



Local Community's Attitude and Satisfaction Towards the Environmental Effectiveness of Urmia Lake Restoration Actions

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ABSTRACT

Aims: Lake Urmia, the most critical aquatic ecosystem and one of the most important wetlands in northwest Iran, has faced a drying-up threat in recent years. Urmia Lake Restoration Headquarters has carried out actions, and there are disagreements between supporters and opponents on the outputs of management actions. One of the main reasons for these disagreements is the need for more sufficient and multilateral monitoring and evaluation of the effectiveness of actions over time. For this purpose, this research was conducted in the year 2021 to evaluate the view of local communities on the environmental effectiveness of the actions of rehabilitation headquarters on the shores of Lake Urmia. Various practices, including Poly-Shrub Planting, Mono-Shrub Planting, and Non-living Wind Breaker, have been implemented in three regions of Ajabshir, Azarshahr, and Shabestar counties.

Materials & Methods: A qualitative survey research method was used according to the research objectives. A researcher-made questionnaire was prepared to evaluate the attitude of local communities. Using snowball sampling to fill out the questionnaire form, a sample size of 150 people from local communities was selected.

Findings: The results showed that respondents' satisfaction was significantly different among various actions, so the highest level of satisfaction within the local communities, with a value of 2.89, is related to the non-living windbreaker, and the lowest level is related to the Poly-Shrub Planting with the value of 1.67. Regarding the opinion of native people, the actions of the restoration headquarters in the Azarshahr region have increased the percentage of rangeland vegetation and consequently have increased the environmental-ecological stability. The Shabestar region has increased the environmental-ecological sustainability and management of livestock and rangelands. Finally, in the region of Ajabshir, the actions of the reclamation headquarters have prevented the rising and scattering of dust and the creation of effective salt dust, as well as people's adherence to the principles of environmental protection. Also, the comparison of the views of local communities regarding the various actions taken in the study areas showed that the non-living windbreaker had the most environmental effects in comparison with other actions.

Conclusion: For the success of the restoration headquarters around Lake Urmia, it is necessary to implement actions based on the ecological conditions of each region and to attract the participation of local communities. In general, despite the relative success of the actions of the rehabilitation headquarters, these actions have not been entirely effective in various aspects, such as proper management of surface and subsurface water resources, the modification of the cultivation pattern, and the prevention of the spread of soil salinity in agricultural lands. Therefore, taking urgent action to save Urmia Lake using all local and international capacities is suggested.

Keywords: Restoration Headquarters; Non-living Windbreaker; Poly-Shrub Planting; Urmia Lake Restoration Headquarters.

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Introduction

Today, human intervention in the environment has caused various problems, which in turn has caused the formation of destructive tensions such as floods, storms, global warming, and the loss of water resources on the Earth's planet. Water, one of the rare factors of the creation and permanence in the environment, is continuously required by humans at any time and place. This valuable resource is considered one of the critical components in the preservation, balance, and sustainability of the ecosystem [1]. Based on this, protecting and preserving water resources and their optimal, economical, and fair exploitation has been considered a global concern. Regarding ecological and economic aspects, wetlands and lakes are considered essential and valuable water resources on regional and global scales. Supplying the water for agricultural needs and human drinking, helping to feed underground water, trapping rich eroded soils, controlling destructive floods, and providing clean energy are among the most important functions of wetlands and lakes [2, 3, 4]. At the same time, these ecosystems have also faced many human and climate pressures. In the meantime, in recent years, one of Iran's most important natural hazards is the reduction in the water level of Lake Urmia and its drying up [5]. If the drying process of the lake continues in the same way, in the near years, it will completely dry up and become a big salt flat, which will destroy all the agricultural and residential lands on the border due to salt storms [2, 6]. Therefore, Lake Urmia faces a severe threat of changing towards an irreversible situation. These dimensions consist of biodiversity issues and economic-social issues whose effects are observed on the livelihood and health of the surrounding communities [7, 8, 9].

Lake Urmia has an area of 5,000 square kilometers and is considered one of the salty lakes located in the northwest of Iran (between

West and East Azerbaijan Provinces). The surrounding area of Lake Urmia and its islands, which are national parks, is counted as one of the wetlands members of the Ramsar Convention in Iran. In addition to the lake body, there are many freshwater and saltwater wetlands around it, which are very important for biodiversity conservation [5, 8, 10]. The research conducted in different parts of Iran and the world [10, 11] demonstrates the undeniable impact of environmental hazards on people's lives. Any change in the ecological balance of environmental elements, directly and indirectly, affects people's lives from different economic, social, and even political aspects.

