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FACTORS OF VISUAL ORGANIZATION EFFECTIVE ON THE PROTECTION OF VERNACULAR LANDSCAPES IN THE FOOTHILL VILLAGES

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Highlights:

- the texture of the vernacular villages, as a cultural heritage of a country, are the main component of the vernacular landscape;
- vernacular landscapes have ecological, cultural, and social values;
- inattention to detrimental interventions in the vernacular landscape will destroy the landscape and disturb the identity of the village;
- the transformation and destruction of the landscape lead to the reduced quality of the living environment;
- visual organization and application of operational solutions in the rural texture result in the protection of vernacular landscapes.

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Abstract. As the cultural heritage of a country, the texture of vernacular villages is the main factor that forms the vernacular landscape. These textures provide visual values that play a determinant role in presence and residence continuity in rural areas. However, many vernacular landscapes of foothill villages in Iran have become problematic due to interferences and a lack of proper management mechanisms. It is essential to formulate a theoretical framework for parameters affecting the vernacular landscape protection to handle the development process and preserve this precious heritage. This is an exploratory study in terms of nature and is descriptive-survey research in terms of data collecting method. The statistical population comprises 31 experts in architectural and rural fields who were interviewed through a non-random network method. The techniques used in this study include content analysis, Delphi, and correlation, and the collected data are analyzed using SPSS software through Q factor analysis, Pearson correlation, and regression analysis. The results show that 9 factors can be extracted based on the priorities and mental patterns of the experts for visual organization: adaptability, coordination and orderliness, visibility, comfort, permeability, compatibility, legibility, attractiveness, and landscape. Among the mentioned factors, the higher explained variance percentage (14.097%) belongs to adaptability. According to the obtained results, 99.4% of variations in the vernacular landscape have been explained by these 9 factors among which, visual attractiveness and visibility have the highest effect on vernacular landscape protection in foothill villages with impact coefficients of 0.318 and 0.279, respectively at the significance level of 99%.

Keywords: rural landscape, vernacular landscape, visual organization, landscape protection.

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1. Introduction

The physical texture of foothill villages in Iran not only has architectural values, such as simplicity, but also provides visual and aesthetical patterns, are adapted to the natural environment, and have cultural-economic values (Asadpour et al., 2024a). Landscapes of the foothill villages are prominent samples where, a complete sensual-visual connection is found because the initial core of these villages has been shaped and developed based on the living and livelihood functions, vernacular architecture knowledge and patterns, form aesthetical characteristics, physical identity in the mountain, and mountainous altitudes. These characteristics help people to know the surrounding natural environment and experience the physical factors of the village, including topography and artificial elements, such as winding alleys and artificial elements such as odors, light shade, and sounds (Mahdinejad et al., 2022a, 2020b, 2020c). As a valuable heritage that remains from the past, these landscapes play an important role in forming cultural, ecological, social, and environmental contexts. These landscapes serve as a vital source for using and developing economic activities in the creation of underlying local cultures and indigenous knowledge (Asadpour & Shirdel, 2022; Asadpour et al., 2021; Mahdinejad et al., 2020a, 2018). Hence, it has been essential to know the visual landscape in politics, management, and planning over recent decades (Fairclough et al., 2018; Loupa et al., 2019; Wartmann et al., 2021; Wascher, 2000).

However, many vernacular villages in Iran were separated from their native values due to the rush and influence of technology and urban image and culture (Maidenhead et al., 2022b, 2020b). Moreover, human interventions done in the contemporizing process and rural development have changed the landscape of these villages. As shown in Figure 1, these interventions include irregularity in the rural space and body, in elements and components, in function, in incompatibility of spaces, in spatial and architectural values, in buildings' arrangement, lack of geometric similarities and lack of coordination in architectural style, lack of coordination in the material and color used in the façades, too much difference between heights of neighboring buildings and their construction details in planning and implementation that have led to some changes in the built body and village and subsequently in its landscape due to lack of certain principles and criteria. Lack of attention to this process on a wider level would separate memories and identity-making vernacular criteria, reduce the physical, visual, and social quality, and make it problematic to create order and unity of visual frame in the rural environment. The inappropriate physical renovation and lack of integrated rules of façade-building for new constructions in the village texture and absence of continuity and coordination between elements creating the physical image of new and old textures have led to deformation and changes in the structure of the physical landscape, and separation from vernacular identity and original image (Mahdinjad et al., 2020a; Mahdinejad & Asadpour, 2020). Hence, it is necessary to identify the visual organization factors to protect the vernacular landscape of foothill villages in Iran. The following questions are asked based on the mentioned points.

Questions: 1 – What are the influential indicators in the visual organization of villages?

2 – What are the mental patterns of experts from visual organization factors affecting the protection of vernacular landscapes in the foothill villages?

3 – How does each of the factors and indicators of visual organization protect the vernacular landscapes of villages?

2. Research background and literature review

Traditional villages are important carriers of tangible and intangible cultural heritage that provide us with important resources (Ghosh, 2019; Yu et al., 2017; Klokov, 2018; Guo & Zhang, 2020; Prasiasa & Widari, 2019; Mahdinejad et al., 2020c). Rural landscape and vernacular landscape as the area perceived by the people (Luginbuh, 2014; Council of Europe, 2000; Arts et al., 2017; Asadpour et al., 2024a; Asadpour, 2023) represent the set of natural and man-made factors (Asadpour et al., 2024a; Yang et al., 2022; UNESCO World Heritage Center, 2008; ELC, 2000). As the residence of villagers (Lee, 2020; Soini et al., 2011), they are a clear representation of people's demands, activities, customs and lifestyles that have shaped it according to their lives and needs by exploiting and changing and developing nature (Tatum et al., 2017; Mahdinejad et al., 2019, 2024). In general, we read physical elements not as single and isolated forms but as manifestations of states and effects in the landscape. They reflect the beliefs, attitudes, traditions and values of these people (Paola et al., 2018). In other words, the concept of rural landscape, in addition to the inherent characteristics of the place, depends on the perception and feeling that humans have about their surroundings and the behavior that occurs in the two-way interaction between humans and nature (Walsh, 2020; Asadpour et al., 2024a), which is the result of a combination of ecological cognitive, historical, and cultural values (Frontuto et al., 2020). Thus, it can be examined from natural, physical, and cultural (Spiren, 2005; Rastandeh, 2009; Mahdinejad et al., 2022a; Abarghouei Fard & Saboonchi, 2020) and visual aspects (Mahdinejad et al., 2022b; Asadpour et al., 2021; Mahdinejad & Asadpour, 2020), and objective and subjective paradigms (Rezaei Rad & Vahdat, 2017; Mahdinejad et al., 2022b; Polat & Akay, 2015; Bergeron et al., 2014; Lothian, 1999; Falahatkar & Aminzadeh, 2018; Tress & Tress, 2001; Swaffield, 2016; Saboonchi, 2021).

