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Climate Change and Its Impact on Humans' Mental Health

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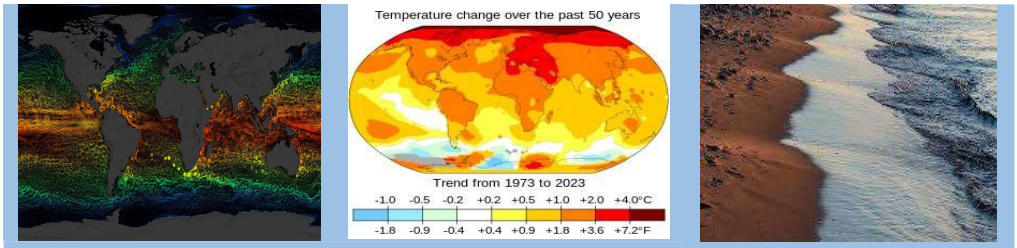
Abstract: Mixed documentary research data methodology including nominal, ordinal, discrete, and continuous data on climate change and its impacts on humans' mental health were reviewed; the Quantitative research method assessed 400 disaster-participating victims who faced natural disasters: floods, droughts and others' natural disasters in 1973-2024 from four provinces in each region of Thailand to their perceptions that creative the 36-item *Questionnaire on Climate Change and its Impacts on Human Mental Health* (CCIHMH) on six scales in five options. The disaster victims' attitudes were assessed using the 10-item *Attitudes Towards Raising Awareness and Consciousness of the Mental Health Impacts of Climate Change* (ARACMH) Inventory. Most of the questionnaires are valid and reliable. Associations between the participant's perceptions of their facing climate change and its impact on their mental health with their attitudes towards raising awareness and consciousness. Statistically significant with simple and multiple correlations, the regression (β) coefficient was associated. The R^2 value indicates that 48% of the variance in participants' facing climate change and its impact on the mental health of their ARACMH attitudes toward raising awareness and consciousness are attributable to their affecting association with the CCIHM scales. Climate change can have a significant impact on mental health: psychological distress, anxiety and depression, suicide, mental disorders, economic challenges, and migration. Suggestions that cause global climate change have affected the Solar and Sunspot Cycles indicate that 11.1 surrounding years: 4.8 years for floods and 6.2 years for droughts that the Dendrochronology of natural plants has recorded are associated, significantly.

Keywords: *Global warming, climate change, facing natural disasters, human mental health impacts, mixed research data methodology, solar and sunspot cycles, plants' Dendrochronology, and independent and dependent variables are associated*

Introduction

How do we know Climate Change is Real? There is unequivocal evidence that Earth is warming at an unprecedented rate. Human activity is the principal cause. Earth-orbiting satellites and new technologies have helped scientists see the big picture, collecting many different types of information about our planet and its climate all over the world. These data, collected over many years, reveal the signs and patterns of a changing climate. Our ocean is changing. With 70 percent of the planet covered in water, the seas are important drivers of the global climate. Yet increasing greenhouse gases from human activities are altering the ocean before our eyes. NASA and its partners are on a mission to find out more. Rising greenhouse gas concentrations not only warm the air but also the ocean, too. Research shows that around 90 percent of the excess heat from global warming is being absorbed by the ocean. Ocean heat has steadily risen since measurements began in 1955, breaking records in 2023. All this added heat has led to more frequent and intense marine heat waves. Global sea levels have risen more than 4 inches (101 millimeters) since measurements began in 1992, increasing coastal flooding in some places. As ocean water warms, it expands and takes up more space. The added heat in the air and ocean is also melting ice sheets and glaciers, which adds freshwater to the ocean and further raises sea levels. The Surface Water and Ocean Topography (SWOT) mission, launched in 2022, and Sentinel 6 Michael Freilich, launched in 2020, are providing unparalleled views of sea level rise on top of decades of data from other missions (National Aeronautics and Space Administration (NASA), 2024).



a) The Ocean is changing b) The Ocean is warming c) Sea levels are rising

Figure Caption 1: The Ocean is changing and warming, and Sea levels are rising
Source: National Aeronautics and Space Administration (NASA) (2024)

Earth's climate system

This is a basic primer on the components of Earth's climate and how and why they are important. It is aimed primarily at humans who are relatively new to the subject and who wish to find more. Too frequently, whether by intent or by mistake, the term 'global warming' is only applied to a subset of a single part of that system, namely the surface temperature record of Earth's atmosphere (National Aeronautics and Space Administration (NASA, 2024). The global climate system arises from the interaction of 5 systems interacting together. There's a lot more to the climate than that: it is a complex system with several key components to understand our climate and how it is changing, humans need to understand these 5 systems: The atmosphere (the thin layer of gases surrounding the Earth); the lithosphere (the land surfaces such as soil and rocks, and human-made surfaces such as roads and buildings); the hydrosphere (the Earth's liquid water in oceans, rivers, lakes, and underground), The cryosphere (the frozen water in ice and snow); and the biosphere (the living things such as plants and animals including humans). All components of the climate system are affected by the increase in the energy imbalance caused by rising greenhouse gas concentrations resulting from burning fossil fuels: rising atmospheric and oceanic temperatures, reductions in polar and glacial ice, thaw of ancient permafrost, migrations of species as their favored climatic zones move pole-wards all being examples with a common cause. Therefore, it is unwise to just look at surface air temperatures when discussing global warming: they are just a part of the multi-component system that is Earth's warming climate.

Earth's warming climate

Global warming occurs when carbon dioxide (CO_2) and other air pollutants collect in the atmosphere and absorb sunlight and solar radiation that have bounced off the earth's surface. Normally this radiation would escape into space, but these pollutants, which can last for years to centuries in the atmosphere, trap the heat and cause the planet to get hotter. These heat-trapping pollutants—specifically carbon dioxide, methane, nitrous oxide, water vapor, and synthetic fluorinated gases—are known as greenhouse gases, and their impact is called the greenhouse effect. Though natural cycles and fluctuations have caused the earth's climate to change several times over the last 800,000 years, our current era of global warming is directly attributable to human activity—specifically to our burning of fossil fuels such as coal, oil, gasoline, and natural gas, which results in the greenhouse effect. Since 1981, however, the rate of increase has more than doubled: For the last 40 years, we've seen the global annual temperature rise by 0.18 degrees Celsius, or 0.32 degrees Fahrenheit, per decade (MacMillan, 2021).

Earth's weather and climate

Weather on Earth is caused by heat from the sun and the movement of the air. All weather happens in the lower layer of Earth's atmosphere, a layer of gases surrounding Earth. The sun's heat warms the air in this layer to different temperature levels in different places. Weather includes factors, such as temperature, wind, rain, clouds, atmospheric pressure, and humidity. These are observed or predicted over smaller regions, weather is influenced by the global climate system. The local weather that impacts our daily lives results from large global patterns caused by the interactions of solar radiation, Earth's large ocean, diverse landscapes, and motion in space (National Oceanic and Atmospheric Administration, 2011).

Earth's climate system is a complex system with five interacting components: the atmosphere (air), the hydrosphere (water), the cryosphere (ice and permafrost), the lithosphere (earth's upper rocky layer), and the biosphere (living things). Long-term weather averages, variations, and extremes define climate. Local climates are influenced by their distance from the equator, elevation, distance from water bodies, vegetation, the presence or absence of mountains, and other geographical features. Climate is the statistical characterization of the climate system (Aiuppa et al., 2006). It represents the average weather, typically over 30 years, and is determined by combining processes, such as ocean currents and wind patterns (Barry & Hall-McKim, 2014). Circulation in the atmosphere and oceans transports heat from the tropical regions to regions that receive less energy from the Sun. Solar radiation is the main driving force for this circulation (Broeker, 1975). The water cycle also moves energy throughout the climate system. In addition, certain chemical elements are constantly moving between the components of the climate system. Two examples of these biochemical cycles (Brengtsson et al.' 2014).

Climate change

Climate change refers to long-term shifts in temperatures and weather patterns. Such shifts can be natural, due to changes in the sun's activity or large volcanic eruptions. Since the 1800s, human activities have been the main driver of climate change, primarily due to the burning of fossil fuels like coal, oil, and gas (United Nations, 2022). Climate change can also be used more broadly to include changes to the climate throughout Earth's history. IPCC AR5 SYR Glossary (2014) refers "Climate change refers to a change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and the variability of its properties and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcing such as modulations of the solar cycles, volcanic eruptions, and persistent

anthropogenic changes in the composition of the atmosphere or land use." (Intergovernmental Panel on Climate Change, 2014).

