

HISAR SCHOOL

JUNIOR MODEL UNITED NATIONS 2019

“Protecting Freedom in the Global Age”

Advisory Panel

*Mitigating the Extreme Effects of El Nino as a Result
of Global Warming*



**RESEARCH
REPORT**

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Forum: Advisory Panel

Issue: Mitigating the extreme effects of El Nino as a result of global warming

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Introduction

With the increase in CO₂ emissions as well as the lack of awareness for the environment and the climate, global warming has become the single greatest environmental issue of the 21st century. With the increase in temperatures and CO₂ accumulation on a global scale, many meteorological phenomena have intensified, causing the increase in the frequency of large-scale droughts, floods, hurricanes, and other such extreme weather events. All of these events strongly impact agricultural yields, living standards, and of course, the environment.

Strong irregularities in weather patterns such as an El Nino extremely affect multiple continents at the same time and cause extensive damage to human life and the environment. With the evident climate crisis, the effects of this kind of climate cycles can hurt local populations, livestock and crops lethally, causing even more damage in disadvantaged communities of South America and the Pacific. These weather patterns do not only influence these regions but impact the global climate as a whole. So, to prevent the intensification of an El Nino's effects, the climate crisis needs to be tackled in underdeveloped communities and the necessary measures to reduce an El Nino's cost should be implemented.



Flooding in Laguna Beach, US, after the 1998 El Nino event. Credit: LDEO - Columbia University.

Definition of Key Terms

Current: A body of water in the depths of the ocean that constantly moves in a specific direction. Ocean currents are influenced by temperature, trade winds, and gravitational forces. They are an integral part of the global climate and control the warming and cooling of ocean waters.

Climate/weather cycle: A cycle of regional weather-related events that occur periodically, most likely at the same time every year. Climate cycles are greatly influenced by changes in temperature and humidity and have the potential to influence local and global weather events. An El Nino is a part of a climate cycle called an ENSO.

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Greenhouse gas: The kinds of gas that absorb heat energy from the Sun in the Earth's atmosphere, causing the Earth's temperature to increase.

Developing countries: Developing countries lack the industrial and economic development that countries like the USA, Germany, or Australia have obtained. There is no universal definition of a developing country; however, to the most simple extent, a developing country does not have the resources or the basis to reach consistent overall development. Some developing countries today include Kenya, Afghanistan, India, and Turkey. Most countries that are most affected by an El Niño are developing countries.

Trade wind: Winds that constantly blow in a specific pattern across a specific region. Trade winds influence the global climate directly and greatly. Trade winds are also influenced by ocean currents, and vice versa.

Precipitation: Another word for rainfall.

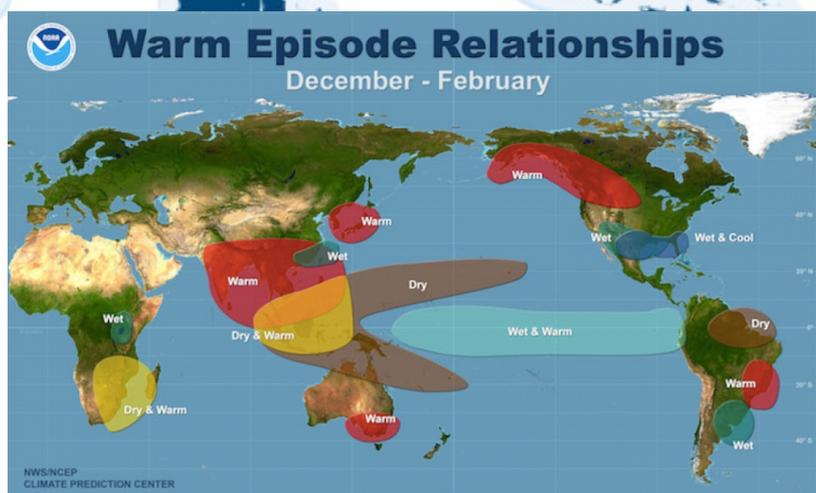
General Overview

What is an El Niño?