Based on Ahmadi et al. (2019), the main changes in landscape and physical landscape in most villages is the change in the land use of rural lands, so that the studies conducted by Xiao et al. (2018) in East China, Qingjuan et al. (2011) in Chengdu, and Balestrieri and Ganciu (2018); Torquati et al. (2017) have indicated that changing agricultural patterns, reducing vernacular agricultural land and reducing the effectiveness of agricultural land protection policy are important factors in changing the landscape of villages. The study conducted by McGranahan et al. (2008) considered landscape characteristics as the main reason for rural migration from rural areas in the United States, since they argue that the villagers are more willing to live and settle in the areas that have suitable topography and water, forest, wide and open lands. Fagerholm and Kayhko (2012) and Asadpour et al. (2024b) believe that people social values are subjectively related to the physical landscape of the environment where people are located, and depending on the geographical context and space where people live, it can create different feedbacks. In this regard, the study conducted by Hernik et al. (2013) found that the difference between cultural and rural landscapes in Poland and England is related to social and cultural acceptability in spatial planning policies. Also, Jung and Ryu (2015) and Mahdinejad et al. (2024) argues that protecting the cultural landscape in rural areas prevents destruction of the natural environment. In this regard, Arts et al. (2017) and Chia and Sufo (2016) that from the environment point of view, nature protection, biodiversity protection, integrated management of natural resources, land use planning, environmental-social systems, climate change and according to Bandarin and Van Oers (2014), cultural heritage protection are crucial in this regard. Lawrence and Laurie (2011) introduced the basis of the landscape approach as the theory of protection and its development is necessary to know the preferences of the landscapes' audiences

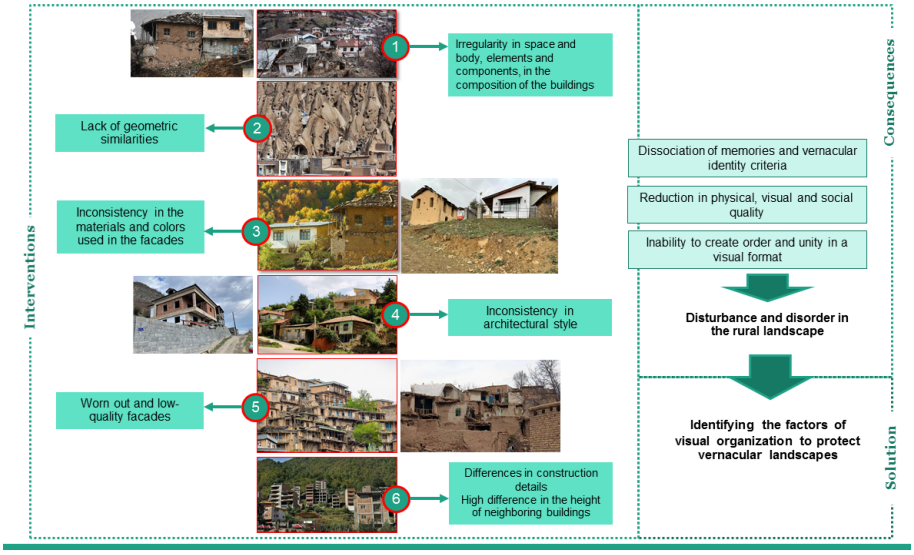

Figure 1. Changing the vernacular landscapes of Iranian villages through human and natural interventions (source: compiled by the authors)

(Sayer et al., 2015), so that the National Trust Foundation in 1895 in England passed laws for the protection of historical monuments, nature and heritage landscapes (Antrop, 2018). The emergence of landscape protection and development management models has had a great impact on creating models that limit human interventions in nature and the use of multi-functional landscapes (Asadpour et al., 2024a; Saxena et al., 2001; Tress et al., 2001; Scherr et al., 2012; Harvey et al., 2014).

According to Figure 1, the inappropriate condition of physical renovation and improvement and the lack of integrated rules for facade design for new constructions in the village texture and the lack of continuity and coordination of the elements that make up the physical appearance of the new texture with the old one lead to a change in the form and changes in the physical structure of the landscape, and a distance from the vernacular identity and original image. For this reason, it is essential to identify visual organization factors to protect the vernacular landscapes of Iranian villages. Thus, based on the theoretical foundations and the studies carried out so far, it has been observed that the main studies have focused on visual criteria in the urban area, and also considering the long-standing value of rural landscapes, an in-depth research has not been conducted on independent variables (visual organization) and the dependent variable (protection of vernacular landscapes), so conducting a study in this area is being felt.

3. Material and methods

This is an exploratory study in terms of nature and is applied research conducted within some steps as shown in Figure 2.

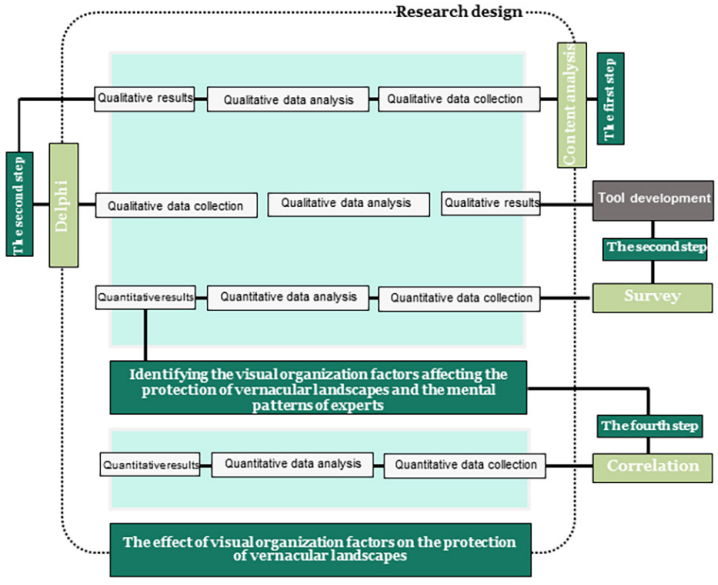

Figure 2. Steps of research design (source: compiled by the authors)

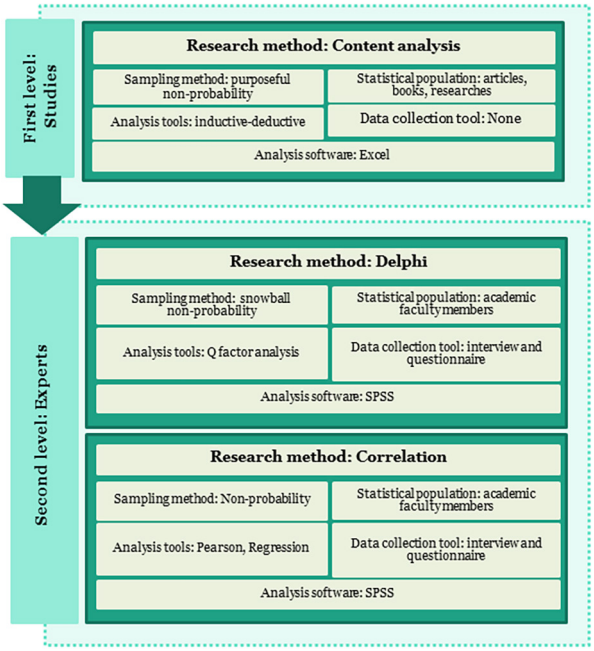

Figure 3. Research process (source: compiled by the authors)

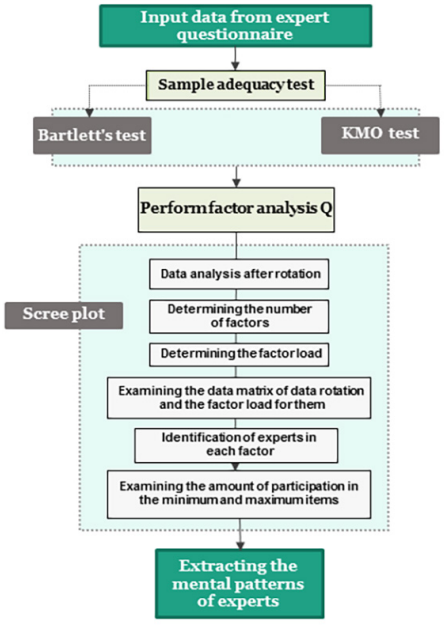

Figure 5. The steps of Q factor analysis (source: compiled by the authors)

According to Figure 3, research methods include content analysis, Delphi, and correlation, and the required data are collected through observation, interview, and field assessment. The gathered data are then analyzed through SPSS software, by using analysis tools, including inductive-deductive, Q-factor analysis, Pearson correlation, and regression analysis as shown below.

