Climate Change And Global Warming Forecast Of Vital Signs; Impact on Temperature And Precipitation In Future In Local Scale

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ABSTRACT

In this study, the climate conditions of Iran in the decades 2000, 2025, 2050, 2075 and 2100 were modeled using the output of two general models of atmospheric HadCM2 and ECHAM4 and with consideration of 18 IPCC emission scenarios. The MAGICC-SCENGEN model was used for microscopic analysis of low-power data from general circulation models. In this research, the results of two models of HadCM2 and ECHAM4 have been reviewed and compared. Based on this, the results of the HadCM2 model indicate that Iran's precipitation has fallen by 2.5 percent by the 2100s, while for the same period in the ECHAM4 model, our rainfall has increased by 19.8 percent. Regional analysis of the results of the HadCM2 model shows that in the coming decades, the provinces of Mazandaran, Golestan, North Khorasan, North Khorasan Razavi and Semnan, Tehran, and parts of Guilan and Qazvin will increase precipitation, while the ECHAM4 model predicts precipitation reduction has done for these areas.. Also, the HadCM2 model for southeastern regions of our country, including the provinces of Hormozgan, Kerman, Bushehr, southern Fars, and parts of Sistan and Baluchestan, has predicted a decrease in precipitation, but in the ECHAM4 model, these areas will increase in precipitation during the same period. Based on the studies, the results of both models indicate an increase in temperature in all of our provinces in the coming decades. The two models predict the average temperature rise of 3 to 6.3 degrees Celsius for our country by the 2100s, which in these two models the spatial distribution of temperature rise, is consistent.

Key words:

Climate change, MAGICC-SCENGEN, HadCM2 and ECHAM4 atmospheric circulation model, Iran.

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1. INTRODUCTION

The growth of industries, whereby the consumption of fossil fuels on the one hand, and the increase in the population of the world and land use change on the other hand, has led to gradual changes in the climate of the planet after the industrial revolution (Babaeian, 2007). In order to examine the issue in more detail, in 1988, the Institute called the Interdepartmental Panel on Climate Change, jointly sponsored by the United Nations World Meteorological Organization and the United Nations Environment Program, aimed at assessing the recognition of scientific, technical and socioeconomic aspects, and the risks posed by the impact Climate change was established by humans. IPCC activities began with the presentation of special reports on the causes of climate change. In order to conduct climate change studies on different sources in future periods, climatic variables must first be simulated by greenhouse gas changes. There are various ways to do this, most notably using the Global Circumference Model (GCM) data. Climate predictions and climate change assessments with problems such as estimating the level of emissions of greenhouse gases and other pollutants in the coming decades, the large-scale spatial and temporal segregation of atmospheric circulation models, and so on. These factors are associated with high uncertainty. Another problem with designing appropriate climatic models is to integrate all the feedbacks in the oceanic bubble system of the community.

Some of these feedbacks have been primitively initialized even in the most advanced general circulation (GCM) models. One of the other problems is the method of modeling the previously mentioned systems. This requires multiple simulations to isolate human effects from natural fluctuations. Climatic models require a great deal of time to evaluate, test, and run, and it may take months and years to design, execute, and identify a good set of experiments. In addition, they also require high computational capacity. For these reasons, CSGs are the appropriate options for this, provided that: a) they can model the behavior of more complex models; b) identify uncertainties of climate predictions efficiently and quickly; and c.) Can easily be used in many areas (Habibi, 2008).

In this study, using the SCENGEN and MAGICC models, the data of two different models of general circulation of barley on Iran were microscopic and the precipitation

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and temperature conditions of the country were modeled until 2100. Finally, the results of the M-S model are compared with the results of the LARS-WG model, which is the meteorological data generation model. The MAGICC SCENGEN model (referred to as M-S) has previously been widely used in a large number of studies related to climate change impact assessment. Lazar et al., In a study, examine the effects of climate change caused by greenhouse gases on the amount and amount of snowfall, as well as changes in avalanches in the Aspen mountain region in the years 2030 and 2100. In the study, the M-S software was used to evaluate temperature and precipitation climatic variations with the output of five general circulation models of barley with the names CSIRO, ECHAM, ECHAM, HadCM, HadCM (Lazar and Williams, 2008, 219) version 4.2 This software was developed by Weighley and colleagues (2000) (Wigley, Raper, 2000, 48). This model was implemented in the International Climate Change Program in four regions including the United States, Southwest Asia, and South Africa. Its results have been presented to the executive and academic institutions of the world in various reports.

