ORIGINAL ARTICLE

Evaluation of the Effects of water level decline of Urmia Lake in sustainable rural Development: Case study: Central Marhamat Abad rural district, Miandoab County

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ABSTRACT

In recent years, Urmia lake, the largest lake in Iran is faced with a dramatic reduction *in the Volume of* Water. This has created some concern in terms of outcomes and impacts. *also, it has effected Rural communities on access to water supplies through restriction and has many economic, social, physical and environmental costs. The aim of this study is to Evaluation of the effects of water level decline of Urmia Lake in sustainable rural development in Central Marhamat Abad rural district, Miandoab County. The type of research is experimental, the method of research is descriptive – analytical,* data collection tools *were library research and field survey (observation, interviews and questionnaires) and for data analysis, descriptive (mean, Variance and standard deviation) and inferential (T-test, Friedman and regression) statistics were used. The spatial scope of the study is Central Marhamat Abad Rural district, Miandoab. According to the Statistical Center of Iran's population census, in 2011, the population of district is against 7040 persons and 1616 households that 125 households are selected as samples by modified formula Cochran and Simple Random Sampling. The* research findings show, *water level decline of Urmia Lake has the most negative influence on the physical (salinization of lands, declining diversification in crops, destruction of orchards and pastures, increasing contamination of water resources and rural environment) , economic (declining of non-agriculture employment opportunities, declining of rural income, declining of employment and job diversity, increase in house and land prices and etc) dimensions and then physical and social dimensions and least influence on the institutional dimension.*
Keywords: Urmia Lake, sustainable rural development, Central Marhamat Abad

INTRODUCTION

Lakes are Large water reservoirs on the earth and as one of the most valuable ecosystems has a very diverse biological functions and hold various natural, economic and social values [1]. The lake is between the provinces of East Azerbaijan and West Azerbaijan. The lake is divided into north and south parts separated by a causeway. The lake is the largest permanent water basin in Western Asia [2]. Furthermore, this place is one of the largest permanent hyper saline lakes in the world [3]. As noted above, the lake water is extremely salty and due to the high concentration of minerals, the water is not good for agriculture, fish life and a lot of other aquatic, but it is not a dead lake, also it is the most active biological reserves [4] so that, it is one of the biggest natural Artemia habitats in the world [5]. This ecosystem is the home for different species. Due to various socio-economical and ecological criteria, Urmia Lake has important role in the Northwestern part of the country [6] and is designated as an international park and protected biosphere reserve [7]. In ecologic zone of lake there are 547 herbaceous species, 27 mammal species, 21 fish species, 212 bird species and 41 reptile species. [8]. The importance of this species is that, it is one of the Tourism ability of district is related to wildlife [9].

The Urmia Lake has about 102 islands both large and small. Five of these islands can be noted here such as the Islands of Islami, Kaboodan, Ashk Daqi, Espir, and Arezoo [10]. The average salinity of the lake ranges between 220-300 mg/l depending on temporal and spatial conditions, in recent years it has reached to more than 380 mg/l [3]. Some reports show that the salinity of Urmia Lake has reached to more than 300 gl since 2001 [11]. Urmia Lake (Chichest), one of the rarest and most valuable biological reserves in Iran and the world is faced with a crisis condition over the past decade [12]. Relevantly, Statistical data from

1955 to 2007 show an overall decreasing trend in area from 5800 km2 to 4017 km2 and this leads to appearance of 1800 km2 salt marsh on adjacent lands [13]. The lake is threatened and has been demolished by the two groups inside and outside the system. The inside system agents which are the part of the essence of the lake system includes climate features, water resources, wildlife, vegetation, etc. The changes occurred in the characteristics of these agents has caused changes in the lake system [14]. So that 65 percent of the decline was from changes in inflow caused by climate change and decreased precipitation over the lake itself (10%) [15].In addition, the outside agents of the system is imposed from outside the system, these agents are man-made and are going to be dried by human exploitation such as overuse of surface water resources, and dam constructions and etc [14]. So that, construction of dams as one of the human intervention in this area allocated 25% of the degradation of the lake [15]. In this regard one quarter of the lake has changed to saline area in the last 10 years [6].

