Temperature Change With Respect To A Baseline Climatology, Corresponding To The Period 2010-2021

Submitted by

SHALEEN DUBEY
(RA2011029010054)

January 2023

ABSTRACT

In this study, the temperature change from 2010 to 2021 is analyzed in relation to the baseline climatology. The study's objectives are to comprehend how the temperature has changed during this time period and to find any trends or patterns that may have developed. The findings of this study will be helpful in understanding how climate change affects people and informing future attempts to lessen its effects.

The United Nations' Food and Agriculture Organization is where this data came from (FAO). 2022. Changes in temperature, and climate indicators.

As part of its mission to support sustainable agriculture and food systems, the Food and Agriculture Organization of the United Nations (FAO) provides data on temperature changes. Effective adaptation and mitigation strategies require an understanding of how temperature changes affect agriculture and food security. These sectors are significantly impacted by climate change. To assist in planning and decision-making in the agricultural sector and to raise public awareness of how climate change is affecting food systems, the FAO collects and disseminates temperature change data. The FAO provides accurate and up-to-date information on temperature change in an effort to create a more robust and sustainable food system for everyone.

INTRODUCTION

Estimates of mean surface temperature change over the years 2010 to 2021, assessed in relation to a baseline climatology. Estimates of changes in the mean surface temperature are shown for the years 210–2021 per nation and globally, in degrees Celsius.

The FAO is used to obtain statistics. The Global Surface Temperature Change data from the Goddard Institute for Space Studies of the National Aeronautics and Space Administration, known as GISTEMP, are used to generate the data (NASA-GISS).

The weighted average of the GISTEMP data for all stations within a specified radius is used to generate the time series temperature change at a site, with the closest stations receiving the highest weighting. FAO calculates FAOSTAT Indicators, which might not match data independently submitted by member nations to pertinent international processes. The Temperature Change domain offers information to support nations and territories' attempts to create climate-change-related statistics and pertinent SDG and climate change reporting procedures.

Countries: This dataset is about the Global Temperature Change country wise over a decade of 2010-2021. In this overall 230 rows are there which comprises of different countries and regions around the world.

Indicator, Unit, Source: These three columns are same around all the 230 rows and that is that it shows What is the data about, what is the unit the data is in, and what is the source of this dataset.

CTS Name and Full Description: In these two columns we get to know about What the dataset indicates and What is the description of it. i.e. It shows the Surface Temperature Change and that Temperature Change is calculated with the help of Environment, Climate Change, Climate Indicators, Surface Temperature Change.

Year Wise Data: Then comes the columns containing the year wise data of overall surface temperature change from 2010-2021.

PROJECT DESCRIPTION

- **Available Datasets**

1. Annual Surface Temperature Change
2. Global Average Temperature
3. FAOSAT Temperature Change

These dataset includes a number of distinct fields, including country names, indicator (as in what it indicates to), unit (as in how it is measured), source (as in where it is taken), CTS Name, CTS complete descriptor (as in what the values mean), and lastly data from 2010 to 2021.

Despite the fact that there are 197 countries in the globe, this dataset includes 230 nations because the IMF also included other regions. The FAOSTAT temperature change figures are calculated at the country and regional levels using a definition of "Land area" derived from the FAO Land Use definitions, which is in line with the System of Environmental and Economic Accounts (SEEA).