In common, climate change describes global warming, the ongoing increase in global average temperature, and its effects on Earth's climate system. The current rise in global average temperature is primarily caused by humans burning fossil fuels since the Industrial Revolution (Lynas, Houlton, & Perry, 2021). Fossil fuel use, deforestation, and agricultural and industrial practices add to greenhouse gases. These gases absorb some of the heat that the Earth is affected by radiation after it warms from sunlight, warming the lower atmosphere. Carbon dioxide, the primary greenhouse gas driving global warming, has grown by about 50% and is at levels unseen for millions of years (Arias et al., 2021).

Climate change and its impact on humans

Public debate about climate change has been strongly affected by climate change denial and misinformation, which originated and has since spread to other countries, particularly Canada and Australia. Climate change denial has originated from fossil fuel companies, industry groups, conservative think tanks, and contrarian scientists (Dunlap & McCright, 2011). People who hold unwarranted doubt about climate change are called climate change "skeptics", although "contrarians" or "deniers" are more appropriate terms (Oreskes & Conway, 2010). Climate change came to international public attention in the late 1980s. Due to media coverage in the early 1990s, people often confused climate change with other environmental issues like ozone depletion (Weart, 2020). In popular culture, the climate fiction movie The Day After Tomorrow (2004) and the Al Gore documentary An Inconvenient Truth (2006) focused on climate change (Myers et al., 2021).

Climate change and its impact on humans' mental health

Climate change is also having an impact on the mental health of people who haven't personally experienced climate-related disasters: more than two-thirds of U.S. adults (68%) have reported having at least some anxiety about climate change. Living through extreme weather such as a hurricane, wildfire, flood, or drought can be traumatizing. The destruction, loss, and displacement people experience can sometimes lead to an array of mental health problems, from anxiety and feelings of helplessness to depression, post-traumatic stress disorder (PTSD), and suicidal thoughts. As climate change continues to drive more extreme temperatures and worsening air pollution, the impact on mental health will likely continue to grow. Rising ambient temperatures have already been found to increase rates of mental health-related emergency department visits. Violent incidents and suicide attempts climb as temperatures rise. Similarly, long-term exposure to air pollution has been associated with elevated anxiety levels and even an increase in suicides (The Commonwealth Fund, 2023).

In this research study, creative documentary data research methodology was reviewed to the effects of climate change and its impact on human mental health directly or indirectly. Climate change is expected to affect physical health but is also likely to affect mental health. Increasing ambient temperatures is likely to increase rates of aggression and violent suicides, while prolonged droughts due to climate change can lead to a greater number of farmer suicides. Natural disasters otherwise can lead to impaired mental health and stress. Increased frequency of disasters with climate change can lead to post-traumatic stress disorder, adjustment disorder, and depression. Changes in climate and global warming may require the population to migrate, which can lead to acculturation stress: Droughts, Floods, Wildfires, Heavy Storms, Extreme Temperatures, etc., can also lead to increased rates of physical illnesses, which secondarily would be associated with psychological distress. The possible effects of mitigation measures on mental health are also discussed. The research concludes with a discussion of what can and should be done to tackle the expected mental health issues to be stressed and anxieties of human mind health by climate change, consequently.

Literature Reviews

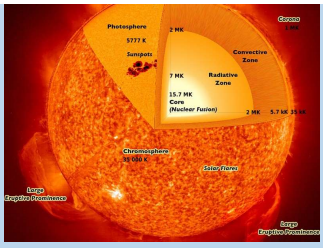
Research on climate change and its effects on human activities was designed using the Documentary Research Methodology was reviewed. Design for writing literature reviews is an important skill. Climate change is also having an impact on the mental health of people (68%). Elderly people living with existing mental health conditions are at greater risk for social isolation, limited social support, and poor living conditions that make them more susceptible to climate events (The Commonwealth Fund, 2023). We will design and plan to apply to pursue a research career in particular. We've made sense a step-by-step guide that we can follow below:

Sunspot circle its' impact on Earth

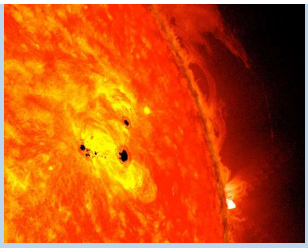
A typical star, the Sun has a diameter of approximately 865,000 miles (1,392,083 kilometers) (nearly 10 times larger than the diameter of Jupiter) and is composed primarily of hydrogen. The Sun's core is an astonishing 29,000,000 degrees F. (16,111,093 degrees C), while the pressure is about 100 billion times the atmospheric pressure here on Earth. Right now, about half the amount of hydrogen in the core of the Sun has been fused into helium. This took roughly 4.5 billion years to accomplish. When the hydrogen is exhausted, the Sun's temperature at the surface will begin to cool and the outer layers will expand outward to near the orbit of Mars. The Sun at this point will be a "red giant" and 10,000 times brighter than its present luminosity. After the red giant phase, the Sun will shrink to a white dwarf star (about the size of the Earth) and slowly cool for several billion more years (National Weather Service, 2019).

Sunspot Cycle: Global Climate Change Indicators

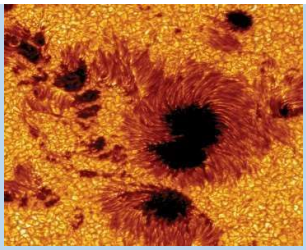
The surface of the Sun is a very active place. It has electrically charged gases that generate areas of powerful magnetic forces. These areas are called magnetic fields. This motion creates a lot of activity on the Sun's surface, called solar activity (Hardaway, 2014). Sunspots: One interesting aspect of the Sun is its sunspots. Sunspots are areas where the magnetic field is about 2,500 times stronger than Earth's, much higher than anywhere else on the Sun. The sunspots appear relatively dark because the surrounding surface of the Sun (the photosphere) is about 10,000 degrees F (5,538 degrees C), while the umbra is about 6,300 degrees F (3482 degrees C). Sunspots are quite large as an average size is about the same size as the Earth (Falls, 2020). Why are sunspots relatively cool? It's because they form in areas where magnetic fields are strong, particularly (NASA Science, 2021).



a) Solar Cycle & Current Sunspots



b) Sunspots and Solar Flares



c) Sunspot: Solar Flares, Magnetic Fields & Sunspots

Figure Caption 2: Sunspots, Coronal Mass Ejections, and their influence on Earth
Source: NASA Science (2021)

The NASA/Marshall Space Flight Center also shows the monthly averaged sunspot numbers based on the International Sunspot Number of all solar cycles dating back to 1750 (Daily observations of sunspots began in 1749 at the Zurich, Switzerland observatory).

The sunspot number is falling progressively below the sunspot number corresponding to the microwave flux, and the sunspot number will be rather useless as a measure of solar activity, so Hathaway will have to adjust the predicted sunspot number will be down, continuously, the next sunspot cycle would be 30% to 50% stronger than the previous one. If correct, the years ahead could produce a burst of solar activity second only to the historic Solar Max in 1958. The sun's conveyor belt is a current, not of water, but of electrically conducting gas. It flows in a loop from the sun's equator to the poles and back again. Specifically, it controls the sunspot cycle. Just as the Great Ocean Conveyor Belt controls weather on Earth, this solar conveyor belt controls weather on the sun. Specifically, it controls the sunspot cycle (Santiboon, 2012).

The prediction for solar cycle 24 gave a smoothed sunspot number maximum of about 69 in the late Summer of 2013. The smoothed sunspot number reached 68.9 in August 2013 so the official maximum was at least that high. The smoothed sunspot number rose again towards this second peak over the last five months of 2016 and surpassed the level of the first peak (66.9 in February 2012). Many cycles are double peaked but this is the first in which the second peak in sunspot number was larger than the first. The predicted and observed size made this the smallest sunspot cycle since cycle 14 which had a maximum of 64.2 in February of 1906. Roughly every 11 years, at the height of this cycle, the Sun's magnetic poles flip on Earth, that'd be like if the North and South Poles swapped places every decade and the Sun transitioned from sluggish to active and stormy.

