Forum: GA4: Environmental Committee

Issue: Mitigating the effects of the collapsing glaciers and the rising sea-level in high risk regions

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Introduction

Collapsing glaciers and increasing sea levels in high-risk areas have serious consequences for both the environment and human societies. One of the main effects of the rising sea levels is climate change. Climate change causes glaciers to retreat, which disturbs the ecosystems around them and causes disasters like glacial outburst floods that threaten infrastructure and cities downstream. Rising sea levels also increase coastal erosion, damaging coastal ecosystems and making coastal communities more vulnerable to flooding and displacement. Serious risks to biodiversity, water resources, and the lives of millions of people who depend on glacial meltwater for agriculture, hydropower, and freshwater supplies are all caused by the disappearance of ecosystems that are dependent on glaciers and changes in water availability.

This issue has drawn international attention because higher sea levels will have serious consequences all around the globe. Comprehensive and immediate action must be taken to address this urgent issue in order to reduce its effects, protect communities that are already at risk and develop climate change adaptation. “Global-mean sea-level rise occurred through the 20th Century, and continued rise is one of the more certain impacts of global warming. This is resulting in a range of impacts including increased flood risk and submergence, salinisation of surface and ground waters, and morphological change, such as erosion and wetland loss. The potential human and ecosystem impacts in the 21st Century are significant but

uncertain. Actual impacts will depend on a range of change factors in addition to the amount of sea-level rise and climate change, including a number of factors which are human-controlled such as coastal land use and management approaches" (Nicholls).

Definition of Key Terms

Climate change:

"Climate change refers to long-term shifts in temperatures and weather patterns" (the United Nations). These changes can be natural, caused by changes in the sun's activity or large volcanic eruptions. But the main cause of climate change is human activities, such as burning of fossil fuels like coal, oil and gas. "Burning fossil fuels generates greenhouse gas emissions that act like a blanket wrapped around the Earth, trapping the sun's heat and raising temperatures" (the UN).

Glacial collapse:

Glacial collapse refers to the sudden and often dramatic failure of a glacier, resulting in the fast release of ice, water, and debris. This phenomenon occurs due to various factors, such as increased temperatures, meltwater accumulation, ice fracturing and changes in the underlying terrain. Glacial collapses can lead to the formation of glacial outburst floods (GLOFs). The collapse of glaciers is a consequence of climate change-induced glacial retreat, which is increasingly observed in many parts of the world.

Glacial Outburst Floods (GLOFs):

The unexpected and frequently catastrophic release of water from glaciers or glacial lakes is known as glacial outburst floods (GLOFs). These floods occur when natural barriers, such as ice or moraine dams, hold back the water give way, usually due to factors like melting ice, heavy rainfall, or seismic activity. When water is released suddenly, it creates a strong surge downstream that carries silt, boulders, and debris. These elements can seriously harm nearby communities, infrastructure, and landscapes. Due to climate change, GLOFs are more common in areas where

glaciers are melting quickly, endangering downstream communities and ecosystems.

Greenhouse gas emissions:

"By trapping heat from the sun, greenhouse gases have kept Earth's climate habitable for humans and millions of other species. But those gases are now out of balance and threaten to change drastically which living things can survive on this planet—and where. Atmospheric levels of carbon dioxide—the most dangerous and prevalent greenhouse gas—are at the highest levels ever recorded. Greenhouse gas levels are so high primarily because humans have released them into the air by burning fossil fuels. The gases absorb solar energy and keep heat close to Earth's surface, rather than letting it escape into space. That trapping of heat is known as the greenhouse effect" (Nunez).

Rising sea levels:

Rising sea levels refer to the long-term tendency of increasing average sea surface levels globally. This phenomenon is primarily driven by two factors: the thermal expansion of seawater and the addition of water from melting glaciers and ice caps. As the Earth's climate warms due to human activities such as burning fossil fuels and deforestation, glaciers and ice caps melt at an accelerated rate, adding more water to the oceans. Also, warmer temperatures cause seawater to expand, further increasing sea levels.

Coastal erosion:

"The power of the sea has shaped Ireland's coast into what we can see today. Two main processes are responsible for this; erosion and deposition. Coastal erosion is the breaking down and carrying away of materials by the sea. Deposition is when material carried by the sea is deposited or left behind on the coast" (Geological Survey Ireland). This natural phenomenon occurs as a result of various factors, such as wave energy, tidal action, wind and the movement of sediment. Coastal erosion can lead to the loss of land, destruction of property and changes to coastal ecosystems. Factors such as sea-level rise, storm events, human activities and the removal of coastal vegetation can worsen erosion rates.

