

# An Overview of Climate Change and Global Warming: Assessing Climate Change and Global Warming in Local Scale

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**Abstract**—The purpose of this research is to identify climate change in India. For the purpose of this research, daily precipitation data, temperature (day and night) (1437 synchronic, climatic and rain gauging stations) were used during the period from 16/9/1966 to 16/9/2016. The data were interpolated using the Kriging interpolation method in cells of  $15 \times 15$  km, and a matrix was created in the size of  $15706 \times 7187$  days that was placed on the rows of the day and placed on the columns of the cells. With the help of the 27 Climate Change Indicators introduced by the Climate Change Identification and Climate Change Expert Team 3, a study was conducted to explore the climate change in India. The results of this study showed that the 4 (g) SU of summer days (SU25), hot days (TX90p), hot nights (TN90p) and night nights (TR20) are increasing during the study period. While the cold-frost indexes trend, including freezing days (FD), ice days (ID), cold nights (TN10p) and cold days (TX10p), are down and decreasing. It has been prolonged and, conversely, cold waves have become shorter. Increasing the nightly temperature rate compared to the daily temperature has led to a decrease in the temperature range of the night. Also, the results of this study showed that the frequency of rainfall is increasing.

**Keywords:** Climate change, Frost indexes, Trend, India.

## 1. INTRODUCTION

Today, the phenomenon of climate change and global warming has attracted the attention of all thinkers and researchers. Increasing the period of growth, increasing the temperature and melting of Arctic ice and increasing the level of water, decreasing precipitation and droughts, and increasing the incidence of flood, heat waves and decreasing cold waves as signs of climate change have caused many economic and social problems. In recent years, the intensity of the change has increased and this has led to several studies in the field of climate change in different parts of the world. Some of these studies have sought to find out the reason for its occurrence, and some of which are limited to the study of climate change. According to Cathoffs et al. (1999), the reason for climate change is the increased use of fossil fuels, urbanization, forestry and desertification. [9] Ebrahimi et al. (2005) Changes in temperature in Mashhad Plain as a Climate Change Index in the region. The results of this research show

that the increasing temperature trend is especially pronounced for the minimum temperature, and the statistical results show that in most months the temperature trend is incremental and at the end they came to the conclusion that temperature variations can be viewed as an indication of changing the climate. [1] Ghorbanizade Kharazi et al. (2009) The effect of climate change on the time distribution of runoff from snow melt in the Karoon area. The results of their research showed that maximum flow time will be transmitted from spring to winter. [15] Alizadeh and Kamali (2002) The effects of climate change on increasing agricultural water consumption in Mashhad plain. The results of these researchers showed that if  $2^\circ\text{C}$  of air temperature increased the requirement for pure irrigation with pattern and combination of current culture would increase 6% compared to normal condition. Based on their findings, the increase in irrigation requirement for 4 and 6 degrees of temperature increase was estimated to be 11 and 17 percent respectively [3]. Azizi et al., (2008). Using multivariate statistical analyzes, they retrieved climate change in the western half of the country. The results showed that in different stations, proximity to large cities and relative geographical position has been effective in the process of change. Also, based on the obtained results, moisture and precipitation data are not much affected by the trend. [5] Azizi and Roshani (2008) study the climate change on the southern shores of the Caspian Sea using the Man-Kendall studied. The results indicate that in most of the plants, minimum temperature, positive trend and maximum temperature show a negative trend and the range of temperature fluctuations has decreased during the course and the percentage change in winter and summer is more than spring and autumn [6]. ] Khalili Aghdam and Soltani (2009) studied the climate change in Urumia over the past 50 years. The results showed that the average rainfall during the last 50 years in Urmia did not change significantly. Global warming and global climate change have led to an increase in the temperature in the area. [18] Babaian et al. (2009), with the help of the microscale of the data of the ECHO\_G atmosphere circulation model, during the period of 2010-2039, assessed the climate change in India.

