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The Impacts of El Nino and La Nina on the Global Weather Condition and Possible Remedial Measures

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Contents:

Introduction
Review Of The Related Literature
El Nino
La Nina
Trade Wind
Occurrence of "El Nino and La Nina"
Social Repercussions of El Nino and La Nina
Conclusions
References

Abstract: *This research aims to investigate the socio-economic and political "impacts of El Nino and La Nina on" global weather conditions. The analogies El Nino - La Nina means "Little baby boy and Little baby girl" are the two different hot and cold climate patterns that developed in the Pacific Ocean due to the warm "Trade Wind", adversely affecting the global weather conditions. The trade winds are permanently flowing from the high-pressure area to low pressure belt between the latitudes of 30° and 40° N and S, bringing more rainfall and causing floods. This phenomenon of "El Nino and La Nina" has the worst impacts on global climate and weather conditions. This mixed high variations in the temperature, and upwelling resulting the swear hurricanes in the Pacific Ocean, frequent tornados in the Atlantic Ocean, destructive tropical cyclones and tsunamis in the Indo-Pacific and the hot surface of the oceans water are the major indicators of increased global change in the weather conditions.*

Key Words: El Niño, Equator, La Niña, Oscillations, Trade Wind, Doldrums, Easterlies

Introduction

El Nino and La Nina are two opposing climatic patterns that are occurring due to the warm "Trade Winds" or Easterlies blowing along Pacific-Equatorial. The concept of "Trade Wind" was first used by the adventurer and Sea Explorer Christopher Columbus in 1451-1506 while sailing his vessel across the Atlantic Ocean to the Pacific Ocean. The trade winds are permanently flowing from subtropical high-pressure areas to the Equator low-pressure belt between the latitudes of 30° and 40° N and S, bringing more rainfall, and causing the flood. These winds are warm due to global warming, flowing from "East to West on the Equator." However, there are two different terms for "El Nino and La Nina." The 'El Nino' phase leads to warmer winds and hot temperature

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conditions while the La Nina phase leads to cold winds, and this "El Nino and La Nina" phenomenon causes extreme variations in global climate and weather. (L'Heureux, Michelle. May 5, 2014). Scientist has observed that because of the 'trade winds' movement in the 'southern hemisphere', the cold water rises from the depth of the Pacific that process is called upwelling due to "El Nino Southern Oscillation (ENSO)." (Walker, G.T. 1924). The "El Nino and La Nina" phases have changed the global climatic conditions, affecting the global economy, ecosystem, eruption of wildfire, and causing droughts and floods worldwide. (Meehl, G. A.; Teng, H.; Branstator, G, 2006). Now the episode of El Nino and La Niña mostly occurs non-perennially, i.e. after two to seven years and lasting eight to twelve months, but in certain situations, it may last for the complete year as well. Since 1950, there have been approximately 23 "El Nino and 14 La Nina" events. (Nicholls, N, 2008).

The study includes the impact of "El Nino and La Nina" on world weather conditions long possible remedial measures. The purpose of this research article is to explain what is prevalent in regard to the phenomenon under study. This research article has been constructed with the following research questions;

- What is the "El Nino and La Nina" phenomenon?
- What is the Trade Wind?
- How did "El Nino and La Nina" occur?
- What is the impact of "El Nino and La Nina" on global weather changes?
- What could be the possible remedial measures?

Review Of The Related Literature

Adamson, G., 2020, has explained in his book titled "Imperial Oscillation" regarding the development of the Southern Oscillation in the Pacific that was resulting in drastic changes in the atmosphere, climatic and weather conditions. Becker, Emily, in his book Titled, "December's ENSO Update; Close, but no cigar", has explained the "El Nino and La Nina" phases occurring in the Pacific region and affecting the global weather conditions. Derek Hayes explained in his book titled "Historical Atlas of the North Pacific Ocean: Maps of the Discovery and Scientific Exploration" that Trade Winds are affecting the Pacific Ocean, resulting in ENSO Southern Oscillation and upwelling. L'Heureux, Michelle, in his book titled, "What is the El Niño–Southern Oscillation (ENSO) in a nutshell?", has explained the phenomenon of ENSO that causes the disruption in the ecosystem worldwide. Sir Gilbert Thomas Walker, in his book titled, "Correlation in seasonal variations of weather. IX. a further study of world weather", has explained that there is also a tendency to fluctuate the global environment due to Southern Oscillations resulting in upwelling in the Pacific.

