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WATER CRISIS, CLIMATE CHANGES AND ITS MANAGEMENT IN IRAN

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ABSTRACT

Nowadays, climate change is known as one of the greatest biological, social, economic, political crises in the world, in most climate models that simulate future climate condition, they mostly pointed to the critical conditions. So that precipitation decreases in most parts and temperature also increased in most regions. The results of many research also suggests that the areas that are most vulnerable, are extremely more vulnerable toward climate changes. Critical condition which is formed as a result of climate change creates tension and conflict between nations over limited resources. The Middle East as a very fragile region, is one of the including areas that are heavily exposed to these risks. Based on the fact that the country of Iran is fragile in this region, is deeply influenced by these climate conditions. Tensions over limited resources may not only occur between countries but also there is potential in the domestic scale, and if there is no readiness to adapt against this crisis and efforts in order to reduce its effects then accordingly, it leads to tension between the provinces of a country. There were 517 cities that faced with the severe water stress in the warm season of 2014. While the number of these cities in the year of 2015 has reached to 570 cities, this water stress caused tension between some of the provinces in the country and if significant planning and management based on climate facts could not be conducted, then it is possible that leads political tensions among provinces.

Keywords: Climate change, water crisis, modeling

INTRODUCTION

One of the most important factors in the structure of the Earth is climate, which affected all its natural manifestations. Climate is the average weather conditions in the area and does not only apply for average conditions, but also includes other variables like minimum and maximum. A significant change in the average weather data over a given time period is also called climate change [1].

Climate change or climate changes have a scientific difference. Climate change is periodical and states volatility and deviations from average climatic parameters and can occur in different time periods, but climate change is broad swings in the climate of a region which is already warming the Earth's temperature as part of their climate change [2]. Perhaps the world's largest ecological disaster is climate change that have taken place and involved all the countries. Ironically, there are still a number of people who look into it with doubts. Today climate change has impact on all biological, social and economic aspects. Currently, atmospheric circulation models in spite of the presence of some imperfections in them are the most reliable tool to predict the future state of climate, and it is the basis of all general circulation models on global warming and the impact of increasing greenhouse gas concentrations. All subsequent consequences of climate warming are predicted based on the increased temperature of earth's surface [3].

Most important feature of climate change is a change that occurs in average climatic parameters, such as changes in average temperature and precipitation of an area. This phenomenon causes many crises, including successive droughts, storms, floods, fires and so on. United Nations about natural disasters in 2007 suggested that 90% of the worst disasters have occurred as a result of climate change.

According to Noam Chomsky, one of the world's top intellectual individual on the earth: on the global stage, we are heading rapidly toward the abyss and we're going to fall. This route is highly thrown the outlook on life and the decent life survival into danger. In fact, there are two headlands. The one is an environmental disaster which is imminent and we do not have much time to deal with it and now we are moving in the wrong direction, and the other has background history about 70 years, which is the threat of nuclear war that we are in fact seeing an increase in this threat.

Although climate change is a global phenomenon and almost all countries involved with this issue, but its effects are different in different regions. These effects will be more severe in developing countries. Developing countries due to the ravages of the economic, social, political, as well as the vulnerability of their natural environment, are more vulnerable to the consequences of climate change.

Some experts are considered the global water crisis and climate change as one of the international root crisis of Darfur in 2003. They argued that declining of rainfall and desertification caused a crisis over water and land conflict in the area. Others considered Darfur crisis as the problem due to prolonged drought period during the decades of 1970 and 1980 in north of Darfur and also the lack of a solution to deal with it by the Sudanese government... Ban Ki-Moon, General-Secretary of the United Nations in 2009 declared that the Darfur crisis is primarily due to the ecological crisis and at first the water crisis got widespread and created intense involvement on the International level.

Climatic changes as a result followed by reduction of rainfall and increasing temperatures and political tensions, which is one of the areas that is vulnerable region to climate change in middle east. Because this region has a fragile environment, the most of countries in this region have a dry desert climate and have strict conflict potential over shared water resources which are limited. Poverty and political strife of border tensions that as a result, caused this crisis, can be a major obstacle in achieving the agreements that were signed between the countries in economic and social fields, the country of Iran is no exception to this rule. Because it is located in this region and has a desert climate and is deeply influenced by the phenomenon of climate change. Since the extent of Iran's climate is different, so the effects can occur as a result of climate change and will vary in different locations. And have different results. And in some areas, the impact is more severe and more exposed to political, literal, economic, environmental, and social tensions. This creates tension with other areas over limited water resources which is not meeting the growing needs of them. In this study we sought to examine aspects and the tensions that can be occurred between the provinces as a result of climate change.