Figure 1: Water level decline of Urmia lake, based on satellite images

Resource: Climatechange.ir

Studies show that the Urmia Lake drying could underlie the broad ecological effects in the North West and even affect neighbor countries seriously. For example salt and dust particles may even damage the snow cover parts of the neighbor countries and alter the flow of water from the mountains and threaten water and food security [16]. It will force many people to abandon their villages and towns around the lake and a vast majority of the flora and fauna will be lost permanently [17]. Also, Water level decline of Urmia lake, unveiling of salt domes and the wind blows containing minerals and salt toward agricultural lands and fruit trees, agricultural land around the lake areas are highly vulnerable to destruction and disruption. results of consecutive drought, Water Shortage and improper irrigation practices, this matter is one of the majoring problems in the agricultural sector of the country and all over the world, and also in the area around Urmia Lake. In addition to this, in parallel reducing the level of the lake and reduce the evaporation rate, the environment temperature increases. This could act as a feedback cycle. That is what the lake area is reduced, the amount of heat discharged into the environment is increasing proportionally [18] and impact on crop pattern in the surrounding villages will be the result. More than 60 percent of the population around the Urmia lake lives in villages that includes 520 villages [19]. Hence paying attention to this condition and the impacts of this crisis must be considered among this huge rural population. This condition makes the salt transport agricultural area and reduces productivity and even reduce rural incomes, the production of the region and the province, employment in the agricultural sector, boom down side industries which is dependent on agriculture, and at last influenced the dimensions of sustainable development in the region [20]

Central Marhamat Abad rural district is located in the southern part of the Urmia lake and in the highly sensitive ecological region [21] And during the recent years it has been strongly influenced by the drying up of Urmia lake. So that this environmental crisis has different impacts on rural sustainable development especially in the economic, social, and physical environment dimensions. Hence the present study aimed to investigate the drying of Urmia lake and its impact on sustainable development in the surrounding villages and is to answer the following question:

Which dimension of sustainable rural development in the cast study is more effected by the declining the level of Urmia lake?

METHODOLOGY

This study is *Experimental.* The method used to describe the characteristics of the study area is descriptive and analytical. Library research and field survey (observation, interviews and questionnaires) were used in order to collect the information in the study area. The spatial scope of the study is Central Marhamat Abad Rural district, Miandoab.

This distinct has 6 villages, that all of them are located in the southern coast of Urmia lake and in a quite plain area. due to the low number of villages Sampling was not performed and all of the rural areas were considered as a part of the target population.

According to the Statistical Center of Iran's population census, in 1390, the population of district is against 7040 persons and 1616 households (The County Planning of Vest Azarbayjan, 1390:15) that 125 households are selected as samples by modified formula Cochran and Simple Random Sampling. Selecting households in each village was conducted randomly, till the equal opportunity to select the households be observed

Accordingly, in order to achieve the desired results, a questionnaire was formulated in 5 dimensions and 45 items to evaluate the effects of Urmia Lake on sustainable rural development of the case study rural district. The reliability of the questionnaire using Cronbach's alpha was calculated 0.529, which indicates that the data is normal. Continue to analyze the data obtained, T-test, Friedman and Multiple regression was used.

Table 1: dimensions and items of study

dimensions	items
economic	the possibility of non-farm employment opportunities, the amount of rural income, Increase motivation to improve work, increase house and land prices in the village, Rural access to credit and financial services, increase f rural migration especially among the youth, declining the areas of employment and job diversity, improving the quality of infrastructure services, improving communication infrastructure, increasing the price of agricultural land in the village after Water level decline
social	Life satisfaction, strengthen local institutions such as village councils, increasing sympathy among villagers, changing shared values over time, increasing access to information and communication technologies, increasing crime rates, anomalies and inconsistencies in the village, changing in the value of the local population, increasing public participation in the affairs of the village, hope for the future, increasing in confidence in the Council
Environmental	The rate of salinization of agricultural land, an increase in natural resource conservation and vegetation, the amount of diversification in crops, recovery rate of waste disposal and waste

