Forum:	Economic and Social Council
Issue:	Reducing economic and social impacts of the increasing number and fortitude of natural disasters caused by climate change
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I. Introduction

On March 11, 2011, Japan was hit by an 9,0-magnitude earthquake. The generated tsunami could be observed throughout the entire Pacific region and caused a tremendous devastation including the infamous nuclear meltdown at the Fukushima I (Daiichi) Nuclear Power station. The natural disaster caused an estimated 18 000 deaths by 2015 and caused $220 billion in damages in Japan, $85 million in damages in the United States, and $6 million in losses for the Chilean fishing industry.[1] Additionally, some experts believe that the sum of the economic impact of the nuclear disaster alone could sum up to the barely imaginable sum of one trillion US-dollars[2]. While there is little scientific evidence to show a causation between climate change and the prevalence and fortitude of earthquakes, climate change is shown to increase the negative effects that tsunamis have on coastal regions. Keeping this in mind, it is extremely likely that the economic and social impact of the increasing number and fortitude of natural disasters, including, but not limited to tsunamis, caused by climate change will drastically increase in the upcoming years.

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[1] "MARCH 11, 2011 JAPAN EARTHQUAKE AND TSUNAMI." *National Centers for Environmental Information*, last modified Mar. 2015, https://www.ngdc.noaa.gov/hazard/data/publications/2011_0311.pdf

[2] "Fukushima's Final Costs Will Approach A Trillion Dollars Just For Nuclear Disaster." *CleanTechnica*, last modified on 8 July 2019, https://cleantechnica.com/2019/04/16/fukushimas-final-costs-will-approach-one-trillion-dollars-just-for-nuclear-disaster/

With climate change advancing every year, some effects will not be able to be undone even if the world would become carbon neutral overnight. How to mitigate the effects and start to deal with its consequences is a discussion one must have when attempting to mobilize mankind to manage climate change, be it on a local, a national, regional, or an international level. Now is the time to start adapting to the world with the changed climate.

II. Definition of Key Terms

A. Climate Change

The United States National Aeronautics and Space Administration (NASA) defines climate change as "a long-term change in the average weather patterns that have come to define Earth's local, regional and global climates."[3] These changes are primarily driven by the human footprint on the environment, especially the burning of fossil fuels. Natural occurrences such as cyclic ocean patterns or changes in the sun's energy output can also influence climate change, leading to a rise in the average Earth temperature in an occurrence commonly referred to as global warming. Key indicators of climate change include rising temperatures and sea levels, ice losses in mountain glaciers and at the North and South pole, as well as the frequency and severity of extreme weather events.

B. Natural Disasters

According to a 2016 publication in the International Journal of Disaster Risk Reduction, "Natural disasters are catastrophic events with atmospheric, geological, and hydrological origins (e.g., droughts, earthquakes, floods, hurricanes, landslides) that can cause fatalities, property damage and social environmental disruption."[4] It is estimated that on average, 100 000 people per year perish due to natural disasters and that 150 million people per year are impacted by them[5]. Notable natural disasters of the past include the 2010 Haiti earthquake and the 2004 Indian Ocean

[3] "Overview: Weather, Global Warming and Climate Change." *NASA*, last modified 28 Jan. 2021, https://climate.nasa.gov/resources/global-warming-vs-climate-change/
[4] "Natural Disaster." *Natural Disaster - an Overview | ScienceDirect Topics*, last modified 2016, https://www.sciencedirect.com/topics/earth-and-planetary-sciences/natural-disaster
[5] "Top 10 Deadliest Natural Disasters in History." *LiveScience*, last modified 17 Dec. 2020, https://www.livescience.com/33316-top-10-deadliest-natural-disasters.html

earthquake and tsunami, each causing hundreds of thousands of deaths and billions of dollars in economic damage.

C. Climate Change Mitigation

According to the United Nations Environment Programme (UNEP), "Climate Change Mitigation refers to efforts to reduce or prevent emission of greenhouse gases."[6] This can include well-known practices such as the use of renewable energies, altering consumer behavior, or increasing the energy efficiency of older equipment, but also plans for entirely new cities or for an improved cook stove design can fall in this category.