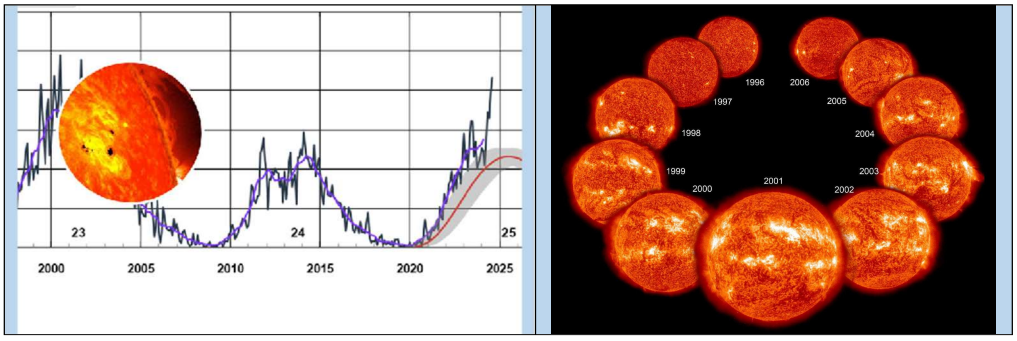


Figure Caption 3: Sunspot Cycle and Sunspot Activity Breaks 23-Year Record and Should be Impacted on Flood Maximum Climate in 2025-2026 (2021-2032)
Source: Jess Thomson (2023,

The sun has seen its most active month for over two decades, with a monthly average of 215.5 sunspots recorded in August 2023. We are currently in Sunspot Cycle 25, Sunspots are temporary, dark regions on the sun's surface caused by concentrated magnetic activity, which inhibits the flow of hot plasma and lowers their temperature compared to the surrounding areas. The sun's magnetic field becomes highly distorted during the solar maximum, creating more areas of intense magnetic activity and forming more sunspots (Thomson, 2023).

Sunspot cycle and its impact on climate change

The natural phenomena have a greater impact on climate change than humans and industrialization. Some studies indicate that sunspot activity overall has doubled in the last century. The apparent result on Earth is that the sun glows brighter by about 0.1 percent now than 100 years ago (Noss, 2009). According to NASA's Marshall Space Flight Center, consists of magnetized plasma flares and is linked to sunspots. It emanates from the sun and influences galactic rays that may affect atmospheric phenomena on Earth. But scientists are learning about phenomena like sunspots and solar wind, some

of which are visible to humans on Earth in the form of Aurora Borealis and other far-flung interplanetary light shows. Many climate scientists agree that sunspots and solar wind could be playing a role in climate change (Harring, 2020).

Solar Cycle

Solar cycles have an average duration of about 11 years. Solar maximum and solar minimum refer to periods of maximum and minimum sunspot counts. Cycles span from one minimum to the next. The solar cycle, also known as the solar magnetic activity cycle, sunspot cycle, or Schwabe cycle, is a nearly periodic 11-year change in the Sun's activity measured in terms of variations in the number of observed sunspots on the Sun's surface. Throughout a solar cycle, levels of solar radiation and ejection of solar material, the number and size of sunspots, solar flares, and coronal loops all exhibit a synchronized fluctuation from a period of minimum activity to a period of a maximum activity back to a period of minimum activity (BBC Sky at Night Magazine, 2024).

The researchers at NASA and the world advance our solar activity models to help improve those forecasts. Solar cycle forecasts give us a sense of how stormy the Sun will be over the next 11 years and how much radiation spacecraft and astronauts may face during heavy bouts of solar activity. NASA captured the first moments of a solar flare, seen as the bright spot on the left of the Sun, at six different wavelengths (NASA Science, 2021). The solar cycle lasted 11.3 years, beginning in February 1755 and ending in June 1766. The maximum smoothed sunspot number observed during the solar cycle was 144.1 (June 1761), and the starting minimum was 14.0. Johann Rudolf Wolf defined the list of numbered solar cycles, consequently (Kane, 2002).

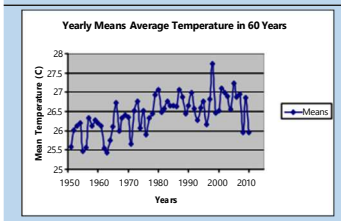
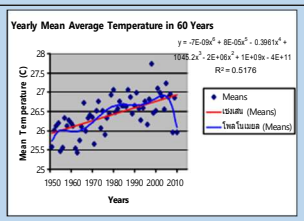
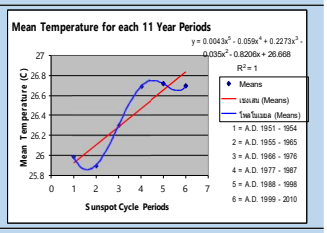
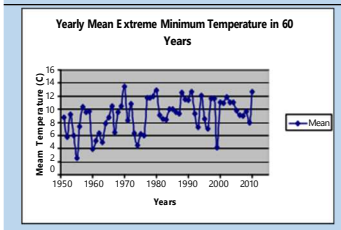
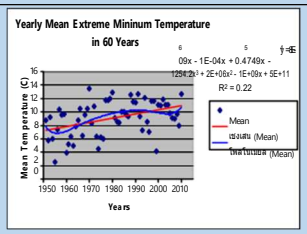
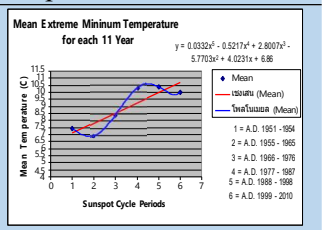
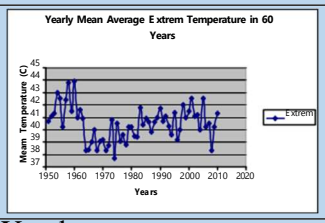
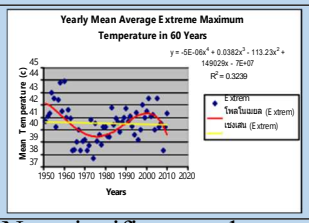
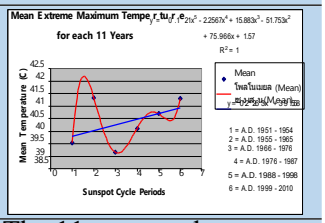
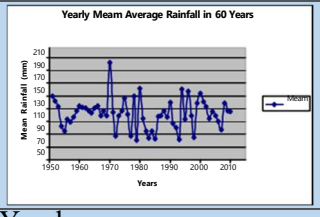
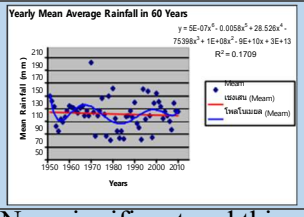
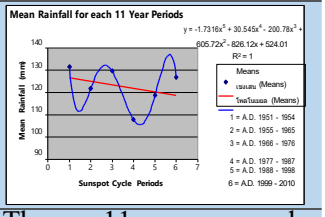
Solar Cycle and its impact on the climate on Earth

Both long-term and short-term variations in solar activity are proposed to indicate the potential effect of global climate, but it has proven challenging to show any link between solar variation and climate (Haigh, 2012). The solar cycle variation of 0.1% has small but detectable effects on the Earth's climate. Camp and Tung (2007) suggest that solar irradiance correlates with a variation of 0.18 K ±0.08 K (0.32 °F ±0.14 °F) in measured average global temperature between solar maximum and minimum. Other effects include a study that found a relationship with wheat prices and another one that found a weak correlation with the flow of water in the Paraná River (Ananthaswamy, 2008). Eleven-year cycles have been found in tree-ring thicknesses and layers at the bottom of a lake hundreds of millions of years ago (Li et al., 2018).

The current scientific consensus on climate change is that solar variations only play a marginal role in driving global climate change since the measured magnitude of recent solar variation is much smaller than the forcing due to greenhouse gases (Haigh, 2012). Also, average solar activity in the 2010s was no higher than in the 1950s, average global temperatures had risen markedly over that period low (Forster et al., 2007). In 1974, the Sun's solar wind and, in turn, Earth's weather, culminating in multiple catastrophes on March 10, 1982, were none of the occurring catastrophes. In 2023, Cionco et al. (2023) reported the hypothesis that tidal forces on the Sun are related to the modulations of the solar-activity cycle gained increasing attention and would provide a periodicity of ≈11.0 years able to synchronize the operation of the solar dynamo with these planetary configurations.

Effects of sunspot cycle and its impacts on the weather changes in Thailand

Santiboon studied and reported the associations between the plants' dendrochronology and the sunspot cycle determining the effects of global warming on climate change in 30 years (1979-2008) and the effects of global warming on climate change in Udon Thani province in 60 surrounding years (1951-2010). The results are shown in Figure Cation 4.

Modeling the Weather of Udon Thani in 60 Surrounding Years (A.D. 1951 – 2010)	*Associations Graphics of the Weather of Udon Thani in 1951 – 2010*	*Graphics of the Weather of Udon Thani in 1951 – 2010 for every 11 Years of the Sunspot Cycle Times*
		
Yearly mean average temperature	Multivariate analysis is non-significant and this temperature rise is an unequivocal certainty	Multivariate analysis is significant and is the 11-year cycle running mean of increasing temperature.
		