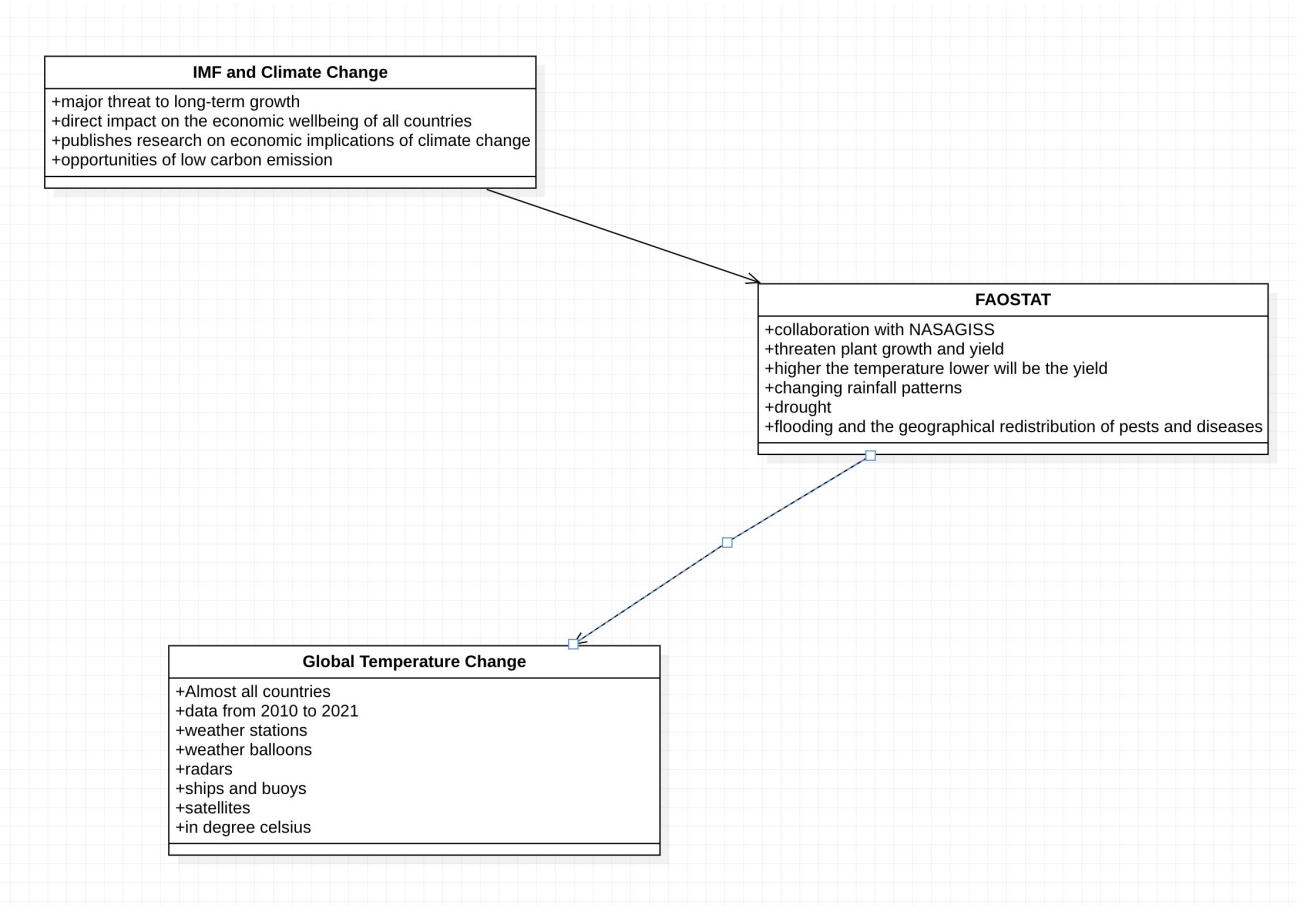
- **GISTEMP**

In the framework of early investigations of observed temperature changes, the NASA-GISS analysis got started in the late 1970s (Hansen et al., 1981; Hansen et al., 2006; Hansen et al., 2010). The GISTEMP data contain information starting in 1880 and define temperature anomalies as the change in surface temperature relative to a fixed baseline, which is defined as the years 1951–1980. To correct for potential warming biases in metropolitan areas caused by heat-island effects, GISTEMP data are updated.

Multiple independent data sources with monthly updates are used as inputs for the NASA GISS analysis. The National Oceanographic and Atmospheric Administration's Global Historical Climatology Network (NOAA-GHCN) version 4, which contains information from roughly 26 000 stations globally, is the source of monthly mean station measurements (Menne et al., 2018). The Extended Reconstructed Sea Surface Temperature (ERSST) v5 for ocean regions is also included in the GISTEMP analysis. The study

by Hansen and colleagues (Hansen et al., 2010) contains a thorough explanation of the methodology used to combine these data, while Lenssen et al. (2018) offered an analysis of global GISTEMP uncertainty.

SCHEMA



METHODOLOGY

- **GISTEMP Analysis:**

The initial GISTEMP analysis was designed with the intention of calculating a global average. To do this, the closest stations are given the most weight when computing the time series at a position as a weighted average over all stations within 1200 km.

- **Paradox:**

Dec-Jan-Feb corresponds to the meteorological winter in the Northern Hemisphere, Mar-Apr-May to the meteorological spring, Jun-Jul-Aug to the meteorological summer, and Sep-Oct-Nov to the meteorological autumn.

Dec-Jan-Feb is the meteorological summer in the Southern Hemisphere, Mar-Apr-May is the meteorological autumn, Jun-Jul-Aug is the meteorological winter, and Sep-Oct-Nov is the meteorological spring.

- **Solution:**

The meteorological year, which begins on December 1 of the preceding calendar year and ends on November 30 of the same calendar year, corresponds to the annual mean temperature change data for both hemispheres.

INFERENCE

1. Why does the data about Temperature Change needs to be analysed in today's world? What's the need of it?

   Ans:

   - To Understand The Causes Of Temperature Change:

   Climate change is driven by a complex set of factors, including human activity, natural variations in the Earth's systems, and external influences such as solar radiation. By analyzing temperature change data over time, researchers can identify patterns and trends that can help us better understand the underlying causes of global warming.