D. Climate Change Adaptation

As defined by the United Nations Framework Convention on Climate Change (UNFCCC), "adaptation refers to adjustments in ecological, social, or economic systems in response to actual or expected climatic stimuli and their effects or impacts."[7] Adaptation strategies can take on many different forms, ranging from setting up flood barriers to redesigning business operations. The "Possible Solutions" section of this research report will present a few possible adaptation methods.

E. Climate Finance

The UNFCCC defines Climate Finance as "refer[ing] to local, national or transnational financing - drawn from public, private and alternative sources of financing - that seeks to support mitigation and adaptation actions that will address climate change."[8] This concept is mainly geared toward supporting developing countries, recognizing the varying degrees of ability for different countries to provide the financial means to mitigate and adapt to climate change. Under this concept, developed countries take the lead in acquiring and distributing financial resources for

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[6] "Mitigation." *UNEP*, last modified 2021, https://www.unep.org/explore-topics/climate-change/what-we-do/mitigation

[7] "What Do Adaptation to Climate Change and Climate Resilience Mean?" *UNFCCC*, last modified 2021, https://unfccc.int/topics/adaptation-and-resilience/the-big-picture/what-do-adaptation-to-climate-change-and-climate-resilience-mean

[8] "Introduction to Climate Finance." *UNFCCC*, last modified 2021, https://unfccc.int/topics/climate-finance/the-big-picture/introduction-to-climate-finance

developing countries, which these can apply for in climate change mitigation and adaptation projects.

III. General Overview

A. Natural disasters and their prognosed effects

1. Severe Thunderstorms

While humanity has come to live with thunderstorms, severe thunderstorms, consisting of sustained winds of more than 93 km/h or unusually large hail still pose a challenge. Climate change will affect the prevalence and feriosity of severe thunderstorms all around the world. In some places they are prognosed to become less frequent, while other parts of the world will be experiencing more severe thunderstorms. According to the Insurance Company Munich Re, severe thunderstorms with torrential rain, hail, gusts, or tornados have led to rising amounts of destroyed property, leading to rising costs for the insurance company. According to one of their reports on the issue, a single thunderstorm in July 2013 in Germany led to property damages worth 4,6 billion Euros.[9] With severe thunderstorms increasing in some parts of the world in the years to come, property damage and also fatalities due to severe thunderstorms will likely rise.

2. Wildfires

Scientists have found that for every 1° C of warmer air, the atmosphere is able to hold 7% more moisture[10]. This moisture is often pulled out of the soil and vegetation, making the Earth drier and more prone to wildfires. Therefore, it is unsurprising that the size and prevalence of wildfires have increased at an alarming rate in the past years. Some recent examples that have received much press coverage include destructive wildfires in California as well as those in Australia. While these two countries receive the most attention regarding the problem of

[9] "Climate Change and Its Consequences." *Munichre.com,* last modified 2 Mar. 2020, https://www.munichre.com/topics-online/en/climate-change-and-natural-disasters/climate-change/climate-change-heat-records-and-extreme-weather.html

[10] "The Undeniable Link between Weather Disasters and Climate Change." *The Washington Post*, last modified 22 Oct. 2020, https://www.washingtonpost.com/climate-solutions/2020/10/22/climate-curious-disasters-climate-change/

wildfires, all regions on all continents are at risk of experiencing increasingly destructive wildfires more often.

3. Heat waves

Heat waves are one of the most dangerous natural hazards, yet they rarely receive the deserved attention due to their destruction not immediately being obvious. The World Health Organization (WHO) reports that from 1998 to 2017, more than 166 000 people died due to heat waves[11]. Climate change has increased the number of people exposed to heat waves by 125 million, according to the WHO.

Aside from the strain on health, heat waves can also have severe economic effects. A 2014 study suggests that heat waves could decrease productivity of workers by up to 24%[12]. Additionally, crops and livestock may wither or die off due to heatwaves, leading to economic losses for farmers.