Yearly mean average extreme minimum extreme temperature	Non-significant and minimum extreme temperature increase unequivocal certainty	The 11-year cycle running mean of minimum extreme temperature increasing rainfall significantly
		
Yearly mean average maximum extreme temperature	Non-significant and maximum extreme temperature increase unequivocal certainty	The 11-year cycle running mean of maximum extreme temperature increasing rainfall significantly
		
Yearly mean average rainfall	Non-significant and this rainfall decreases unequivocal certainty	The 11-year cycle running mean of decreasing rainfall significantly

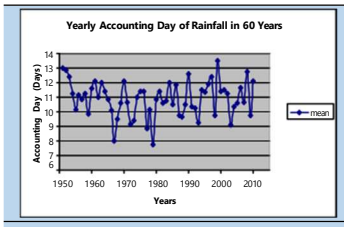
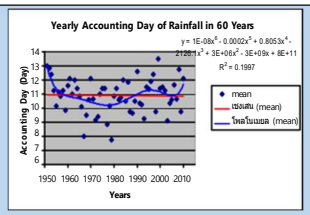
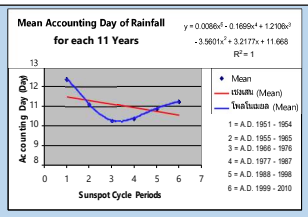
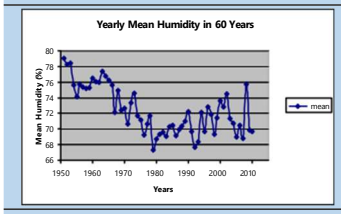
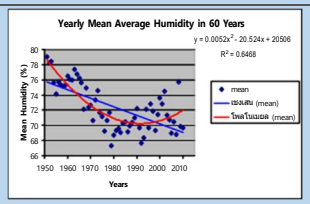
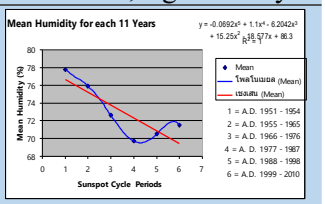
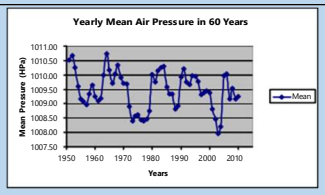
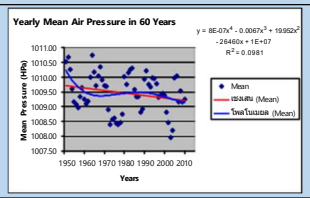
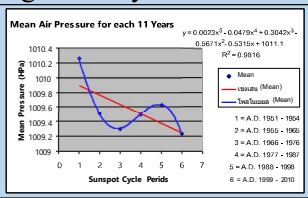
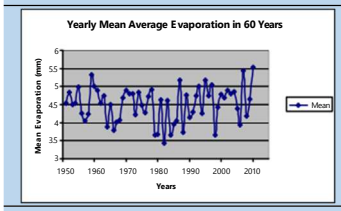
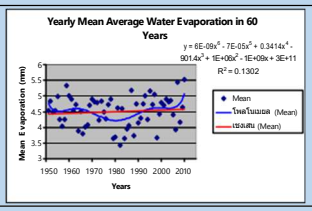
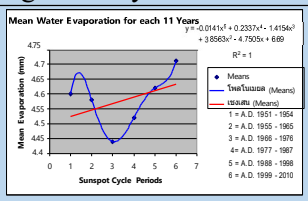
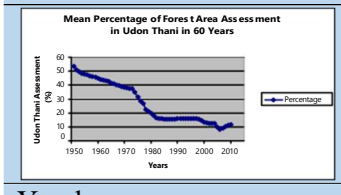
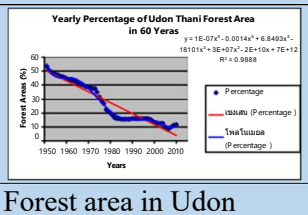
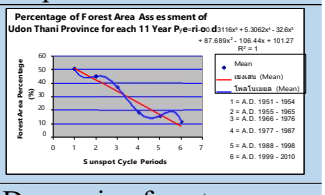
		
Yearly mean average accounting day rainfall	Accounting days of rainfall decreases unequivocal certainty	The 11-year cycle running means of decreasing days accounts for rainfall, significantly
		
Yearly mean average humidity	Humidity decreases unequivocal certainty	The 11-year cycle running mean of decreasing humidity significantly
		
Yearly mean average air pressure	Air pressure decreases unequivocal certainty	The 11-year cycle running mean of decreasing air pressure significantly
		
Yearly mean average water evaporation	Water evaporation rise is an unequivocal certainty	The 11-year cycle running mean of increasing water evaporation.
		
Yearly mean average forest assessment area in Udon Thani	Forest area in Udon Thani decreases unequivocal certainty	Decreasing forest assessment area in Udon Thani significantly

Figure Caption 4: Modeling and Graphs of the Weather in Udon in 60 Surrounding Years (Colum 1-2), and Graphs for each 11-Years of Sunspot Cycle Period Times

Source: Toansakul T. Santiboon (2015)

The models and graphics shown in Figure Caption 5 have confirmed the influence of climate change on Earth based on the accounting increase or decrease in sunspot cycle every 11.1, 22.2, and 44.4 years, the impact of natural disasters on humanity, and other impacts recorded by tree year rings. The fact indicators of solar and sunspot cycles are of global climate change on the Earth is valid and reliable. Most of the natural disaster phenomena effects are impacted such as floods, droughts, numbering cyclone storms, the greenhouse effect, or the El Niño and La Niña phenomenon, etc., These natural disasters have been recorded by the Dendrochronology with the Sunspot Cycles are associated, significant. Figure caption 4 indicates that the determinants of 60 surrounding years of Udon Thani's climatological changes are affected by increases in temperature, minimum extreme temperatures, and evaporation of water. Weather characteristically decreasing in rainfall and accounting rainfall cycles, number of cyclone storms, and dry humidity, forest assessment was found.

Climate change in Thailand

Since the 20th century, climate change has caused temperatures in Thailand to increase. Thailand is considered highly vulnerable to the effects of climate change. Extreme heat and rising sea levels threaten parts of Thailand, including the capital city of Bangkok. Thailand's long coastlines, fragile agriculture system, and susceptibility to extreme weather events make it vulnerable to the effects of climate change. Thailand has led to significant demand for energy (Climate Change Adaptation, 2021). Erosion is considered a major problem due to climate change within the country. As a signatory to the 2015 Paris Agreement, the Thai government has committed to a nationally determined contribution to reduce its annual greenhouse gas emissions by 20–25% by 2030. The treaty covers climate change mitigation, adaptation, and finance. The Paris Agreement was negotiated by 196 parties at the 2015 United Nations Climate Change (Marks, 2011).

Thailand's Department of Meteorology reported that temperatures have increased in Thailand over the past half-century, though there is some variability in their assessments, the annual mean temperature in Thailand rose by one degree Celsius from 1981 to 2007. Average annual temperatures in Thailand increased by 0.95 °C between 1955 and 2009, more than the average world temperature increase of 0.69 °C (World Bank Group, 2021). The annual highest temperature has increased by 0.86 °C and the annual lowest temperature has decreased by 1.45 °C over the past 55 years. From 1993 to 2008, the sea level in the Gulf of Thailand has risen 3–5 mm per year, compared to the global average of 1.7 mm per year (The Center for Excellence in Disaster Management and Humanitarian Assistance (CFE-DM), 2018). The visible effects of climate change now include severe droughts, water shortages, intense fires, rising sea levels, flooding, melting polar ice caps, massive storms, loss of biodiversity, and more.

Heat effects

Climate change has led to about 1.8° F (1° C) of average global warming so far. The world records increasing extreme heat events and record-high temperatures (Robinson et al, 2021). In April 2024, the heat low-pressure cell covered upper Thailand areas throughout the month, causing warmer air and hotter weather. Particularly at the end of the month, the scorching heat affected the Northern, Northeastern, Upper Central, and Upper Eastern parts, with several places recording new highest temperatures. The average temperature was above normal nationwide, especially in the Northeastern part where temperatures were 3.8°C higher than normal, and the monthly mean temperature in Thailand was 2.6°C above normal. The highest temperature in 2024 was recorded in Lampang at 44.2°C, nearing the national record of 44.6°C. The heat has also driven power consumption to a record peak of 36,477.8 megawatts on 30 April 2024. The Ministry of Public Health reported

approximately 30 heat-related fatalities nationwide due to the extreme temperatures (Thai Meteorological Department, 2024).

Flood and Drought Risk 2024 in Thailand

Climate change is worsening floods, and droughts, reducing water quality, and posing an increasing threat to our health, according to a European Environment Agency (EEA) report published today (European Environment Agency, 2024). Thailand will move from El Niño to La Niña conditions over 2024, although the country will continue to feel the effects of El Niño through the first half of the year, the emergence of a monsoon trough in 2023 means that reservoirs are currently close to their historical average (Sowcharoensuk, 2024). Protecting human lives and health from the impacts of climate change, including droughts, floods, and worsened water quality is of utmost importance and urgency. People's exposure to weather extremes, with serious health consequences. Senior citizens, children, those in poor health, lower income groups, farmers, and emergency service teams are among the groups experiencing the greatest health impacts from floods, droughts, wildfires, or water- and vector-borne diseases (Ylä-Mononen, 2024).