   - To Assess The Impacts Of Temperature Change:

   Rising temperatures have a wide range of impacts on the environment, from melting ice caps and rising sea levels to more frequent and intense heatwaves, droughts, and extreme weather events. By analyzing temperature change data and modeling its effects, scientists can better predict the impacts of climate change on ecosystems, human health, and infrastructure, allowing us to plan and prepare for these changes.

   - To Track Progress Towards Climate Goals:

   In recent years, there has been growing awareness of the need to reduce greenhouse gas emissions and limit global warming to less than 2 degrees Celsius above pre-industrial levels. By analyzing temperature change data over time, researchers can track progress towards these goals, identifying areas where more action is needed and evaluating the effectiveness of different policies and strategies.

   - To Inform Policy And Decision-Making:

Temperature change data is a critical input for policymakers and decision-makers at all levels, from local governments to international organizations. By providing clear, reliable information about the state of the climate and the impacts of temperature change, scientists can help inform policies and strategies that aim to mitigate the worst effects of global warming and protect vulnerable communities and ecosystems.

2. What will be the outcome of the analysis?

   Ans:

   Once the data has been analysed and clear picture has been obtained, and the countermeasures put into place, a cleaner and a more healthier place to live and a much more livable earth to give to our future generations.

3. What do we infer from this data?

   Ans:

   From these datasets, we can infer that the Earth's surface temperature has been increasing over the past century, and that this warming trend has accelerated in recent decades. The datasets show that this last decade has been successively warmer than any preceding decade. Additionally, the datasets indicate that the 20 warmest years on record have occurred since 1981, with the warmest year being 2016.

   We can also infer that this global warming is largely driven by human activities, particularly the emission of greenhouse gases from burning fossil fuels. The datasets show that the rate of temperature increase over the past century is much faster than any natural warming trend that could be attributed to factors such as solar variability or volcanic activity.

   Furthermore, the datasets highlight the potential impacts of global warming, including rising sea levels, more frequent and severe heatwaves, changes in precipitation patterns, and more intense storms. Understanding these impacts is crucial for developing strategies to mitigate and adapt to the effects of climate change.

CONCLUSION

In conclusion, Global Surface Temperature Change is a critical issue that demands our attention and action. The data shows that the Earth's temperature is rising at an alarming rate, driven by a combination of human activity and natural processes. This temperature change has far-reaching impacts on the environment, ecosystems, and human society, from melting ice caps and rising sea levels to more frequent and intense heatwaves, droughts, and extreme weather events.

FOA generates a dataset about Global Change In Surface Temperature from all the countries to better understand the global trend and how it will going to affect the overall food and agricultural growth around the globe. Then that data is used by the IMF to see and understand how different countries are doing in terms of global carbon emission and carbon footprint.

However, through this data we can look for the solutions to this problem, from reducing global carbon emission, carbon footprint and greenhouse gas emissions to increasing the use of renewable energy sources and investing in more sustainable practices. By taking bold action now, we can limit the worst effects of climate change and build a more resilient and sustainable future for all.

The Analysis of Global Surface Temperature Change data must continue to inform our policies and decision-making, so that we can take the necessary steps to address this critical issue. Only by working together at all levels, from local communities to international organizations, can we hope to tackle this challenge and protect the planet for future generations.

REFERENCES

International Monetary Fund - IMF." IMF, 31 Jan. 2023, www.imf.org/en/Home.

@FAO. "Home — Food and Agriculture Organization of the United Nations." FAO-Home, www.fao.org/home/en.Accessed31Jan.2023.

NASA Global Climate Change. (n.d.). Global Temperature. Vital Signs of the Planet. Retrieved February 19, 2023, from https://climate.nasa.gov/vital-signs/global-temperature/

National Oceanic and Atmospheric Administration (NOAA). (n.d.). Global Surface Temperature Anomalies. Climate.gov. Retrieved February 19, 2023, from https://www.climate.gov/maps-data/dataset/global-surface-temperature-ano

Met Office Hadley Centre. (n.d.). Global Temperature. Retrieved February 19, 2023, from https://www.metoffice.gov.uk/research/climate/monitoring/global-temperature

Berkeley Earth. (n.d.). Global Temperature Report. Retrieved February 19, 2023, from http://berkeleyearth.org/global-temperature-report/

Goddard Institute for Space Studies (GISS). (n.d.). GISTEMP Updates. Global Surface Temperature Analysis. Retrieved February 19, 2023, from https://data.giss.nasa.gov/gistemp/updates_v4/

- **Project URL:**

https://www.overleaf.com/1924181751yndwfmkrshzs