The first step: In the first step, existing knowledge about the "factors affecting people's visual perception of the appearance of the rural environment" was organized and classified using the content analysis method by library studies and tools such as tables and forms.

Second step: Delphi method: In the second step, the Delphi research method was used due to the exploratory nature of the subject and the insufficient research background in the rural field. Thus, the research plan in the tool development and data preparation section is defined in 2 steps: 1) document content analysis; 2) Delphi survey. Then, the results of these two steps lead to the development of a tool for information survey in the third step (Figures 2, 3 and 4).

The third step: In the third step, the Q factor analysis method is used determine the indicators of visual organization and the mental patterns of experts (with asking the question of to what extent each of the indicators of visual organization affects the protection of vernacular landscapes in villages). Based on Steelman and Maguire (1999), the Q method, in which Q factor analysis is used as a part of it, is a powerful tool for perceiving the values, tastes, concerns, and typology of individual views. In this study, a Delphi method was used to collect data. In the data analysis section, Q factor analysis (performed based on a study by Mahdinejad et al., 2020b), were used (Figures 4 and 5).

The fourth step: In this step, the correlation coefficient was measured for each pair of factors and relevant variables to determine the mutual relationship between each visual organization factor and vernacular landscape protection. After ensuring that a significant relationship exists

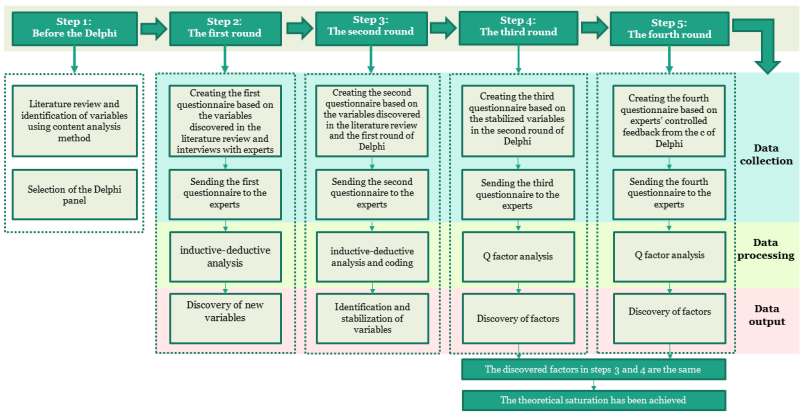

Figure 4. The methodology steps (source: compiled by the authors)

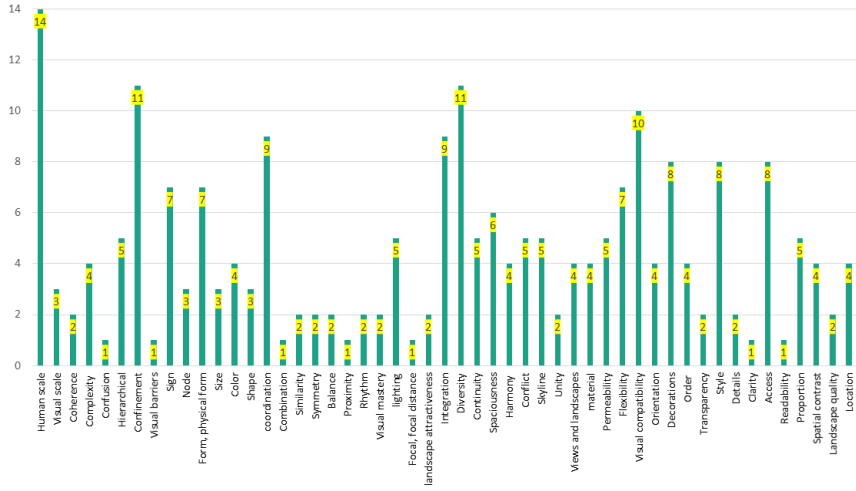

Figure 6. The frequency of indicators extracted from document content analysis in relation to visual organization (source: research findings)

between them, regression analysis was used to examine the effect of visual organization factors (independent variables) in the vernacular landscape protection (dependent variable).

3.1. Statistical population and sample size

Content analysis: The statistical population in the documentary content analysis phase includes papers, books, and Iranian and foreign studies related to the research scope. The samples were extracted from available references based on the non-random purposive method. Therefore, non-random purposive sampling methods are used. According to Vogt and Johnson (2011), the Sample size is selected based on academic methods, and the process is continued until no new reference is identified. In this case, the literature review process reaches data saturation.

Delphi phase: The statistical population in this phase includes experts in architectural, urban planning, and rural fields who are faculty members of the University of Tehran, Shaheed Beheshti University, University of Science and Technology, Shahid Rajaee Teacher Training University, and Kharazmi University. According to a study conducted by Hungler et al. (1997) and Etikan et al. (2016), sample size is measured based on the non-random purposive method for the first member and based on the snowball technique for the other members in the Delphi phase. According to Oranga and Nordberg (1993) and Powell (2003), the sample size in the Delphi technique is usually less than 50 members, and a maximum of 10–20 members is adequate. In this research, 10 experts were chosen in the first and second rounds of Delphi, and 31 experts participated in Q-factor analysis in the third and fourth rounds.

Correlation phase: The statistical population and sampling method in the correlation phase is similar to the process done in the Delphi phase. Following Landeta (2006), the minimum sample size in the studies with the correlation method equals 30 members, and 31 experts participated in this study.

3.2. The research process is as follows

In the document content analysis section related to the research subject, indicators related to visual organization were extracted according to Figure 6.

In the second step, to complete the indicators affecting visual perception, a Delphi survey was used based on experts' opinions in two rounds. In the first Delphi round, the indicators of document content analysis were submitted to 10 experts. Accordingly, the indicators were reviewed in the form of an in-depth and unstructured interview. Then, the effective indicators were submitted to the same experts to confirm and finalize the indicators affecting visual perception (Table 1).