RESEARCH METHODOLOGY

Due to the occurrence of phenomenon of climate change and its different effects and different intensities that can have in the range

of the country, the importance of this study gets clear. This study emphasized on examining the climate change and its impact on potential conflicts that may occur within provinces. The research method is analytical and with documents and research data had been given from other sources and then we will discussed about analyze.

DISCUSSION AND RESULTS

Many studies have been done in Iran in the field of climate change. Most of the studies of climate change have been emphasized very strongly. These studies are the indication of rising temperatures and declining rainfall, in most of these studies have shown a rise in temperature with greater certainty. According to the scenario in Khorasan Razavi A1 Temperature increased by 0.5 Celsius degree and the number of frost days has decreased precipitation. And climate change in the province will be between 46 to 65 percent [4].

Model hadcm2 indicated our country's rainfall until the 2100 decade has declined to the 2.5 percent. In this model, the largest decline is in the country's southern region, including the provinces of Hormozgan, Sistan-Baluchestan, Fars, Kerman, Bushehr [5].

The mean temperature of all provinces of the country has increased, so that their means in the coming decades and with different scenarios will be increased between 0.4 to 3 ° C in the model of HADC2 and between 0.5 to 4 ° C in the ECHAM2 model. That the highest temperature change occurs in the late 2100 by the degree of 4.4 to 5.3

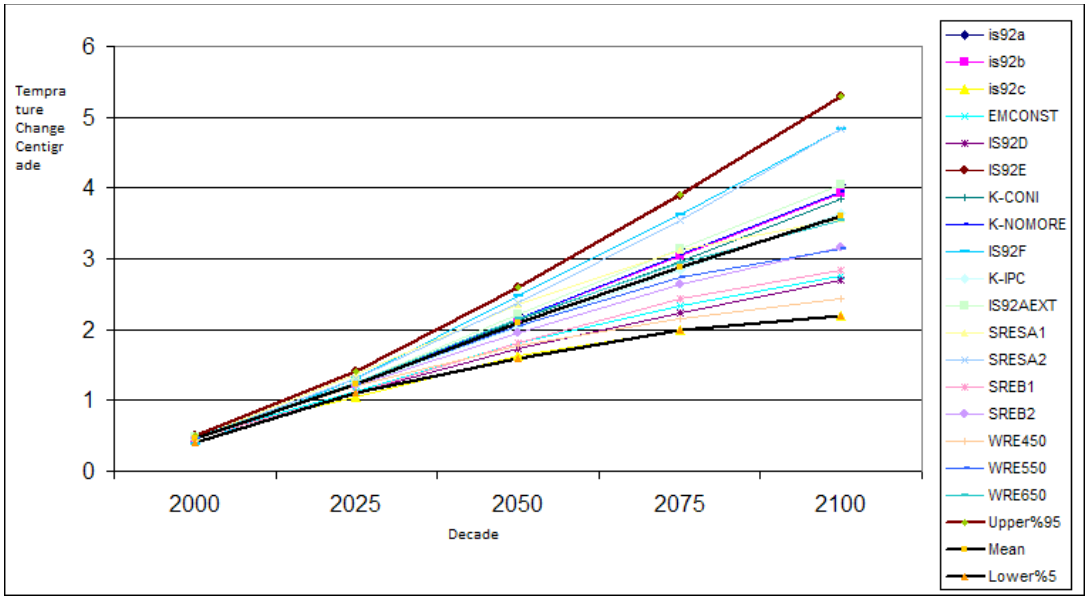


Figure 1: Estimation of late changes of temperature in the country during 200-2100 with MS model by using the data of atmospheric general circulation model of HADCM2 (6).