2. METHODOLOGY

Description of the MAGICC SCENGEN model

In recent years, a large number of CSGs have been developed and developed and used in climatological studies. The combination of a simple climatic model called MAGICC and the SCENGEN climatic scenario database comprise the MAGICC SCENGEN scenario generator. The M-S model consists of two main parts of MAGICC and SCENGEN that assess the greenhouse gas change of the MAGICC sector, consisting of a series of simple models that are related to each other (Harvey et al., 1997, 50). Although MAGICC is not a GCM model, it uses data from some climatic models to model the behavior of GCM models on different regions of the world. MAGICC (Wigley et al., 2002, 2690). The average annual temperature of the ground and the average annual temperature It calculates the sea level from greenhouse gas emission scenarios and sulfur dioxide (Kattenberg et al., 1996, 258) (Warrick et al., 1996, 358) (Raper et al., 1996, 20). This section includes a set of climatic observation data and outlets for atmospheric circulation models that allows the user to evaluate and assess the different dimensions of uncertainty about the future climate. In fact, this section includes a set of coupled models that are integrated into a software package. This

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software allows users to change the concentrations of carbon dioxide (CO 2), the average surface temperature of the earth and the sea between 1990 and 2100 using carbon dioxide carbon dioxide (CO 2), methane (CH4), nitrogen oxide (N2O), halocarbons (Such as 5HCFC, 6HFC and (7PFC) and sulfur dioxide (Schimel et al., 1997, 52) and (Wigley et al., 2000, (11-11) (Wigley et al., 1993, 409) and (Wigley et al., 1994, 194) and Wigley et al., 1997, 41. This model has been widely used by the IPCC for various evaluations. In the MAGICC section 18 scenarios. The second part of this model is SCENGEN, a database of the results of a large number of atmospheric circulation models, global observational data and four cluster collections of Europe, South Asia, the United States and South Africa. SCENGEN, which has been developed and developed over many years, can also be used alone. The MAGICC and SCENGEN scenarios of greenhouse gas and sulfur dioxide converted to estimates of changes in the average temperature of the surface of the earth and the sea level (Santere et al., 1990, 29) and. (Hulme et al., 2000, 52). In the MAGICC-SCENGEN model, the global climate data set with a resolution of 5 degrees latitude and longitude is available for three climatic variables: mean temperature, precipitation, and cloud cover, but climatic observational data with a resolution of 0/5 degrees for only 4 large areas Europe, South Asia, the United States and South Africa) (Wigley et al., 2003, 11). In addition to average temperature, precipitation and cloud cover, this model can include minimum temperature, maximum temperature, steam pressure, wind speed and temperature variations modeling (Wigley, et al., 2000, 72) and. (Covey et al., 2003, 120).

3. IPCC RELEASE SCENARIOS

The release scenario includes information on the socio-economic status and greenhouse gas emissions in the planet's atmosphere. In 1992, the first IPCC emission scenarios, IS92a (IS92) (IS92f), were developed for use in the introduction of atmospheric circulation models to model climate change scenarios. IS92 scenarios include population estimates, gross domestic product, energy consumption by business, industry, transport and residential sectors, energy production, production and consumption of secondary fuels, production of energy from liquid fuels, solids, hydrogen gas, solar nuclei, biomass, The amount of carbon dioxide emissions, carbon monoxide, nitrous oxide, nitrogen oxides, methane by combustion, methane emissions from mines, and many greenhouse gas emission sources for ten regions The land

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includes the United States, Western Europe and Canada, Asia and South-East Asia, Central Europe, Central Asia, Africa, the Middle East, Latin America, South and Southwest Asia and Russia for 1985, 1990, 1995, 2000, 2005, 2010, 2015 , 2020, 2025, 2050, 2075 and 2100 respectively. In 2000, the IPCC developed a new series of release scenarios, SRES1, to be presented in the third special report of the release scenarios. The SRES Group used three scenario families named A1, A2 and B2, B1 to describe the relationship between processes that produce greenhouse gases and aerosols and how they changed during the twenty-first century in important parts of the planet. Additional information on each of the IPCC scenarios and scenarios developed by other organizations in the form of a database is available at the IPCC site at www.IPCC.ch (Harvey et al., 1997, 50) (Houghton et al., 1996, 572).