An El Niño is half of a naturally occurring weather cycle called the El Niño-Southern Oscillation (ENSO). During an El Niño event, the surface waters of the Pacific Ocean get warmer than usual, especially at the equator and along the coasts of Central and Southern America. Warm ocean waters cause atmospheric pressure to decrease, which in turn causes an extreme season of rainfall for the western coasts of the Americas.

An El Niño has the opposite effect in the coasts of Eastern Asia, which is the other half of an ENSO event, called a La Niña. A La Niña causes Pacific Ocean waters to cool down in the coasts of Eastern Asia, which causes that part of the Pacific to heat up, decreasing rainfall and causing large-scale droughts and extreme temperatures.

An ENSO tends to occur every two to seven years, the most recent one having been experienced in 2016. Being able to last a year, El Niño events tend to be strongest through October and February. Some of the biggest events spark up during Christmas, which is how El Niño got its name, which means holy child (referring to Jesus). Although being most influential in the Asian Pacific and Americas, an El Niño event extensively influences the global climate. Rainfall patterns shift globally: California and the Horn of Africa tend to dampen while the Indian subcontinent and Indonesia dries out. Record rainfall is observed in Peru, Chile, and Ecuador and fish



The climate impacts typically associated with an El Niño during the months of December, January, and February.
Credit: NOAA.

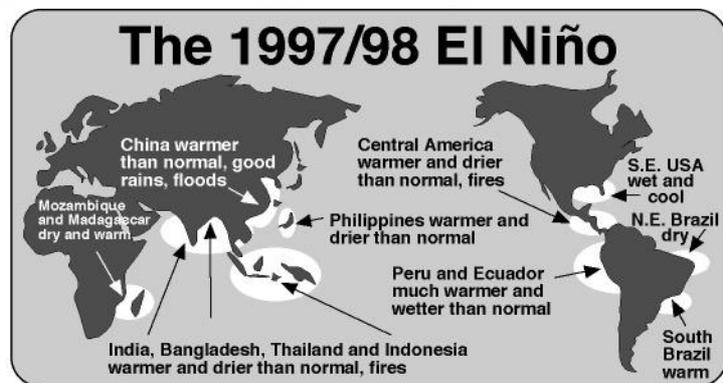
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catches on the Southern American shores are significantly reduced because most marine fish migrate to colder waters. Adverse effects observed in the Pacific include bleached coral reefs, which extremely affects marine biodiversity and ecological stability in marine ecosystems.

Scientists have still not figured out why exactly an El Niño event kicks off; however, they are increasingly alarmed by them due to extreme climate conditions and global warming. Recently, ENSO events have become stronger due to increased CO₂ emissions and global increases in temperatures. Although the Pacific Ocean has tended to cool down in 2016, the risk of an El Niño still poses a serious humanitarian and environmental threat to the entire world.

Historical Context

ENSO events have existed for thousands of years, the first one being concretely documented in the 19th century by Christmas fishermen from Peru. Noticing that they couldn't catch enough fish around February with the warming up of the ocean surface, fishermen realized that with the movement of the colder ocean currents to the deeper parts of the ocean, fish were migrating to the depths. However, ENSO events have been identified happening back to the 16th century, the first one being identified at the year 1500. This means that the climate cycle has existed for a longer period than that of the global warming becoming problematic.



In the early 20th century, a scientist named Gilbert Walker first identified the phenomenon as a cycle and discussed its implications, naming it the Walker Circulation. However, it is in the 21st century that scientists have started to observe the most violent ENSO events.

The two strongest El Niño years recorded were 1998-1999 and 2015-2016. However, it is important to note that there is a strong chance of an El Niño occurring in 2019 as well, with the increase in the acceleration of global warming and release of greenhouse gases. Its effects will be more severe than before, impacting a broader region than the Americas and the Pacific.