Water scarcity:

Water scarcity refers to the condition where the demand for freshwater exceeds the available supply in a specific region or during a particular period. It occurs when there is insufficient water to meet the needs of various users such as households, industries, agriculture and ecosystems. Water scarcity can result from natural factors such as droughts, low precipitation and reduced groundwater recharge, as well as human activities such as over-extraction, pollution, inefficient water management practices and population growth. Water scarcity can have severe consequences such as reduced access to safe drinking water, compromised sanitation, decreased agricultural productivity, economic losses and conflicts over water resources.

Biodiversity:

"Biodiversity is all the different kinds of life you'll find in one area—the variety of animals, plants, fungi, and even microorganisms like bacteria that make up our natural world. Each of these species and organisms work together in ecosystems, like an intricate web, to maintain balance and support life. Biodiversity supports everything in nature that we need to survive: food, clean water, medicine, and shelter" (World Wildlife Fund).

High-risk regions:

High-risk regions typically refer to areas that are vulnerable to multiple natural or environmental hazards, such as extreme weather events, geological hazards, or climate-related impacts. These regions often face increased exposure to risks due to factors such as their geographical location, topography, climate patterns or socio-economic conditions. Identifying and understanding high-risk regions is essential for effective disaster preparedness, risk mitigation and adaptation planning to protect populations, infrastructure and ecosystems from potential consequences.

Background Information

Collapsing glaciers

Collapsing glaciers are sudden and often dramatic failures of glaciers, resulting in the rapid release of ice, water, and debris. Our earth is becoming less covered with ice due to the melting of glaciers, a phenomenon that became worse in the 20th century. The primary cause of greenhouse gas emissions, including carbon dioxide, is human activity. How these massive amounts of recrystallized snow evolve will determine the sea level and stability of the entire planet. “The Earth's glaciers have been silently retreating for more than half a century as climate change inexorably marches on. There is no place on the planet — except south-east Asia — capable of withstanding the effects of a phenomenon that has melted more than 9.6 billion tonnes of glacial ice in the world since 1961, according to a 2019 satellite study by the University of Zurich (Switzerland), and threatens to evaporate over a third of all glaciers by 2100, according to the World Wildlife Fund” (Iberdrola).

These enormous blocks of moving ice form when snow that has collected in freezing climates compacts and recrystallizes, as occurs in polar and mountain glaciers (which are not to be confused with the enormous Arctic plates). Glaciers are classified according to their morphology: ice fields, cirque glaciers, valley glaciers, etc. They are also classified according to their climate: polar, tropical or temperate; and also their thermal conditions: cold, hot or polythermal base. A glacier forms over millions of years, and the amount of ice that remains throughout that time determines how big it gets. These masses behave similarly to the rivers they feed during thaws, and their velocity is determined by friction and the incline of the ground they travel over. Together with the ice caps, glaciers make up 10% of the Earth's surface and provide almost 70% of its freshwater resources.

The melting of glaciers throughout history has certainly been caused by the Earth's rising temperature. These days, the rate at which climate change is occurring might wipe them out in record time. CO2 emissions and ocean warming are the main causes of melting glaciers. The concentration of greenhouse gases (GHGs) in the atmosphere, which are produced by burning fossil fuels, industry, transportation, and deforestation, among other human activities, warms the earth and melts glaciers. oceans absorb 90% of the Earth's warmth, and this fact affects the melting of marine

glaciers, which are mostly located near the poles and on the coasts of Alaska (United States).

Types of Collapses: Collapsing glaciers can take several forms, such as:

- Glacial Avalanches: Rapid downhill movement of ice, snow, and debris, often triggered by a sudden collapse or release of a glacier's front or terminus.
- Glacial Calving: Breaking off of large chunks of ice from the terminus of a glacier, particularly in marine-terminating glaciers, resulting in the formation of icebergs.
- Glacial Lake Outburst Floods (GLOFs): Sudden release of water stored in glacial lakes, often triggered by the collapse of natural barriers such as moraines or ice dams.

"In the aforementioned study, the University of Zurich revealed that glacial melting has accelerated over the last three decades. This loss of ice has already reached 335 billion tonnes per year, which is 30% of the current rate of ocean growth. The main consequences of deglaciation are: sea level rise, impact on the climate, the disappearance of species and less fresh water" (Iberdrola). Since 1961, there has been a 2.7 centimeter rise in sea levels due to glacial melting. The world's glaciers have 170,000 cubic kilometers of ice, which is enough to raise sea levels by over half a meter. Ocean currents are slowing down as a result of glacial melting at the poles, a phenomenon linked to changes in the global climate and an increase in the amount of extreme weather occurrences worldwide. Since many species, both aquatic and terrestrial, have glaciers as their native habitat, the melting of glaciers would also result in the extinction of many species. Reduced water for irrigation, reduced hydroelectric power generation potential and less water available for human use are all consequences of the melting glaciers.

Scientists study glaciers and determine the likelihood of their collapse using a variety of techniques such as modeling, field measurements and remote sensing. Predicting and reducing the effects of glacier collapse on human populations and the environment requires an understanding of the mechanics of the process.