Table 1. Concepts extracted from document content analysis and the first and second rounds of Delphi related to visual organization (source: research findings)

Indicator code	Indicator	Indicator code	Indicator
V1	Transparency	V28	Symmetry
V2	Movement in space	V29	Coordination in the body
V3	Flexibility	V30	Scale
V4	Degree of confinement	V31	Coherence
V5	Connection	V32	Harmony
V6	Spatial contrast	V33	Decorations
V7	Variability	V34	Rhythm
V8	Access	V35	Details
V9	Complexity and conflict	V36	Geometry
V10	Disorder and confusion	V37	Color
V11	Location	V38	Light
V12	Diversity of structure	V39	Balance
V13	Proximity	V40	Orientation
V14	Neighborhood	V41	Sign
V15	Spatial opening	V42	Node
V16	Coordination in the texture	V43	Unity

End of Table 1

Indicator code	Indicator	Indicator code	Indicator
V17	Legality in the body	V44	Order
V18	The distance between buildings	V45	Height
V19	The relationship between mass and space	V46	Density
V20	Shading	V47	Size
V21	Scope of vision	V48	Symbolic
V22	Sequential views	V49	Shape
V23	Scenic beauty	V50	Skyline
V24	Compatibility	V51	Architectural style
V25	Slope	V52	Material
V26	Topography	V53	Flooring
V27	Greenness		

In the third step, questions were set in the form of items in the questionnaire on a Likert scale from 0 to 9 (0 = strongly disagree and 9 = strongly agree. Then, they were distributed among 31 experts. The sample size was also examined and confirmed using KMO and Bartlett's sphericity test. In this step, Q factor analysis (factor analysis on experts and extraction of indicators from interviews, according to the study by Mahdinejad et al. (2020b) was performed on the data, so the mental patterns of experts that include the indicators affecting the visual organization were revealed.

Table 2. KMO and Bartlett's sphericity test for sample size adequacy (source: research findings)

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.601
Bartlett's Test of Sphericity	Approx. Chi-Square	754.456
	df	435
	Sig.	.000

4. Results

First, the Q factor was analyzed on the data extracted from the questionnaire and the results were extracted. After data rotation, sampling adequacy was measured through KMO and Bartlett's sphericity test. If the value of this index is above 0.6, the adequacy of the sample size is confirmed (Kaiser, 1974), which according to the result of the KMO test in Table 2, 0.601 is higher than 0.6, indicating that the sample size is sufficient. In Bartlett's test of sphericity, the null hypothesis states that the correlation matrix is a single and identical matrix. If the significance of Bartlett's test is less than 0.05 (null hypothesis rejection), factor analysis is suitable for identifying the structure (factor model). As seen in Table 2. Bartlett's smaller Sig is 0.05, which means that the correlation value can be calculated.

According to Table 3, data analysis after rotation shows that 10 factors out of a total of 31 people have been identified. The total cumulative percentage of these 10 factors is 74.475, which shows about 74% of respondents' opinions are common and about 26% of individual opinions may be due to specific awareness, tendencies and individual preferences. It means that up to 74%, effective factors in protecting the vernacular landscape of villages are identified and interpretable based on interviews with experts with certainty. The most important mental pattern of experts is the first factor, which accounts for 14.097% of the total variance. The ninth factor, despite its eigenvalue above one, is removed due to obtaining the score of neutral and close to the median by experts.

The results of Q factor analysis can be seen in the scree plot (Figure 7). In ten factors, their initial eigenvalues are

Table 3. Variance of data from factor analysis rotation (source: research findings)

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	7.024	23.415	23.415	7.024	23.415	23.415	4.229	14.097	14.097
2	2.729	9.098	32.513	2.729	9.098	32.513	2.610	8.699	22.796
3	2.245	7.482	39.995	2.245	7.482	39.995	2.569	8.562	31.359
4	2.059	6.864	46.859	2.059	6.864	46.859	2.353	7.845	39.204
5	1.892	6.306	53.165	1.892	6.306	53.165	2.130	7.099	46.302
6	1.522	5.074	58.239	1.522	5.074	58.239	1.876	6.255	52.557
7	1.420	4.733	62.973	1.420	4.733	62.973	1.709	5.696	58.254
8	1.240	4.133	67.106	1.240	4.133	67.106	1.651	5.505	63.758
9	1.157	3.857	70.962	1.157	3.857	70.962	1.622	5.406	69.165
10	1.054	3.513	74.475	1.054	3.513	74.475	1.593	5.310	74.475
11	.935	3.116	77.591						
12	.826	2.753	80.344						
13	.712	2.375	82.719						

End of Table 3

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
14	.689	2.297	85.016						
15	.668	2.225	87.241						
16	.547	1.824	89.065						
17	.535	1.783	90.849						
18	.431	1.438	92.287						
19	.384	1.280	93.566						
20	.330	1.099	94.665						
21	.308	1.027	95.693						
22	.257	.858	96.551						
23	.239	.796	97.346						
24	.174	.580	97.926						
25	.160	.532	98.458						
26	.155	.515	98.974						
27	.113	.378	99.352						
28	.096	.321	99.672						
29	.064	.214	99.886						
30	.034	.114	100.000						

Note: Extraction Method: Principal Component Analysis.

above one and have become significant. Among them, only 9 factors are acceptable due to the existence of common variables, with very high and low scores among experts. These 9 identified factors are the same 9 mental patterns. In other words, experts' opinions are divided into 9 distinct and interpretable categories.

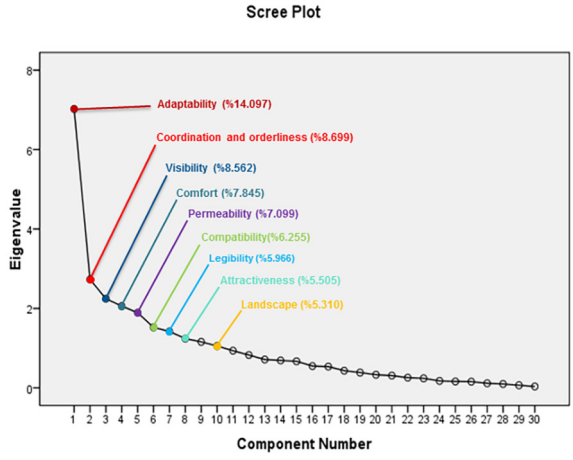

Figure 7. Scree plot to determine factors of factor analysis (source: research findings)

Table 5, which is obtained with the help of a scree plot, indicates the data matrix of data rotation and the factor load of each person after rotation. With the help of these statistics, it is possible to identify factors that can be defined. Any person who has a factor load greater than ±0.3 is considered significant and is included in that category. The factor load of 0.3 indicates that 9% of the variance of the variable is explained by that factor. This value of explained variance is adequate to consider the factor load as significant. Given what was stated above and factor load table, the first factor which is the first class of respondents includes 6 experts, the second factor includes 4 experts, each of the third, fourth, fifth, sixth, seventh factors includes 3 experts, the eighth and tenth factors include 2 experts, and the factor ninth factor includes 1 expert. In this regard, interpretation of the given matrix shows that 9 factors can be defined. The first to eighth and tenth (mental patterns) factors, which were the biggest and most understandable factors, included the indicator meanings that are shown in Tables 4 and 5 according to the questionnaire.

After identifying the experts in each factor, their answers were referred to in the answers and to find the common line of thought of the experts in each factor, answers (variables) with the highest and lowest points with a score of 0 or 9, 1 or 8 are extracted. Then, each factor was named and interpreted considering the variables (differentiating-uncommon and agreed-common). After extracting the questions and concepts, each of the factors was named and then it was provided to 5 experts from the university faculty members. The components and their subsets were examined by experts in a face-to-face meeting, and final opinions were applied to the titles of the factors. Finally, according to Tables 5, 9, factors were named with the titles of adaptability, coordination and orderliness, visibility, comfort, permeability, compatibility, legibility, attractiveness and landscape) (Figure 8).