Humanitarian Consequences

The environmental implications of an El Niño year poses serious humanitarian risks to developing countries, especially those that are located nearest the Pacific Ocean. The United Nations (U.N.) Office for the Coordination of Humanitarian Affairs reported in April 2016 that 60 million people across Africa, Asia, the Pacific, and Latin America needed food assistance due to weather extremes from the 2015-16 El Niño. Looking back at 1997-98, the U.N. attributed more than 20,000 deaths and \$36 billion in infrastructure damage to that El Niño.

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Severe drought, flooding, heavy rains and temperature rises can lead to food insecurity and malnutrition, disease outbreaks, acute water shortages, and disruption of health services. The health implications are usually more intense in developing countries with fewer capacities to reduce the health consequences. Thus far, requests for financial support by seven high-risk countries (Ethiopia, Lesotho, Kenya, Papua New Guinea, Somalia, Tanzania and Uganda) facing the health costs of El Niño have reached US\$76 million. In the Horn of Africa, the devastating drought has been followed by unusually heavy rains causing a high risk of vector-borne disease and communicable disease outbreaks, especially among displaced populations and those with high levels of malnutrition. El Niño caused heavy rains and flooding in eastern Africa which could lead to cholera outbreaks in Tanzania, Mozambique, Kenya, the Democratic Republic of the Congo (DRC) and Uganda.

In 2016, extreme drought in Southern and Eastern Africa contributed to declining food security, nutrition, and health. Since ENSO events reduce precipitation and thus alter crop yields and agricultural markets in certain regions, shortages of food are expected after El Niño events. Although organizations such as FAO and UNICEF try to deliver nutritional and medical aid as much as possible, the storm's effects reduce crop yields on the long-term, leading to longer shortages of food in developing countries in South America and Africa. After the 2016 El Niño, 2.8 million people needed humanitarian assistance in Guatemala and Honduras and 10.2 million people were in need of emergency food in Ethiopia. There were 14 million food-insecure people only in Southern Africa—for which the situation of shortage persists today. In addition, such a strong El Niño meant that millions more were in danger of a severe La Niña event, which increased the risk of hunger, disease, and water shortages in affected regions in 2016.

As mentioned before, in the equatorial Pacific, as warm water moves east, clouds and rainfall move with it and leave the Western Pacific in dry conditions that often lead to drought across Indonesia, southeast Asia, and northern Australia. The problems of drought are intensified by slash-and-burn land clearing. For example, in Indonesia it is common for farmers to clear-cut forests for lumber and to burn rainforest to develop the land. Normally, these fires are extinguished by the consistent rains that fall in the tropics. But when the rain dries up during a strong El Niño, those fires burn uncontrolledly. Massive El Niño-fueled fires were blamed for thousands of premature deaths from air pollution in 1997-98 and contributed to as many as 100,000 deaths in 2015-16, according to a recent study by Harvard University scientists. Wildfires also release extra carbon dioxide into the air. Plants that are stressed from heat and drought cannot absorb as much atmospheric carbon as they normally take up during photosynthesis. Thus, the rise in atmospheric CO₂ is more during El Niño years.

ENSO events provide a more conducive environment for spreading diseases such as malaria, chikungunya, hantavirus, Rift Valley fever, cholera, plague, and Zika, which are most contagious in humid weather, even if the country does not regularly have this disease. The outbreak of malaria in the Americas in 2016 was caused by the previous El Niño event of 2015-2016. With a 36% increase in malaria cases across the US, Disease outbreaks in multiple El Niño-connected regions worldwide (including Southeast Asia, Tanzania, western US, and Brazil) followed shifts in rainfall, temperature, and vegetation in which both drought and flooding occurred in excess. These shifts made ecological conditions appropriate for these diseases to emerge and increase activity in these regions. Such outbreaks cause medical difficulties, especially in developing countries where medical resources aren't as developed. These diseases also have the potential to affect food resources and livestock.

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Major Parties Involved and Their Views

Some of the countries that are in highest risk of El Nino damage include Cambodia, Myanmar, Pakistan, Papua New Guinea, Vietnam, Guatemala, Haiti, Venezuela, Ethiopia, Sudan, and Eritrea. Higher-income countries such as the USA are also affected by El Nino events. However, these countries will not be outlined in this report as much of the consequences they face are very similar and have been outlined in previous sections.