Rising sea levels

"Sea levels reached a record high in 2021, and NASA says sea levels are rising at unprecedented rates in the past 2,500 years. The US space agency and other US government agencies warned this year that levels along the country's coastlines could rise by another 25-30 centimetres (cm) by 2050. This 30-year increase would match the total sea level rise over the past 100 years. The global sea level has risen by about 21cm since records began in 1880. While measuring in centimetres or even millimetres might seem small, these rises can have big consequences. This is particularly true where storm surges end up sweeping further inland than they would have done previously" (World Economic Forum).

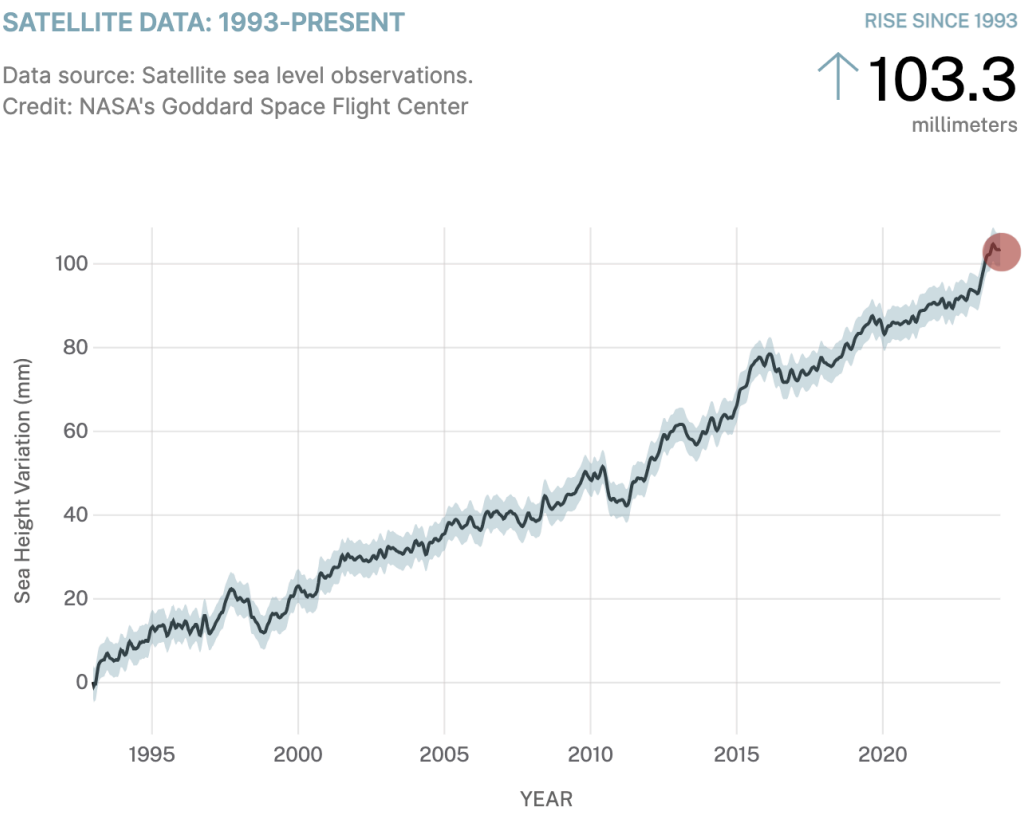

Figure 1: Satellite sea level data 1993-Present (NASA)

"Average sea levels have swelled over 8 inches (about 23 cm) since 1880, with about three of those inches gained in the last 25 years. Every year, the sea rises another .13 inches (3.2 mm.) Research published in February 2022 shows that sea level rise is accelerating and projected to rise by a foot by 2050" (Nunez).

Causes of sea level rise

In order to identify the cause of this concern, we must focus on the three ways that climate change-related global warming raises sea levels. The first is thermal expansion, which causes oceans to enlarge as a result of water's tendency to expand when heated by temperature increases. Water expands when it gets hotter. The simple fact that warmer oceans have taken up more space has contributed to about half of the sea level increase over the previous 25 years.

Global warming gets worse by the melting of West Antarctica and Greenland's ice sheets. The seepage of freshwater from the surface, which lubricates the ice streams and promotes their quick sliding, has a destructive effect on this process. In other words, the ice sheets melt, get weaker, and slip into the sea when fresh and filtered water reaches their base. Mountain glaciers and other large ice formations naturally melt slightly every summer. Snowfall throughout the winter, mostly from evaporated seawater, usually contributes to melting. However, recently, due to continuously rising temperatures caused by global warming, there has been less snowfall due to later winters and earlier springs, as well as more summer melting than usual. Sea levels increase as a result of the imbalance this causes between runoff and ocean evaporation.

