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CLIMATE CHANGE

Issues, Challenges and Control Measures

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EVENTS IN CLIMATE HISTORY OVER THE PAST DECADES

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Introduction

Climate change encompasses not only rising avera temperatures but also extreme weather events, shiftir wildlife populations and habitats, rising seas, and a range other impacts. All of these changes are emerging as huma continue to add heat-trapping greenhouse gases to t atmosphere. The last decade was the hottest ever record flashing a warning sign to anyone who was paying attentio On average, the annual temperatures over the years howev a little less than 1.8 degrees Fahrenheit (1 degree Celsiu higher now than they did from 1950 to 1980. The last fi years alone was the hottest stretch ever recorded. So far, 201 is shaping up to be the second hottest year ever, about 1. degrees F (0.94 degree C) above that long-term average. Th number might not sound like much, but its effects are larg Each little shift in the average increases the likelihood extreme hot events and just little shifts in the overall amount

of heat stored in the oceans, air, and water can have huge effects on the planet. And in the past year, activity has exploded amongst young people. Youth climate activists are gathering millions deep, to bring attention to their stolen futures. Scientific teams are issuing stronger and stronger warnings. Global attention to the problem and the potential solutions is growing. But at the same time, the action that's been taken so far is far from enough.

The Global Carbon Project reported earlier this month that global carbon dioxide emissions from fossil fuels and cement are on track to climb to a record high in 2019. While global emissions growth plateau between 2014 and 2016, it was short-lived: Emissions from fossil fuels grew 1.5% in 2017, 2.1% in 2018 and are projected to grow another 0.6% in 2019. The latest climate science suggests that our best chance of limiting warming to 1.5-2 degrees C will require emissions to peak no later than 2020 and drop to net-zero by mid-century. A critical question is whether we'll see signs next year of emissions peaking and declining afterwards. Global mean sea level rise was roughly 3.3 millimeters (mm) per year (0.13 inch/yr) between 1993 and the present. This trend accelerated significantly this past decade: Between 2010 and 2018, sea level rise grew to about 4.4 mm/yr (0.17 inch/yr), rising almost 2 inches overall in the past decade. In 2018, global mean sea level was the highest in the satellite record.

Eight of the world's 10 largest cities are located in vulnerable coastal areas. Seas rising by even a couple of inches leads to more frequent high-tide flooding, storm surges pushing further inland, and devastating risks to homes, habitat

and infrastructure. Glaciers around the world are also los
ice, accelerating with each passing decade. Glacier melt gr
from 460 millilitres of liquid water in the 1990s to 500 in
2000s to 850 millilitres in 2010-2018. Ice loss can lead
rising seas. It can also change the ocean's surface reflectiv
exposing dark waters that absorb more solar radiation — ma
like a dark shirt on a hot, sunny day — in turn leading
greater warming and a positive feedback loop.

This past decade has been marked
devastating extreme events, including heat waves on land a
in the ocean, record rainfall and flooding, massive fires a
heat-charged hurricanes. Communities around the world a
already living with the impacts of just 1 degrees C (1.8 degre
F) of warming; our climate will only become deadlier a
more devastating with every additional fraction of a degree
temperature rise. Among many other examples, the repo
found that climate change increased the odds of intense he
waves in northeast Asia in 2018 and in southern Europe
2017, exceptional precipitation in Mid-Atlantic states in 201
and an East African drought in 2017, which contributed
food insecurity. In addition, several international researc
programs came together to develop the World Weath
Attribution project to analyze the role of climate change
extreme events.

Reason behind the Climate Change

Earth-orbiting satellites and other technologic
advances have enabled scientists to see the big pictur
collecting many different types of information about our plan
and its climate on a global scale. The heat-trapping nature of

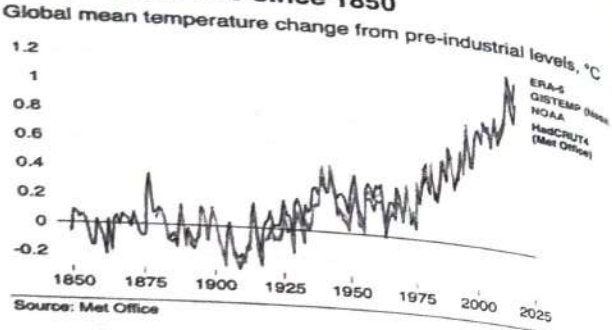
carbon dioxide and other gases was demonstrated in the mid-19th century. Their ability to affect the transfer of infrared energy through the atmosphere is the scientific basis of many instruments flown by NASA. There is no question that increased levels of greenhouse gases must cause Earth to warm in response.

Ice cores drawn from Greenland, Antarctica, and tropical mountain glaciers show that Earth's climate responds to changes in greenhouse gas levels. Ancient evidence can also be found in tree rings, ocean sediments, coral reefs, and layers of sedimentary rocks. This ancient, or paleoclimate, evidence reveals that current warming is occurring roughly ten times faster than the average rate of ice-age-recovery warming. Carbon dioxide from human activity is increasing more than 250 times faster than it did from natural sources after the last Ice Age.