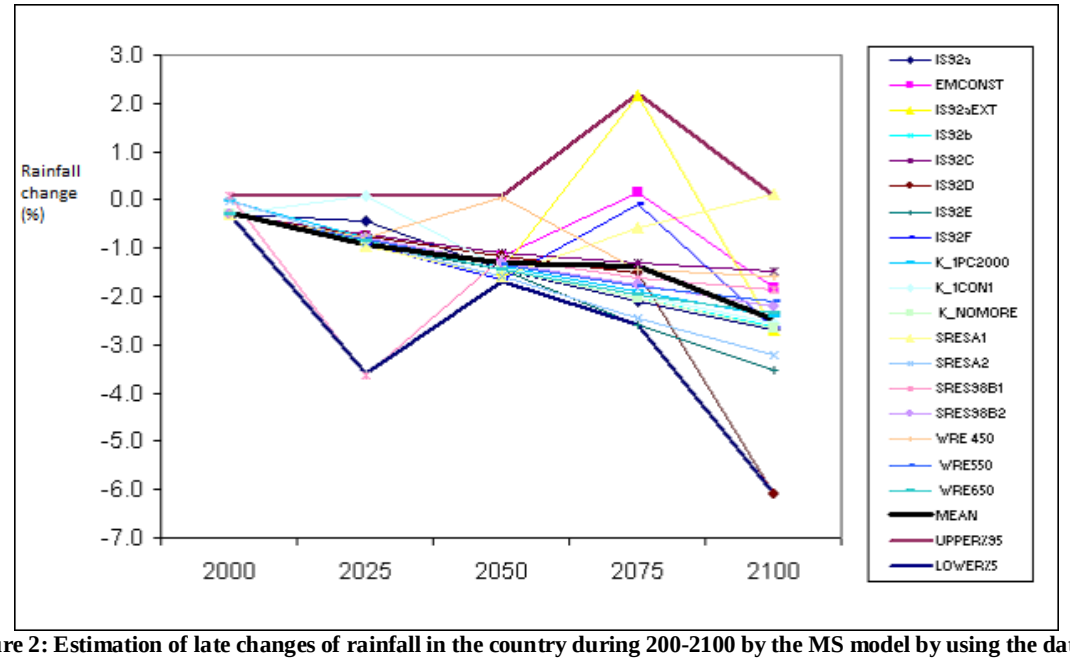
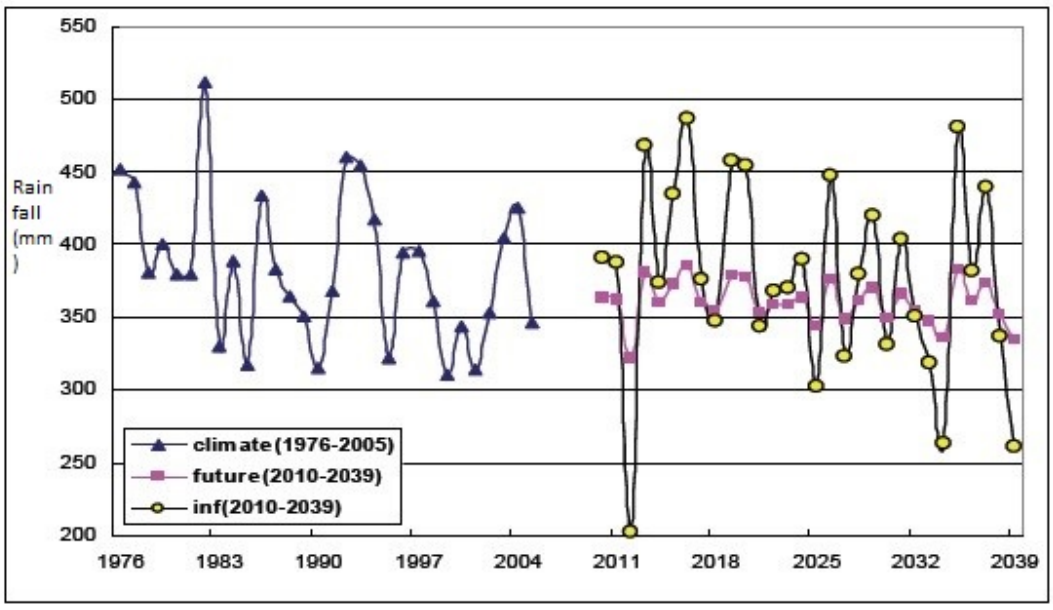