higher rates of rural drinking water quality, changes in agricultural land, declining of orchards and pastures, allowing the collection and disposal of surface water, increasing contamination of water resources and the environment |
| physical | The possibility of improving the facilities in the village, amount of housing Improvement, Use of standard architectural styles in the housing sector, the amount of improving in green spaces within the context of housing, the rate of development of second houses in the villages, the rate of improvement in construction methods, the amount of improvement in rural roads (Asphalt, setting the table) |
| Institutional | The amount of experience in improving the rural environment, The role of rural councils in establishing the relationship between villagers, the ability of local institutions to provide services in rural areas, Council's ability to create a friendly link between farmers, rural administrators's ability to deal with the crisis, having and access to proper equipment and financial resources to deal with the salty land by rural institutions, local authorities and county level efforts to improve production efficiency |

Source: research findings

Introduction to study area

Central Marhamat Abad Rural district is located in the northern part of Miandoab, the south of Urmia Lake and in the east of West Azarbaijan. According to the latest data of the Statistical Center of Iran and West Azarbaijan province Jihad agriculture, the study area contains 6 rural points (Rouian Faranegar system consulting engineers, 2011:3). the History of Central Marhamat Abad rural distric goes back thousands of years and to the oral literature arrives to Hulagu Khan period in Maragheh accordingly that because of

good geographic and climatic conditions such as: Urmia lake, a few hundred kilometer forests famed as Shamat, proper hunting place and whereabouts of horse and sheep and proximity to *Zarineh* Rood *River* (Jaghatu) and the great Plains in the area, has been suitable place for farming and gardening. And because of enough water, agriculture , horticulture and other vital facilities join boom in this region.

Figure 2: Location of Central Marhamat Abad rural district in Miandoab county
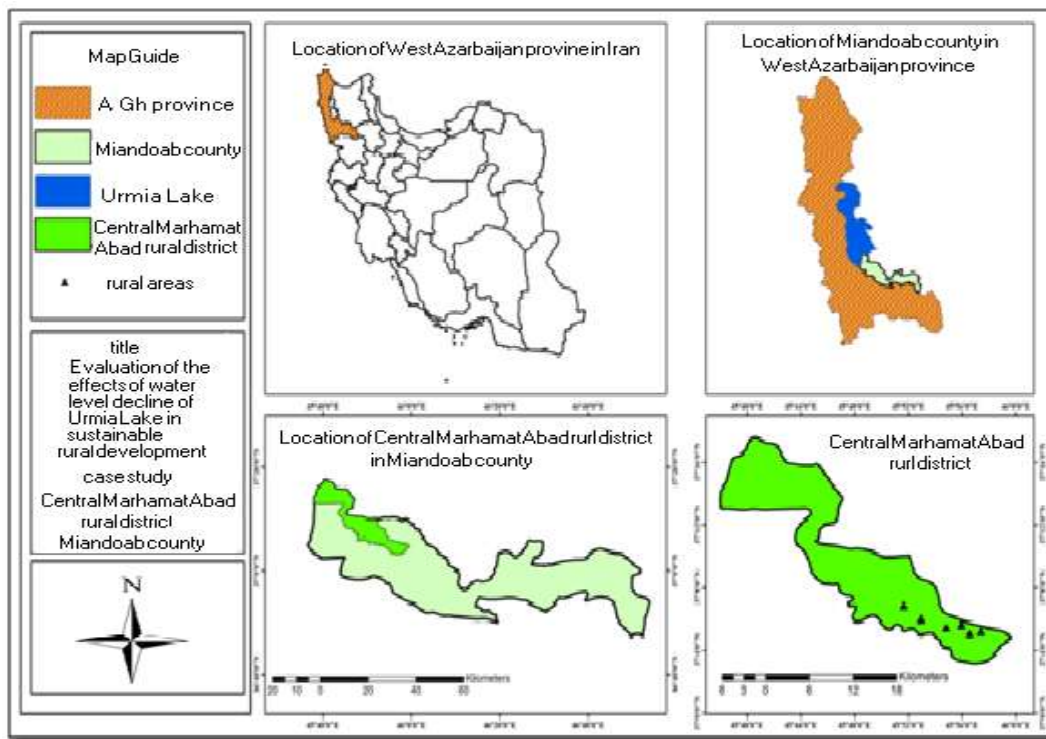
RESEARCH FINDINGS
Of the 125 respondents, 11.2% were single and 88.8% married, 75.2% male and 24.8% female, the average age 43.4 years, in terms of educational status 13.6% were illiterate, 44.8 literacy and primary education, 19.2 percent elementary and high school education, 22.4 percent have diplomas and diplomas to higher education. Also in terms of employment 44.8% of the respondents were employed as full-time farmers and ranchers (Table 2)