Therefore, it seems necessary to pay attention to these changes and think about ways to reduce the expected issues. In this regard, in the framework of the comprehensive management program of Lake Urmia, many technical restoration actions have been carried out since 2009, and according to the variables and ecosystem complexities of the projects, the types of actions are as follows [1, 3, 8, 13]:

- a) Activities related to the water and sewage engineering company, including sub-collection networks
1. and central lines and refineries.
- b) The regional water company's activities include restoration and reconstruction plans, surface and underground water balancing, completion of measurement network equipment, river dredging and organization, water and wastewater transfer plans, inter-basin transfer plans, determination of unauthorized wells, and updating authorized wells.
- c) The Agricultural Jihad organization's activities include pressurized irrigation, piped water transfer, drainage irrigation networks, educational and promotional methods, and crop and breed methods.
- d) The activities related to the organization of forests, rangelands, and watershed

management of the country, including the identification of dust hotspots, stabilization and monitoring of their status in the lands outside Urmia Lake National Park, control and management of livestock grazing on the shores of Urmia Lake.

e) The activities related to the governorship include cultural and social issues, empowerment of local communities, and information projects.

f) The activities related to the Environmental Protection Organization, including projects related to the ecological restoration of lands in the area of the Lake National Park.

g) Iran's Water and Power Resources Development Company's activities include projects to regulate and transfer border waters of the Zab River to Urmia Lake through the construction of dams and diversion dams, tunnels, and transmission lines (canals and pipes).

In some areas of the dried margins of Lake Urmia, there are dunes with the potential risk of dust storms due to the lack of moisture and inferior stability in the dry season. In addition to the high sensitivity of the sand beds of the dry banks of Lake Urmia, the frequency of solid and erosive winds in the northwest of the country in the dry season has aggravated the conditions for the separation, harvesting, and transportation of sand particles and the salts attached to them to the agricultural, residential and industrial areas of the adjacent areas. Therefore, it is necessary to manage and control the transfer of salt particles and dust from the area sensitive to erosion on the edges of Lake Urmia and protect the ecosystems under stress. Therefore, in addition to conventional actions such as planting trees, planting bushes, and building windbreaks, it is inevitable to present and test ecologically oriented, economical, and sustainable solution methods ^[14]. Since the formation and activities of Urmia Lake Restoration Headquarters (ULRH), various criticisms

have been directed at it. The pressure of criticism decreased in 2019 following the improvement in rainfall and a slight increase in the lake's water level. However, according to the designed plan, Iran is looking to complete the restoration of the lake by 2024 by monitoring previous projects. As a final report, ULRH claims that in the first three years, the successful implementation of the designed plan has been achieved. However, due to the need for more evaluation and monitoring of the activities and actions, different results and reports are published, which are interpreted differently ^[3].

According to the data and figures, if Urmia Lake is not restored, environmental, economic, social, and cultural problems will follow, which are irreparable. Several cases are mentioned as factors affecting the dryness of Lake Urmia, one of which is the excessive use of water in the agricultural sector, so it is necessary to attract the participation of local communities in preserving and revitalizing Lake Urmia. One of the main elements of management with which success will be achieved is the level of awareness of the people about the values of the wetland and the threats facing it. Therefore, raising the general public's awareness is one of the main priorities in restoring the lake. Therefore, knowing the attitude of the local communities towards the importance of the lake and its restoration has a fundamental role in planning to attract their participation. In this regard, the design of a systematic and cooperative exploitation system with the help of local communities for the optimal use of resources will not be possible except with systematic thinking, attitude, and planning, and the use of local knowledge and the participation of local communities ^[15]. Attitude is one of the most essential concepts of modern social psychology. All port considers attitude a mental and psychological state of readiness

organized based on experience and will directly impact a person's reaction to the objects and situations he encounters. Among the many psychological factors, people's attitude plays a vital role in influencing people's behavior. As one of the three most important dimensions of behavior (knowledge, attitude, motivation), attitude plays a significant role in its formation [16]. Investigating people's attitudes in different fields is essential because it helps managers and executives know how activists think about specific issues [17]. The importance of this research is that by evaluating the attitude of local communities towards the restoration measures of Urmia Lake Restoration Headquarters in the field of activities related to the organization of forests, rangelands, and watershed management of the country, it can provide collaborative and practical solutions to attract the participation of local communities and their satisfaction with the situation. To identify economic, social, and environmental conditions for the lakeside residents.