This research work will be significant for the students of BS, M Phil and PhD levels in Geography, Environmental Sciences, International Relations and other specific fields of social sciences due to its severe political, economic and social impacts on the nations of the world. It will open new avenues and opportunities for the researchers to conduct their research in the relevant field.

El Nino

The word El Nino originates from the Spanish word, analogous to the meanings "Little Boy" or a Christ Little Baby Boy. El Nino is also called the anti-La Nina ("Little Girl or a Christ Little Baby Girl"). (Trenberth, Kevin E December, 1997). In the 1960s, it was the first time observed by South American fishermen that there was hot water in the Pacific Ocean, and they called this hot phenomenon El Nino or "Navidad". The word El Nino is mostly used to relate to the hotter phase of "Southern Oscillation (ENSO)" in the Pacific that develops astride the equatorial Pacific and lies 120°W between the International Date Line. This cycle results in low air pressure in Eastern Pacific and higher air pressure in Western Pacific on the Sea Surface Temperature (SST), causing abrupt changes in global weather conditions. (Changnon Stanly A, 2000). This phenomenon has totally opposite impacts on La Nina. "El Nino" has a hotter phase,

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and "La Niña" has a colder phase. (Xie, Shang-Ping, February 1998).

La Nina

The word "La Nina" comes from 'Spanish.'

word, analogous to the meanings "Little Girl or a Christ Little Baby Girl." It was the first time observed by the South American fishermen. "La Nina" relates to the cooling phase of southern oscillations (LNSO) in the Pacific due to upwelling. During the "La Nina" phase, the temperature of the Sea Surface along the eastern part of the central pacific is lower than 5.4-9 Fahrenheit (3-5 Centigrade). The emergence of "La Nina" exists five to seven months. It has the worst effect on the weather and climatic condition worldwide, resulting in swear hurricanes in the Pacific, tornados in the Atlantic, cyclones and tsunamis in the Indian-Pacific Oceans. (Cai, W.; Cowan, T. 2009). La Nina has a cogent contribution to the adverse weather condition across the globe. La Nina has the opposite or anti-El Nino effect. (Barnston, Anthony May 19, 2014).

Trade Wind

Primarily Trade is defined as the activity of selling, buying, purchasing or exchange of voluntary services or goods between economic actors, firms, traders, companies, groups and states. However, the term "Trade Wind" was first used by the adventurer and Sea Explorer Christopher Columbus in 1451-1506 while sailing his vessel across the Atlantic Ocean to the Pacific Ocean, who discovered America with the help of trade wind. The trade wind is the flow of "wind from a high-pressure area to low pressure area" astride the equator with the latitude of 30° North and 40° south. (Derek Hayes, 2001). These trade winds are also known as tropical easterlies. During the winter season, these winds are stronger than normal, drier and warmer in the summer. (Glossary of Meteorology, 2009). These winds on the earth are broadly classified as primary, secondary, and tertiary winds.

Now during the course of the El Nino phase, these trade winds get weakened because of hot water in the Pacific. But right on the equator, there are doldrums of wind pressure in the Atlantic Ocean (depression, stillness and stagnation), and this atmospheric phenomenon forms circular systems over the surface current, which are called gyres (A large systematic clockwise rotations of ocean currents and anti-clockwise rotation of the ocean current in the Southern Hemisphere). (John E. Oliver, 2005). Here, doldrums means unpredictable storms and winds. In metrological term, these trade winds are formed astride the equator, causes storms and transport the nitrate and phosphate particles, blowing the Saharan dust over the land, resulting air born pollutant in the atmosphere, changing the colour of the sky from blue to white, red sunset and also have a negative impact in the air quality which is dangerous for the global ecosystem. (Robert R. Steward 2005). The discovery of these trade winds enabled the colonial expansion all over the world and permanently established the sea routes for trades and wars in the oceans, and explored Africa, the Arctic and Antarctic region, Asia, North America and South America. Consequently, it produces a negative socio-economic and political impact on the coastal states.