Table 2: Descriptive statistics of respondents

	gender	age	educati	tahol	activit
			on		y
N Valid	125	125	125	125	125
Mean	1.25	2.77	2.87	1.11	3.33
Std. Deviation	.434	1.048	1.555	.317	1.800
Variance	.188	1.099	2.419	.100	3.238
Sum	156	346	359	139	416

Evaluation of Sustainable rural development (in five dimensions)
In this part, dimensions of sustainable rural development in the five indicators (economic, social , physical, environmental and institutional) have been studied by using T- test. Analysis of numeral average of dimensions of sustainable rural development among the rural households in the study area based on T- test, revealed low levels of sustainable rural development research in all indicators. As Table 3 shows, calculating the spectral range of residential households in the villages between 1 to 5 according to Likert scale is fluctuated, this rate is less than average condition (3) for all of the dimensions, that indicates negative impact of Water level decline of Urmia lake in all dimensions. The difference in the level of alpha 0/01 is Significant and their difference rate from the numerical utility is estimated to be negative.

Table 3: Analysis of sustainable development dimensions of rural households after Water level decline of Urmia lake

dimensions	Test Value = 3						
	Mean	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
						Lower	Upper
economic	3.11	2.779	124	.006	.11760	.0338	.2014
social	2.86	-4.192	124	.000	-.13840	-.2037	-.0731
ecological	2.82	-5.320	124	.000	-.17040	-.2338	-.1070
physical	2.42	-18.709	124	.000	-.57600	-.6369	-.5151
institutional	2.00	-26.288	124	.000	-.99700	-1.07	-.921

The following study, examines (investigate), the relationship between the drying of Urmia Lake and sustainable rural development dimensions by using Friedman test.

As Table 4 shows, the Friedman test shows a significant difference between the score average of each sustainable rural development dimensions among studied households with respect to the alpha level of 0/01.However, the highest ranking level belongs to the economic and the least is related to institutional dimension.

Analyzing the ranking average of obtained from the quantitative analysis of the dimensions of sustainable rural development dimensions shows the negative influence of Water level decline of Urmia lake in the economic and environmental dimensions and low influence on the physical dimension.

Water level decline and unveiling salt domes and translating it to the distinct agriculture lands, has reduced the efficiency of agricultural production, increased salinity and thereby has reduced income and increased rural migration(Table 4).

Table 4: Significant difference in the ranking average of Urmia lake drying and the dimensions of sustainable rural development, based on Friedman test.

dimensions	Mean	Mean Rank
physical	3.11	2.33
institutional	2.86	1.31
economic	2.82	4.29
ecological	2.42	3.78
social	2.00	3.29
N		125
Chi-Square		286.741
Df		4
Asymp. Sig.		.000

At this stage of the study, Urmia lake drying effects on the social, economic, physical, institutional, environmental dimension of sustainable rural development has been investigated (Table 5).