Flood Risk in Thailand

Thailand suffers from an annual monsoon season from July to October. Although floods are common nationwide, authorities say this year has been the worst in decades. In 2024, The floods were exacerbated by Typhoon Yagi, which rampaged through Thailand and other Southeast Asian countries in mid-September. Upwards of 150,000 families have been affected by the floods in Thailand, with 46 killed, according to the Disaster Prevention and Mitigation Department. It triggered severe flash floods and mudslides over the Northern Region. As a result of heavy rainfall since August, land turned into saturated soil. Thus, when the heavy storm from the Yagi Typhoon hit the region, it caused extreme flooding. Flooding and extreme events happen in Vietnam, the Philippines, Laos, and Myanmar. In Chiang Mai and Chiang Rai, floods have intensified in recent days. Direct daily train service between Bangkok and Chiang Mai was temporarily affected by a landslide, while roads were flooded. Economically, the floods could cause Thailand up to $176 million in damages, Thailand's Chamber of Commerce has estimated (Walker, 2024) (Figure Caption 5).

Flooding in Thailand maroons thousands in the Northern Province
Source: Thepgumpanat & Setboonsarng (2024)

Thailand: Nearly 1 million people hit by floods to hasten warning system upgrade
Source: Khaosod English (2024)

Mental health support was provided following flooding in flooded
Source: Thai PBS World (2024)

Figure Caption 5: Flooding in Thailand, nearly 1 million people hit by floods to hasten warning system that its' impact on human's mental health

The Mental Health Department has dispatched assessment and treatment teams to Chiang Rai province, to support people affected by the ongoing flooding and its aftermath. Information collected by the Mental Health Crisis Assessment and Treatment Team (MCATT) on September 11 and 12, from 3,081 people in 15 shelters, as well as those remaining in their homes, showed no signs of depression or thoughts of self-harm. However, 402 people are at risk of developing mental health issues, while 217 others are experiencing medium to high levels of stress. Chiang Rai suffered the most casualties and damage among the Human Northern Provinces hit by the flooding, with ten killed, 133 injured, and more than 24,000 households affected (Thai PBS World, 2024).

Droughts Risk in Thailand

Increases in infectious diseases can be a direct consequence of drought. Viruses, protozoa, and bacteria can pollute groundwater and surface water, accounting for rainfall decreases. People who drink water from private wells may be at higher risk for drought-related infectious diseases. Drought health impacts water, food and nutrition, air quality, sanitation and hygiene, recreational risks, infectious disease, chronic disease, and diseases transmitted by insects and animals (Centers for Disease Control and Prevention (CDC), 2024). Thailand's changing climate patterns have led to instability and challenges to the people and the infrastructure. Drought is caused by irregular rainfall and has become a significant issue in Thailand in 2004, 2015, and 2021. The Central Plain has no large water reservoirs and must rely on dams in the country's lower Northern region for water. Due to the long periods of droughts each year this has led to a decrease in the amount of water flowing into the dams.

Figure Cation 6: The Trifecta of Drought: Monitoring Three Types in Thailand in 2015 Source: McCartney, Source: Suksangpanya, & Supunyachotsakul (2015)

On the other hand, Thailand also faces a flooding crisis, with many regions facing lengthy heavy rainfall. This has led to agricultural and livestock damage effects on people's health (Guest, 2021).

Climate Change and its Impact on Human Mental Health in Thailand

Since the 20th century, climate change has caused temperatures in Thailand to increase. Thailand is considered highly vulnerable to the effects of climate change. Climate-induced health hazards are increasingly evident and frequent, with mental health emerging as a critical concern. The extreme heat and rising sea levels threaten parts of Thailand, including the capital city of Bangkok. Erosion is considered a major problem due to climate change within the country. High average monthly temperatures exceeding 30°C and exposure to floods or droughts elevate the risk of mental health challenges. With these risks, a holistic approach integrating Sustainable Development Goals and mental health initiatives is essential (Hausfather & Peters, 2020). There was a research analysis on mental health morbidity from 2018 to 2022, high average monthly temperatures exceeding 30°C and exposure to floods or droughts elevate the risk of mental health challenges. A holistic approach integrating Sustainable Development Goals and mental health initiatives is essential. This approach should prioritize understanding the impacts of climate change on the environment and human health challenges related to climate variability in Northeastern Thailand (Wongpanarak & Langkulsen, 2024).

This research study was focused on climate change and its impact on human mental health in Thai people including droughts otherwise can lead to impaired mental health and stress. Increased frequency of disasters with climate change can lead to post-traumatic stress disorder, adjustment disorder, and depression. Global warming may require the population to migrate, which leads to acculturation stress. Designing the Documentary Data Research Methodology was reviewed, and the Quantitative data Research Method assessed the natural disaster victims' perceptions and their attitudes who would be responses of their impacts to their attitudes toward their natural disaster victims the climate change, significantly.

Methodology

Data documentation is not a one-time requirement or retrospective task, but rather an active and ongoing process throughout a research project. The two most common types of documentation used in research are note citations and parenthetical citations to explore various data and types of data, we'll come across four main categories: nominal, ordinal, discrete, and continuous data were described on climate change and its impacts on humans' mental health.

Research objective documentary data research methodology

1. To understand global environmental change and how it will impact nature and society was reviewed with the documentary data research methodology.
2. To tackle the expected mental health issues of climate change that impact a discussion of what can and should be done and supporting humans' mental health
3. To assess the perceptions of the humans' mental health who used to be risked and affected by climate change in many situations in the last five years and their attitudes to the facing and recurring problems that impact climate change.

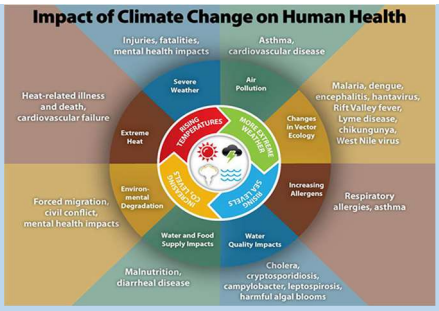
Research procedures

Designing a documentary data research methodology

The visible effects of climate change now include severe droughts, water shortages, intense fires, rising sea levels, flooding, melting polar ice caps, massive storms, loss of biodiversity, and more. The mechanics of citing sources will vary from style to style, but two primary methods are parenthetical (in-text) references and notes. Although most documentation styles provide guidelines for in-text references and notes, each is generally identified with one or the other.

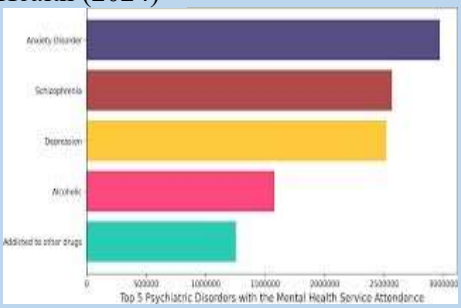
Nominal data on climate change and its impact on humans' mental health

Increased frequency of disasters with climate change can lead to post-traumatic stress disorder, adjustment disorder, and depression. The possible effects of mitigation measures on mental health are also discussed.



a) Impacts of Climate Change on Human Health
Source: CDC Climate Effects on Health (2024)

b) Why does Thailand rank ninth for the risk of harmful effects from climate change?
Source: Government of Thailand (2023)



c) Statistics on the effects of natural disasters on the mental health of Thai people
Source: Rotejanaprasert et al., (2024)

d) Climate Change and Mental Health
Source: Climate Central (2022)

Figure Caption 7: Ordinal data on climate change and its impact on humans' mental health

Figure Caption 7(a) was reported by the National Environmental Public Health Tracking Network about extreme weather events, extreme heat, drought & air quality, emergency response, mosquito-borne disease, and water-related disease factors that are Impacts of Climate Change on human mental Health (CDC Climate Effects on Health, 2024). Thailand was ranked 24th in the global rankings, with greenhouse gas emissions of 258 million tons of carbon dioxide (equal to 0.76%). Even though Thailand is a small country that creates less than 1% of the harmful pollutants, it was ranked ninth among the countries that would suffer from the effects (Figure Caption (b)) (National Oceanic and Atmospheric Administration, 2024). The impact of floods on mental health problems found that mental health problems from the impact of floods accounted for 13.46%, with symptoms including insomnia at 34.88%, headaches in the temples and back of the head, and dizziness at 27.9%. It can be seen that when floods occur, people are affected, especially mentally.