Occurrence of "El Nino and La Nina"

In geological term, "El Nino" mostly occurs during December and get weakened due to low temperature, resulting in pushing back the warm water to the east and towards the west coast of the Americas (Becker, Emily, Dec 2014). Since the warm water causes the jet stream in the Pacific Ocean, therefore, the El Nino jet stream moves south of its neutral position, inflicting a significant effect on weather conditions. With this shifting process, the climatic behaviour abruptly changes. (Welsh, Jon Spring 2016). The opposite condition of "El Nino is La Nina" that occurs during the "El Nino southern oscillation phase (ENSO)," resulting in the upwelling in the Pacific, which is a colder part than the usual and the east winds become stronger than the normal conditions. The La Nina is the colder phase that mostly occurs three to four months with sewer conditions across the globe and causes more hurricanes, tornados, and tsunamis in the

Indian, Atlantic and Pacific oceans (Nicholls, N, 2008). ENSO consists of three phases "El Nino, La Nina and Neutral."

Socio-Economic And Political Impacts Of "El Nino And La Nina" On Global Weather Conditions

The phenomenon of "El Nino and La Nina" has an adverse impact on the world climatic conditions and climatic change due to ENSO and the upwelling process. During the course of the upwelling phase, the cooled water beneath the ocean tends to bring the rich nutrients over the surface, thus affecting the sea marines and also bringing more disasters, rainfall and floods. This tends to usher the dearth in the Southern US and inflicts heavy rains in Northwest Pacific. In the Eastern equatorial, the Sea Surface Temperature will be lower rather than usual by 5.4-9 Fahrenheit (3-5 Centigrade) in the central pacific ocean, whereas the SST(Sea surface temperature) crossways to Asia will be hotter and leads to destructive cyclones, early monsoon, floods, dust storms, heat waves and significant rise in the global temperature. (Robert R. Steward 2005). Although the occurrence of ENSO is merely a single climate phenomenon, it has a divested effect on the disruption of global weather conditions.

Since easterlies winds are stronger, thus the El Nino phase causes health problems, the outbreak of diseases, heat stress, respiratory diseases, malnutrition, inflicting drought, food insecurity, flooding and swear rains in a wider range. In general, El Nino causes an extreme rise in the global temperature, drier and shortage of water than usual. The La Nina causes heavy rainfall and destructive water flood. During the La Nina phase, the sea surface temperature (SST) remains fluctuates worldwide. (Nicholls, N, 2008).

These extreme weather conditions have affected Asian countries, Australia, African countries; European countries North and South American countries, for example, rise in temperature, high rate of hurricanes in the Americas, high rate of tornados in Europe and cyclones in South Asia, heavy rainfall, flood and rise in the temperature than the usual particularly in Bangle Dash, Indonesia, Pakistan, Philippine, Malaysia, Sri Lanka, and in India and droughts in most of the African countries. In some areas, the winter is extremely cold and wet winter than normal, and summer is extremely hot and driers than usual, depending upon the location. So these extreme weather conditions have severe economic consequences that affect the agricultural product, reduce crops with lower crop yields, lead to a shortage of food, hike the prices of common commodities and trigger high inflation rates, resulting in social unrest worldwide and particularly in those countries that are more affected and dependent upon merely on imported food products (Bampton, Anthony May 19, 2014). These socio-economic impacts will ultimately lead to political instability due to huge economic loss and large migrations of masses from affected areas to least impacted and metropolitan cities.

On the other hand, the marine life in the oceans and the global ecosystem are also affected. El Nino processes affect and disrupt oceanic behaviour and cause a gradual global change in atmospheric and weather conditions. The upwelling process also brings tropical marines like albacore tuna and yellow tail species into the areas which are normally cold, affecting the tropical marines in extreme danger. (Cai, W.; Cowan, T, 2009).

Economic Consequences of "El Nino and La Nina

Extreme climatic conditions prompted by "El Nino and La Nina" have devastating economic impacts on the world because the weather does not respect the state borders and creates an equal disaster for all countries of the world. However, few states could manage to hand over the impacts but were unable to have complete control and its impacts. Owing to these concerns, Economists are prognosticating that "El Nino and La Nina" would ultimately affect the economic performance of a state. According to a report by the International Monetary Fund (IMF), agricultural production, commodity prices, labour activity, health and the industrial economy would be impacted highly because of extreme rainfall, droughts, extreme low and high temperature and unpredicted storms. All these impacts would

exacerbate the economic performance of the world, and resultantly, it will engage states in billions of dollars of loss (Bank, 2019) (Paul Cashin, 2016).

