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Effects Study of Environmental Stressful Factors on Qom Province Lagoons with Emphasis on the Drought

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A B S T R A C T

Drought phenomenon repeated in different climates to arid and semi-arid and its effects are not limited, but may be in areas with high rainfall or in different seasons occur. Drought is a slow phenomenon with high spatial spread to many different parts of the economic losses each year makes The monitoring and mapping as an important principle to be considered in the overall planning. In this study, the drought station, Qom using(rainfall anomaly index RAI) rainfall anomaly index, is the standard (SPI) standardized precipitation, and the decile index (DI) deciles index was And significant anomalies, standardized precipitation index, index decile and the impact of drought on wetlands has been studied in Qom. And outcome and its destructive effects on the natural environment, physical, social and economic region.

Introduction

Rainfall is one of the climatic important factors that has great role in economy, agriculture, industry and tourism. Although achieved water from rainfall based on capability of societies and time conditions and different seasons has different consumptions, but often its surplus that greatly includes more percentage as compared with optimum consumption, causes flowing the floods and loss derived from it as uncontrolled. This is while dilemma of drought and damages derived from it always has brought abundant difficulty for animal, plant and human communities. Drought is the component of insensible natural disasters that occurs due to the lack of rainfall during a period of time, usually one season or more.

And it abundantly damages to the human life and natural ecosystems and it has differences with the other natural incidents such as flood, storm and earthquake. Most of these differences is in gradual effect of

drought during a relatively long period, impossibility of the exact determination of the commencement and end time and geographic area of its effect. On the other hand, lack of exact and universal acceptable definition for drought, adds complexity and bewilderment of this phenomenon. Droughts generally are 3 types: meteorology drought, hydrological drought and agricultural drought. Meteorology or climatic drought results from lack of the rainfall that due to the continuity it results in hydrology and agricultural drought.

Rainfall is the most primary parameter that has been used in definition of the drought that is Drought and wet year compared to being less or more of precipitations is evaluated from the rainfall average of an area. To reduce the effects of this phenomenon and management of its danger, evaluation of the drought and continuity of its courses is necessary. Iran has arid and semiarid climate due to lying in drought belt and neighborhood with tropical high pressure area and consequently has suffered extreme drought in the majority of years. Early works about monitoring was started by Whipple in 1966 primarily with abundance analysis of the drought area in small scale and then was followed by other researchers for some states of U.S.A that were more in exposure to the drought. Spi index is able to evaluate the state of drought in different scales of time and also to monitor types of drought and long period scales is related to hydrologic drought. Rainfall anomaly index is based on the computation of rainfall rate deviation from normal amount. Balm and Molly drought index also is determination of deviation percentage of rainfall data from normal amount that its time scale is either monthly or annually. Also in deciles index, occurred rainfall distribution in a long period is divided in to 10 units. Every of these units is names one deciles. The first deciles represents rainfall that is less than 10% rainfall and the second deciles shows rainfall amount less than 20%. Many researches have been carried out about the drought subject such as the following cases that we can point to them: Cruitor *et al* (2011) studied drought event in Romania and expressed that created belkings in the way of pluvial masses is the factor of drought. Pari *et al* (2010) studied time- local development and characteristics of large droughts of Europe scale in spi method. Results showed that high pressure systems of North Atlantic ocean is the cause of drought. Kim *et al* (2009) have dealt with evaluation and performance comparison of effective rainfall index and spi index for monitoring Denmark drought and results express that effect of Edi index is more than spi index in evaluation of the drought.Yazdani *et al* (2006) using rainfall series and Sa,adati and Soltani (2007) studied about Isfahan province drought and the results of both showed that west and southwest and east areas of the province have more sensitivity to the drought.

Indices used in this research included:

Rainfall anomaly index (RAI)

Standardized precipitation (SPI)

Deciles index (DI)

With regard to the lagoons importance in this region of country, in this research has been dealt with study of drought and its effect on the lagoons.