Figure 2: Estimation of late changes of rainfall in the country during 200-2100 by the MS model by using the data of atmospheric general circulation model of ECHAM4 (6)



In the model of HADCM2, the most increase in temperature are in the states of Yazd, Southern Khorasan, Chahar Mahalo Bakhtiari, and Esfahan, some sections of Khorasan Razavi, Semnan, Tehran, Markazi, Qazvin and Gilan. Other provinces are faced with a significant increase in temperature, are as follows; Hormozgan, Sistan and Baluchestan, Bushehr, Kerman, Fars, but in the model of ECHAM4, the maximum temperature rise are occurred in

the provinces of Fars, Isfahan, Chahar Mahal and Bakhtiari, Bushehr, Mazandaran , Tehran and other parts of the province Yazd, Semnan, Qazvin, Gilan and Markazi [6].

According to the study, (7) and based on predictive models, rainfall reduces in the country about 9 percent that the biggest drop is along the Zagros Mountains, in the West, and East and West coast of the Caspian. This area has decreased by more than 23 mm.

And the average temperature will be increased during the period of 2010-2039 by an average of 0.5 ° C in comparing with the base period. The greatest increase will be 0.7° **C** which is related to the cold period of the year**.**

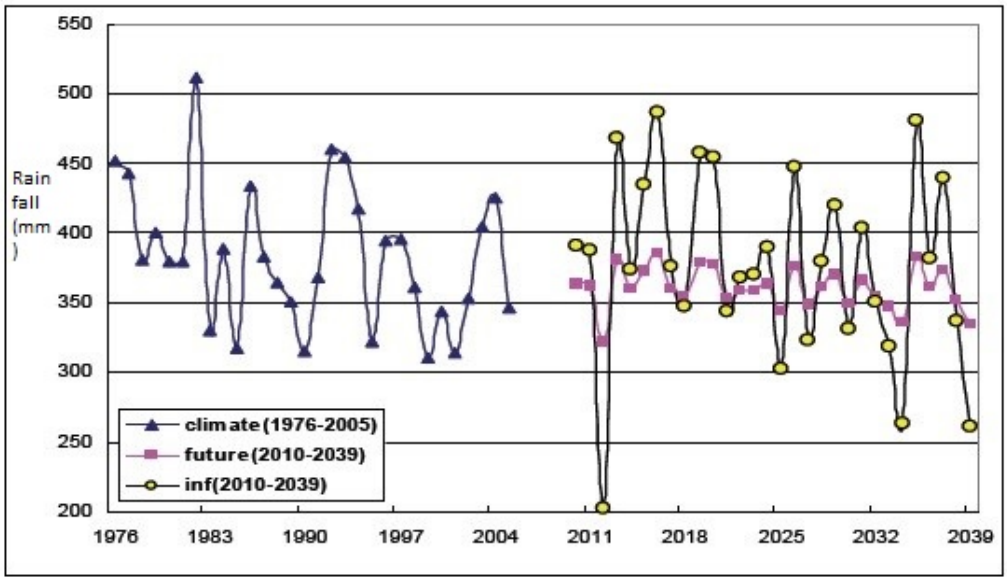


Figure3. The average temperature of the country by 2039, according to ECHO-G (7)