Australia and New Zealand both experiences hot and dry summers, which increase the severity and frequency of bush fires, and a huge drop in wheat export which, consequently, reduces the GDP of the country. Due to this phenomenon, not only were these countries affected, but wheat and other prices commodities escalated globally. South Asia is also a victim of El Nino conditions where pre-monsoon and sudden rain have printed its devastating impacts in Pakistan, India and Bangladesh. In the case of Pakistan, leading Economists have said that "Over the past two decades, climate change in Pakistan resulted in a loss of more than half a per cent per unit of GDP (gross domestic product), resulting in $3.8 billion of annual economic losses."

Social Repercussions of El Nino and La Nina

Besides its economic loss, these conditions also have societal repercussions where it affects the livelihood, civic facilities, health, education, water, sanitation, agriculture, food security, and other sectors. All these sectors have a direct link to floods, disease, and malnutrition, which ultimately increase the mortality rate. According to the comprehensive report of the United Nations, "In Eastern and Southern Africa, some 50.2 million people are food insecure, many due to drought exacerbated by El Niño or due to a combination of drought and conflict. This number is expected to increase significantly towards the end of the year. Drought, flooding and extreme weather events caused by El Nino affect women and girls in particular ways which must be understood and incorporated into humanitarian and development interventions." Undoubtedly, El Nino and La Nina have severe social impacts in every field of life, which directly and indirectly influence the nature of life and lower or degrade the quality of life (Bank, 2019).

Political Ramifications of El Nino and La Nina

When socio-economic sectors would get affected, it would ultimately impact the political institutions of the states (Paul Cashin, 2016). Due to extreme weather temperatures, floods, droughts, or storms, masses would prompt to migrate from affected areas to stable ones. On that account, it will lead to mass migration, and it will impact the political activity of the state. Therefore, the confidence of folks in the state would be disturbed. Besides it, socio-economic problems and emerging challenges of the "El Nino and La Nina" emphatically create instability in destructive natural regions.

Possible Remedial Measures

The "El Nino and La Nina" are the two cooled and hot oceanic phenomenons resulting from the "interaction between the surface of the ocean and the atmosphere in the tropical Pacific" that are creating extreme and unusual changes in the global temperature, climate pattern, weather conditions, and causing the worst impact on the oceanic behaviour and affecting ecosystems around the globe. In order to combat or overcome this aggressive oceanic behavior, the following possible remedial measures are recommended to stop the "El Nino and La Nina" phases from occurring;

a. World environmental litigation
b. Global law for “El Nino and La Nina” mitigation
c. Global public awareness
d. Global political consensus to contain global warming
e. Hurricane-proof buildings and infrastructures all along the affected areas should be constructed.
f. Implementation of the Kyoto Protocol with its true letter and spirit
g. Legitimization of global weather conditions
h. The contributing factors of global warming must be curtailed by all the stakeholders.
i. The early prediction and detection of “El Nino and La Nina” through satellites and sea level analysis.

Conclusions

To conclude, the **“**El Nino-Southern Oscillation (ENSO) and La Nina" are oceanic phenomena

occurring due to the warm trade winds or easterlies blowing from east to west astride the equatorial. Pacific, because of the increase in the global warming system, is the major indicator of global climate change and weather conditions. The easterlies and ENSO system oscillate from normal to warmer and tends to increase the temperature high than normal, and La Nina decreases the temperature more down than usual in the Pacific Ocean, tending to upwell in the Pacific Ocean, resulting in high temperature, early winter, long summer and swear hurricanes in Pacific-Americas, more destructive tornadoes and cyclones affecting the South Asian countries with prolong and early monsoon and rise in the temperature than the normal. The "El Nino and La Nina" episodes are unusual oceanic behaviour coupling across the Pacific, affecting the marine system, ecosystem, and global weather conditions and causing climate change, heat, droughts and floods worldwide.

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