It has been reported in this regard, from the point of view of local communities; in the environmental dimension, the actions of the rehabilitation headquarters of the Urmia Lake have resulted from increased environmental awareness and dry-farming. Also, in livestock and rangeland management, the actions of the restoration bureau of the Urmia Lake have been evaluated as moderate [18]. It was reported in another research, from an economic and social point of view, that the actions of the rehabilitation headquarters have not led to an increase in the social and economic sustainability of local communities but have increased environmental sustainability at the regional level. Despite the success of environmental measures, the measures taken to manage the water and subsurface resources properly, modify the cultivation

model, and present a multi-purpose land-use model in the agricultural sector could have been more effective [1].

Therefore, the current research aims to investigate the attitude of local communities on the edge of Lake Urmia about the level of satisfaction and environmental effects of activities related to the country's forests, rangelands, and watershed management organization, including identification of dust centers, stabilization and monitoring of their condition and livestock grazing management were carried out on the edge of Lake Urmia in East Azerbaijan province. We tested the following hypothesis: (i) the satisfaction of local communities with the restoration measures of Lake Urmia is at an optimal level. (ii) There is a statistically significant difference in the level of environmental effectiveness of various actions taken by the rehabilitation headquarters.

Materials & methods

Study Area

In order to carry out this research, three types of restoration operations related to the activities of the country's forests and rangeland organization regarding the restoration of Lake Urmia in East Azerbaijan province have been selected:

1- Shrub planting operation with *Atriplex* species on the edge of Lake Urmia located in Azarshahr city: The project implementation started in 2013 with an area of 600 hectares, where the residents of Qeshlaq, Khasallu, Qeshlaq Piazi, and Kelvanagh villages of the local communities are affected by this project (**Mono-Shrub Planting**).

2- Shrub planting operations with *Tamarix*, *Nitraria*, and *Atriplex* species on the edge of Lake Urmia located in Shabestar County: The project implementation was started in 2014 in an area of 120 hectares, where the residents of the villages of Shendabad and Kafi-al-Mulk local communities were affect-

Table 1) Variance analysis of the average satisfaction of local communities with the actions of the Rehabilitation Headquarters.

Source of Variation	Sum of Squares	df	Mean Square	F	Sig.
Restoration Actions	34.507	2	17.253	35.188**	0.000
Error	72.077	147	0.490		
Total	106.584	149			

Note: * and ** are significant at 5% and 1% probability, respectively.

Table 2) Variance analysis of the environmental effectiveness of the Rehabilitation Headquarters actions from the point of view of local communities.

Source of Variation	Sum of Squares	df	Mean Square	F	Sig.
Restoration Actions	43.594	2	21.797	58.105**	0.000
Error	55.144	147	0.375		
Total	98.738	149			

Note: * and ** are significant at 5% and 1% probability, respectively.

ed by the implementation of this project **(Poly-Shrub Planting)**.

3- The construction of a non-living wind-breaker on the edge of Lake Urmia using dried branches of the *Tamarix* species located in Ajabshir County: the start of the project implementation in 2016 with an area of 20,000 meters long, which the residents of the villages of Khezerlu, Razian, Pesian, Shiraz, Harvan Mehrabad and Shishovan local communities, are affected by this plan **(Non-living WindBreaker)**.