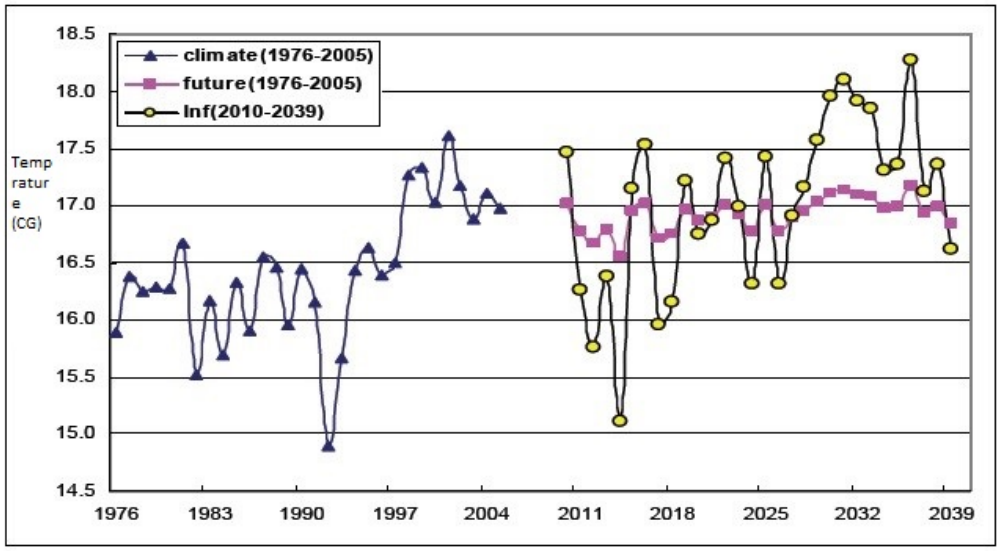


Figure 4: Average precipitation in the country by 2039, based on the model ECHO-G (7).

Many studies have been conducted in this area (8) which have pointed to the rise in temperature in some provinces. And have confirmed the climate change.

In the majority of studies that have been conducted in the field of climate change, the occurrence of this phenomenon has been emphasized. So we have to prepare the consequences that it brings along. Because it passes the prevention level so we should put adaptation and mitigation reduction in the priority of programs.

Environmental Crisis in Iran

Only the review of the current environmental crisis in the country is enough to understand that the environment is much more terrible than that it has been portrayed. While it is only more than 3 decades remained, until 2050, the phenomenon of dust and dirt due to the increasing desertification and land degradation in the neighboring countries of Iran and Iran's performance have been affected more than half of the country and, of course, other countries in the region have not been deprived of this phenomenon. On the other side, the presence of the salt storms in the northwest corner of Iran due to the drying of Lake Urumia has already started and it is going forward so to create one of the largest environmental disasters in the next decade; such disaster like the destruction of the Aral Sea and the incidence of storms salt of this region, which have affected more than five million women and children in the past few decades due to a variety of lung diseases, asthma and cancer. Although many of the United Nations Environment Programs warned to the destruction of wetlands in the Middle East and a sharp reduction in groundwater resources, but the reality is that not only in region countries but even in Iran also there were no plans to reduce these dangers and risks. For many years, the first warnings stated about the destruction of Hamun wetlands and wetlands of Mesopotamia, they did not care about it and these wetlands each destroyed more than 90 percent, but nowadays, Urumia, Bakhtegan, Praishan and Jazmurian Lakes, were added to the total destroyed wetlands area. More than 600 plains faced a severe decline of the aquifers and seawater intrusion into freshwater aquifers is taken so quickly that, even on some parts of Mazandaran province, the farmers faced with salty water instead of fresh water after digging the well! And this is the only part of the rapid process of land degradation in the country, a country that now is dedicated the population of the Middle East and North Africa close to 20% and a few years later, its population could’ve been grown to 200 million. While a third of

its northern forests has been destroyed on the basis of statistics and desertification threatens about 90 percent of the country's lands and their all wetlands, lakes and rivers faced with drought. Zagros forests and plowed mountains of these regions that generally have become the wheat fields, it is better to say nothing that the evidence screams the fact (9). At the same time the most important problem is perhaps water crisis because more people means more need for food and water and this requires removal of more of the limited water resources in the country.

Water Crisis in Iran

Recently worldwide reports published that water resources in the Middle East, including Iran, have stated warning situation. The investigated studies referred to factors such as increase of consumption, weaknesses in the management of water resources, drought and particularly climate change as effective factors in creating a crisis point. English newspaper "The Guardian" by referring to different parts of the world water crisis, reported that Middle East, North of Africa and South of Asia due to bad management in the coming years will have a shortage of water. Iran is listed among the countries affected by the water crisis. In this regard, World Bank statistic figures indicated severe water crisis in Iran. According to this statistics, Iran among these 180 countries in terms of per capita water resources is at position of 112 in the world. Per capita water resources in Iran is 1,704 cubic meters, while per capita water resources in the world and in the world's high-income countries, are respectively, 3.6 and 6.65 more than Iran. Research findings and national studies have predicted worrisome prospect for the future of the country. For example, the minister pointed out that the country's renewable water resources reduced from 130 billion to 120 billion cubic meters and this is exacerbated in the future, and stated that the country's water situation has also passed the crisis level and it is far from it. Chintz Qian said, if a country consumes between 20 and 40 percent of its renewable water resources, in terms of sustainable use of water resources and if it consumes between 40 and 60% of the water resources, so they are at a critical level of water. At present time, from the country's 120 billion cubic meters of renewable water, 96 billion cubic meters is used per year, which is 80% of the country's renewable resources and the country now has passed the stage of the water crisis. As far as water supply will become one of the biggest challenges in the coming years in many provinces, cities and regions.