Materials and Methods

Qom province with the area of 11240 km2, is located in the center of Iran. This research using rainfall anomaly index (RAI), standardized precipitation (SPI) and deciles

index (DI) and its effect on the lagoons such as (Behesht-e Ma,soomeh lagoon and Mereh no hunting lagoon and Hoz-e Soltan no hunting lagoon), has dealt with study of Qom station drought. For study of droughts, data of Qom Synoptic meteorology station has been used during course (1986-2014).Specifications of the named station has been explained in table 1.

Based on the collected present statistics from monthly rainfall amount of Qom Synoptic station, rainfall anomaly index (RAI) and standardized precipitation(SPI) and deciles index (DI) has been used for determination of the drought intensity based on the present data of rainfall during the named years.

With regard to the tables (5 and 6), review of the drought in Qom studied station that has been done in time interval (1986 to 2014) and with named indices, has been brought in breakdown. With regard to the reduction of rainfall in the area, drought dominates with different intensities in the area. Therefore, it is necessary that with study of the drought, recognition of features and its monitoring and anticipation we pave the way for better and more adequate management of the water.

Monitoring drought using drought profiles such as (RAI), (DI) and (SPI) as one of the effective components in the prognosis system of disasters risk management has enabled us to recognize the regions that has been damaged by the drought and to manage with regard To the vulnerable ecosystems of these regions until with considering possibilities and anticipation of the drought incidence to be dealt with the correct planning and management of the water sources in low water years. Effects derived from drought on the environment are very vast because some of these effects are not recognizable in short term and their effects will show themselves in long term. Long term and permanent effects will show themselves more in lagoon ecosystems because these ecosystems primarily lie in the end of catchment areas and these sources bear the most pressures derived from the low water and drought. Generally the effects of the drought can be divided in to 3 groups of environmental effects, economic effects and social effects. Reduction of the water surface of the lakes, rivers and lagoons is one of the clear signs of the drought. With reduction of the rainfall, actions and reactions between lakes and peripheral land environment is destroyed and coastal shallow regions and lagoons expose to the variation and growth patterns and chemical sycles suffer change. After the reduction of lagoons water and the reduction of runoff, entry of DOC shows significant reduction during the drought courses.

Other environmental effects of the drought phenomenon on the lagoons are increase of alga efflorescence phenomenon, destroying plant species, destroying animal species, destroying habitats, effect on the weather quality, reduction of the biodiversity, qualitative reduction and destroying landscapes, soil erosion and increase of the desertification extent. In consistent with the management of drought phenomenon in the lagoons, 5 following factors have special importance: identification of the drought characteristics, determination and selection of the government officials, warning drought incidence, reduction of the water consumption and protection of economic structure and method of monitoring on the observance of the water consumers plan.

Qom province lagoons such as Behesht-e Ma,soomeh lagoon, Mereh no hunting lagoon, Hoze-e Soltan no hunting lagoon have special and unique characteristics. For the following reasons, we can name these lagoons as the gene treasury:

1-Identification of a rare species of reptiles

2-Identification of ultrasaline rare microorganisms (200 levels)

3-Special aquatic species(parthenogenetic Artmia species)

4-Plant species that are interested in very saline ambient.

In terms of natural tourism value, despite of suitable accesses and basic infrastructures for Reception and tourism development, rarity of the region against the other global ecosystems is important that should be noted individually. Lagoon changes are related to the water changes in the rivers leading to it, therefore due to the occurred changes in water supply sources, it has changes and fluctuations.

Table.1 Specifications of Qom Synoptic station

Station	Latitude	Longitude	Height from sea surface	Statistical course
Qom	35 degree and15 minute northern latitude	30 degree and 51 minute eastern longitude	930 meters from sea surface	1986-2014

Table.2 Rainfall specifications of Qom Synoptic station

kurtosis	skewness	range	minimum	maximum	varianc	Standard deviation	median	mean	Station
1.03-	**0.37-**	**130.1**	**76.1**	**206.2**	**1699.86**	**41.23**	**150.6**	**143.97**	Qom

