

Assessment of Influential Components in Vernacular Housing Architecture of Villages in the Gilan Plain

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ABSTRACT: Recent advancements in construction and shifts in traditional housing practices in the villages of the Gilan Plain have resulted in a disconnect between the newly-constructed housing and its surrounding environmental, economic, physical, social, and cultural conditions. This study aims to identify and evaluate the key components affecting traditional rural housing in the Gilan Plain and compare these with those found in the literature review. The study employed a mixed-methods design, including descriptive-analytical approaches, a survey method, and a case study approach, to examine rural housing in the Gilan Plain. The components were distilled into items and evaluated through a questionnaire distributed to 100 architectural experts, the validity and reliability of which were confirmed. The components were then ranked using the Friedman test. To observe the functions of these components, 23 case studies of rural housing in the Gilan Plain were investigated. The findings showed that livelihood played a significant role in shaping the physical structure of rural homes in the Gilan Plain compared to other rural areas of Iran. Due to the region's favorable climate conditions, including an abundance of rain and vegetation, there has been a lack of emphasis on climate adaptation strategies and resource management compared to other regions of Iran. The abundant fields and vegetation also serve important cultural functions, such as providing privacy.

Keywords: Vernacular Rural Housing, Rural Architecture, Plain of Gilan, Ranking of Architectural Components.

INTRODUCTION

Rural housing is rooted in architectural vernacularism and forms in response to physical, environmental, economic, and socio-cultural conditions. The rapid and drastic changes in rural housing and the replacement of new urban models in rural areas due to cultural changes, technological advancements, and livelihood shifts indicate that past architectural models are no longer compatible with current conditions. However, the disuse of vernacular housing models has led to problems with the compatibility of the new models with the environmental, economic, socio-cultural, and physical conditions of rural areas. Vernacular rural housing in the Gilan Plain has changed to conform with current rural architecture in Iran, highlighting the need to identify and assess the components that influence vernacular architecture in the area.

This study aims to determine the components that influence

vernacular and rural architecture in Iran and evaluate their effectiveness in vernacular rural housing in the Gilan Plain. Furthermore, this study compares these components' effectiveness in Gilan Plain's rural houses to those in other rural areas of Iran. It analyzes the similarities and differences between the two. The research questions posed for this study are as follows:

- What components have the greatest and least influence on rural vernacular architecture in the Gilan Plain?
- How does the influence of these components on vernacular rural housing in the Gilan Plain compare to their frequency in other rural areas of Iran?
- What are the causes of these similarities and differences?

To address these questions, the most frequent components of vernacular architecture found in the literature were applied to the Gilan Plain.

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Literature Review

Firstly, the definition of vernacular architecture is discussed, and then the components influencing vernacular rural housing are studied.

Definition of Vernacular Architecture: Words such as "traditional," "folk," "popular," and "primitive" are close to the word "vernacular," but they cannot replace it. Thus, the term "vernacular architecture" encompasses the concepts of popular, local, traditional, and primitive architecture, as well as social and cultural complexities. Vernacular architecture is simple and local, lacks association with a specific period, and is widely accepted in form by the public. This architecture aims to achieve human comfort and peace (Ghobadian & Chaisaz, 2015). The characteristics of vernacular buildings include a lack of theoretical or aesthetic claims, compatibility with the site and climate, respect for others and their houses and the surrounding environment, and the ability to create specific patterns within a framework. The vernacular building is open and adaptable, unlike buildings with a closed-form style. This allows for changes and development. In vernacular buildings, the relationship between components and the means of achieving them is more important than the elements themselves (Rappaport, 1983, 19). Vernacular housing embodies the traditional style in which the general culture is the producer of the house. This structure serves as a shelter and provides security and other necessary functions while preserving its residents' values, economy, and lifestyle (Membalkuga & Murray, 2012).

Influential Components in Vernacular Rural Housing

The influential components in rural vernacular architecture are studied in four categories: physical, environmental, economic, and socio-cultural.

Physical Components Influencing the Architecture of Vernacular Rural Housing: The components include "using vernacular resources," "utilizing leading-edge knowledge and technology," "harmony with the rural landscape," and "adapting spaces to functions" (Fathi Saqalaksari et al., 2022).

The basic idea of rural people when building a house is to minimize costs, utilize available resources and materials, and enhance the capacity and durability of vernacular materials to construct a shelter that is suitable for living, as well as production and storage of goods (Zargar, 2014, 163). Architects or experts are not usually hired to build vernacular houses, and the builders use traditional models and technologies. They procure the needed materials from locally available resources (Membalkuga & Murray, 2012). Vernacular resources include choosing local materials and construction methods, substantially influencing the physical body of rural houses.