There are four main non-governmental organizations (NGOs) that focus their studies on El Nino events and ENSO cycles. Experts of the panel can make use of these NGOs while creating solutions to the problem at hand.

Economic and Social Council for Asia and the Pacific (ESCAP)

ESCAP is a sub-organization of the UN that focuses on Asia and the Pacific as a whole, which is basically the starting point of any El Nino event. It focuses on creating cooperation between countries that are included in this region, and the UN.

However, ESCAP has failed to take any significant action regarding El Nino and its implications so far. It is expected to provide more cooperation between Pacific member states to promote help across countries to tackle the environmental and humanitarian damage that these weather events cause.

World Meteorological Organization (WMO)

WMO is the all-inclusive meteorological authority that measures the scale and intensity of weather patterns across the globe. It is one of the parties to which we rely on to determine the start of an ENSO cycle. They conduct global research and provide analysis so that countries can be better prepared for El Nino events and their results.

WMO has not taken direct action in tackling the results of El Nino events; however, they regularly warn countries about the implications of an ENSO event, especially focusing on its intensification caused by global warming and CO2 emissions. They do not have a specific guideline for member states on how to be prepared for an El Nino event.

United Nations Office for the Coordination of Human Affairs (OCHA)

OCHA is a non-governmental part of the UN that coordinates the delivery of humanitarian aid to regions that are affected by extreme events ranging from climate catastrophes to military activity. OCHA has helped out many affected member states after the El Nino event of 2016 by supplying humanitarian aid, especially by providing temporary shelter and medical help.

In 2016, OCHA published a report on the expected impact on and humanitarian needs of countries after the strongest El Nino event recorded in history. The contents of this report has been outlined in the Humanitarian Consequences section of this chair report.

Food and Agricultural Organization (FAO)

FAO is a specialized agency of the UN that works to defeat hunger on a global scale. They address international emergencies by helping other humanitarian organizations deliver aid to certain regions and people.

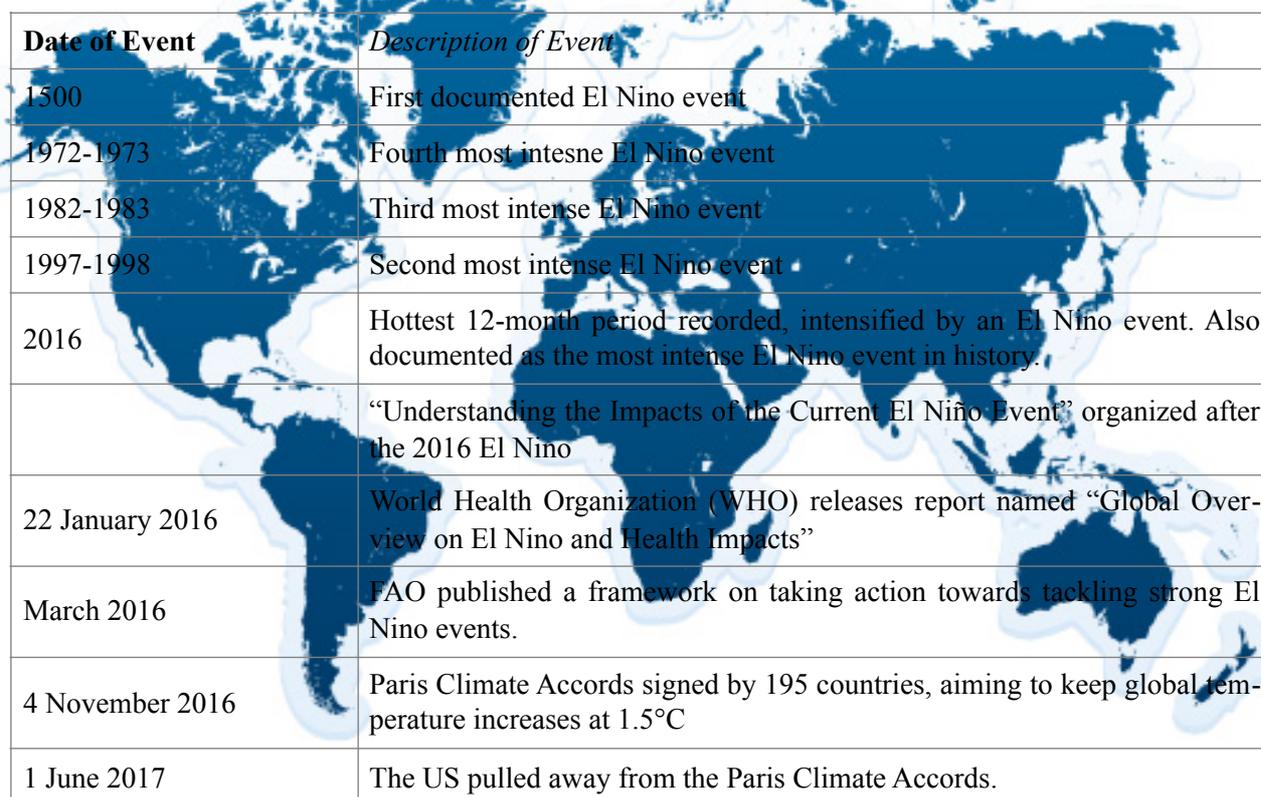
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So, FAO is one of the organizations that deliver aid to countries that are affected by an El Nino. They also analyze the effects of ENSO events on agriculture and food production as a whole.