A process similar to this one results in the melting of massive ice structures found in glaciers and ice caps, which are never reconstructed. These enormous frozen constructions usually broke partially in the summer and solidified again when winter temperatures arrived. Ice does not reattach in the same way or quantity as it formerly did due to global warming, which has caused snowfall to become softer, winters to arrive late and springs to arrive earlier.

Much like mountain glaciers, the enormous ice sheets that cover Greenland and Antarctica are melting faster due to rising temperatures. Additionally, scientists think that seawater and meltwater from below are penetrating into Greenland's ice sheets, lubricating ice streams and accelerating their movement toward the ocean. Scientists have been paying close attention to melting in West Antarctica,

particularly since the break-off of the Larsen C ice shelf in 2017. However, there are also indications that the glaciers in East Antarctica are becoming unstable.

Rising sea levels can also be caused by changes in the dynamics of land ice, such as faster glacier flow rates and ice discharge into the ocean, in addition to melting. Multiple reasons, including changes to marine and atmospheric circulation patterns and feedback mechanisms brought on by rising temperatures, could be responsible for these changes. Sea levels can also be affected on a global scale by changes to ocean circulation patterns, such as the slowing of the Atlantic Meridional Overturning Circulation (AMOC). Sea level changes around coastlines can result from changes in ocean circulation, which can also impact how heat and water masses are distributed within the ocean.

In certain regions, human activities like drilling for groundwater, producing oil and gas and reclaiming land can result in land subsidence, which is the downward movement of land concerning the sea level. Because land subsidence increases local sea levels and makes coastal areas more vulnerable to flooding, it can worsen the effects of rising sea levels. Ocean currents, winds and tides are some of the factors that cause sea levels to naturally shift over time. Even while these natural changes happen over short periods of time, they can combine with longer-term trends in sea level rise to produce variations in sea level change across different regions.

Consequences of sea level rise

Coastal erosion is worsened by rising sea levels, which results in the loss of land, beaches, and coastal habitats. Coastal communities are more vulnerable to floods and storm damage when roads, buildings, and seawalls are weakened by erosion. As sea levels rise, low-lying coastal areas become more vulnerable to flooding. Increased frequency and severity of coastal flooding can be caused by storm surges, high tides and extreme weather events, which can cause damage to agricultural land, property and infrastructure.

As a result of groundwater resources getting polluted and drinking and agricultural water supplies becoming less available due to rising sea levels,

saltwater could leak into freshwater sources. Coastal ecosystems and agricultural production are at risk from saltwater intrusion, especially in areas where groundwater is limited.

Sea level rise puts coastal ecosystems including coral reefs, salt marshes and mangroves at risk of degradation and extinction. Important functions including carbon storage, biodiversity support and coastal protection are provided by these environments. Decreases in fisheries, coastal protection and tourism earnings may result from their disappearance.

Communities in low-lying coastal areas may have to relocate as a result of increased erosion and floods brought on by rising sea levels. Disturbances in society, the loss of cultural legacy and disputes over territory and resources might result from this relocation. Urban migration by climate refugees could put pressure on infrastructure and increase social inequalities. Coastal cultural heritage sites, such as historic structures, archeological dig sites and native cultural landscapes are at risk due to rising sea levels. The preservation of traditional knowledge, heritage tourism customers, and cultural identity are all weakened by the loss of these locations.

Significant economic concerns are associated with sea level rise, such as the destruction of coastal infrastructure, decrease in property value, higher rates for insurance and interruptions of business and transportation routes. Coastal flooding and habitat deterioration may cause losses to the tourism, agricultural and fishing industries.

Health risks associated with rising sea levels

Even though there have been limited studies directly connecting rising sea levels to negative health effects, international studies still found a number of direct health risks from incidents worsened by rising sea levels, like coastal erosion and flooding, as well as indirect and long-lasting risks that could have a major negative impact on the health of coastal populations around the globe. The effects of extreme weather events on coastal areas will worsen due to increasing sea levels. Increased storm surges, coastal flooding and coastal erosion will occur more

frequently when weather events like strong winds, heavy precipitation and storms occur more frequently and intensely. This could increase the risk of physical harm or death from damaged infrastructure, buildings or roads.

"Waterborne pathogens can impact water used for drinking, bathing, recreation, or food harvesting, leading to human illness. Sea level rise may influence exposure to waterborne pathogens by causing rising water tables, or damaging water and sanitation infrastructure, contributing to contamination of drinking water sources and facilitating the transfer of microbial pollutants into marine environments used for recreation or food harvesting" (National Collaborating Centre for Environmental Health).