Table 5: The impact of Urmia Lake drying on the dimensions of sustainable rural development

dimensions	B	Beta	Std. Error	t	sig
ecological	0.272	0.842	0.033	17.287	.000
economic	0.197	0.723	0.032	11.621	.000
physical	0.502	0.501	0.055	6.415	.000
social	0.217	0.436	0.054	5.739	.000
institutional	0.357	0.231	0.050	2.631	.010

Results from stepwise multiple regression test based on BETA values shows that Water level decline of Urmia lake has the greatest impact on the environmental (salinity of agricultural lands , reducing the diversity of crops, destroying of orchards and pasture in villages, an increase in water resources and rural environment pollution and etc),economic (reduction of non-agricultural employment opportunities, reduction of diversified and sustainable income, increase of housing prices and etc), physical and social aspects, and has the minimal impact on institutional dimension. According to the results, equation sustainable rural development in the study area is as follow:

Y= 0.842 (X1) + 0.723 (X2)+ 0.501 (X3) + 0.436 (X4) 0.231 (X5)

Y= sustainable rural development, dependent variable

$X_1 X_5$ = sustainable rural development dimension, Independent variables

DISCUSSION AND CONCLUSION

The most important environmental hazard that happened in Iran is the water level decline of Urmia Lake. The results show that Urmia lake during the recent years have been exposed to drying and is effected its surrounding towns and villages especially in the southern part of the lake due to several factors such as some projects, consecutive drought, average increase in air temperature and increase in evaporation rate of the lake. So that, spreading drought and water level decline of the lake is one of the serious threats to agriculture, which is the largest source of income in the villages located in North West of Iran. The lake as natural exclusive system is threatened and has been demolished by the two groups inside and outside the system. The inside system agents which are the part of the essence of the lake system includes climate features, water resources, wildlife, etc. vegetation. The changes occurred in the characteristics of these agents has caused changes in the lake system. In addition, the outside agents of the system is imposed from outside the system, These agents are man-made and are going to be dried by human exploitation such as overuse of surface water resources, and dam constructions and etc. It has variety effects in sustainable rural development, especially in the economic, social, and physical and environment dimension in the study area. Hence, this study is to evaluate the effects of water level decline of Urmia Lake in sustainable rural development dimensions in Central Marhamat Abad rural district, Miandoab County which is located in the West part of Urmia Lake. Research findings show that Urmia lake drying has different effects in sustainable rural development dimensions in the study area. As T-test shows, condition of sustainable rural development dimensions in Central Marhamat Abad rural district is not in a desirable level. So that for all of the dimensions studied, it is lower than numerical utility (3). that Indicates a low level income of agriculture and non-agriculture activities, declining the areas of employment, job and economic diversity in the villages, declining of participation, trust and social cohesion, declining of quality in rural roads, declining the ability of local institutions and etc. the Friedman test shows a significant difference between the mean scores of each sustainable rural development dimensions among households surveyed with respect to the alpha level of 0/01. However, the highest ranking level belongs to the economic and the least to institutional dimension. The results of this test shows the negative influence of Water level decline of Urmia lake in the economic and environmental dimensions and low influence on the physical dimension. water level decline and unveiling salt domes and translating it to the distinct agriculture lands, has reduced the efficiency of agricultural production, increased salinity and thereby has reduced income and increased rural migration. In addition, the results from stepwise multiple regression test shows that water level decline of Urmia lake has the greatest impact on the environmental, economic physical and social aspects, and has the least impact on institutional dimension. the wind blows cause to spread salt on agriculture lands and this lead to decline the acreage of crops, rural incomes, the production of the region, employment, boom down side industries which is independent on agriculture, increase in salinization of land and agricultural land, declining of orchards and pastures, declining of groundwater levels, the loss of fruit trees and crops, Declining in non-agriculture employment opportunities and job diversity, increasing house prices and farm land, Increasing contamination of water resources and environment of the village, Weaken the power of local institutions, including the Council and the rural administrator, increasing crime rate, anomalies and inconsistencies in the In the studied villages, declining life expectancy, and therefore undermining the sustainable rural development dimension and Seasonal migration of rural youth to different cities.

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