Research Methodology

Based on the purpose, this research is categorized as applied research, and from the aspect of collecting information, it is considered survey research. By using the documentary (library) method, searching in the literature and theoretical principles related to the subject, reviewing previous studies as well as field observations, and qualitative information taken from experts in various educational, research, and executive departments, the suitable items for

evaluating the attitude of local communities towards the satisfaction, and environmental effects of the rehabilitation actions of Urmia Lake Restoration Headquarters were designed in the form of a Researcher-made questionnaire and provided to the respondents. The validity of the questions was confirmed by the content validation method and by repeatedly referring to the respondent community; Cronbach's alpha method was used to evaluate the reliability of the questionnaire, which was confirmed with a value of 0.91. The data in the questionnaire were measured and evaluated quantitatively or qualitatively with a rating scale based on a five-point Likert scale (very low, low, medium, high, and very high in 1 to 5 scores) ^[19]. The statistical population of this research includes all the households of Ajabshir county with the number of 7 villages with the names (i.e., Khezerlu, Razian, Pesian, Shiraz, Harvan, Mehrabad, Shishovan), Azarshahr county with the three villages with the names (i.e., Qeshlaq

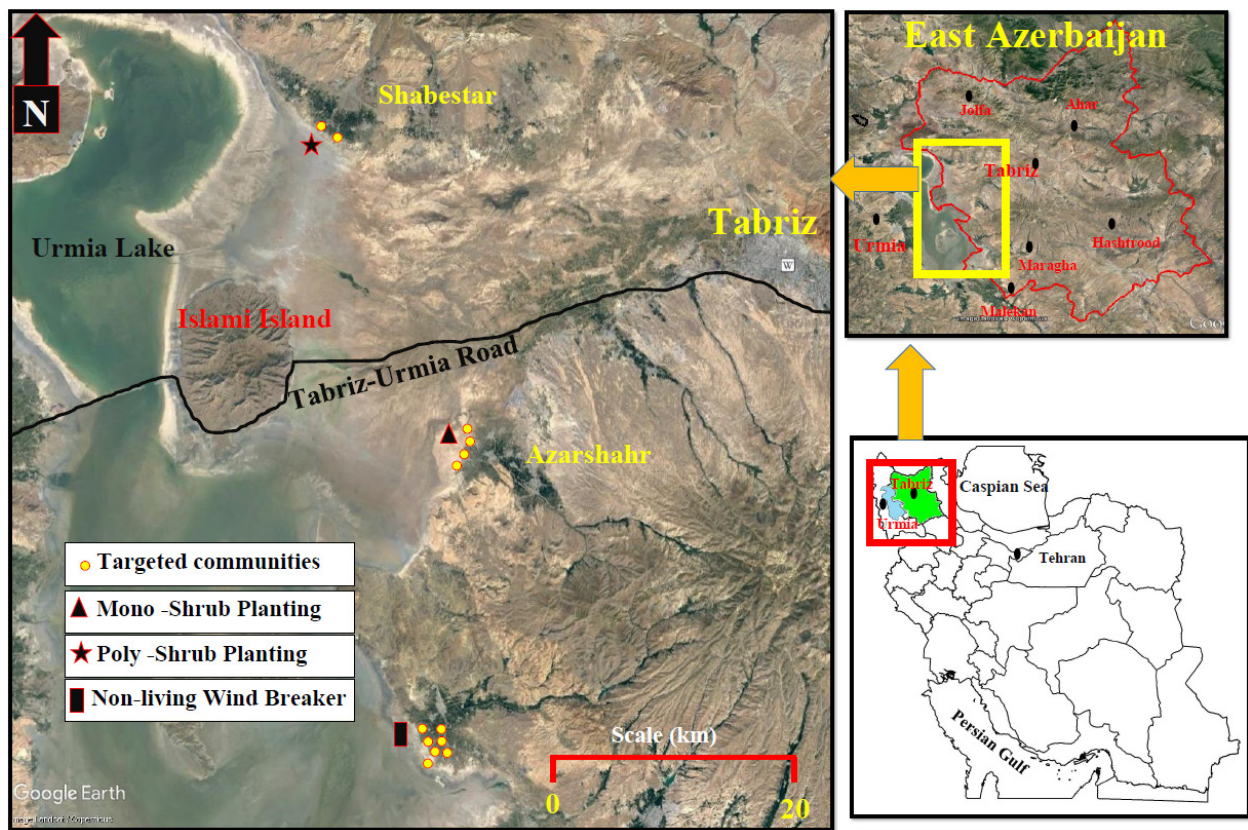


Figure 1) The site of restoration operations and local communities studied in Iran, East Azerbaijan Province, Azarshahr, Shabestar, and Ajabshir cities.