Increased exposure to pathogens in urban and coastal environments can result from rising sea levels and saltwater intrusion that disturb sewage and sanitation systems. As many as 500 million people worldwide may be affected by the salinization of drinking water, which poses a serious risk to human health due to sea level rise. Since seawater leaks into groundwater systems from below the surface and continuously invades freshwater aquifers, especially in dry spells and periods of low freshwater levels, saltwater intrusion has been referred to as a "slow poison." Rising sea levels are predicted to make it possible for saltwater to travel farther inland, increasing the salinity of drinking water in coastal areas where groundwater is the primary source of water.

Toxins from hazardous sites and long-buried landfills are expected to be released more easily as a result of rising sea levels and coastal erosion. Coastal soil contamination has been a legacy of the growth of industry along coastlines, which was previously an accepted method to assist marine transportation of manufactured goods.

"Vector-borne diseases are infections transmitted to humans by the bite of an infected vector, such as a mosquito or tick. Coastal inundation and flooding exacerbated by sea level rise can cause expansion of water-based habitat for vectors such as mosquitoes. Mosquito-borne diseases such as encephalitis

(inflammation of the brain tissue) are caused by arboviruses such as West Nile Virus, the most common type in Canada. While not currently threats in North America, Dengue fever, Malaria, and Zika virus are also vector-borne diseases affected by warmer climates and may become more significant issues in tourist destinations in the future" (National Collaborating Centre for Environmental Health).

Rising sea levels can also cause poor air quality exposure and mental health effects. Rising sea levels result in saltwater intrusion, coastal erosion and increased coastal flooding, which physically destroys buildings and land and causes food and water insecurity, job loss and displacement. Migration from homelands and the disappearance of historic and coastal archeological sites are two examples of displacement. People who have been displaced by sea level rise may migrate inward, which could result in temporary overpopulation, a shortage of housing and an increase in the demand for goods, services or jobs. Loss and displacement can have an impact on one's mental health.

Displacement due to rising sea levels

A significant proportion of the world's population lives along the coast, where the effects of sea level rise are expected to occur and could affect millions of people's migration. Upward of 600,000 Canadians are thought to be at risk of flooding annually due to landscape below yearly flood levels, according to Kulp and Strauss' estimation. This contrasts with the estimated 840,000 Canadians living on land that would be at risk of yearly flooding due to sea level rise by the year 2100.

Undoubtedly, certain coastal populations will be forced to move from their current places due to the constant rise in sea level. Coastal towns may be forced to relocate due to infrastructure damage and contaminated drinking water, in addition to the actual loss of land. The phenomenon of migration resulting from sea level rise is complicated and is subject to various aspects such as environmental risks, and political, demographic, economic, and social aspects that are intertwined with government policies that encourage or discourage migration. However, other studies indicate that this century's sea level rise may cause widespread migration

away from vulnerable coastlines, shifting population density throughout nations and placing significant pressure on inland areas. Due to increased stress and uncertainty, population displacement has a significant negative influence on mental health. Individuals may experience depression, anxiety disorders or post-traumatic stress disorder (PTSD) as a result of this.