Table 4. The data matrix of given rotation and the factor load of each (source: research findings)

Expert No	Component									
	1	2	3	4	5	6	7	8	9	10
Expert15	.768	.074	.160	–.041	.121	–.029	–.170	.059	–.019	.061
Expert26	.750	.038	.171	.210	.098	.133	–.004	.221	–.041	.114
Expert10	.649	.187	.050	.410	.301	.075	–.201	.064	–.048	.109
Expert16	.642	–.027	–.027	–.045	–.162	.264	.277	–.184	–.020	–.372
Expert23	.602	–.013	.373	.289	–.115	–.298	.045	.125	–.048	.053
Expert17	.582	–.070	.096	.518	–.048	.216	–.015	.200	.237	–.044
Expert5	.075	.836	–.079	.081	.065	–.118	–.086	–.130	.173	–.106
Expert7	–.286	.584	.190	.060	.061	.188	.231	–.120	.061	.377
Expert1	.039	.531	.477	.260	.259	.167	.081	.021	.234	–.109
Expert2	.474	.519	.279	.133	.059	–.048	–.075	.139	–.217	–.117
Expert30	.092	.147	.781	.106	–.041	.125	–.029	.259	–.058	.054
Expert21	.337	–.140	.704	–.034	.085	–.129	.146	–.278	–.178	.173
Expert13	.357	.153	.568	.350	.345	–.032	.020	–.034	.213	–.127
Expert20	.104	.095	.180	.853	.083	.183	.006	.071	–.172	–.102
Expert9	.386	.419	–.102	.580	–.009	–.158	.113	–.094	.334	.120
Expert14	.244	.406	.347	.452	.050	–.063	.066	.154	–.042	–.196
Expert24	.015	.270	–.020	–.017	.841	–.044	.140	.116	–.063	–.055
Expert31	.025	–.271	.128	.034	.711	.221	.022	.239	.326	.026
Expert19	.343	.115	.110	.309	.537	.098	–.171	–.332	.203	.085
Expert12	.070	–.071	–.021	.202	.087	.839	.001	–.124	–.037	.055
Expert4	.358	.344	.289	–.306	.013	.523	–.147	.106	.109	.144
Expert11	.285	.380	.368	.029	–.088	–.428	–.027	–.024	.419	.110
Expert27	–.164	.002	–.018	–.009	–.046	.005	.781	.012	.133	.044
Expert28	.022	.044	.068	.034	.209	–.084	.674	.103	–.169	.271
Expert6	.412	–.155	.322	.098	.009	.371	.467	–.273	–.048	–.201
Expert29	.163	–.171	.081	.031	–.015	–.130	–.077	.701	.256	–.183
Expert25	.182	.038	.039	.130	.350	–.015	.176	.684	–.116	.139
Expert22	–.116	.164	–.087	–.054	.155	–.020	.011	.098	.848	.023
Expert8	.221	–.022	.117	–.067	–.099	.136	.169	–.028	.000	.823
Expert3	.331	.214	.196	.133	–.197	.265	–.166	.085	–.115	–.488

Note: Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. a. Rotation converged in 19 iterations.

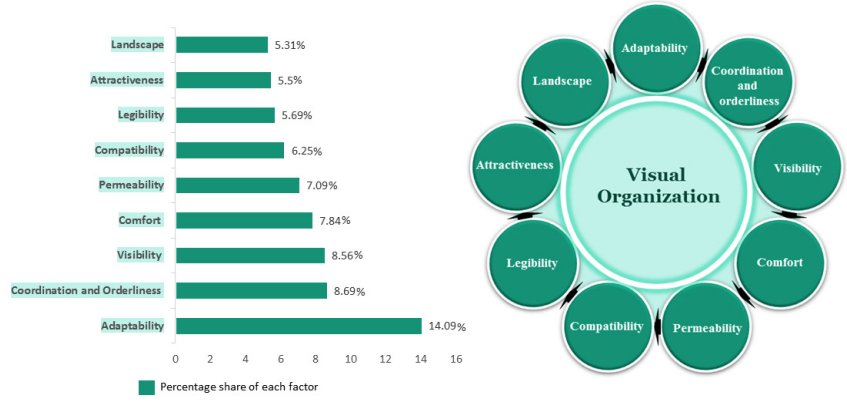

Figure 8. Visual organization factors affecting the protection of vernacular landscapes of villages (source: research findings)

Table 5. The mental patterns (thoughts) of experts of the factors of visual organization affecting vernacular landscape protection (source: research findings)

Factor	People number	The most important concepts	Mental pattern
The first factor	15–26–10–16–23–17	Location, Coordination in the texture, Scenic beauty, Compatibility, Material	Adaptability
The second factor	5–7–1–2	Location, Diversity of structure, Proximity, Spatial opening, Coordination in the texture, Legality in the body, Scope of vision, Sequential views, Scenic beauty, Slope, Topography, Greenness, Legality in the body, Harmony Details, Architectural style, Material, Legality in the body, Harmony	Coordination and Orderliness
The third factor	30–21–13	Transparency, Movement in space, Spatial contrast, Access, Diversity of structure, Coordination in the texture, The distance between buildings, The relationship between mass and space, Scope of vision, Scenic beauty, Compatibility, Topography, Greenness, Color, Light, Unity, Order, Height, Density, Skyline, Architectural style, Material, Flooring	Visibility
The fourth factor	20–9–14	Variability, Access, Location, Diversity of structure, Spatial opening, Coordination in the texture, Legality in the body, The relationship between mass and space, Shading, Scenic beauty, Topography, Greenness, Color, Light, Unity, Skyline, Architectural style, Material	Comfort
The fifth factor	24–31–19	Degree of confinement, Access, Complexity and conflict, Location, Diversity of structure, Proximity, Neighborhood, Spatial opening, Coordination in the texture, Legality in the body, The distance between buildings, The relationship between mass and space, Scope of vision, Scenic beauty, Topography, Greenness, Symmetry, Legality in the body, Scale, Coherence	Permeability
The sixth factor	12–4–11	Connection, Spatial contrast, Disorder and confusion, Coordination in the texture, The distance between buildings, The relationship between mass and space, Scenic beauty, Slope, Topography, Greenness, Color, Light, Height, Density, Skyline, Architectural style	Compatibility
The seventh factor	27–28–6	Flexibility, Connection, Variability, Disorder and confusion, Coordination in the texture, The relationship between mass and space, Scope of vision, Sequential views, Scenic beauty, Compatibility, Greenness, Harmony Color, Sign, Unity, Skyline, Compatibility, Greenness, Harmony	Legibility
The eighth factor	29–25	Movement in space, Flexibility, Complexity and conflict, Disorder and confusion, Location, Neighborhood, Coordination in the texture, Compatibility, Greenness, Coherence, Harmony Details, Geometry, Color, Balance, Unity, Order, Height, Density, Symbolic, Skyline, Architectural style, Material	Attractiveness
The ninth factor	–	–	–
Tenth factor	3–8	Access, Scope of vision, Sequential views, Scenic beauty, Compatibility, Topography, Greenness, Light, Skyline, Architectural style	Landscape

Effect of visual organization factors on villages' vernacular landscape protection

According to Table 6, Pearson correlation and its relevant significance rate were measures to determine the mutual relationships between visual organization variables, including adaptability, coordination and orderliness, visibility, comfort, permeability, compatibility, legibility, attractiveness, and landscape with the dependent variable of vernacular landscape protection. The results of this study indicate a significant relationship between visual organization factors and vernacular landscape protection in all cases. Among components of visual organization, the highest correlation belongs to permeability, coordination, and orderliness with a correlation coefficient of 0.915 at the significance level of 99%. According to the result of the calculated coefficient of correlation between each visual organization factor and the dependent variable of vernacular landscape protection, the highest correlation is related to the relationship between visibility and vernacular landscape protection, which is significant with a 0.945 rate at the confidence level of 99%.