The physical structure of buildings changes continuously as knowledge advances over time (Mortaz Hejri et al., 2022). Vernacular knowledge always suggests a method based on the local climate, materials, and culture. Architectural

vernacularism has not only been in contrast with technology but also persistently innovated and improved the utilization of technologies (Härmănescu & Enache, 2016). Vernacular architecture is defined by its connection to place and time. While it has past roots, it should reflect current knowledge and be forward-looking. The idea that vernacular architecture merely imitates old architecture is a misconception (Mahdian & Sartipipoor, 2013).

Vernacular buildings are closely tied to their surrounding environment. The process of building and the final product reflects the local culture and natural surroundings (Membalkuga & Murray, 2012). The formation of decorations that arise from the environment and the culture of the people is a prevalent characteristic of vernacular architecture and a factor that integrates rural buildings with their surroundings (Najarnejad Mashhadi et al., 2021). In recent years, changes in villages can be attributed to the influence of urban culture on rural landscapes and migration from villages to cities (Anabestani et al., 2016).

The physical structure of rural houses is influenced by the functional features of their spaces (Alalhesabi & Raheb, 2008). The physical structure of rural housing serves many crucial functions in rural life. Any changes to the structure can result in numerous alterations in the spatial aspects of rural inhabitants' daily lives (Saeedi et al., 2013). Throughout history, vernacular architecture has balanced size, shape, and function optimally. Departing from vernacular strategies for meeting housing needs can result in new challenges (Fathy, 1976, 24). Furthermore, despite the relative growth in recent years, the quantitative and qualitative indices of rural housing in Iran, such as household density (HD), persons-to-room ratio, and room-to-building ratio, are still lower compared to those of urban housing (Tarkashvand & Raheb, 2016, 19).

Environmental Components Influencing the Architecture of Vernacular Rural Housing: The environmental components include "climate adaptation," "thermal and visual comfort," "preservation of natural resources," and "health and hygiene."

Climate conditions, environmental properties, and the type of building formation in each area influence the physical body of rural houses (Alalhesabi & Raheb, 2008). The rural architecture model is not based on definite rules and precise geometry. Instead, it is a general schema sustained by its surrounding environment. Geographical factors and climate conditions have formed basic models that have evolved and been optimized over time (Raheb, 2015). The materials used in vernacular houses are adapted to environmental conditions based on thermal behavior and climate resilience (SadeghPey, 2013). In the architecture of the moderate and humid climate in the north of the country, it is important to pay attention to high humidity and rain, the angle of the sun, the direction of favorable summer winds, and protection from cold winter winds (Tabbaz & Jalilian, 2011).

New methods and materials have replaced traditional

strategies in vernacular architecture recently. On the one hand, this has resulted in alterations of rural landscapes and increased energy consumption, leading to higher building and maintenance costs (Tabbaz & Jalilian, 2016). Although thermal comfort and optimal conditions are essential for rural houses, adopting vernacular methods and incorporating innovative solutions can lead to more optimal conditions in domestic spaces. In addition, energy consumption can be reduced to the point where heating and cooling equipment is only needed in a complementary capacity (Yang et al., 2009).

In recent years, vernacular knowledge has been neglected, posing numerous threats to the environment and natural resources (Härmănescu & Enache, 2016). Rural housing and planning literature focuses on balancing rural development and preserving natural resources (Gkartzios et al., 2020).

The primary goal of housing is to maintain health (Rappaport, 1983, 180). One of the challenges faced by villages in Iran is poor sanitation caused by the involvement of livestock in the living area (Mahdian & Sartipipoor, 2013). Regardless of location, building houses with healthy and sanitary ventilation are of great importance (Soltandoost, 2015, 10). Focusing on mental security and comfort is also necessary to maintain health in building houses (Roumiani et al., 2018).

Overall, considering optimizing factors such as ceiling and wall insulation, type of windows, shading, airlocks, and the window-to-wall ratio (WWR) can substantially reduce energy consumption and CO₂ emissions and improve thermal comfort, thereby enhancing the functionality of living areas in rural houses (Tahsildoost & Zomorodian, 2020).

Economic Components Influencing the Architecture of Vernacular Rural Housing: The economic components include "easy and low-cost building and maintenance" and "correlation of life and livelihood."

Housing should be affordable enough for people to access (Rappaport, 1983, 180). Rural housing always seeks easy construction at low cost, focusing on economic efficiency. Achieving this requires a precise evaluation of the financial justification of any architectural method that balances environmental and social purposes (Haidar & Bahammam, 2021).

Concordance between livelihood and rural life is a major determining factor in the lives and relationships of rural people (Raheb, 2007). Residential-livelihood activities form the nature of rural life (Mahdian & Sartipipoor, 2013).

Social Components Influencing the Architecture of Vernacular Rural Housing: The social components include "focusing on the residents' needs of the day" and "preserving values and traditions."