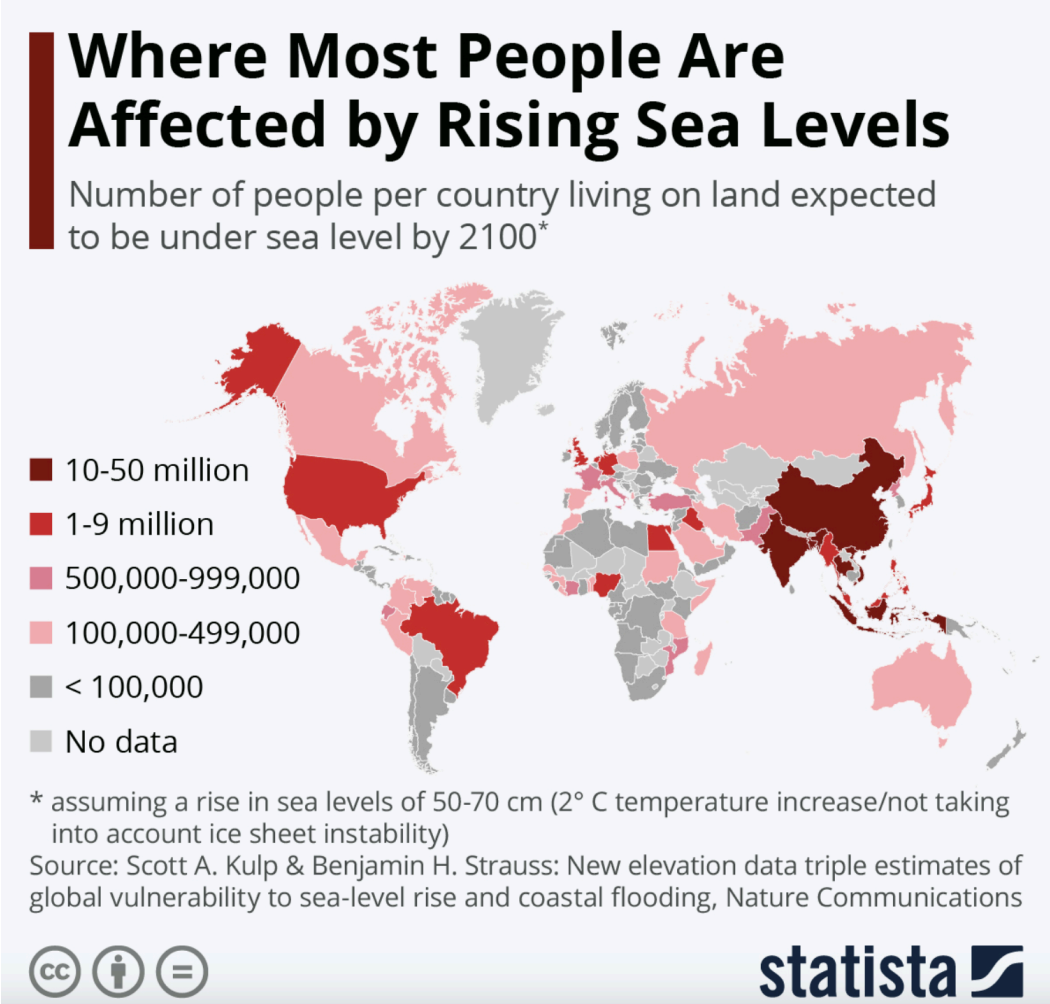

Figure 2: Where Most People Are Affected by Rising Sea Levels (statista)

Major Countries and Organizations Involved

The Intergovernmental Panel on Climate Change (IPCC)

The United Nations plays a central role in global climate governance through agencies such as the Intergovernmental Panel on Climate Change (IPCC). The IPCC

serves as a scientific body responsible for assessing and synthesizing research on climate change, its causes, impacts, and potential mitigation and adaptation strategies.

The World Bank

The World Bank provides financial assistance and technical expertise to support climate resilience and adaptation projects in vulnerable countries. It funds initiatives such as coastal protection, disaster risk management and climate-smart infrastructure development.

United Nations Environment Programme (UNEP):

UNEP is working to improve governance and assist nations in their efforts to combat the effects of climate change. In order to comply with international accords, it provides technical support for the creation of national greenhouse gas inventories and reporting regimes. Through its programs, UNEP ensures that environmental policies are grounded in clear and reliable data, which promotes informed decision-making and international collaboration in the fight against climate change.

Green Climate Fund (GCF):

The Green Climate Fund helps developing countries mobilize financial resources for climate action, with a focus on projects that improve transparency and compliance with international climate targets. The GCF funds mitigation and adaptation programs, allowing governments to accurately track and publicize their progress. The fund's role in promoting transparent and effective climate action is critical to achieving fair and sustainable global development.

Low-Lying Coastal Areas

Low-lying coastal regions are among the most vulnerable to sea level rise. These areas, including deltaic plains, river deltas, and coastal wetlands, often have minimal elevation above sea level, making them prone to inundation and flooding. **Bangladesh and the Netherlands** are examples of low-lying coastal areas. The low-lying deltaic plains of Bangladesh are highly susceptible to sea level rise, putting millions of people at risk of displacement and loss of livelihoods. Just like

Bangladesh, much of the Netherlands lies below sea level, protected by an extensive system of dikes, levees, and coastal defenses. However, rising sea levels pose ongoing challenges for coastal management and flood protection in the country.

Small Island Developing States (SIDS)

Small island nations are particularly vulnerable to sea level rise due to their small land area, limited elevation and dependence on coastal resources. These countries face risks of coastal erosion, saltwater intrusion and loss of freshwater sources. **Maldives, Fiji, Seychelles and Tavulu** are examples of small island developing states. The Maldives, a nation of low-lying coral atolls in the Indian Ocean, is highly vulnerable to sea level rise, with much of its land area lying just a few meters above sea level. The small island nation of Tuvalu in the Pacific Ocean is threatened by sea level rise, with concerns about coastal erosion, saltwater intrusion, and loss of land.

River Deltas

River deltas are highly productive and densely populated regions that are vulnerable to both sea level rise and upstream changes in river flow. Increased flooding, saltwater intrusion, and sediment loss threaten agriculture, fisheries, and human settlements in these areas. **Mekong Delta, Vietnam and Nile Delta, Egypt** are great examples of river deltas. The Mekong Delta is one of the world's most vulnerable regions to sea level rise, with millions of people reliant on agriculture and aquaculture for their livelihoods. The Nile Delta is also home to a large population and essential agricultural land, but it faces threats from sea level rise, land subsidence and coastal erosion.