Therefore, it is necessary to study mental health problems after floods (Figure Caption 7c). Up to 54% of adults and 45% of children suffer depression after a disaster, according to the World Public Health Association, and climate impacts on others can contribute to widespread climate anxiety, with 70% of humans feeling at least "somewhat worried" about global warming (Figure Caption 7d).

Ordinal data on climate change and its impact on humans' mental health

World Health Organization (2016) reviewed and analyzed climate change and health activities in Thailand that the earth's climate is changing rapidly, mainly due to human activities (IPCC 2014). Increasing temperatures, changing precipitation patterns, increases in the frequency and intensity of extreme events, and sea level rise are expected to increase a range of health risks. Risks include the

direct effects of heatwaves, floods, and storms; increasing the suitability of conditions for the transmission of various of infectious diseases; and impacts on the natural systems and socioeconomic sectors that ultimately underpin human health.

The health of Thais has improved in recent decades, with chronic diseases now the leading causes of death. In 2012, the top five leading causes of death were ischemic heart disease (13.7% of all deaths); stroke (10.3%); lower respiratory infections (9.4%); road injuries (5%); and chronic obstructive pulmonary disease (COPD) (4.7%). Cardiovascular disease and diabetes combined are the leading cause of disability-adjusted life years lost. Annex 2 shows the WHO Statistical Profile for Thailand. Public health agencies under the provincial administration are the Provincial Public Health Offices, hospitals under the Ministry of Publish Health, District Health Offices, and health centers. Each Provincial Public Health Office reports to the provincial governor. All hospitals and health centers have primary care units or community health centers for health service delivery. In 2010, there were 311 primary care units, 9,768 subdistrict health centers, 48,049 community primary healthcare centers, and 1039**,**729 village health volunteers**.**

The 13th National Economic and Social Development Plan (2023-2027) is a second-level plan that acts as a key mechanism to translate the National Strategy into implementation and serves as a framework for the third-level formulation plans to enable relevant development partners to function in support of achieving. The 13th NESDP strategy policy supports people's mental health affected by climate change on Goal 13: Take urgent action to combat climate change and its impacts: Thailand has submitted its Nationally Determined Contribution (NDC) proposal to the UNFCCC Secretariat, setting a minimum GHG emission reduction target of 20 percent above business-as-usual, and a maximum target of 25 percent above business-as-usual by 2030.

The Climate Change Master Plan 2015–2050, and the National Climate Change Adaptation Plan (NAP). Thailand is also studying the development of Thailand’s Long-Term Low Greenhouse Gas Emission Development Strategy. In monitoring Thailand’s GHG reduction results, it was found that Thailand was able to reduce its GHG emissions by not less than 14 percent, or a total reduction of 51.72 million tons of carbon dioxide equivalent (MtCO2eq), in 2020, which has achieved the target of the Master Plan in the first phase. and the minimum targets set in the NDC will likely be achieved by 2030 (Figure Caption 8).

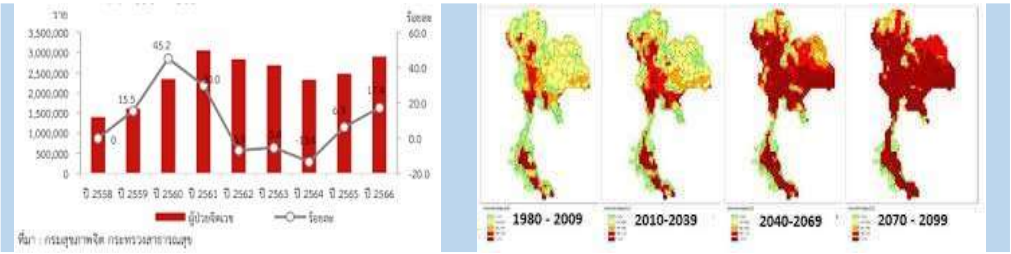


Figure Caption 8: Review of Climate Change in Thailand and its impact on mental health

Source: Health Impact Assessment Division: Department of Health, Ministry of Public Health (2024)

As reported in Figure Caption 8, the National Economic and Social Development Board (NESDB) stated that mental health problems in Thai society are still on the rise due to various factors that affect each age group to face different mental problems, causing damage to both themselves and people in the surrounding society and may lead to enormous economic losses. Mental health problems in Thailand are much more severe than the number of patients seen. 7 out of 10 Bangkokians experience burnout at work, and data from the Department of Mental Health's 1323 hotline in 2023 found that working-age people requested services for stress, anxiety, and unhappiness at work, up to

5,989 calls out of a total of 8,009 calls. Thai people have higher mental health problems than the world average due to the influence and impact of natural disasters that change all the time. The winter season is also short, and the cold-weather plants that are planted do not grow and wither and die, resulting in accumulated mental stress and no income to support the family, further increasing poverty and causing overwhelming debts to the point where many people have to take their own lives (Health Impact Assessment Division, 2024).

Discrete data on climate change and its impact on humans' mental health

Climate change may affect mental health. We conducted an umbrella review of meta-analyses examining the association between mental health and climate events related to climate change, pollution, and green spaces. We searched major bibliographic databases and included meta-analyses. The meta-analyses on climate events suggested an increased prevalence of symptoms of post-traumatic stress, depression, and anxiety associated with exposure to various types of climate events, an association between climate events and mental health, and some evidence for an association between pollution and mental disorders. More high-quality research is needed to verify these associations (Cionco et al., 2023).

Continuous data on climate change and its impacts on humans' mental health

Continuous data embodies information that assumes some value within a defined range or interval. It's typically measured on a continuous scale such as time, temperature, or distance to apply various techniques, including calculating summary statistics and visualizing data with histograms, scatterplots, or line charts to identify trends and relationships. The consequences of climate change on exposed biological subjects, as vulnerable societies, and a concern for the entire scientific community. Rising temperatures, heat waves, floods, tornadoes, hurricanes, droughts, fires, loss of forest, and glaciers, along with the disappearance of rivers and desertification, can directly and indirectly cause human pathologies that are physical and mental. However, there is a clear lack of psychiatric studies on mental disorders linked to climate change in different geographical areas and with different types of threats to public health (Cianconi, Betro, & Luigi, 2020).

Tragedy and disaster in Thailand

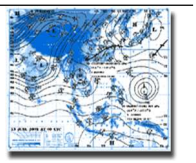
Natural disasters that are not directly caused by human activities are classified according to their causes as follows:

Flood: Water-related disaster

Flood: An overflow of water onto normally dry land. A dry area is caused by rising water in an existing waterway, such as a river, stream, or drainage ditch. Ponding of water at or near the point where the rain fell. Flooding is a longer-term event than flash flooding: it may last days or weeks. Table 1 reports the natural disasters caused by floods disasters: caused by water, such as floods, and flash floods in Thailand.

Table 1: The natural disasters caused by floods disasters: caused by water, such as floods, and flash floods in Thailand

Date	*The event occurred*	*Area*	*Number of deaths*	*Cause/Factor*
August 20 - November 30, 1983	It was one of the most severe	42 Provinces in the North, Northeast,	Damage: 49 Persons, 697 houses were	2 Tropical depressions:

(occurring in mid-late 1983).	flooding events in Thailand	East, Central, and Bangkok.	completely damaged, 2,970 houses were partially damaged, 352,016 people in 108,762 households were affected, and 10,601 people were evacuated.	Herbert and Kim. 
September 25, 1994	Wang Takrai Flood	Wang Takrai National Park, Nakhon Nayok Province	A tragedy that will never be forgotten: The flood in 1994 took the lives of 21 people.	
August 6, - November 15, 1995	Floods in Thailand 1995	68 provinces, and 585 districts in the North, Northeast, East, Central, and South.	Damage: 260 deaths, 4,500,000 people affected.	Tropical Depression Olis.
June 13-17, 2004	Heavy rain in the Northeast and Lower North, caused flooding in many areas.	Northeastern and Northern regions, especially in the provinces have heavy and dense rain in many areas.	Water levels rose rapidly in mid-June due to heavy rains resulting from Tropical Depression Chantu.	
May 22-23, 2006	Flood and Mudslides in the Lower Northern Region	The affected areas include 5 provinces, 26 districts, 1 sub-district, 171 sub-districts, and 1,200 villages	Damage: 260 deaths Disaster victims found that the prevalence of mental illnesses and psychiatric disorders decreased, including post-traumatic stress disorder, suicide risk, and other mental health problems/disorders by 9.08 percent.	 
October - December 2010	Floods in Thailand 2010	The flooding in Thailand is the worst in	39 provinces, 425 districts, 3,098 sub-districts,	The cause is the influence of a low-

		decades due to heavy rain in many areas. Agricultural areas are estimated to be damaged: 7,784,368 rai	26,226 villages, 2,002,961 households, or 7,038,248 people have been affected. 181 people have died.	pressure trough passing through the upper southern, central, and eastern regions.
July 25, 2011 – January 16, 2012	Floods in Thailand 2011: The Great Flood was a severe flood that affected the Chao Phraya River Basin and the Mekong River Basin.	Number of disaster-affected areas: 77 provinces, 87 districts, 6,670 sub-districts. 4,086,138 households or 13,595,192 people were affected. 2,329 houses were damaged and 96,833 homes were partially damaged.	More than 12.8 million people were affected, with the World Bank estimating the damage at 1.44 trillion baht. Quality of life, stress, and depression in the elderly affected by the 2011 floods	
August 2024	Floods in Thailand 2024	Flash floods and landslides hit several provinces	In area 19 provinces, 43,535 households 45 people died	Southwest monsoon