Khaslu, Qeshlaq Piazi, and Kelvanagh) and Shabestar county with two villages named (i.e., Shendabad, and Kafi al-Mulk), which according to the census of 2015 had 4500 rural households and a population of 15625. It was tried to select the sampling villages within a maximum of two kilometers of the projects.

Items for evaluating the environmental effectiveness of Urmia lake restoration actions:

- The actions of the restoration headquarters have made people adhere to the principles of environmental protection.
- The actions of the restoration headquarters have been effective in preventing the rising and scattering of dust and the creation of fine salt dust.
- The reclamation headquarters' actions have successfully controlled and prevented

the spread of soil salinity and underground water along the lake.

d) The rehabilitation headquarters' actions have increased the percentage of vegetation in the region's rangelands and the lands along the lake.

e) The rehabilitation headquarters' actions have effectively stabilized Lake Urmia and prevented the reduction of agricultural areas.

f) The reclamation headquarters' actions have effectively preserved the region's plant and animal biodiversity.

g) The reclamation headquarters' actions in livestock and rangelands management (preventing overgrazing and illegal livestock and providing fodder and livestock inputs) have been successful in the region.

h) The actions of the reclamation Headquarters have generally increased environmental-ecological sustainability.

Items for evaluating the satisfaction level of local communities towards the restoration actions of Lake Urmia

- a) The rehabilitation headquarters' actions, in the form of the activities of the natural resources bureau, have satisfied the communities by reducing the problems related to drought and improving the living conditions of the local communities.
- b) The local communities are satisfied with the rehabilitation headquarters' actions in controlling and preventing the spread of soil salinity in the lands bordering Lake Urmia and underground waters.
- c) The restoration headquarters' actions in the biological operations (planting, seeding, wind-breaking), choosing the right place, and correcting and principled implementation of these operations have satisfied the local communities.
- d) The reclamation headquarters' actions in soil stabilization, preventing the creation of salt dust, and solving problems related to health and hygiene in the region have been successful from the point of view of the local communities and have increased their satisfaction.
- e) Generally, the rehabilitation headquarters' actions satisfy the local communities by creating favorable economic, social, and environmental conditions.

Local experts and people active in the restoration activities were used to select the sample through the snowball sampling method, prioritizing white beards in the studied villages. Finally, about 150 questionnaires were completed, including 30 in the Azarshahr study area, 30 in the Shabestar study area, and 90 in the Ajabshir study area ^[20, 21].

Data Analysis

Two descriptive and inferential statistical methods were used to investigate research questions and hypotheses. Data were tested for normality before analysis using the Anderson-Darling test. The satisfaction level of the local

communities with the types of rehabilitation actions and the environmental effects of these actions was compared using analysis of variance and Duncan's multiple-range test. All statistical analyses were performed in SPSS₂₄.

Findings

Descriptive Findings

The descriptive information of the selected respondents from the local communities shows that 95.5% of the people are men and 4.5% are women. Most respondents are in the middle age range, so 46.6% are in the age range of 41 to 50 years, and 24.9% are in the age range of more than 50 years. Also, 4.2% of the respondents are in the age group of less than 30 years. The literacy level of most of the respondents is under diploma (27.7%) and at the level of reading and writing (21.5%). About 4.8% are illiterate, 18.4% have a diploma, 2% have a post-diploma, 9% have a bachelor's degree, and 16.7% have a master's degree. Regarding the occupation of the respondents, 61.9 percent are farmers, 17.2 percent are employees, 9.6 percent are self-employed, 6.8 percent are employees, and 4.5 percent are homemakers.

Evaluation of the Level of Satisfaction of Local Communities with the Restoration Actions of Lake Urmia

Table (1) shows the analysis of variance comparing the average satisfaction of local communities with rehabilitation actions. The results showed that different actions significantly differ in respondents' satisfaction. Therefore, Duncan's multiple range test was used to group the averages, as shown in Figure 2. The highest level of satisfaction, with a value of 2.89, is related to the non-living windbreak, and the lowest level is related to the Poly-Shrub Planting, with a value of 1.67.