Arctic and Antarctic Regions

Polar regions such as **Greenland and West Antarctic Ice Sheet** are experiencing rapid warming and melting of ice sheets, leading to rising sea levels globally. Loss of polar ice contributes to sea level rise and impacts global climate systems. Greenland's ice sheet is melting at an accelerating rate, contributing to sea

level rise and affecting global ocean circulation patterns. The West Antarctic Ice Sheet is also particularly vulnerable to collapse, with the potential to raise sea levels by several meters over centuries or millennia.

The United States of America

The United States is a major player in tackling sea level rise and climate change since it is one of the world's top producers of greenhouse gases and is home to several coastal towns and communities. Monitoring and research efforts are supported by programs like NASA's Earth Science Division and the National Oceanic and Atmospheric Administration (NOAA).

India

India's high population, growing urbanization and reliance on fossil fuels for energy production make it one of the world's top emitters of greenhouse gases. India is particularly vulnerable to the impacts of increasing sea levels because of its large low-lying coastal lands, long coastline and highly populated coastal towns. There are serious risks to infrastructure, agriculture, coastal populations and ecosystems from seawater intrusion, coastal erosion and flooding.

People's Republic of China

China is the largest greenhouse gas emitter in the world, therefore its actions are essential to the global effort to reduce climate change. China has made commitments to cut emissions and invest in sustainable development, renewable energy and economic growth. Still, there are issues in finding a balance between these goals.

Timeline of Events

Date	Description of event

1988	The Intergovernmental Panel on Climate Change (IPCC) is established by the United Nations.
1990	The first IPCC Assessment Report is published.
1992	United Nations Framework Convention on Climate Change (UNFCCC) was adopted.
1995	The second IPCC Assessment Report is published.
1997	The Kyoto Protocol, under the United Nations Framework Convention on Climate Change (UNFCCC), is adopted.
2001	The third IPCC Assessment Report is published.
2007	The fourth IPCC Assessment Report is published.
2014	The fifth IPCC Assessment Report is published.
2015	The Paris Agreement is adopted at the UN Climate Change Conference (COP21).
2022	The sixth IPCC Assessment Report is published.

Relevant UN Resolutions and Other Documents

- United Nations Sustainable Development Goals

  The 2030 Agenda for Sustainable Development, adopted by all United Nations Member States in 2015, provides a shared blueprint for peace and prosperity for people and the planet, now and into the future. At its heart are the 17 Sustainable Development Goals (SDGs), which are an urgent call for action by all countries - developed and developing - in a global partnership. They recognize that ending poverty and other deprivations must go hand-in-hand with strategies that improve health and education, reduce inequality, and spur economic growth – all while tackling climate change and working to preserve our oceans and forests.

  https://sdgs.un.org/goals

- IPCC Sixth Assessment Report: Fact Sheet

  The regional and crosscutting fact sheets give a snapshot of the key findings, distilled from the relevant Chapters and Cross-Chapter Papers, the Technical Summary and the Global to Regional Atlas.

  https://www.ipcc.ch/report/ar6/wg2/about/factsheets

- IPCC Sixth Assessment Report: Introduction to WGII AR6 Fact Sheets

  Gives general information about regions and traceability. Gives selected terms and their definitions. Gives information about time periods and scenarios.

  https://www.ipcc.ch/report/ar6/wg2/downloads/outreach/IPCC_AR6_WGII_IntroductionWGII.pdf

- IPCC Climate Change 2022: Impacts, Adaptation and Vulnerability

  The Working Group II contribution to the Sixth Assessment Report assesses the impacts of climate change, looking at ecosystems, biodiversity, and human communities at global and regional levels. It also reviews vulnerabilities and the capacities and limits of the natural world and human societies to adapt to climate change.

https://www.ipcc.ch/report/sixth-assessment-report-working-group-ii/

- IPCC Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation
  https://www.ipcc.ch/report/managing-the-risks-of-extreme-events-and-disasters-to-advance-climate-change-adaptation/
- IPCC Sea Level Change by John A. Church and Peter U. Clark
  This document includes information about changes in global mean sea level, regional sea level, sea level extremes and waves. Confidence in projections of global mean sea level rise has increased since the Fourth Assessment Report (AR4) because of the improved physical understanding of the components of sea level, the improved agreement of process-based models with observations, and the inclusion of ice-sheet dynamical changes.
  https://www.ipcc.ch/site/assets/uploads/2018/02/WG1AR5_Chapter13_FINAL.pdf
- IPCC AR4 Climate Change 2007: Impacts, Adaptation, and Vulnerability
  https://www.ipcc.ch/report/ar4/wg2/
- IPCC TAR Climate Change 2001: Synthesis Report
  https://www.ipcc.ch/report/ar3/syr/
- IPCC Sixth Assessment Report: Fact sheet - Responding to Sea Level Rise
  Gives information about climate change impacts and risks, adaptation options and barriers, and climate resilient development.

https://www.ipcc.ch/report/ar6/wg2/downloads/outreach/IPCC_AR6_WGII_FactSheet_SLR.pdf

Previous Attempts to Solve the Issue

Many international agreements, initiatives and policy measures have been adopted in the decades-long efforts to address the problems of increasing sea levels and climate change. International climate funds, such as the Global Environment Facility (GEF) and the Green Climate Fund (GCF), provide developing

nations with financial support for climate adaptation and mitigation initiatives, especially those that deal with the effects of rising sea levels. Our understanding of climate change and increasing sea levels is made possible by scientific studies and monitoring initiatives, such as those carried out by organizations like the World Meteorological Organization (WMO) and the Intergovernmental Panel on Climate Change (IPCC).