4. DATA, AREA AND PERIOD OF STUDY

Given the constraints on the implementation of climate dynamic models and the limited space-time separation capabilities of these models for assessing climate change in the coming decades, the MS model was selected for the microscopic statistical output of two generic atmospheres of HadCM2 and ECHAM4 atmospheres, and by dividing Iran into 9 computational networks For each of these areas, rainfall and temperature changes were modeled for the years 2000, 2025, 2050, 2075 and 2100. The time periods for displaying climate change scenarios can be monthly, seasonally or annually. Computations were performed for Iran with a resolution of 0/5 degrees.

In addition to the quarterly seasons of the standard, an additional period of June, July, August, and September is also due to the importance of the Indian era. This model can use either one or all of the 16 GCM models, or in the case of multiple GCMs, if the choice of several GCMs is their average (Hulme, Wigley, 2000, 52). In this study, calculations based on the outputs of the two HadCM2 models And ECHAM4. Figure 1 Worldwide and a region for using the M-S model for microscopic data from the general atmospheric model of atmosphere using 18 scenarios in the South West Asia region. In regional networking, it is noted that Iran is located within the 9 M-S computing grids. In this study, the statistical period from 1961 to 1990 is considered as the basic climate, with data from 1986 to 2015 (representing the decade (2000, 2011 to 2040 (decade (2025, 2036-2065 (2050 AD) , The period from 2061 to 2090 (decade (2075 and period 2086 to 2115) (decades) were analyzed.

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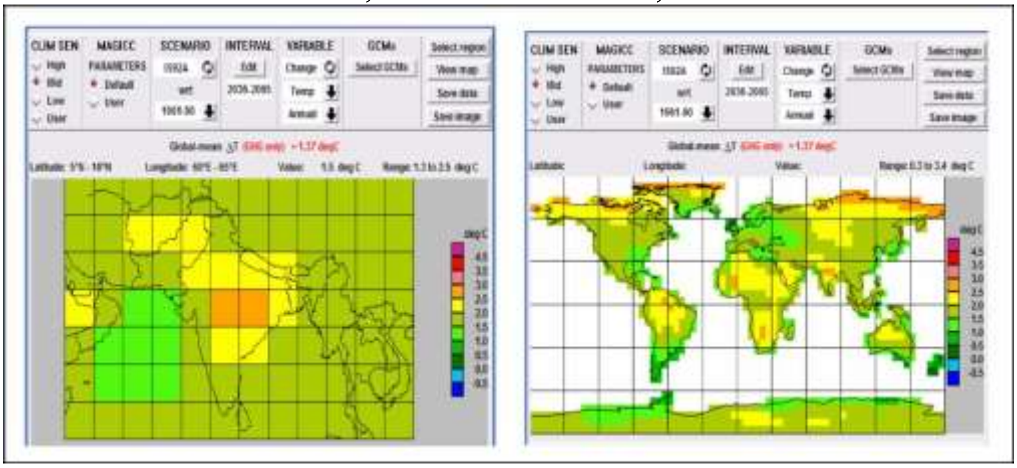

Figure 1. Regional region (left and right) and global (right shape) model MAGICC-SCENGEN

5. RESULTS

5.1.Average rainfall

The results of microdisplaying of the HadCM2 model indicate a decrease in the average rainfall in the entire region in the coming decades. Among the decades, the decade of 2100 (representative of the period 2086 to 2115) has the highest drop in rainfall compared to other decades (Fig. 3 and Table 1). The highest rainfall decline in the decade is due to the IS92D scenario with about 6%. 1, 2 and 3 include Mazandaran, Golestan, North Khorasan, northern regions of Khorasan Razavi, northern Semnan province, Tehran, and parts of Gilan, Qazvin and Central in the coming decades with rising rainfall. The highest rainfall Daghi occurs in the 3rd district, which includes northeastern and eastern Khorasan Razavi province. The increase of precipitation on the eastern and southern coasts of the Caspian region is not enough to require serious scrutiny. Also, the highest precipitation in 7, 8 and 9 regions in the southern provinces And southeast of the country, including Hormozgan, parts of Sistan and Baluchestan, south of Fars province, Kerman and Bushehr.