The ocean has absorbed much of this increased heat, with the top 100 meters (about 328 feet) of ocean showing warming of more than 0.6 degrees Fahrenheit (0.33 degrees Celsius) since 1969. Earth stores 90% of the extra energy in the ocean. The Greenland and Antarctic ice sheets have decreased in mass. Data from NASA's Gravity Recovery and Climate Experiment show Greenland lost an average of 279 billion tons of ice per year between 1993 and 2019, while Antarctica lost about 148 billion tons of ice per year. Glaciers are retreating almost everywhere around the world — including in the Alps, Himalayas, Andes, Rockies, Alaska, and Africa.

Satellite observations reveal that the amount of spri snow cover in the Northern Hemisphere has decreased over t past five decades and the snow is melting earlier.

Temperature rise since 1850



Both the extent and thickness of Arctic sea ice l declined rapidly over the last several decades. The numbe record high temperature events in the United States has b increasing, while the number of record low temperature eve has been decreasing, since 1950. The U.S. has also witnes increasing numbers of intense rainfall events.

Since the beginning of the Industrial Revolution, t acidity of surface ocean waters has increased by abo 30%. This increase is the result of humans emitting mo carbon dioxide into the atmosphere and hence more be absorbed into the ocean. The ocean has absorbed between 20 and 30% of total anthropogenic carbon dioxide emissions recent decades (7.2 to 10.8 billion metric tons per year).

Climate Risk Index

Climate risk is a concept that reflects countr vulnerability to the direct consequences – deaths and econom

losses – of extreme weather events and is measured annually by the Germanwatch observatory via the Global Climate Risk Index. The 2020 Climate Risk Index was presented in Madrid during the last United Nations Conference on Climate Change (COP25 Chile) and determines the 10 countries presently most affected by climate change.

Affected Countries Around the World Due to Climate Risk Index

1. JAPAN (Climate Risk Index: 5.5)

Heavy rains, heat waves, the Osaka earthquake and Jebi typhoon, which ravaged Japan in 2018, made it the most threatened country in the world by climate change. Weather events themselves were behind 1,282 deaths on the island – 1.01 per 100,000 inhabitants – and caused economic losses of 35,839 million dollars and a collapse of per capita Gross Domestic Product of 0.64%.

2. PHILIPPINES (Climate Risk Index: 11.17)

Typhoon Mangkhut's passage through the Philippines in 2018 affected more than 250,000 people across the country and left at least 59 dead due to torrential rainfall. According to Germanwatch, extreme weather events caused a total of 455 deaths in the country that year – 0.43 per 100,000 inhabitants – as well as more than 4,540 million US dollars in economic losses and a drop in GDP of 0.48% per capita.

3. GERMANY (Climate Risk Index: 13.83)

The German country ranks the third position of the most affected countries by climate risk due to the heat wave it suffered in 2018, the hottest year in its history with damages of more than 3,500 million dollars for the agricultural sector. The

weather events in Germany caused a total of 1,246 deaths –
per 100,000 inhabitants –losses of 5,038 million dollars and
decrease in per capita GDP of 0.12%.

4. MADAGASCAR (Climate Risk Index: 15.83)

Global warming and climate risks threaten the survi
of the lemur and other endemic animal species on t
island. Adverse weather events have also made the Afric
country one of the most vulnerable to climate change with
deaths –0.27 per 100,000 inhabitants –about 568 milli
dollars in economic losses and a drop in per capita GDP
1.32%.

5. INDIA (Climate Risk Index: 18.17)

The Indian subcontinent is other major victim
extreme heat, floods and sandstorms, among other devastati
natural events. In 2018 caused more than 2,000 deaths –0.
per 100,000 inhabitants – losses of 37,807 million dollars a
a decrease in per capita GDP of 0.36%.

6. SRI LANKA (Climate Risk Index: 19)

This small country in the gulf of Bengala could lose
substantial part of its population due to future clima
migrations. Furthermore, weather events in 2018 caused
deaths in Sri Lanka — 0.18 per 100,000 inhabitants –
over 3,625 million dollars in losses and a collapse in per capi
GDP of 1.24%

7. KENYA (Climate Risk Index: 19.67)

This African country is another of those most vulnerable
climate change due to the droughts of 2018 that, months late
left more than a million people on the brink of famine. Th
hostile climate of that year in Kenya claimed the lives of 113

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people –0.24 per 100,000 inhabitants –and produced losses of more than 708 million dollars and a drop in per capita GDP of 0.4%.

Conclusion

The planet's average surface temperature has risen about 2.05 degrees Fahrenheit (1.14 degrees Celsius) since the late 19th century, a change driven largely by increased carbon dioxide and other human-made emissions into the atmosphere.[4] Most of the warming occurred in the past 40 years, with the six warmest years on record taking place since 2014. Not only was 2016 the warmest year on record, but eight months out of that year — from January through September, with the exception of June — were the warmest on record for those respective months. Addressing climate change will require many solutions—there's no magic bullet. The required changes span technologies, behaviours and policies that encourage less waste and smarter use of our resources. For example, improvements to energy efficiency and vehicle fuel economy, increases in wind and solar power, biofuels from organic waste, setting a price on carbon, and protecting forests are all potent ways to reduce the amount of carbon dioxide and other gases trapping heat on the planet.

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