According to Table 7 and the significant relationship between visual organization components and vernacular landscape protection, regression analysis was done between these factors and relevant factors. Visual organization components were considered as independent variables and improvement of vernacular landscape protection was taken as the dependent variable in this analysis. According to the results of this analysis, a correlation rate of 0.998 exists between vernacular landscape protection and visual organization components. According to the adjusted R square, 99.4% of variations in the vernacular landscape are explained by the linear combination of variations in independent variables that are visual organization components, including adaptability, coordination and orderliness, visibility, comfort, permeability, compatibility, legibility, attractiveness, and landscape.

Table 6. Correlation between visual organization factors and vernacular landscape protection) (source: research findings)

Factors	Vernacular landscape protection	Adaptability	Coordination and Orderliness	Visibility	Comfort	Permeability	Compatibility	Legibility	Attractiveness	Landscape
Vernacular landscape protection	1.000	.517***	.865***	.945***	.850***	.903***	.172**	.882***	.870	.109**
Adaptability	.517***	1.000	.358**	.520***	.487***	.352**	.123**	.422***	.569***	.270**
Coordination and Orderliness	.865***	.358***	1.000	.798***	.886***	.915***	.140**	.775***	.623***	.163**
Visibility	.945***	.520**	.798***	1.000	.859***	.796***	.174**	.832***	.818***	.127**
Comfort	.850***	.487***	.886***	.859***	1.000	.807***	.182**	.839***	.660***	.132**
Permeability	.903***	.352**	.915***	.796***	.807***	1.000	.104**	.814***	.655***	.151**
Compatibility	.172**	.123**	.140**	.174**	.182**	.104**	1.000	.124**	.153***	.036**
Legibility	.882***	.422***	.775***	.832***	.839***	.814***	.124**	1.000	.660***	.169**
Attractiveness	.870***	.569***	.623***	.818***	.660***	.655***	.153**	.660***	1.000	.164**
Landscape	.109***	.270**	.163**	.127**	.132**	.151**	.136**	.169**	.164**	1.000

Note: *** P < 0.01 – Significance at the 99% confidence level. **P < 0.05 – Significance at the 95% confidence level. *P > 0.05 – Meaningless.

Table 7. Summarized regression of visual organization components and vernacular landscape protection (source: research findings)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.998[a]	.995	.994	2.84627

Note: a. Predictors: (Constant), adaptability, coordination and orderliness, visibility, comfort, permeability, compatibility, legibility, attractiveness, landscape.

According to Table 8 and the significance level of analysis at the confidence level of 99%, it is found that independent variables can explain and predict the variations in the dependent variable, which is vernacular landscape protection in the village.

Table 8. The significance level of regression on visual organization components and vernacular landscape protection (source: research findings)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	37321.809	9	4146.868	511.880	.000[b]
	Residual	170.126	21	8.101		
	Total	37491.935	30			

Note: b. Predictors: (Constant), adaptability, coordination and orderliness, visibility, comfort, permeability, compatibility, legibility, attractiveness, landscape.

According to Table 9 and measured standard coefficients, the effect of independent variables on the dependent variable shows that all visual organization components have a significant impact on the dependent variable of vernacular landscape protection. Among independent variables, attractiveness and visibility have the highest effect on the vernacular landscape protection of villages with impact coefficients of 0.318 and 0.279 at the significance level of 99%, respectively.

Table 9. Coefficients of impact of independent variables of visual organization factor on the dependent variable of physical image improvement (source: research findings)

Model		Unstandardized Coefficients		Standardized Coefficients Beta	T	Sig.
		B	Std. Error			
1	(Constant)	–59.479	9.426		–6.310	.000
	Adaptability	.150	.068	.046	2.225	.037
	Coordination and Orderliness	–.479	.131	–.172	–3.654	.001
	Visibility	.596	.059	.279	10.047	.000
	Comfort	.471	.135	.181	3.490	.002
	Permeability	.484	.090	.236	5.391	.000
	Compatibility	.075	.032	.038	2.328	.030
	Legibility	.638	.093	.230	6.826	.000
	Attractiveness	.662	.087	.318	7.566	.000
	Landscape	.134	.041	.056	3.257	.004

Note: a. Dependent Variable: vernacular landscape protection

5. Discussion

Based on the results of the research, 9 factors have been extracted for visual organization, each of them is effective in protecting the native landscapes of the foothill villages as shown in Figure 9 and as follows.

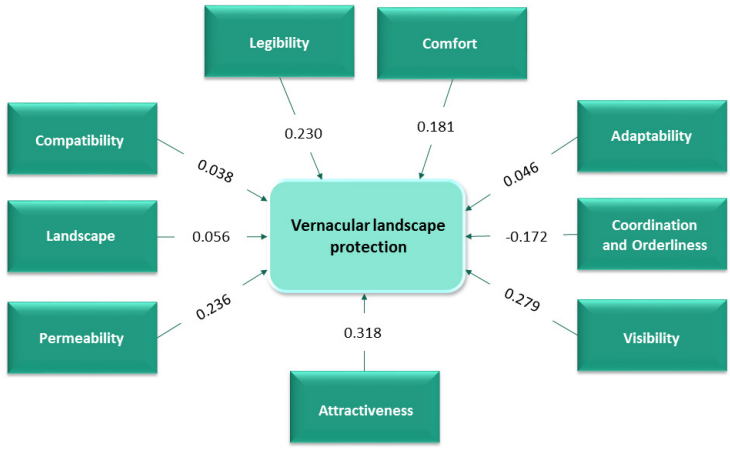

Figure 9. Visual organization factors affecting the protection of vernacular landscapes of villages (source: research findings)

5.1. Adaptability factor

In the process of architectural adaptability and protecting the values of organic textures, factors such as: architectural form and simple facade and harmony with texture, appropriate scale and proportions, functional form and structure of architectural building, use of legible and durable materials is very effective. During this process, the design of the facade of building in the villages should be in such a way that it has a functional and organized relationship with the interior of the building as well as the whole texture. The study conducted by Asadpour et al. (2021 and 2024a) has shown that walls and buildings that are built with special vernacular materials creates a harmonious and homogeneous landscape in the village, so that it represents the past architecture of that region, which protects the vernacular culture and architectural values. In this respect, if the materials are formed in the floor, body and walls of the rural environment based on adaptation to the climate and adaptation to the rural texture, the values and tradition and ecology of the region will be shaped and it will be effective in the identity of the village and then strengthening the values of the vernacular landscape.