United Nations Framework Convention on Climate Change (UNFCCC)

The UNFCCC was adopted during the Earth Summit, which took place in Rio de Janeiro, Brazil, in June 1992. On March 21, 1994, it was put to action. Stabilizing atmospheric concentrations of greenhouse gases at a level that would stop harmful human intervention with the climate system is the main goal of the UNFCCC. The treaty highlights the necessity of international collaboration to decrease greenhouse gas emissions and prepare for the effects of climate change in order to achieve this. The UNFCCC has been recognized by almost every nation, with 197 parties, 196 nations and the European Union.

The Kyoto Protocol

The Kyoto Protocol was adopted in Kyoto as an extension of the UNFCCC Japan in December 1997. The Kyoto Protocol sets legally binding emission reduction targets for developed countries (Annex I countries) between 2008-2012. These goals, which differ from country to country, are stated as a percentage of the amount of greenhouse gas emissions that were produced in 1990. On February 16, 2005, the Kyoto Protocol was put into force following its adoption by a sufficient number of countries to meet the necessary emission threshold. The United States was one of the main polluters who chose not to sign the protocol. The Kyoto Protocol's Doha Amendment was approved in 2012, extending the protocol's commitment term to 2020. However, the failure to achieve major global carbon reductions and the withdrawal of some countries has limited the benefits of the protocol. Despite its drawbacks, the Kyoto Protocol has been helpful in guiding global climate debates,

creating frameworks for emissions trading and encouraging collaboration between developed and developing countries.

The Paris Agreement

The Paris Agreement was adopted at the 21st Conference of the Parties (COP21) to the UNFCCC, held in Paris, France, in December 2015. It was negotiated by representatives from 195 countries and the European Union, making it the first universal and legally binding climate agreement. The primary objective of the Paris Agreement is to strengthen the global response to climate change by limiting global warming to below 2 degrees Celsius above pre-industrial levels, with efforts to limit it to 1.5 degrees Celsius. Achieving this goal requires countries to adopt determined reduction efforts and enhance their adaptation measures. Every five years, the Paris Agreement establishes a framework for a worldwide assessment of the progress made toward its goals. In this process, the efforts made by all nations to decrease emissions, prepare for the effects of climate change and encourage climate finance and technology transfer are assessed. Every country that has signed the Paris Agreement is required to submit a nationally determined contribution (NDC) explaining its climate action plan. In addition to the short-term goals of limiting global warming, the Paris Agreement also sets a long-term goal of achieving net-zero greenhouse gas emissions in the second half of the century.

Possible Solutions

In order to address this issue, we need to think about mitigation and adaptation strategies. These mitigation strategies can be reducing greenhouse gas emissions, carbon capture and storage (CCS), afforestation and reforestation and reducing deforestation. Protecting and restoring forests are important since forests absorb carbon dioxide. This helps to preserve biodiversity and the ecosystem. CCS technologies capture carbon dioxide emissions from power plants and industrial facilities and then store them underground, stopping them from entering the atmosphere. The adaptation strategies can be coastal protection measures,

elevating infrastructure, improved land-use planning, enhanced early warning systems, climate-resilient agriculture, community engagement and capacity building.

International cooperation and funding is essential for tackling this issue. Achieving global climate goals requires collecting financial resources from economically developed countries to support developing countries' efforts to decrease the effects of climate change and adapt to it. Encouraging the adoption of environmentally friendly practices and renewable energy technologies may speed climate action and increase sensitivity to its effects. Effective climate action at all levels can be encouraged and adaptive capacity increased by governments and stakeholders sharing information, best practices and lessons learned.

Integrated coastal zone management, regulations and long-term planning is also important. Implementing integrated approaches to coastal zone management that take into consideration different goals, involved parties and industries can assist in finding a balance between environmental preservation, climatic adaptability and economic development. An environment that is beneficial to climate-resilient growth can be created by providing rewards for sustainable land use and development practices and putting laws in force to control emissions and safeguard coastal habitats. Building resilience and decreasing future risks can be achieved by incorporating long-term climate considerations into infrastructure investments, development initiatives and national and regional planning processes.

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