4. Floods

Climate change will almost certainly lead to rising sea levels all around the world. When no or insufficient adaptation measures are taken, it is easier for water to surge inland and flood coastal areas during high tides. This can be observed in the United States of America, where in the past 20 years, flooding during high tides has doubled, according to the National Oceanic and Atmospheric Administration. Coastal communities are also more vulnerable to flooding during hurricanes. For example, Cyclone Amphal in May 2020 brought floods that reached up to 15 km into India and Bangladesh.

Scientists have also shown concerns that climate change will increase the frequency of heavy rainfall and flash floods, which could result in billions of dollars worth of property damage in addition to numerous possible fatalities.

5. Droughts

Higher average temperatures can increase evaporation from soil, making periods of little rainfall even drier than they would be without climate change. On a

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[11] "Heatwaves." *World Health Organization*, last modified 2021, https://www.who.int/health-topics/heatwaves#tab=tab_1

[12] "This Heat Wave Is Going to Make You - and the Rest of America - Less Productive, by as Much as 28%." *Business Insider*, last modified 19 July 2019, https://www.businessinsider.com/heat-wave-effects-on-economic-productivity-2019-7?r=DE&IR=T

global scale, scientists estimate that this phenomenon will affect already dry places, while wet parts of the world will get even wetter. Droughts especially affect agriculture, potentially leading to crop failures. This can be observed in the Horn of Africa, where around 15 million people are in need of aid due to the effects of droughts, and in Central America, where 3.5 million people are struggling to cope with the effects of a sustained dry season. Additionally, transportation via rivers can be impeded during droughts leading to critically low water levels.

6. Tropical Cyclones

As the average temperature of the sea surface is prognosed to increase by 1-4 °C by 2100,[13] hurricanes and tropical cyclones are prognosed to intensify in severity. The effects of the warming seas and their effects on tropical cyclones can catch warning authorities off guard. For example, 2020 Hurricane Laura increased its speed by more than 100 km/h just 24 hours before it was planned to hit the United States East Coast. The storm ultimately killed 42 people and caused $14 billion in property damage. In the future, tropical cyclones are prognosed to become more severe, which could lead to even more fatalities and property damage.

IV. Major Parties Involved

A. United Nations Environmental Programme (UNEP)

The United Nations Environmental Programme (UNEP) is the environmental organization of the United Nations. As such, it assesses regional and international environmental trends and developments, and develops instruments to manage these trends. In doing this, the UNEP works closely with member states, civil society, businesses, and many other stakeholders in order to pursue their commitment to sustainability. As part of this mandate, the UNEP attempts to lessen and mitigate the impact of climate change through various measures.

B. Intergovernmental Panel on Climate Change (IPCC)

The Intergovernmental Panel on Climate Change (IPCC) is a United Nations body which “provides regular assessments of the scientific basis of climate change,

[13] “Ocean warming”, *IUCN,* last modified 5 Dec. 2018, https://www.iucn.org/resources/issues-briefs/ocean-warming

its impact and future risks, and options for adaptation and mitigation."[14] Through its reports, the IPCC provides valuable information for member states in order to assist them in developing climate policies, and regularly provides vital input into climate change negotiations.

C. Global Center on Adaptation (GCA)

The Global Center on Adaptation (GCA) is an international organization working on accelerating support and action for adaptation to climate change. The GCA cooperates with a multitude of partners, including universities, governments, banks, as well as multilateral and United Nations organizations to help people all around the world adapt to climate change. The GCA focuses on helping the poorest of the poorest who are the least prepared to withstand the multifaceted effects of climate change.

D. Bangladesh

According to the 2015 World Climate Change Vulnerability Index, Bangladesh is the most susceptible country to the impacts of climate change worldwide[15]. In response to the challenge, the Bangladesh government has made addressing climate change a national priority, invested more than $10 billion with support by the World Bank in adaptation actions, and adopted a 10-year Climate Change Strategy and Action Plan in 2008. In this plan, the government recognizes that the increasing number and severity of storm surges, tropical cyclones, droughts, and floods has the potential to threaten Bangladesh's achievements in fighting poverty over the last 20 years. Therefore, Bangladesh decided to implement measures such as modern warning systems and community-based preparedness for natural disasters which mitigate the impact of climate change on their population with a focus on continuing their fight against poverty and protecting the vulnerable.