Table.3 Different categories of the studied drought indice

Drought intensity categories	Grade	Standardized precipitation(SPI)	Rainfall Anomaly Index (RAI)
Normal	0	-	-0.3than0.3
Weak drought	1	than -0.990	-0.3than -1.2
Mean drought	2	1.44 - -1 than	-1.2 than -2.1
Extreme drought	3	1.50 Than-1.99	-2.1 than -3
Very extreme drought	4	-2 than 0	-3≤

Table.4 Different categories of drought index (deciles index)

Number of deciles	Drought intensity	Incidence percentage rate
First	very extreme drought	less than 10%
Second	extreme drought	10% to 20%
Third	drought	20% to 30%
Fourth	approximately normal	30% to 40%
Fifth	normal	40% to 50%
Sixth	normal	50% to 60%
Seventh	a little wet	60% to 70%
Eighth	wet	70% to 80%
Ninth	much wet	80% to 90%
Tenth	extremely wet	more than 100%

Table.5 Index of Qom station drought in deciles method (DI Index)

Date	Precipitation	DI Index	Drought Severity
1986	115.2	DI(3): 123	Below normal
1987	79.4	DI(1): 79.4	Very much below normal
1988	138.8	DI(4): 142.1	Slightly below normal
1989	90.4	DI(2): 99.5	Much below normal
1990	129.5	DI(4): 142.1	Slightly below normal
1991	185.1	DI(9): 202	Much above
1992	193.5	DI(9): 202	Much above
1993	202	DI(9): 202	Much above
1994	85.1	DI(2): 99.5	Much below normal
1995	206.2	DI(10):> 202	Very much above normal
1996	76.1	DI(1): 79.4	Very much below normal
1997	142.1	DI(4): 142.1	Slightly below normal
1998	163.6	DI(7): 165.4	Slightly above normal
1999	175.1	DI(8): 183.9	Above normal
2000	151.5	DI(6): 156.2	Normal
2001	149.7	DI(5): 149.7	Normal
2002	165.4	DI(7): 165.4	Slightly above normal
2003	177.4	DI(8): 183.9	Above normal
2004	146.4	DI(5): 149.7	Normal
2005	156.2	DI(6): 156.2	Normal
2006	183.9	DI(8): 183.9	Above normal
2007	99.5	DI(2): 99.5	Much below normal
2008	165	DI(7): 165.4	Slightly above normal
2009	78.1	DI(1): 79.4	Very much below normal
2010	143.4	DI(5): 149.7	Normal
2011	119.9	DI(3): 123	Below normal
2012	144.5	DI(5): 149.7	Normal
2013	152.8	DI(6): 156.2	Normal
2014	123	DI(3): 123	Below normal

Table.6 Index of Qom station drought in rainfall anomaly method (RAI Index)

Date	Precipitation	RAI Index	Drought Severity
1986	115.2	-1.91	Moderately dry
1987	79.4	-4.40	Extremely dry
1988	138.8	-0.27	Near normal
1989	90.4	-3.64	Extremely dry
1990	129.5	-0.92	Weakly dry
1991	185.1	2.32	Normal
1992	193.5	2.78	Normal
1993	202	3.25	Normal
1994	85.1	-4.01	Extremely dry
1995	206.2	3.48	Normal
1996	76.1	-4.63	Extremely dry
1997	142.1	-0.04	Near normal
1998	163.6	1.14	Normal
1999	175.1	1.77	Normal
2000	151.5	0.48	Normal
2001	149.7	0.38	Normal
2002	165.4	1.24	Normal
2003	177.4	1.90	Normal
2004	146.4	0.20	Near normal
2005	156.2	0.74	Normal
2006	183.9	2.26	Normal
2007	99.5	-3.00	Extremely dry
2008	165	1.22	Normal
2009	78.1	-4.49	Extremely dry
2010	143.4	0.03	Near normal
2011	119.9	-1.58	Moderately dry
2012	144.5	0.09	Near normal
2013	152.8	0.55	Normal
2014	123	-1.37	Moderately dry

Table.7 Index of Qom station drought in standardized rainfall method (SPI Index)