Although FAO is not an agency that is directly related to environmental or meteorological issues, they have been active about this issue. They have published a framework that outlines how international bodies and member states should act in such cases of reoccurring and extreme weather events. Experts can find a detailed summary of the contents of this framework in the Treaties and Events section of this chair report.

Timeline of Events

Below, you can find a timeline of recent and important recorded El Nino events as well as the important steps taken on a regional and global scale to tackle such weather events.



Date of Event	<i>Description of Event</i>
1500	First documented El Nino event
1972-1973	Fourth most intense El Nino event
1982-1983	Third most intense El Nino event
1997-1998	Second most intense El Nino event
2016	Hottest 12-month period recorded, intensified by an El Nino event. Also documented as the most intense El Nino event in history.
	“Understanding the Impacts of the Current El Niño Event” organized after the 2016 El Nino
22 January 2016	World Health Organization (WHO) releases report named “Global Overview on El Nino and Health Impacts”
March 2016	FAO published a framework on taking action towards tackling strong El Nino events.
4 November 2016	Paris Climate Accords signed by 195 countries, aiming to keep global temperature increases at 1.5°C
1 June 2017	The US pulled away from the Paris Climate Accords.

Treaties and Events

Paris Climate Accords - The Paris Climate Accords of 2016 is the most recent all-encompassing agreement on climate action by the largest number of signatories in history. Having been signed by 195 countries, the Paris Climate Accords seemed promising because what was aimed for was global cooperation in tackling the climate crisis, focusing on global warming. 195 member states agreed to keep global temperature increase at 1.5°C by measures such as reducing greenhouse gas emissions.

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Experts do not need to know the specific details of the Paris Climate Accords as it does not directly address El Nino. However, since it is a global agreement to tackle climate change, experts should consider it a milestone in the history of climate action and as a strong step taken globally towards tackling global warming. Until the United States pulled out of

Evidently, the Paris Climate Accords failed to fully address the dangers that an El Nino poses to human life and the environment. Although focusing on cooperation about climate change and despite aiming to keep global temperature increase at 1.5°C, the frequency and intensity of an El Nino event will massively increase.

“Understanding the Impacts of the Current El Niño” Event - The “Understanding the Impacts of the Current El Niño Event” in 2016 was organized by NERC and the Department for International Development (DFID), aiming to increase knowledge about the impacts of the 2015-2016 El Nino in low and middle income countries and to increase preparedness for future incidents of El Nino.