The results showed that during the period from 2010 to 2039, precipitation on India would decrease by 9%, the thresholds for heavy and heavy precipitation increases by 13 and 39%, and the mean annual temperature will increase by about 0-5 ° C. The cold months of the year will experience the most monthly temperature increase compared to other months of the year. [7] Pine et al. (2002), using the RCM model, to investigate climate change in the Columbia River Basin they studied. Their study period was from 2040 to 2060. Their findings showed that climate change would result in an increase of 1.2 degrees Celsius of air temperature and precipitation would fall by 3 percent. Also, for the basins, predicted increased winter runoff and reduced it in other seasons. [21] Geun et al. (2016) studied the effects of climate change on increasing the sea level of the lake in the years from 2070 to 2100. The results showed that due to global climate change and global warming, lake water level up to 50 cm for period The future will increase. [16] [Rydygordiz and colleagues]) 2007 the effects of climate change on the need for irrigation water in the Giudat-Al-Kivi River Basin region. The results of their study indicated an increase in drought and water demand for irrigation. Modeling of irrigation requirement showed that the irrigation water demand during the period 2070-2070 depending on the location and pattern The cultivation will increase by about 15 to 20 percent. [23] Freys et al. (2009) examined the role of climate change in Mediterranean crop production. The results indicate that wheat yield reduces for the next century, as its negative effects begin with low latitudes and with increasing latitudes, the role of climate change on wheat yield increases [13] By reviewing the resources and researches on climate change in India, we can conclude that there has not been a complete and comprehensive study on India's climate change curriculum. The research has either done at a point (station) or regional or full indexes of climate change measurements have not been thoroughly investigated. Using the 27 profiles proposed by the Climate Change Identifiers and Profiles, To measure climate change on the Indian border as a study unit. To do this, we use high-resolution (15 × 15 km) resolution network data and daily time resolution.

## 2. METHODOLOGY

For the purpose of this research daily rainfall data, minimum daily (and maximum) daily temperature (on 1437 synchronic, climatic and rainbow stations were used during the period 1966 to 2016). In this There is no doubt that the distribution of the most important amounts of atmospheric, temperature and precipitation parameters is equivalent to India's land and Uniform and different regions may not have the same effect on global warming and climate change. As the findings of the Mas'udiyah are, they are (2016) and show the partners (2015). The velocity rate of atmospheric measurements in the form of temperature and precipitation indexes in different regions of India is not the same and the same. In some areas) are limited in scope (even the type of trend is not in harmony

with other areas. [20] However, when speaking of a basin or area, there are many questions in the mind of the researcher which needs to be addressed in order to respond to them. We need to consider the basin or area in question as a unit. For example, in reports provided by the Intergovernmental Panel on Climate Change, when referring to the Verdiani of the Farin Climatic Indexes, the entire Earth is considered as a unit of study, apart from the spatial differences. -2100, mean temperature of the earth's surface is 1.1 to 4.6 The degree of centigrade will increase.

But the point is that a simple averaging of spatial data is allowed when the data is uniformly distributed over the area concerned. If the data does not have a homogeneous distribution over the place, the average is not calculated for the exact area, and the average for the regions (location), which has more data, will tend to be. [2] In a study by Frych et al. (2002), problems associated with the use of station data with distribution Uniformity in assessments and understanding of climate change. [14] Using the Kriging statistics method, daily data was interpolated on 15 x 15 km networks. On the basis of the spatial separation mentioned above, 7187 spatial cells are located in the Indian political frontier. The database was created in the dimensions of 15,706 × 7,187, placed on rows per day and on the columns of the cells (networks). For each of the three measurements of 1, a separate database was created. Then, the average of 7187 cells were calculated for each day in order to determine the extent of India's land as a unit of study. Finally, a database was created in the size of 15706 × 3, with the mean of precipitation, the minimum and maximum daily temperatures set on the columns. With the help of daily data, the indexes were calculated in each of the different years of the statistical period (2016-2005). Different profiles have been introduced and presented by individuals and research institutes for the study of climate change in the world. Each of the introduced indexes has its own disadvantages and advantages. In general, many features important indexes analysis of climate change must-have is a (together very dependent not, and any information independent of climate change express, B (indexed addition to the ability to compare different parts of the world together Should be based on regional conditions and have the possibility of comparing different areas; and c) in addition to the above, the new indexes should have the ability to measure climate change on a time scale and spatial scale. In this study, 27 indicators of temperature and precipitation parameters were proposed by climate change experts and indexes experts to identify and evaluate climate change. In these proposed indexes, all the features necessary for climate change indexes are seen, and often show the aspects and characteristics of the temperature and precipitation precipitations, including incidence, severity and durability. Of the 27 proposed or proposed profiles, 16 are indexes of temperature curves and 11 indexes related to rainfall. This profile can be classified in five groups: [2] (a) (Percentile indexes: These indexes include the occurrence of cold nights TN10p, warm nights TN90p, cold

days TX10p, hot days TX90p, many days Wet R95p and very wet days R99p. The percentile-based temperature indices select the hottest and coolest defiles for the minimum and maximum temperatures, so that they can judge which stage is changing.

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