate at which the earth's temperature has been rising eased slightly in the past decade, but temperature is still increasing; calling the slowdown a "pause" is false. New calculations by the author indicate that if the world continues to burn fossil fuels at the current rate, global warming will rise to two degrees Celsius by 2036, crossing a threshold that will harm human civilization. To avoid the threshold, nations will have to keep carbon dioxide levels below 405 parts per million. statistical analysis to show that there is a 95% chance that Earth will warm more than 2 degrees at century's end, and a 1% chance that it's below 1.5 C.

Study analyzed past emissions of greenhouse gases and the burning of fossil fuels to show that even if humans suddenly stopped burning fossil fuels now, Earth will continue to heat up about two more degrees by 2100. It also concluded that if emissions continue for 15 more years, which is more likely than a sudden stop, Earth's global temperature could rise as much as 3 degrees.

"Even if we would stop burning fossil fuels today, then the Earth would continue to warm slowly," said Thorsten Mauritsen. "It is this committed warming that we estimate."

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