Source: Meteorological Department of Thailand (2024)

Table 1 shows the significance of the flood disaster occurrence that the Meteorological Department of Thailand, reported the flood occurrence since 1983. It was found that the severe flood will have a cyclical interval of approximately every 10-12 years, such as from 1983, 1994-1995, 2005-2006, 2016-2017, etc., which is consistent with the research of Santiboon (2011, 2012, and 2015). The cycle of such events will be recorded by tree-year rings associated with the accounting sunspot cycles. The rain will increase every 4.8 years and gradually decrease to the lowest every 6.2 years. The indicator of each area depends on the latitude of the earth. Each line will have a disaster that is 15 days apart from the South Pole to the North Pole.

Data Collection Sources

Primary data sources: This is the raw original data collected by a researcher, using the research instrument to assess the participants' perceptions data questionnaires in mental health patients affected by climate change in Thailand, registered by the Department of Mental Health, Ministry of Public Health, aged 25 to 60 years, including parents of young children, and those who received or did not receive treatment but received assistance from organizations, were interviewed in-depth and audio-recorded to provide quantitative data for further analysis.

Secondary sources of information: This information has already been compiled by studying, researching, and synthesizing articles, textbooks, research, and various documents related to natural disasters from floods and droughts that lead to impaired mental health and stress. Increased frequency of disasters with climate change can lead to post-traumatic stress disorder, adjustment disorder, and depression in climate change and global warming may require the population to migrate, which can lead to acculturation stress.

Research instruments

The Questionnaire on Climate Change and its Impact on Human Mental Health (QCCHMH)

The 30-item *Questionnaire on Climate Change and its Impacts on Human Mental Health* (QCCIHMH) assessed the 400 participants on their perceptions of climate change and its impacts on human mental health in six scales: Severe Weather Changes Post-Traumatic Stress Disorder (PTSD); Climate Change Thinks Nobody can't Change Anything (TNCA), Climate Change is Thought to have an Impact on Daily Life (TIDL), Everyone has Experienced Depression after Experiencing a Severe Climate Change (EDES), and Ability to Cope with Stress, Anxiety Hopelessness (ACSAH), and Raising Awareness of Chronic Fear of Environmental Catastrophe (RAEC) scales. Each scale consists of six items in five rating scale options: Strongly Agree (5), Agree (4), Neither Agree Nor Disagree (3), Disagree (2), and Strongly Disagree (1).

The Attitudes Towards Raising Awareness and Conscious of the Mental Health Impacts of Climate Change (ARACMH) Inventory

The 10-item *Attitudes Towards Raising Awareness and Consciousness of the Mental Health Impacts of Climate Change* (ARACMH) Inventory assessed the 400 participants on their perceptions to raise awareness and consciousness of the mental health impacts of climate change by sharing their feelings with friends and family. The ARACMH) Inventory scale in five options: Always (5), Often (4), Sometimes (3), Seldom (2), and Never (1) rating scale levels.

Data Collection Sources

People's risk perceptions and related beliefs regarding (1) the likelihood of different risks occurring at different times and places and (2) collective (government) responsibility and personal efficacy in dealing with climate change, as well as (3) exploring how climate risk may be amplified when posed against individual health and well-being. Previous research on this topic has largely focused on one community or provincial environment. So, a unique characteristic of this study is the comparison the effects of climate change and its impact on the mental health of humans between four different environmental areas sites by their development and national wealth. Here, we collected 400 surveys from Chieng Mai (Northern Region), Maha Sarakham (Northeast Region), Ayutthaya (Central Region), and Phatthalung (Southern Region) Provinces when approaching ways to mitigate their risk against climate-related health and well-being impacts.

Data analysis

Documentary data methodology analysis was conducted and reviewed from 1952 to 2010 and 1983 to 2024 using centenary analysis, linked to the original organizations, trained by the Meteorologists at the Meteorology Centers in the USA, Australia, and Thailand which was obtained from documentary research and in-depth interviews, analyzed, synthesized, and presented descriptively. Statistical significances are associated with item means, standard deviation, variance, internal consistency (Cronbach alpha reliability) coefficient, grand means, F-test, simple and multiple

correlations, standardized regression weight validity coefficient, and Determination predictive (r-square) value coefficient statistics were analyzed.

Results

The Mixed Documentary Research Data Methodology was reviewed (in the head section: Literature Reviews), and the quantitative research data method was assessed and described. The results as reported in the sub-section, have the following research objectives focused on the natural disaster victims in Thailand.

Quantitative research data method

Creative the Questionnaire on Climate Change and its Impact on Human Mental Health (CCIHMH)

The 30-item *Questionnaire on Climate Change and its Impact on Human Mental Health* (CCIHMH) assessed the 400 participants' perceptions of climate change and its impacts on human mental health on six scales. The six scales of the CCIHMH are independent variables.

The Attitudes Towards Raising Awareness and Conscious of the Mental Health Impacts of Climate Change (ARACMH) Inventory

The 10-item Attitudes Towards Raising Awareness and Consciousness of the Mental Health Impacts of Climate Change (ARACMH) Inventory assessed the 400 participants on their perceptions to raise awareness and consciousness of the mental health impacts of climate change by sharing their feelings with friends and family. The ARACMH Inventory scale in five options: Never to Always levels. The totalized grand mean of the 10-item ARACMH is the dependent variable.

Validity and Reliability of the *CCIHMH and the ARACMH Inventory*

The 36-item Questionnaire on Public-Private Partnerships Interaction (CCIHMH) assessed the 400 participants' perceptions on six scales in five options (as detailed above). The results are shown in Table 2.

Table 2: Item means, Standard deviation, variance, α-reliability, grand means, and F-test for the CCIHMH

Scale	*Item mean*	*Standard deviation*	*Variance*	*α-reliability*	*Grand means*	*F-test*	*Sig.*
PTSD	19.975	3.059	9.360	0.753	3.329	3.023**	.010
TNCA	19.650	3.296	10.865	0.822	3.275	5.019***	.000
TIDL	19.465	3.117	9.718	0.769	3.244	6.625***	.000
EDES	19.857	3.374	11.386	0.819	3.316	8.700***	.000
ACSAH	20.010	3.098	9.599	0.768	3.335	5.948***	.000
RAEC	19.847	3.178	10.099	0.781	3.308	4.550***	.000
Total	118.800	16.535	273.434	0.950	3.300	5.374***	.000

*N=400, *p<.05, **p<.01, ***p<.001*

The internal consistency (Cronbach alpha reliability) coefficients are criteria by which researchers assess the measurement quality of research instruments' reliability and validity. that is, how closely related a set of 6-7 items are suitability. It is considered to be a measure of scale reliability (Taber, 2018). The accepted value of Cronbach's alpha; however, values of 0.6-0.7 (acceptable), and 0.7-0.8 values are also accepted (good, and acceptance), 0.8 and above is better, and 0.9 and above is best (Frost, 2022).

The results given in Table 2 show the scale item means (scoring minimum is 6.00 and the maximum is 36) ranged from 19.465 to 20.010, scale item standard deviation ranged from 3.098 to 3.374, variance values indicated from 9.599 to 11.386, and grand means ranged from 3.244 to 3.335, and an F-test statistic is significant at .05 ($p<.05$) in the six scales of the CCIHMH research instrument that the F-test of overall significance tests whether all of the predictor independent variables are jointly significant.

Table 3: Item means, Standard deviation, variance, α-reliability, grand means, and F-test for the ARACMH

Scale	*Item mean*	*Standard deviation*	*Variance*	*α-reliability*	*Grand means*	*F-test*	*Sig.*
ARACMH	36.970	3.998	15.984	0.732	3.397	3.498***	.000

*N=400, *p<.05, **p<.01, ***p<.001*

The results are reported in Table 3, the values of Cronbach alpha reliability ranged from 0.732 on the 10 items for the ARACMH scale.