Date	Precipitation	SPI Index	Drought Severity
1986	115.2	-1.10	Moderately dry
1987	79.4	-2.17	Extremely dry
1988	138.8	-0.52	Near normal
1989	90.4	-1.81	Severely dry
1990	129.5	-0.73	Near normal
1991	185.1	0.48	Near normal
1992	193.5	0.63	Near normal
1993	202	0.77	Near normal
1994	85.1	-1.98	Severely dry
1995	206.2	0.84	Near normal
1996	76.1	-2.29	Extremely dry
1997	142.1	-0.41	Near normal
1998	163.6	0.07	Near normal
1999	175.1	0.29	Near normal
2000	151.5	-0.19	Near normal
2001	149.7	-0.23	Near normal
2002	165.4	0.10	Near normal
2003	177.4	0.34	Near normal
2004	146.4	-0.31	Near normal
2005	156.2	-0.08	Near normal
2006	183.9	0.46	Near normal
2007	99.5	-1.53	Severely dry
2008	165	0.09	Near normal
2009	78.1	-2.22	Extremely dry
2010	143.4	-0.38	Near normal
2011	119.9	-0.97	Near normal
2012	144.5	-0.35	Near normal
2013	152.8	-0.16	Near normal
2014	123	-0.90	Near normal

These changes that in fact are natural changes, has been occurred permanently and during many years. But meanwhile we should also note the second type of the changes that its source is from the human interference. These changes has formed either directly as a result of the projects performance and special operations in the area of the lagoons or is indirectly as a result of measures that was carried out about logistics of watershed areas and utilization from original water sources of the lagoons before reaching to it, that make the change of the lagoons areas in many years. Drought in this region has resulted in drying the lagoon and consequently destructive effects on the natural, physical and economic-social environment of the region. Among the primary threats for Qom province lagoons we can point to the following cases:

1-Reduction of the water stop surface and potential of the lagoon water due to irregular removal from the water sources in upstream of the watershed area.

2- Regardless of the drought that directly results in change of the lagoons face, establishment of the made dams on the rivers of lagoons catchment area is their destructive factor.

3- Discovery of considerable mineral reserves in some lagoons such as Hoz-e Soltan lagoon and becoming the extraction activities economic.

4- Irregular and excessive grazing and out of ecological potency of the lagoon.

5- Conversion of some parts of lagoons to the lands with agricultural use.

The effects of drought on physical environment bring reduction of nutrients existing in the soil surface due to the increase of wind erosion, increase of wind and water erosions in the region, reduction of transfers of nutrients in the soil, increase of dust storms and destruction of tissue and soil structure. The effect of drought on biological environment brings reduction of biodiversity of the region, reduction of plant cover and consequently animals of the region, destruction of the wild animals and water organisms of the region, disturbance in reproduction of the wild animals, attack of the wild animals to agricultural lands and villages and becoming easier their hunting and vulnerability due to the hunt, change in the food habits and emigration of the wildlife, increase of the wildlife diseases and invasion of insects to the native plant cover of the region. Therefore, management of the lagoon and upgrading it to desired ecological state is very necessary. If drying of Qom province lagoons continues, it can hit irreparable implications and losses to the environment that its rehabilitation and restoration will take many years and may have bad effects on the human health via extension of the micro dust.

References

1.Farajzadeh M. 2005.Drought from concept to solution, publication of geographical organization of armed forces.

2.Ensafi Moghaddam T. 2007. Evaluation of some indices of climatic drought and determination of the most suitable index in the area of Namak lake, 271, scientific- research quarterly of researches institute of country forests and pastures, volume 14, number 2,p. 288.

3.Mosaedi A., Khalilizadeh M., Mohammadi Ostad Kelayeh A. 2008. Monitoring meteorology in the level of Golestan province, agricultural

science and natural sources magazine, volume 15, number 2, p.8.
4.Khoda Gholi M. 2008. Study and zoning of Isfahan province droughts using standardized rainfall index, general administration publication of natural sources of Isfahan province, p.25.
5.Khoda Gholi M., Soltani S., Mirsa,idi A., Mahmoodzadeh A.,Shirvani F., Ghazanfarpoor N., 2009.Study of province drought using 5-month and 8-month SPI index, Isfahan in time intervals of the second national conference of drought effects and management solutions, Isfahan.

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