The elements of rural architecture are rooted in the material and spiritual needs of rural people. Their needs regarding their environment, livelihood, development of social life, and technical power are so wound into the warp and weft of rural

housing (Zargar, 201, 34). Social identity is formed through living with others in a residential space, where one feels a sense of belonging to a particular place (Khakpour et al., 2015). This also applies to a rural person's relationship with their housing needs. A feeling of belonging to a home and forming an individual and social identity are ever-present needs for rural people.

Home is one of the most important and influential components of a family's social and cultural base. The functions of rural housing are interconnected with a set of factors related to the natural environment and socio-cultural conditions, resulting in a consistent dynamism aimed at meeting the needs of rural people over time (Roumiani et al., 2018). Reflection of cultural beliefs, particularly religious beliefs, is evident in the architecture of rural communities. An instance is the concept of privacy in rural housing. Nonetheless, the architecture in rural areas in Iran is a combination of religious beliefs, traditions, and customs (Zargar, 2014, 135).

Theoretical Framework

The components extracted from the literature review form the theoretical framework of the research. These components are divided into four dimensions:

- Physical components: using vernacular resources, utilizing leading-edge knowledge and technology, harmony with the rural landscape, adapting spaces to functions;
- Environmental components: climate adaptation, thermal and visual comfort, preservation of natural resources, health, and hygiene;
- Economical components: easy and low-cost building and maintenance, correlation of life and livelihood;
- Social components: focusing on the residents' needs of the day and preserving cultural values and traditions (fig. 1).

To answer the research questions, the above components are assessed based on their impact on the architecture of vernacular rural housing in Gilan Plain.

MATERIALS AND METHODS

This study used a mixed methods design. The literature was reviewed through a descriptive-analytical study and library research. The influential components in vernacular rural housing were identified and categorized during this phase. The extracted components were then examined in the architecture of the Gilan Plain through a survey and case study. Firstly, the components influencing rural vernacular housing that formed the basis of the theoretical framework for this research were extracted from previous literature. These components were assessed to answer the research questions based on their impact on the architecture of vernacular rural housing in the Gilan plain. Furthermore, these components were used to compare vernacular rural housing between the Gilan plain and other parts of the country (Fig. 2).

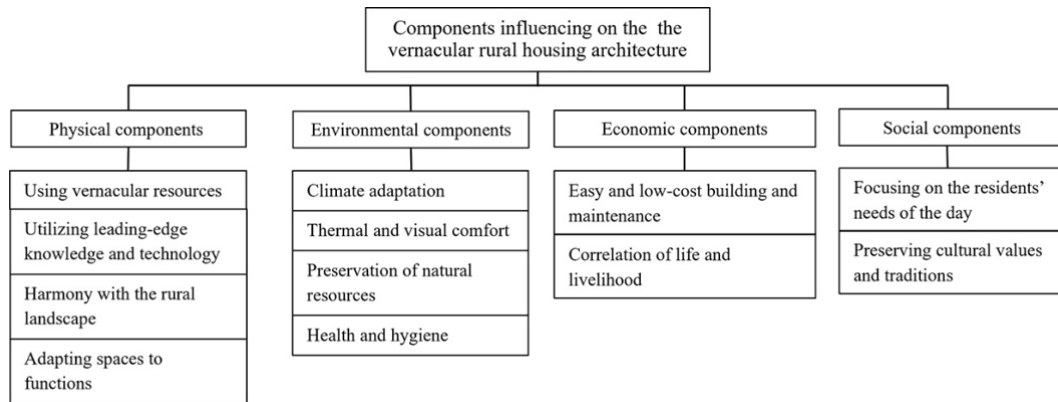


Fig. 1: Diagram of the influential components in the architecture of vernacular rural housing