E. South Africa

As a result of climate change, the Republic of South Africa is prognosed to be hit by heat waves, increasingly severe storms, floods and droughts among other

[14] "About the IPCC." *IPCC*, last modified 2021, https://www.ipcc.ch/about/
[15] "Improved Early Warning Systems Protect the Most Vulnerable - World." *ReliefWeb*, last modified 16 Nov. 2017, https://reliefweb.int/map/world/world-climate-change-vulnerability-index-2015

extreme weather events in the upcoming years. Similar to Bangladesh, the South African government also realizes that these events have the potential to undermine the gains of the Millennium Development Goals and impede the country's efforts to achieve the Sustainable Development Goals. The South African government has set up a row of policies to adapt to climate change. Among other schemes, the government has instituted "Climate Services", which offers decision makers in South Africa access to scientific information and models. The government hopes that this will empower their citizens to manage the risks and opportunities of climate change, and is continuously taking steps to improve the system, for example by establishing a network to share resources and lessons learned regarding climate change adaptation.

F. The Netherlands

In 1953, the Netherlands experienced a flooding of the North Sea, covering 400 000 acres and costing 1800 lives. More than 100 km of seawalls and 50 dikes burst, showcasing the state of the country's flood protection. In response to this event, the Netherlands instituted the Delta Project, consisting of a system of multiple dams and dikes to protect the country from further catastrophic floods. With rising sea levels and the increasing feriosity of storms, the dams may need to be improved in the coming years. The Netherlands also have developed strategies to address the increasing other extreme weather events such as droughts.

G. Tuvalu

Tuvalu is a group of widely scattered and sparsely populated islands in the Pacific Ocean, and one of the most vocal countries internationally calling for addressing climate change and particularly addressing how it will affect low-lying countries. Rarely exceeding three meters in height, the islands of Tuvalu are one of the most vulnerable to extreme weather events such as cyclones, floods and droughts. Storm surges are also a serious threat to the islands of Tuvalu. At the same time, the country suffers under low awareness for the problems of climate change among their population, and its status as one of the Least Developed Countries (LDC). In the past years, Tuvalu has taken steps in cooperation with the United Nations Development Programme (UNDP) and the Green Climate Fund to

increase its resilience against natural disasters, for example through a coastal adaptation project.

V. Timeline of Events

Date	Event
1953	North Sea Flood - The 1953 North Sea flood covered 400000 acres of land in the Netherlands, killing more than 1800 people. The experiences of this flood led to the Delta Project with the aim of reducing the economic and social impact of further floods.
2004	Indian Ocean Earthquake and Tsunami - On December 25, 2004, a tsunami caused by an 9.1-magnitude earthquake hit the shores of Thailand, Sri Lanka, India, and Indonesia, claiming 230 000 lives within hours as the deadliest tsunami in recorded history. In response to this tragedy, the member states bordering on the Indian Ocean formed the Indian Ocean Tsunami Warning System as a multinational tool to reduce the socio-economic impacts of future catastrophes.
2009	Copenhagen Climate Accords - During the Copenhagen Climate Change Conference, member states agreed to limit the maximum global average temperature to 2° C over pre-industrial times. At the same time, they also set up financing mechanisms such as the Green Climate Fund to ensure that Lesser Economically Developed Countries (LEDCs) would also be able to mitigate and adapt to climate change.
2015	Sendai Framework for Disaster Risk Reduction 2015-2030 adopted - The Sendai Framework aims to reduce existing disaster risks and prevent new ones in the upcoming 15 years through four pillars, including understanding disaster risks better and building resilience. The framework was adopted in 2015 by

the UN General Assembly with the hope of significantly reducing the socio-economic impact of disasters worldwide.

2015 Paris Climate Accords - As a legally binding treaty, the Paris Agreement is a landmark in the fight against climate change. In the accord, the member states agree to limit global warming to well below 2°C, preferably even below 1,5°C. The treaty also involves financial and other provisions to assist lesser economically developed countries (LEDCs) mitigate and adapt to climate change.