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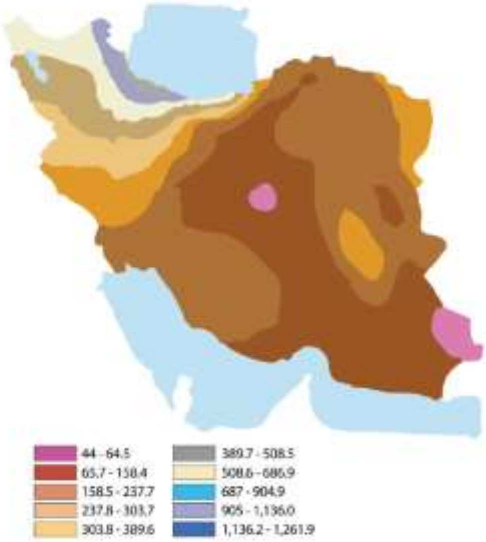

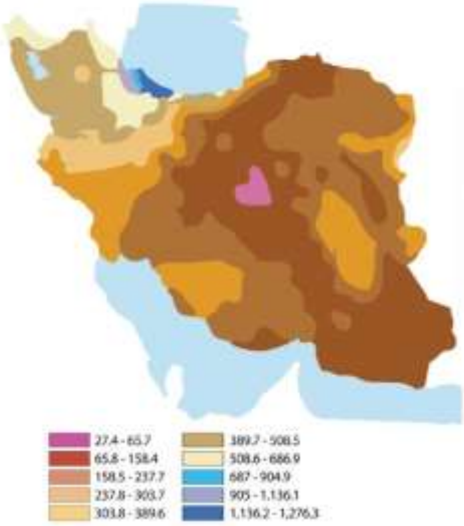

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Figure 2: **Figure 3:**

Figure 2. Distribution of rainfall in the MAGICC SCENGEN model with HadCM2 data using the IS92A scenario for the 2025s in Iran.

Figure 3. Distribution of precipitation in the MAGICC SCENGEN model with ECHAM4 data using the IS92A scenario for the 2025s in Iran.

5.2.Average temperature

The average of the microscopic temperature of the output of two general circulation models of HadCM2 and ECHAM4 atmospheres was compared by the statistical model of MS with the temperature of the country's basic period (1990-1990) and the temperature changes of the decades 2000, 2025, 2050, 2075 and 2100 compared to the base period, according to the table. 2, calculated. Figures 7 and 8 show tidal temperatures in the country with different scenarios in which the average temperature in the coming decades is increasing. Among the decades to come, the 21st century will have the highest temperature rise compared to normal. The results show that the average temperature in all provinces of the country increases, with the average in the coming decades and with different scenarios between 0.04 to 3 ° C in the HadCM2 model and between 0.05 and 4 ° C in the ECHAM4 model, which will increase the most Changes in temperature range from 4.4 to 3.5 degrees Celsius in the 2100's. The global value is between 1.4 and 8.0 degrees Celsius. In the HadCM2 model, the highest temperature rise occurs in Yazd, South Khorasan, Chaharmahal and Bakhtiari, Isfahan, parts of Khorasan Razavi, Semnan, Tehran, Central, Qazvin and Guilan. Other provinces with severe temperature increase include Hormozgan, Sistan and Baluchestan, Bushehr, Kerman and Fars. But in ECHAM4, the highest temperature rise occurs in Fars, Isfahan, Chaharmahal and Bakhtiari, Bushehr, Mazandaran, Tehran and parts of Yazd, Semnan, Qazvin, Gilan and Central provinces.

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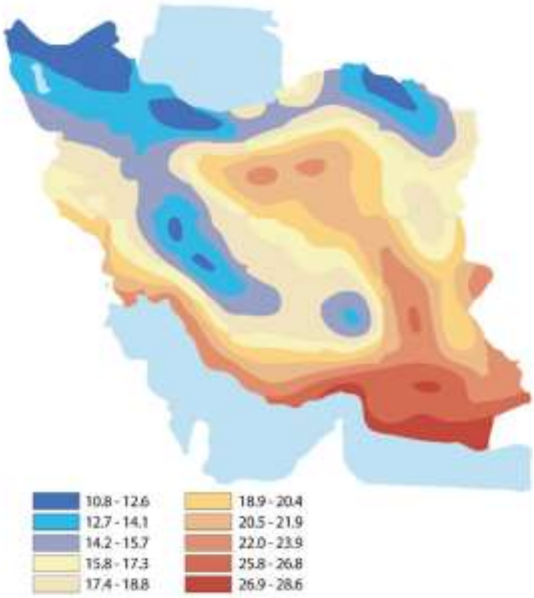