To achieve these goals, the NERC and DFID decided to provide funding to provide evidence of the impacts of the 2015-16 El Niño event, particularly at the local and regional level, have the potential to contribute to increased resilience to El Niño events and therefore to increased social wellbeing and economic growth, and focus on the collection of data that is timely and urgent that cannot be supported through other funding routes.

FAO Framework of Action Towards El Nino - This framework was proposed by the FAO in 2016, shortly after the El Nino event of 2016. The framework presents a different approach to the implications of El Nino events: while acknowledging that we should address the emergency needs of those affected by such extreme climate events, we need to understand that with the current situation of the climate, El Nino events will only get worse. So, we need to be better prepared for its impact before the events begin.

The framework states that preparations need to be focused on the most vulnerable communities to build resilience and create situation-specific solutions. Also, more cooperations needs to exist between humanitarian and development sectors to have a more coordinated response to an El Nino’s impact. The framework includes introducing climate resilient agricultural practices and disaster-proof food and water systems while also aiming to promote cooperation between sectors to address the needs of the most vulnerable people and provide quick and reliable solutions to climate-related social problems.

The framework specifically includes building resilience of communities in the Dry Corridor of Guatemala, enhancing human security through disaster risk reduction in Haiti, strengthening human security in the border communities of Turkana, Kenya, and strengthening rural livelihoods severely affected by climate induced drought in Lesotho, prioritizing the most vulnerable countries to be able to better address their needs.

Evaluation of Previous Attempts to Resolve the Issue

The general problem with the previous attempts to tackle the consequences of El Nino events is that they fail to specifically address the ENSO issue. Although El Nino is the strongest extreme climate phenomenon present on our planet at this time, most NGOs do not focus enough resources to address its implications. The actions that are presently being taken by a few NGOs and regional organizations are not enough because they fail to put the issue in a broader perspective, which causes countries to think that El Nino is not their problem

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if they are not under its immediate effect zone. So, most action is taken **after** an El Nino, which only addresses the immediate damage that the weather events cause. Parties of this conflict do not realize that El Nino affects the global climate as a whole, and all previous attempts have failed to widen the scope of their solutions.

Possible Solutions

The Nino 3.4 Region is a region in the middle of the Pacific Ocean that is tracked regularly for temperature increases. It is the region by which experts distinguish the beginning of an El Nino event, also being the most impacted region of the climate event. Since this region does not include any specific states or islands in it, it is considered as international waters and thus is under the protection and obligation of all countries. This can be used as the basis of the El Nino problem in general: there is no specific side that needs to address this issue. El Nino events affect the global climate as a whole, which means that all countries have to act together to reduce their environmental impacts to reduce the impact of El Nino events and prevent them from becoming extreme due to global warming.

El Nino and La Nina events are unavoidable. They have been existing for 6 centuries, which means that they were there when there wasn't any industrial production or excessive greenhouse gas production. They are a part of the natural climate of the world; however, their intensification can be prevented if countries are willing to take steps in reducing CO2 emissions, fossil fuel consumption, pollution, and global warming as a whole.

In this regard, experts of the Advisory Panel need to focus as a group in creating measures that are adoptable by every member state. Most of the countries that are most affected by ENSO events are developing states, which do not have access to proper financial and technological resources to tackle the results of an ENSO event if one occurs.

Experts need to establish a strong international framework of measures that need to be adopted by member states even before an El Nino occurs so that the necessary precautions can be taken. Also, strong humanitarian response networks specifically focusing on El Nino incidents need to be set up to deliver adequate humanitarian aid to every individual affected. Since this is a global climate phenomenon, any legal obstacle in front of such a response mechanism should also be eliminated.

The long-term solution to reducing the effects of ENSO events is to include it in the discussion of tackling global warming. If we reduce greenhouse gas emissions on a global scale, El Nino events will certainly be less violent. Experts need to get all countries on board to an extensive climate plan, one that should be broader and more inclusive than the Paris Climate Accords, to ensure each and every member state's binary participation.

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