2020 Warmest year on record - According to the World Meteorological Organization, 2020 was one of the three warmest years on record, with the average temperature being around 1.2° C above pre-industrial levels.[16] This phenomenon, which experts see as a direct sign of climate change, has led to a multitude of socio-economic problems all around the world.

VI. Possible & Previous Solutions

Each and every community is different. It will not be possible to find one one-size-fits-all solution, but it is rather necessary to develop a toolbox of solutions which can be implemented on a local level in order to meet the local needs. This section will introduce a variety of ideas which can be used to develop solutions to this multifaceted issue, however many other solutions to the question are possible.

A. Awareness and Capacity Building

Raising awareness for the issues of climate change seems self-evident, but as of 2008, 40% of adults worldwide have not even heard of climate change.[17] Even though this number has likely fallen in the last years, a significant part of the world's

[16] "2020 Was One of Three Warmest Years on Record.", *World Meteorological Organization,* last modified 20 Jan. 2021, https://public.wmo.int/en/media/press-release/2020-was-one-of-three-warmest-years-record

[17] "Climate Change Awareness and Concern in 119 Countries.", *Yale Program on Climate Change Communication* last modified 22 Feb. 2016, https://climatecommunication.yale.edu/publications/analysis-of-a-119-country-survey-predicts-global-climate-change-awareness/

population lacks awareness of this pressing issue, and is therefore ill-equipped to deal with its effects. To combat this lack of awareness, education campaigns are key. Through education, people can be empowered to understand the issue and engage in climate change mitigation and adaptation actions.

The process of capacity building is also an important part of climate change adaptation. Through education, training, specific coaching, networking, or technical assistance, groups directly involved in climate change adaptation on a local level can be given the tools to implement adaptation schemes competently and sustainably. To make capacity building as successful as it can be, it should be part of a long-term process instead of a one-time event. When capacity building is done well, local decision makers and other stakeholders involved in climate change mitigation can be empowered to make the process a sustainable one.

B. Early Warning Systems

Early warning systems give people living in places prone to natural disasters a forewarning of incoming weather events, giving them time to prepare and move into safety. While these early warning systems work well in many developed countries, the World Meteorological Organization (WMO) estimates that more than 80% of Least Developed Countries (LDCs) only have basic early warning systems, that are unable to protect the population as well as those in developed countries. Additionally, the WMO notes that many countries in Africa have poor weather observation networks. Since these are the basis for warning systems, populations in the aforementioned African countries are also at risk of experiencing a natural disaster without adequate prior warning.

To address this issue, member states launched the “Climate Risk and Early Warning Systems” (CREWS) initiative at the Paris Climate Conference in 2015. This initiative aims to mobilize $100 million by 2020 to increase the quality of and access to early warning systems. While initiatives such as CREWS are a good start to make early warning systems available to all people, many people still live at risk of sudden natural disasters without adequate prior warning today.

C. Ecosystem-based Adaptation

Ecosystem-based Adaptation (EbA) attempts to use the forces of nature to reduce the impact of climate change. For example, coastal habitats like mangroves

or coral reefs can provide a cheap natural defense against floods and storm surges when compared with the proposition of building very costly sea walls. Equally, the greening of inner cities can help reduce the impact of increasing heat waves, and afforestation can be helpful in replenishing groundwater in areas stricken by draughts. EbA does not only have the benefit of cheap and uncomplicated adaptation to climate change, but can also have a positive social impact on populations that will be able to increasingly enjoy the benefits that nature offers.

D. National Adaptation Plans (NAPs)

Many member states have already developed National Adaptation Plans (NAPs) which seek to identify medium- and long-term adaptation needs in individual countries and develop strategies to address these. As established under the Cancun Adaptation Framework (CAF), the country-driven process aims to reduce the vulnerability to the impacts of climate change. It's content is guided by the best science available, as well as traditional and indeginous knowledge in the member state. Being non-prescriptive, the NAPs are aimed to be integrated into existing economic, social and environmental policies in a country-driven action. While national adaptation plans are a vital step to move toward a more resilient future, global action is still required to enable all member states to have the resources, funding and the know-how to establish and implement these adaptation plans.