Evaluation of the Environmental Effectiveness of the Activities of the Rehabilitation Headquarters

The results of the environmental effectiveness

of the activities of the Rehabilitation Headquarters from the point of view of local communities are shown in Table (2). Considering that the significance level of the test is less than 0.05, it can be stated that the actions of the reclamation headquarters have a significant difference in terms of impacting the environmental situation of the region from the point of view of the local communities. Based on the obtained results in Azarshahr region, based on the point of view of local communities, the most critical environmental effects related to the increase in the percentage of vegetation in the area's rangelands and lakeside lands and the increase in environmental-ecological sustainability with a score of 2.36 and 2.66 respectively. In the Shabestar region, the most important environmental effects of the rehabilitation headquarters actions are related to the increase of environmental-ecological sustainability and the management of livestock and rangeland (preventing overgrazing, illegal livestock, providing

fodder and livestock inputs) with an average score of 2.3 and is 2.6 and finally in Ajabshir region, the most important environmental effects are the actions of the rehabilitation headquarters related to preventing the rise and dispersion of dust and creating effective salt dust and people's adherence to the principles of environmental protection with an average score of 3.37 and 3.15.

A comparison of the average environmental impact of various actions taken by the rehabilitation headquarters and their order shows that the environmental impact of the windbreak construction method was more significant than that of the other two methods from the point of view of the local communities (Figure 3).

Discussion

Evaluation of the Satisfaction Level of Local Communities with the Restoration Actions of Lake Urmia

To evaluate the level of satisfaction of local communities with the restoration actions

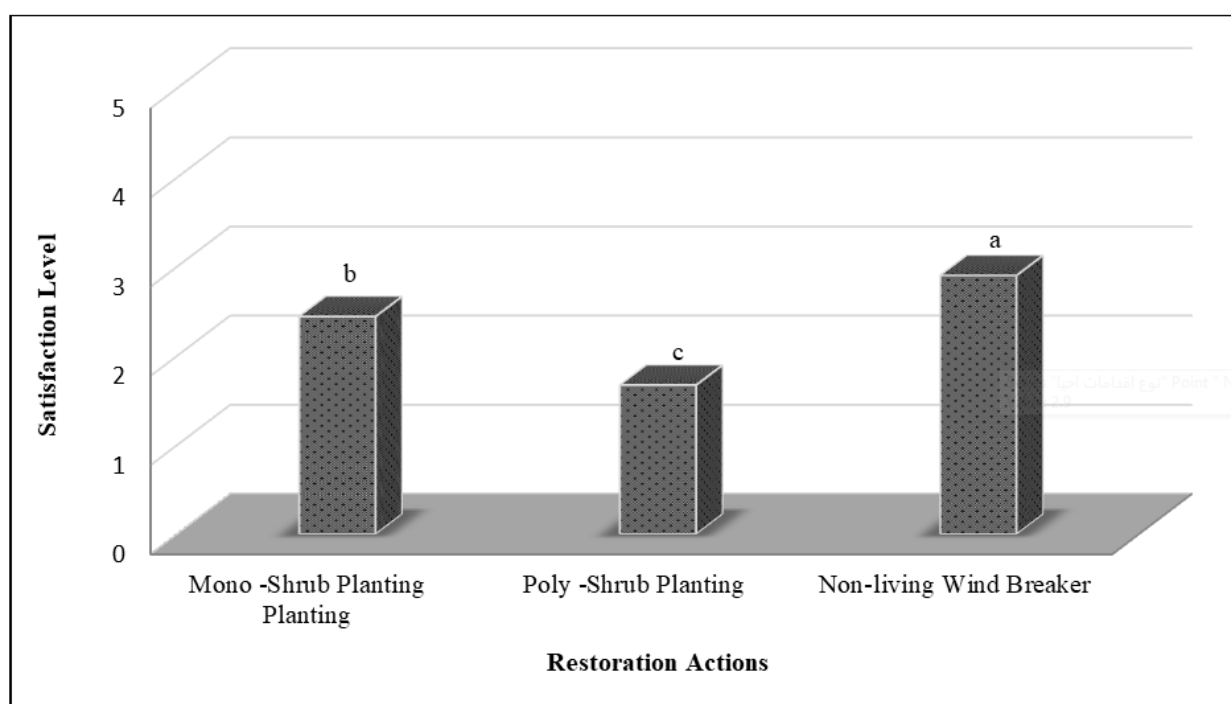


Figure 2) Total mean and Duncan test results for satisfaction level of local communities with the various actions of the rehabilitation headquarters in the study areas.