5.2. Coordination and orderliness factor

The facade of a rural building is one of the most important external elements for the building appearance. Beautiful design and high-quality work in the facade of the building can have a great impact on the mind of the audience. If proportion and harmony are not observed in the composition of the visual elements of the buildings that are placed next to each other, the environment will suffer visual chaos and disarrangement. Thus, in order for the environment to have a good visual quality, the components and components of the buildings, as well as the important elements of building facades, including: windows, openings, materials, color, vertical and horizontal structures, decorative elements, etc., must have a good harmony and proportion with each other. A form is beautiful when there is harmony between the architectural elements and the design platform, and the more order and harmony between the elements of environmental stimuli, the easier they are to perceive. Therefore, the newly-built walls and buildings in the village should have a good visual harmony with the vernacular structures and buildings.

5.3. Visibility factor

According to research results, the more the natural visual view of humans in an environment, the more movement is provided in that environment. Because natural visual view consists of visual criteria that affect human behavior. The more the movement, the more exploration and understanding are provided in the environment. More attention must be paid to illumination tools for the visibility of architectural details of the buildings' facade in rural environments, so these facades would obtain more clarity and transparency. In the opinion of Mahdinejad et al. (2020b), human perception varies based on what exists in the scope of vision. These authors introduce light and luminance as effective indicators for the visibility of the buildings and rural environment believing that the effectiveness of these indicators will be increased through spatial opening and flexibility.

5.4. Comfort factor

According to the research results, comfort is an effective factor in creating the rural landscape. Visual comfort components, including balance, the relationship between mass and space, density, spatial opening, degree of confinement, etc. must be considered appropriately to create a context for paying attention to visual rural factors and beautification elements and improve landscape quality. In village spaces, a balance must be created between open and built spaces in the courtyard, so that a suitable proportion should exist between the height and width of buildings, the spaces should not be too open or closed, and the courtyard' size and dimension is proper enough for the comfort of occupants.

5.5. Permeability factor

According to the results of the study, those places that provide proper physical and visual permeability create mutual contacts and actions between individuals, which, in turn, shapes various behavioral patterns. In a village, the location of roads passage routes, and buildings' location must be easily accessible and perceivable to make that village visually permeable. In this way, the village becomes familiar and attractive to visitors. Therefore, access routes in the villages are the dominant elements of images created in people's minds, which create a visual connection between desirable rural landscapes and prominent elements of the village through a movement axis or visual channel based on their diverse patterns. Therefore, transparency, hierarchy, and various visual potentials must exist in long routes because visual diversity and uniform, regular, and high-quality flooring in movement routes increase the commutation and presence of people in the environment.

5.6. Compatibility factor

According to the results of the study, proportionality and compatibility with vernacular patterns of the area lead to the unity and integrity of the village's landscape in the process of contemporizing rural spaces. Therefore, the design and construction of new buildings must be based on the available patterns of rural development and keeping visual features of the village's image and landscape. Vernacular architectural patterns are shaped in consistency with the climate conditions of the area by using special indigenous materials that are compatible with the climate, adding the tangible and visual components of the space, including vegetation diversity through planting proper species that are consistent with the climate of the region, and using native and resistance plants under the mental and spiritual conditions of the space. Therefore, examinations have shown that restoration and renovation of traditional and historical buildings and the application of vernacular architecture's principles in the new constructions and texture are effective strategies for developing visual connections between old and new buildings in the village.

5.7. Legibility factor

The results indicate that legibility rate and degree depend on the space's ability to create a mental image. A legible space shapes harmonious relationships between individuals and their surrounding environment leading to more movement and attendance of people in the space and easy access for them. According to Mahdinejad et al. (2020b, 2022c), those landscapes with harmony and proportionality would strengthen the visual perception and create a transparent and desirable mental image in the minds of observers. In the opinion of Asadpour et al. (2024a) and Mahdinejad et al. (2019, 2023), religious, historical, and recreational places serve as rural signs that reflect common meaning in the minds of most residents living in a village. These places play an important role in their perceptual memory. Therefore, these signs can be used to navigate and find the address and the location of buildings inside the village. In the opinion of Asadpour et al. (2024a) and Mehdinejad et al. (2020b, 2022c), these signs must have the highest legibility degree in terms of form and must be homogenous and coherent with morphological and natural features of that environment having an eye-catching landscape in terms of the location in the spatial organization.

5.8. Attractiveness factor

According to research results, landscape beauty results from a specific combination of phenomena and physical features, including skyline, sign, node, landscape, form, density, details, decorations, and geometry; in visual perception of the image of a village, therefore, those images that are clear and readily perceivable are more attractive and desirable than the case in which, a kind of irregularity exists or is shaped suddenly. The study conducted by Asadpour et al. (2021) showed that the village landscape has a pleasant and beautiful perceptual structure if it reminds special symbols for the person by using decorations and decorative elements, such as color, material, geometry, etc. providing joyful sensual experiences for individuals. According to the findings of this study, winding paths, narrowing and widening roads and passages, and continuous walls coordinated with buildings throughout the movement routes would create diverse and attractive views in the village, so that vegetation, river, flooring, connected walls, vernacular and old buildings in movement routes, connectivity and coordination in texture of native villages with the context and climate of the area leads to landscape beauty of the village through which, a coherent and beautiful image of village is shaped in mind of people.

5.9. Landscape factor

According to the obtained results, the greenness index is seen more than other natural elements in the villages, so it is a significant index in forming vernacular architectural features in rural areas, place-making, vernacular physical design, and developing the texture of settlements. According to Asadpour et al. (2021), agricultural lands and landscapes are the major greenness factors introducing the rural landscapes in the natural image of villages. Green space and natural elements such as trees and green strips on the edge of spaces play a significant role in creating a dominant image with specific visual effects in the villages. Hence, as one of ley layers of the landscape, green networks existing in the rural environment play a considerable role in creating rural structures and a continuous landscape. Moreover, the results of this study show that the quality of the environmental landscape can be improved by converting sloped surfaces to green spaces, improving road conditions through stair-shaped and placement of houses in the village within different slopes of the land.

6. Conclusions

In the first step of answering the first question of the study, 54 indicators were extracted for research variables (visual organization and vernacular landscape protection) through documentary content analysis. Since most theories and studies reviewed in the first phase of research in Iran including urban scope and rural landscapes have received less attention, the Delphi survey has been used based on the experts' opinions to scrutinize the indicators obtained from content analysis on the research variables and rural scope. This survey was done through interviews with 10 experts, and 53 indicators were considered for visual organization.

The second question was examined in the second phase. To do so, the Delphi technique and Q-factor analysis were used through the participation of 31 experts to identify mental patterns of experts about the visual organization factors affecting the vernacular landscape protection. According to the research results, 12 patterns were significant among 14 identified mental patterns. These patterns have been sorted based on their variance coefficients and impact rate as follows: adaptability (14.09%), coordination and orderliness (8.69%), visibility (8.56%), comfort (7.84%), permeability (7.09%), compatibility (5.25%), legibility (5.69%), attractiveness (5.50%), and landscape (5.31%). These factors are effective in protecting the vernacular landscapes of foothill villages.