E. Climate Finance

Climate finance, as introduced in the Key Terms, is an integral part in ensuring that Lesser Economically Developed Countries (LEDCs), and most importantly also the Least Developed Countries (LDCs) have the opportunity to adapt to the increasing number and fortitude of extreme weather events. At the 2009 Copenhagen Convention, member states pledged 100 billion US-dollars annually for climate finance by 2020, and the funds for climate finance are rising annually. However, some sources estimate that hundreds of billions of US-dollars will be needed yearly in the coming decades to address the effects of climate change in developing countries.[18] In order to reach the required amount, member states as well

[18] https://www.greengrowthknowledge.org/research/climate-finance-challenges-and-responses

as the private sector will need to drastically increase funds for climate finance in the upcoming years.

In addition to the issue of limited funds being available for developing countries, climate funds, such as the Green Climate Fund, are also difficult to access for these countries. If all member states are to be empowered to take steps toward climate change adaptation, the international community must take steps to make access to these funds easier for developing countries.

F. Climate change mitigation

While all of the above outlined strategies are very effective tools to adapt to the new reality of climate change, the most effective solution still remains combating the root cause - climate change. This includes increased energy efficiency and the use of renewable energies worldwide. If member states want to sustainably reduce the economic and social impact of natural disasters caused by climate change, more and less economically countries alike must work together to take resolute steps to fight climate change. Only if the problem is addressed, it's consequences can be fully assessed and sustainably dealt with.

VII. Questions to Consider

- Which natural disasters are likely to affect your member state?
- What is your member state's government doing to reduce the economic and social impact of these natural disasters? What measures could help these efforts?
- How can various approaches and solutions to the issue be implemented in other parts of the world?
- How can Less Economically Developed Countries (LEDCs), and especially the Least Developed Countries (LDCs) be assisted in protecting their citizens and economies from the negative effects of natural disasters?
- What is the better strategy in the current time: Climate change mitigation or adaptation? How can both approaches be pursued simultaneously?

VIII. Conclusion

Climate change will almost certainly increase the prevalence and severity of natural disasters all around the world. Fighting climate change remains an integral part in limiting the negative effects that it brings, but at the same time communities all around the globe need to be empowered to cope with these increasingly severe weather events. In order to prepare for the new future, member states must work together to develop and share ideas and strategies of adaptation, and enable even the poorest of countries to implement these. Through a combination of mitigation and adaptation, the disastrous social and economic effects of climate change and the weather phenomena it causes can still be limited. The time to act is now!

IX. Sources for further research

- Video documentary "Adapting to a changing climate", UNFCCC (2014)

This 20-minute video documentary gives an introduction to the growing recognition of international actors for the need to adapt to the realities of climate change. Through interviews with experts from various corners of the globe combined with inspiring stories of successful local adaptation projects, this documentary gives a very good introduction to the topic as a base for further research.

- Video collection "Adaptation Voices", Global Center for Adaptation (2019)

This collection of currently seven 3-minute videos compiled by the GCA tell of ways people and communities all over the world have adapted to the effects of climate change. Videos portray city planners in the United States and Netherlands in addition to farmers and fishermen from Jamaica, Costa Rica, the Cook Islands, India, and Indonesia, and how they and their communities are preparing to cope with the effects of climate change.

- Floating houses and mosquito nets: Emerging climate change adaptation strategies around the world, Meister Consultants Group (2009)

This lengthy but worthwhile report examines adaptation strategies in industrialized and developing countries all over the world, and shows a multitude of ideas which

could be adopted by other member states and communities to adapt to climate change.

- Adaptation Gap Report 2020, United Nations Environment Programme (2020)

This report compiled by the UNEP in cooperation with other United Nations Agencies summarizes the progress made on the field of climate change adaptation in the previous year. While it does not specifically focus on extreme weather events, it provides a very useful background on the topics of planning for, financing, and implementing adaptation, focusing on nature-based solutions.

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