On the other, in a surface look water shortage seems a second-grade level problem, although, in the opinions of the most of the security and intelligence authorities, the root of many future domestic and international unrest, especially in areas such as the Middle East, is water resources, which is including warning of security agencies of America to war over water range (10). Inattention to exacerbation of growing water crisis has been considered so far that some American researcher have added drought phenomenon in the civil war in Syria based on the factors such as oppression, religious conflict and ethnic politics. It is argued that the drought caused many farmers to lose their source of livelihood and about 1.5 million people in the periphery of these cities were added to the more than 1 million internally displaced Iraqis and ensued competition on jobs, shelter, food, water and energy. In this situation, the unprecedented growth of Syria's population should be added that from 4 million people in 1950, they reached to 20 million in 2010. Struggle over access to scarce resources, caused to the growing discontent in the country. According to the researchers' speculates, the noted situation could be grounds of protests and conflicts that in following, the civil war began. Of course, one of the researchers by the name of Klein believes that: "We do not claim that drought and climate change caused by humans, is the beginning a civil war." Kelly and his colleagues have emphasized on the "Chance" of long-term impact of the lack of rain and increase of heat stress in unrest region. Moreover, the recent drought was more severe than before (11).

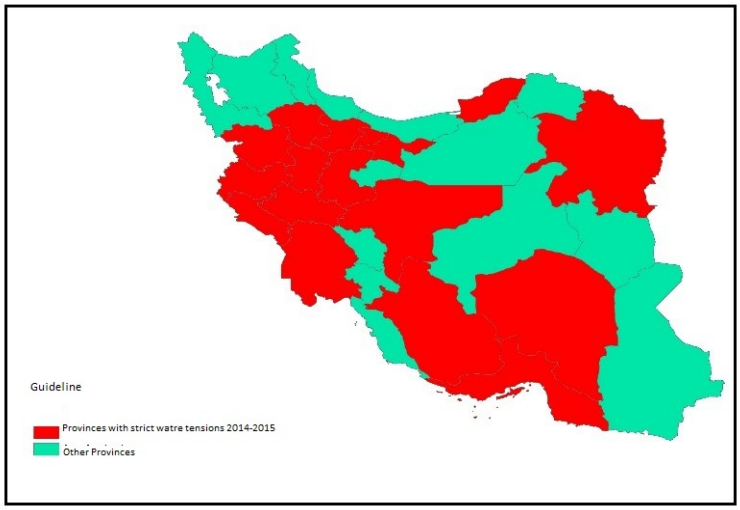


Figure 1: provinces that have been subject to severe water stress in 2014 and 2015 (12)

In Iran, though not to this extent but worrisome prospect for the future can be predicted. So long the rumors of dissatisfaction with the status quo, can be heard once in a while especially on the issue of waste water.

In June of 2007 when Mahmoud Ahmadinejad was the Iranian President, on the occasion of the liberation of Khorramshahr, had traveled to this city, according to news agencies, the most request of the people was the water problem that people wanted to express their slogan. This outcry of those who for years had a decent grappling with the problem of drinking water. Just a little far from there on the other side of the city, the people of Abadan also said the problem of drinking water and 100 km away in the city of Ahvaz also objected to the lack of clean water. People nearby villages of Poldokhtar region in the province of Lorestan, two years ago due to water problems closed the north and south of transit road for hours. On the other hand in the East of the country, the people's condition is not better than the people of the Abadan. Some marginal locals "Hemat Abad", of Mashhad which most of whom were women years ago to protest the water problem blocked cement roads of Mashhad and people of South Khorasan and many parts of Sistan-Baluchestan have great problems of facing with water shortage (13).