On the whole, these results are acceptable for the CCIHMH in six scales and total scale, and the ARACMH questionnaires' producing guidelines, respectively. These are the two research instruments, which are valid and reliable.

Associations between the disaster victims' perceptions of their facing climate change and its impact on their mental health with their attitudes towards raising awareness and consciousness

In statistics, the simple correlation coefficient, r, tells us about the strength and direction of the linear relationship between the independent and dependent variables which describes the strength and direction of the relationship between two variables. A multiple correlation coefficient (R) yields the maximum degree of linear relationship obtained between independent variables and a single dependent variable. Standardized regression coefficients (β) allow researchers to compare the relative magnitude of the effects of different explanatory variables in the path model by adjusting the standard deviations such that all the variables, despite different units of measurement, have equal standard deviations. R-squared is used in various fields such as risk analysis in finance, marketing campaigns, scientific research, or economics. the standards for a good R-squared reading can be much higher, such as 0.7-0.9 or above. An F-test is any statistical test used to compare the variances of two samples or the ratio of variances between multiple samples. The test statistic, random variable F, is used to determine the F-statistic, which is simply a ratio of two variances. Associations between the disaster victims' perceptions of facing climate change and its impact on their mental health (six scales of the CCIHM: the independent variables) with their attitudes towards raising awareness and consciousness (grand means of the ARACMH: the dependent variable). The results are reported in Table 4.

In this study, for the 400 disaster victims who faced natural disasters: floods, and droughts from 1973 to 2024, the disaster victims' perceptions of their facing climate change and its impact on their mental health with their attitudes toward raising awareness and consciousness through their perceptions were associated.

Table 4: Simple correlation (r), Standardized regression weight (β), Multiple correlations (R), Determination predictive (R^2) value coefficient, and F-test for the ARACMH with the six CCIHM scales

Scale	*Simple correlation (r)*	*Standardized regression weight (β)*
Severe Weather Changes Post-Traumatic Stress Disorder (PTSD)	0.596***	0.229***
Climate Change Thinks Nobody Can't Change Anything (TNCA)	0.514***	0.145*
Climate Change is Thought to have an Impact on Daily Life (TIDL)	0.475***	0.140*
Everyone has Experienced Depression after Experiencing Severe Climate Change (EDES)	0.543***	0.154**
Ability to Cope with Stress, Anxiety Hopelessness (ACSAH)	0.573***	0.161**
Raising Awareness of Chronic Fear of Environmental Catastrophe (RAEC)	0.650***	0.409***
Multiple correlations (R) coefficient		0.690*
Determination predictive (R^2) value coefficient		0.476*
F-test		59.465***

*N=400, *p<.05, **p<.01, ***p<.001*

The simple correlation values (r) show statistically significant correlations (p<.001) on all scales. The second type of analysis consisted of the more conservative standardized regression coefficient (β) which measures the association between participants' perceptions on each scale of the CCIHM scales and the attitude scale of the ARACMH when the effect of relationships between the scales is scales controlled for significance (p<.05) all on scales. The multiple correlations, R are significant for the CCIHM and show that when the scales are considered together (R = 0.690) there is a significant (*p*<.05) association with the CCIHM scales. The R^2 value indicates that 48% of the variance in participants' facing climate change and its impact on the mental health of their ARACMH attitudes toward raising awareness and consciousness are attributable to their affecting association with the CCIHM scales. Statistics are analyzed on associations between the two variables indicating that the F-test of overall significance whether the regression model provides a better fit than a model, an F-test is more suitable when comparing means across multiple groups or factors, significantly (*p*<.001).

Discussion and/or Conclusion

This section should be used to provide an interpretation of the results of your study. Do not use any advanced Word features, such as automatic reference tools, drawing objects, automatic table of contents and table of indexes, bookmarks, background or font colors, highlighting, strike-through, embossing, etc. The final appearance of your article may differ to some extent from this submission. We all know that 2014 has been declared the hottest year globally. Climate change is a global challenge that is likely to affect mankind in substantial ways. Climate change is expected to affect physical health, it is likely to affect mental health. Increasing ambient temperatures increase rates of aggression and violent suicides, while prolonged droughts due to climate change can lead to a greater number of farmer suicides. Droughts otherwise can lead to impaired mental health and stress. Increased frequency

of disasters with climate change can lead to post-traumatic stress disorder, adjustment disorder, and depression. Climate Changes and global warming may require the population to migrate, which can lead to acculturation stress. It can also lead to increased rates of physical illnesses, which secondarily would be associated with psychological distress. The possible effects of mitigation measures on mental health are also discussed. The research study concludes with a discussion of what can and should be done to tackle the expected mental health issues of climate change, consequently.

People with underlying mental health conditions or substance use problems are at higher risk for death from increased heat and humidity. From 25 percent to 30 percent of people who are homeless have a severe mental health condition, and many also have poorly controlled chronic conditions that make them particularly vulnerable to the deleterious effects of climate change. Humans are also at higher risk. Mental health conditions are more prevalent among Black Americans than other groups, plus they are more likely to live in areas marked by elevated temperatures, air pollution, higher flood risks, and poor-quality housing, such as historically redlined areas. Indigenous communities, too, are highly susceptible, with many experiencing both the direct effects of climate change, in the form of extreme heat, drought, or floods, and indirect effects like food insecurity and loss of land. For indigenous people with deep connections to their land, loss or displacement from climate change can profoundly affect psychological well-being.

The phenomenology of the effects of climate change differs greatly—some mental disorders are common and others more specific about atypical climatic conditions. Moreover, climate change also affects different population groups who are directly exposed and more vulnerable in their geographical conditions, as well as a lack of access to resources, information, and protection. Perhaps it is also worth underlining that in some papers the connection between climatic events and mental disorders was described through the introduction of new terms, coined only recently: eco-anxiety, Eco guilt, ecopsychology, ecological grief, solar-otalgia, bio-spheric concern, etc. The effects of climate change can be direct or indirect, short-term or long-term. Acute events can act through mechanisms similar to that of traumatic stress, leading to well-understood psychopathological patterns. In addition, the consequences of exposure to extreme or prolonged weather-related events can also be delayed, encompassing disorders such as posttraumatic stress, or even transmitted to later generations.

UNICEF (2024) has reported that extreme temperatures pose critical challenges to children in Thailand and elsewhere, limiting outdoor activities, increasing their reliance on cooling methods, and disrupting education. Simultaneously, changing weather conditions including unexpected storms can cause damage to homes and infrastructure and prevent many children from accessing basic services. Heatwaves – which are made more likely by climate change - present a serious health threat to children, who struggle more than adults to regulate their body temperature. Greater exposure to heat waves raises the risk of various health issues such as chronic respiratory conditions, asthma, and cardiovascular diseases. Babies and young children are at greatest risk of heat-related mortality. In Thailand, the situation is particularly alarming. A significant majority of children experience the harsh realities of frequent heatwaves. Over 75% of children, approximately 10.3 million were affected by natural disasters in 2020 alone. Without intervention, it's forecast that every Thai child under 18 will face more frequent and prolonged heatwaves by 2050. Nearly 6 million children are affected as floods and landslides devastate Southeast Asia that effects in the wake of Typhoon Yagi. UNICEF is committed to working with partners to ensure child-focused recovery efforts when floodwaters have receded (UNICEF, 2024).

According to the latest IPCC reports, “Approximately 20–30% of those who live through heavy storms develop depression and post-traumatic stress disorder (PTSD) within the first few months following the event, with similar rates for people who have experienced flooding.” As Mental Health Awareness Month ends and the rainy season begins, people are focused on scientific insights and reporting resources around climate change and mental health. Links between climate change and mental health Climate change presents widespread risks to human health. A growing body of research provides evidence for climate change impacts on mental health in particular. In February 2022, a major

scientific report from the IPCC systematically reviewed evidence linking climate change to diagnosable mental health disorders and broader outcomes for well-being. This was the first time that mental health was directly discussed and assessed within IPCC reports, a sign of our growing scientific understanding of the topic, and its importance for the global response to climate change.

In the yearly range from 2015 to 2023, mental health facilities documented a total of 13,793,884 visits and found anxiety, schizophrenia, and depression emerged as the top three illnesses for mental health visits, with an increase in patient attendance following the onset of the natural disaster outbreak. Spatial analysis identified areas of significance for various disorders across different regions of Thailand. Positive correlations between certain disorder pairs were found in the regions, suggesting shared risk factors or comorbidities. In Thailand, mental health problems in adolescents are increasing, and the country is struggling to evaluate the mental health situation accurately.

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Informed Consent

- The authors have obtained informed consent from all participants.
- The authors declare that informed consent was not required, even though this research involved human participants who provided their perceptions, opinions, and academic data was required as participants involved.

Conflict of Interest

The authors declare that there is no conflict of interest.

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