The third question was answered in the third step. Pearson correlation and its significance rate were measured firstly to determine the mutual relationships between visual organization factors and vernacular landscape protection. The results show a significant relationship between visual organization factors and between these factors and vernacular landscape protection in all cases. Among visual organization factors, the highest correlation belongs to permeability, coordination, and orderliness with a correlation coefficient of 0.915 at the significance level of 99%. Then, regression analysis of visual organization factors with the vernacular landscape protection variable has shown a correlation rate of 0.998 between vernacular landscape and visual organization factors. According to the adjusted coefficient of determination (R^2), 99.4% of changes in the vernacular landscape have been explained by the linear combination of variations in independent variables that are visual organization factors. This indicates the considerable effect of each factor (among nine factors) on vernacular landscape protection in foothill villages. According to the assessment of obtained results, the effect of visual organization factors on vernacular landscape protection in foothill villages can be interpreted as follows.

The foothill villages of Iran that have vernacular landscapes have been created based on the geographical position and location in the mountain with an organic shape adaptable to the pristine climate and nature and natural substrate having natural landscapes, such as forest, plain, mountain, river, and other natural elements. In this case, the foothill villages that have vernacular texture and architecture are located in the mountains creating an environmental attractiveness for the residents living there and other people due to its specific structure, natural amenities and potentials, climatic characteristics, eye-catching ecological landscapes, as well as cultural and religious centers that introduce traditional rituals, beliefs and ceremonies of native people living in this area. The mentioned potential can also be used in creating modern buildings. This type can be admired by people if it emphasizes the architectural vernacular patterns, enhances the non-symbolic buildings with vernacular architecture, and serves as a way to experience an original place. Therefore, examinations have shown that restoration and renovation of vernacular and historical buildings, as well as using vernacular architecture principles in constructions and new textures of contemporary villages are effective strategies for creating a pleasant and satisfying landscape. In this case, the access and route network patterns must be based on the slope and topography in these villages, so that physical and visual permeability is created to provide the field for mutual actions and interactions between individuals and forming different behavioral patterns. Hence, a view of the mountain's natural landscape must exist throughout the movement routes allowing a slow and thoughtful movement to involve different feelings. Hence, suitable places should be used to pause and see the surrounding landscape, indigenous plants, and beautiful identity-maker elements throughout the movement routes to allow more presence and commutation of people. The reason is that visual diversity in movement routes makes streets more attractive, and the visual attractiveness of the sidewalks and movement routes increases individuals' commutation and presence in the environment. Therefore, different building heights must be considered in different topographies and land slopes to create a better view of buildings and gain suitable sunlight and luminance. Moreover, buildings' heights must be matched with the height of vernacular buildings on different slopes, so that a regular and coherent skyline is shaped for the village leading to landscape legibility. The building distance and neighborhood affect the visual permeability and visual dominance over the surrounding environment. Accordingly, a natural visual view results in more movement, exploration, and perception of the environment. Regarding the cultural and architectural characteristics of the texture in the foothill villages of Iran, the distance between buildings must be considered compact shape close to each other in some villages, while they must be dispersed with more distance in other villages, and neighborhood uses also must interact with each other and placed properly next to each other in terms of location, height, volume, and building density. The local and vernacular materials should be used in walls and buildings, and the color of materials and wild plant species in the environment must be matched and compatible with the climate of the area. In the villages, the greenness indicator is effective in forming vernacular architecture features of rural areas, place-making, vernacular physical design, and

developing the texture of settlements, so that in vernacular villages, green space and some natural elements such as trees, and green strips in the margin of spaces play a vital role in creating a dominant image with special visual effects that expands human thoughts about the landscape beauty criteria and satisfies users' needs in this case. According to research results, façade compatibility with neighborhood façades and walls is an important visual factor that affects the visual quality of buildings. Hence, the components and details of the buildings and other substantial elements of façade-building including windows, openings, materials, color, vertical and horizontal structures, decorative elements, etc. must be coordinated and consistent, and become more attractive by using simple decorative elements because they can create an extraordinary visual mixture from a simple texture with simple architectural elements that prevents visual disturbance and landscape disorder and confusion. The neighborhood uses in the texture of vernacular villages must interact with each other and be placed properly next to each other because dual-use incompatibility leads to disturbance in rural texture in terms of landscape. Since the compatibility of physical-spatial patterns of rural texture with climate conditions of the area creates an effective texture, renovated walls and buildings inside the villages must have proper visual coordination with vernacular structures and buildings. According to research results, decorations, details, and geometry are effective in perceiving and creating visual beauty, and the value and quality of the environment landscape are improved when the aesthetical qualities, such as symmetry, balance, continuity, coordination, etc. are observed in the constructed buildings. Therefore, a village landscape has a pleasant and beautiful perceptual structure if it can remind special symbols for the person by using decorations and decorative elements, such as color, materials, geometry, etc. Historical and traditional buildings in vernacular villages can be classified and studied within two groups of visual and perceptual attractions. In this way, various attractions existing in decorative motifs and bodies of these buildings are tangible visual components that can draw the attention of people. Moreover, the cultural identity in the body of the buildings is sensual and perceptual components that bring a sense of place effectiveness and place attachment among occupants. Hence, simultaneous observation of space, life, and meaning in a complex, proper, and attractive connection between indoor and outdoor spaces of the building, diversity of decorations, lighting, and special decorations of entrance gates and windows, as well as interior architecture such as plasterwork with different motifs, brickwork, and diverse decorations in these valuable houses are attractive characteristics for audiences. Therefore, decorative elements and architectural style are important mental images of the village in the minds of people regarding the capacities available in the vernacular villages. The research results show that some criteria including luminance, color, lighting, bodies, quality of the building, and access are the substantial components of visual comfort, which improve the quality of the landscape. Hence, peace of mind is created among people living in a society if these criteria are observed in the landscape of the environment providing the field for paying attention to visual rural factors and beatification elements. Therefore, the lack of an accurate visual relationship between villagers and the rural landscape gradually destroys the identity of the village and causes failure in making emotional connections between the village and those who live there. However, it is not expected that these landscapes remain in a fixed status. On the other hand, these landscapes cannot be changed considerably, but these changes must be under control, and more attention should be paid to the maintenance of the physical structure and visual effects of the natural environment and rural landscape. Accordingly, the following managerial strategies must be considered in the contemporizing process of villages to protect vernacular landscapes.

1. Design and implement modern developments regarding the available rural development patterns and protecting visual features of village appearance and landscape.
2. Create proportion and adaptability in new rural developments to do a contemporizing process based on the vernacular patterns of the area.
3. Try to create a visual connection with proximate spaces to prevent disorder and confusion in patterns, rural appearance, and landscapes.
4. Pay attention to infill development and follow coordination between the height of new buildings and existing buildings.
5. Pay attention to considerations of rural appearance and landscape concerning skyline, appearance of alley, route and paths, color, shape, details, and formation of rural appearance.
6. Deployment and locating uses that are compatible with rural appearance.
7. Consider the relationship between buildings' dimensions and their shape visibility and compatibility with rural appearance and determine its positive or negative effect on the disturbance or confusion of the rural body and identity.
8. Protect the elements having the value of old and vernacular texture, coordination of proportions, scales, texture and color of proximate buildings with each other.
9. Keep the physical appearance of old and valuable texture through visual organization and renovation of old and valuable parts of the village.
10. Use design techniques of old textures to protect the identity and continuity of rural landscapes.
11. Create proportionality and development balance in visual connections between old and new buildings.
12. Coordination between beautification measures with historical and vernacular context.
13. Create diversity, change, and innovation while keeping coordination and visual homogeneity.

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