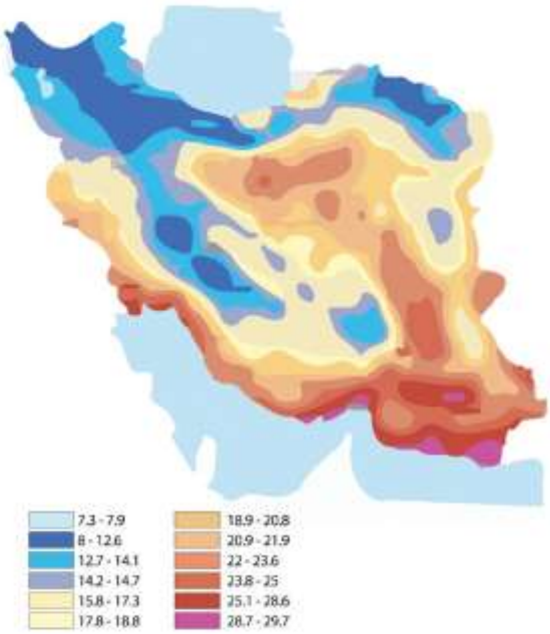

Figure:4 **Figure 5:**

Figure.4. Spatial distribution of mean temperature in MAGICC SCENGEN model with HADCM2 using IS92A scenario for Iran's 2025 dec.

Figure.5. Spatial distribution of mean temperature in MAGICC SCENGEN model with HADCM2 using IS92A scenario for Iran's 2025 dec.

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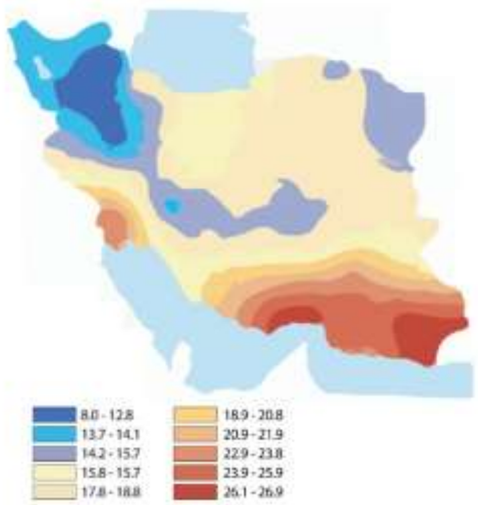

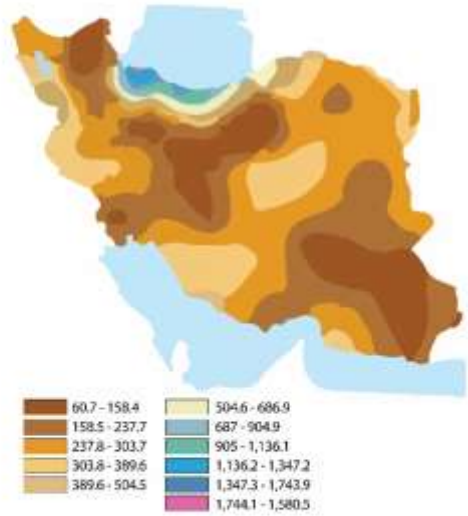

Figure 6:

Figure 7:

Figure.6. Map of LARS-WG model for the period of 2011-2040 in Iran.

Figure 7. The spatial distribution of rainfall in the LARS-WG model for the period 2011-2040 in Iran.

The models for the coming decades have predicted an increase in temperature. The prediction of the HadCM2 model for increasing the temperature between + 4 (2000s) to +4.4 ° C (2100s) and ECHAM4 model is between + 4 (2000s) and 3.5° C (2100s) degrees centigrade. In both models, the IS92E predicted the highest increase, with the highest carbon dioxide emissions and sulfur dioxide emissions. The IS92E scenario predicts an increase in temperature, which is due to the prediction of carbon dioxide emissions and sulfur dioxide compared to other scenarios. In both spatial distribution models, temperature increases are matched, but the highest prediction of the 2100's temperature rise in the ECHAM4 model is about one degree higher than the HadCM2 model. Comparison of the results obtained from the implementation of the M-S model on Iran with the results of the LARS-WG model shows the regional variations in rainfall of the two models LARS-WG and MAGICC SCENGEN with HADCM2 data. But these changes are statistically 95% reliable, and both predict a decline in rainfall in the 2025s. The LARS-WG model confirms the results of implementing the MAGICC SCENGEN model with the HADCM2 general air circulation model. In predicting the

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mean temperature, the results of the M-S model are in good agreement with the LARS-WG model.

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