The water transmission pipeline break down of Zayanderood to Yazd by farmers who had gathered with their tractors in some parts of the East of Isfahan for 40 days in order to show their protest, it was different reaction that led to rationing in Yazd (14). These events which indicate that experts should believe that Iran remains on the verge of a water crisis and water supply will become one of the greatest challenges in the coming years in many provinces, cities and regions. And these are all less important, as a new wave of rural migration to cities because of shortage or lack of water discharge, especially in the eastern parts of the country, and this is the case that in cities also in the summer of 2014, according to the sum, from 1152 cities, 517 cities, and in 2015, 547 cities in the warm season faced with water stress (15).

In most provinces of Iran including Isfahan or more southern provinces such as Ahvaz their water needs are supplied from other provinces. In other words, the source of water that is used in these provinces is located in other provinces. For example, in the province of Khuzestan, the water supply resources are located behind the dam of

Gotvand, Caron and others in the province of Lorestan, Kermanshah and .....

However, considering the studies that have been conducted in these provinces which are the source of water supply for other provinces, the climate change have occurred. And it is faced with water stress. An example of it, is the province of Kordestan that located in red zone in the water year of 2014 and they only could reduce the severity of the stress through the water that is channeled from other dams in the provinces.

Another example is related to Dam of Mashore in Kuhdasht city. Lorestan, which is the source of water supply of Khuzestan province. In terms of groundwater and surface is in a very dangerous situation. And sealants have been intensified. Mashoreh dam construction in the city of Kuhdasht faced with the protests of Khuzestan representatives. Arguing that the construction of the dam will reduce water storage in dams of Khuzestan. On the other hand people have to stop construction of the dam of Mashoreh in Kuhdasht city to protest against their government.

In the worst case scenario, management of water resources and the use are facing with many problems in different parts of Iran and waste of water sources in Iran's in urban agriculture is much higher than international standards. For example, according to the World average water use per person is about 150 liters per day. While in Iran, this number is more than 250 Liter. On the other hand comparison of water resources management in the country with international standards shows that the management of water resources which is a strategic commodity is very weak. According to the Energy Department in the country from the 130 billion cubic meters of annual renewable water potential, 92% in agriculture, 6% in urban and rural water and only 2% in the industrial sector consumed. While the share of agriculture in the global average is 70 percent of renewable water resources, the share of consume is 8 percent and 22 percent is the share of industry. Therefore, if a country is faced with population growth in the years ahead in terms of water supply placed in critical condition. In the past 90 years, the population grew from about 10 million in 1920 to more than 75 million people in 2011 so the countries per capita share of water per person has fallen sharply. So that the water potential of each Iranian at the beginning of this Persian solar century has been 13 thousand cubic meters that in the 1960 reduced to 5,500 cubic meters in 1976 and toward the verge of

revolution it has reached to 3400 cubic meters in 1988 to 2,100 in 2007 to 1900 cubic meters and if this trend continues as it is expected in 2020 it will reached to less than 1,400 cubic meters per year, and this means entering water crisis (13).

There are many examples of tensions that occur as a result of climate change from potential to actual state of the country's provinces. Also it will take place in the very near future. The stresses caused by climate change is a result of the water crisis, among the provinces that surface water sources are located in the provinces it reaches the surface sources, if the programs are not conducted in order to mitigate the effects of climate change and adaptation, it could be intensified and puts national security and the integrity of the country at risk.

CONCLUSION

Climate change nowadays is known as one of the important crisis that has put the planet in peril, and it is for everyone clearly apparent, this crisis affects all countries on the international scale. This effect is different in different parts of the Earth. But the most severe impacts is in arid and semi-dry areas. Middle East regions are one of the most important areas that as a result of climate change is faced with many crises, and in the future will be added to the frequency and severity of these crises. So that the root of many of the political, economic and social crisis in the Middle East and North Africa is toward climate change and the water crisis is the result of that. Climate change and its impact on the water crisis is not only can create tension between the countries. But in the internal scale of the country also has the potential to create tension between the provinces of a country. Iran due to its location which is placed in a dry and desert-making area is heavily influenced by the consequences of climate change. In the interior range of Iran also authors results show that the various parts of country also affected with different intensity of climate change. The water resources in the country are not distributed in a balanced way and this creates tension between some of the provinces over water resources. And according to the process of climate change which is in average precipitation and temperatures, and is expected to have critical perspective, and also it is expected if the plan is based on the realities of climate change, cannot be done for water resources and tension between provinces accelerated, although you have already seen sparks of tension.

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