of Lake Urmia, various aspects of the restoration headquarters' actions, including reducing the problems related to drought and improving the living conditions of local communities, controlling and preventing the spread of soil salinity in the lands bordering Lake Urmia and underground water, in the field of biological operations (shrub planting-wind breakers) in terms of choosing the right place and the correct and principled implementation of these operations, stabilizing the soil and preventing the creation of salt dust and problems related to health and hygiene in the region from the point of view of local communities and generally creating favorable conditions in the economic, social and environmental status of local communities were examined and questions were asked from the respondents. The results showed that the most satisfaction of the local communities with the restoration actions is related to the non-living windbreak. In this regard, one of the main reasons is the delay in the

results of reforestation operations and the failure of the rehabilitation headquarters to implement reforestation operations successfully. In other words, implementing projects such as non-living windbreakers is quick to produce, and the results are tangible for local communities^[15]. It has increased the satisfaction of local communities with the implementation of non-living windbreakers compared to planting. Implementing a non-living windbreaker with adequate control of fine dust, a primary health problem for local communities, and preventing the risk of burial and non-fertility of agricultural land has brought satisfaction to local communities. In this regard, it has been reported that local communities are more satisfied with the implemented projects that bring economic benefits, increase people's income, and reduce the adverse effects of dust^[22, 23]. The satisfaction of local communities from implementing non-living windbreak operations can be an opportunity to attract the fundamental and practical participation

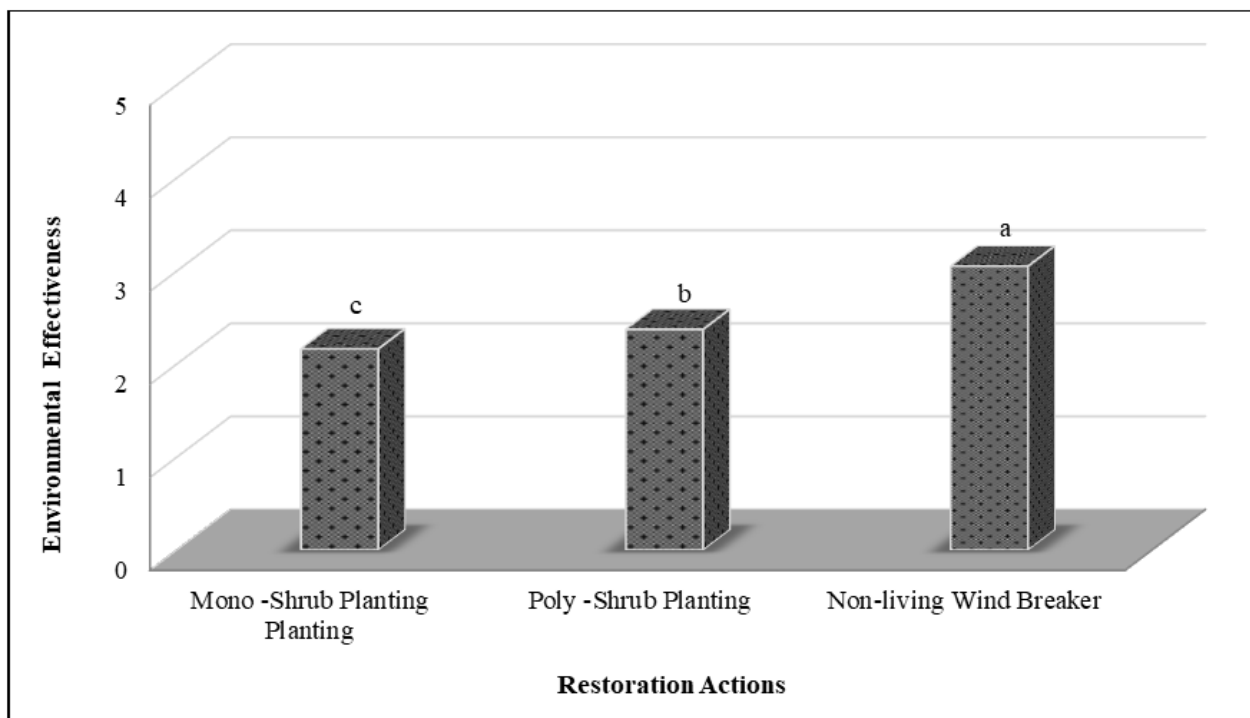


Figure 3) Total mean and Duncan test results for the environmental effectiveness of the Rehabilitation Headquarters' activities from the point of view of local communities.

of local communities in implementing Urmia Lake restoration projects.

Evaluating the Environmental Effectiveness of Urmia Lake Restoration Headquarters' Actions

The results of the study showed that among the restoration actions carried out by the restoration headquarters, the non-living windbreak method was able to control and prevent the spread of salinity from the aspect of influencing people's adherence to the principles of environmental protection, preventing the rise and dispersion of dust and the creation of fine salt particles, soils and underground waters around the lake, increasing the percentage of vegetation in the pastures of the region and the lands around the lake, stabilizing Lake Urmia and preventing the reduction of the area of agricultural lands in the region, maintaining the biodiversity of plants and animals in the region, managing livestock and pastures (preventing grazing excessive, illegal livestock, supply of fodder and livestock inputs) of the region and generally increase the environmental-ecological sustainability to have the environmental effects. These results are consistent with the findings of Motamedi (2019) [1], Azarbar (2023) [10], and Amini (2021) [18]. In this regard, in various research, the positive environmental effects of windbreaks, including reducing dust and preserving agricultural land, have been mentioned [24, 25]. Due to the accumulation of dunes due to reduced wind speed on its sides, the windbreak causes specific environmental changes [22]. Without a doubt, in implementing all operations and activities related to natural resources, considering the role of people, beneficiaries, and beneficiaries of the plan area is the most essential principle. In the implementation of all activities, including the construction of windbreaks, the most direct and indirect benefits are given to farmers, rangeland

owners, and operators living in the region, as well as devices and facilities located in areas affected by wind erosion [26, 27, 28, 29]. Considering the size of such areas, the number of devices and facilities, the limitation of financial resources, and the enjoyment of people and devices from the benefits and advantages of the constructed windbreaks, a method should be taken to maximize their participation. In addition to reducing the financial burden on the government, the advantage is that the local people, by participating in their construction, will consider the project as their own and will be diligent in its preservation and maintenance. Therefore, in the study, design, and construction of living and non-living windbreaks, the role of people should be given serious attention at all stages.

Conclusion

We can hope for positive results from rehabilitation actions if the appropriateness of rehabilitation actions is observed in the conditions of the region and the participation of local communities. Participation is an empowering process; it causes the mobilization of local resources, the use of diverse social groups in defining problems, and making decisions about the design and implementation of activities. It provides the context for preserving, revitalizing, and exploiting the abovementioned areas. The slogan of protection, revitalization, and exploitation of natural resources is practically realized. Suppose the local communities are supported, and the necessary conditions are created. In that case, they are ready to cooperate with the rehabilitation headquarters to reduce water consumption in the agricultural sector and comply with the cultivation pattern. Gaining the trust of local communities and bringing them together can lead to better productivity and more effectiveness in

collaborative planning. Increasing farmers' knowledge of the concepts and categories of participation and management of water resources is recommended by organizing training courses and workshops on agriculture in technical and skill solutions for optimal water management in farms and water transfer methods. Overall, despite the relative success of the environmental actions, the actions taken in the proper management of surface and subsurface water resources, reforming the cultivation pattern and providing a multi-purpose land use model in the agricultural sector by observing the ecological principles and reducing the demand for agriculture and horticulture sectors have not been very effective. In order to succeed in the restoration of Lake Urmia, it is necessary to carry out corrective restoration actions simultaneously; the empowerment and capacity building of local communities should be addressed, and local communities should accept the actions taken. Comprehensive implementation of alternative livelihood plan training courses in the cities of Lake Urmia can be a successful solution in reviving the lake and empowering local communities. Therefore, to prevent the environmental disaster and the occurrence of its destructive consequences, urgent actions should be taken to save Urmia Lake by government officials, scientific centers, and experts using all domestic capacities and international assistance.

Authors' Contributions: Alaei Y. Completing questionnaires from local communities/ Collecting data (20%). Mofidi-Chelan M. (Corresponding Author), Introduction author/ Methodologist/Main Researcher (50%); Sheidai-Karkaj E. (Second author), Statistical analyst/ Discussion author (30%).

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