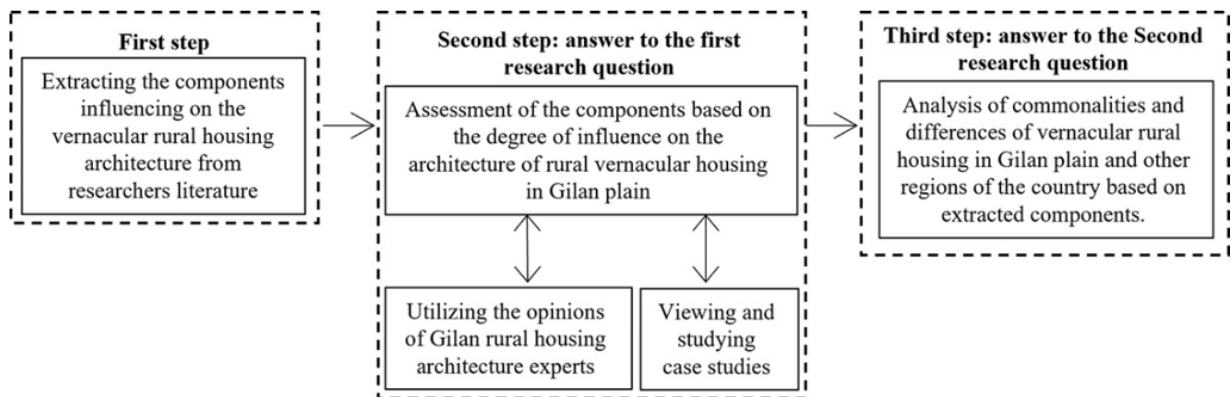


Fig. 2: Diagram of the research method

Survey method: The items extracted from the literature review (Table 1) are the basis of the researcher-made questionnaire. Based on the theoretical framework of the research, twelve components and related items form thirty-five questions in four physical, environmental, economic, and social dimensions. The Likert scale questionnaire is assessed by referring to Gilan architecture experts. For this purpose, points from 1 to 9 are given by the architectural experts of this region according to each item's impact on the vernacular rural housing architecture in Gilan.

The validity of the questionnaire was confirmed by consulting experts in vernacular and rural architecture. A Cronbach's alpha score of 0.867 indicated the questionnaire's good reliability. The final version of the questionnaire consisted of 35 items. As per Kline's recommendation, the sample size was determined to be at least 2.5 times the number of items, so a sample size of 100 was selected, including experts in architecture who have worked in the rural architecture of Gilan. The answers were analyzed using the Friedman test in SPSS 26.

Case study method: The study's geographical area covered villages in the Gilan plain. As these villages are located near

cities, they are greatly influenced by urban architectural models. The Gilan plain is comprised of three regions: the eastern region (Astaneh-ye Ashrafiyeh, Lahijan, Langarud, and Rudsar), the central region (Rasht, Bandar Anzali, Khomam, and parts of Sowme'eh Sara), and the western region (Fuman, Shaft, Talesh, Rezvanshahr, and parts of Sowme'eh Sara).

The case studies of rural vernacular houses in the Gilan plain were chosen randomly to conform to the definitions of vernacular architecture, including the use of local patterns, materials, and constructions by residents, and to ensure representation of all three areas of the Gilan plain (west, east, and center). Due to the high humidity and the use of low-durable materials, only a few vernacular types of rural houses have remained. Twenty-three houses were selected from the three regions of the Gilan plain as follows:

- Seven houses from the western region, located in the Gilan Rural Heritage Museum;
- Four houses from the central region, three located in the Gilan Rural Heritage Museum and one in a village north of Rasht city;
- Twelve houses from the eastern region, seven located in the Gilan Rural Heritage Museum, and five from villages around

Table 1: Influential components and items in vernacular rural housing extracted from the literature

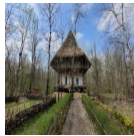


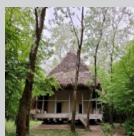
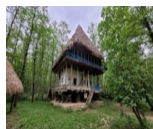
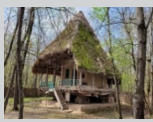






Macro aspect	Components	Items
Physical aspect	Adapting spaces to functions	Providing a sufficient number of rooms based on the size of the household (Roumiani et al., 2018)
		The proportion of dimensions with the function of spaces (Roumiani et al., 2018)
		The adjacency of related spaces (Raheb, 2015)
	Harmony with the rural landscape	Coordination of house and yard with topography (Membalkuga & Murray, 2012)
		Harmony with the natural appearance of the village (Tabbaz & Jalilian, 2016)
		The use of dominant decorations arising from the culture of the environment (Najarnejad Mashhadi et al., 2021)
Using vernacular resources	Use of local materials (Membalkuga & Murray, 2012)	
	Using local manufacturing methods (Membalkuga & Murray, 2012)	
Environmental aspect	Preservation of natural resources	Optimum use of natural materials (Roumiani et al., 2018)
		Non-pollution of air for heating, cooling, and cooking (Tahsildoost & Zomorodian, 2020)
		Water resources management at home (Roumiani et al., 2018)
	Climate adaptation	Wastewater management at home (Roumiani et al., 2018)
		Use of materials with suitable thermal capacity (SadeghPey, 2013)
		Resistance of materials against climatic conditions (SadeghPey, 2013)
		Protection of the living space against the penetration of rainwater (Tabbaz & Jalilian, 2011)
		Use of favorable north and northeast wind (Tabbaz & Jalilian, 2011)
		Orientation based on the angle of the sun (Tabbaz & Jalilian, 2011)
	Thermal and visual comfort	The effect of traditional heating on house architecture (Yang et al., 2009)
		Cooling through natural ventilation (Yang et al., 2009)
		Natural methods of reducing relative humidity (Tabbaz & Jalilian, 2011)
	Health and hygiene	Use of natural light (Tahsildoost & Zomorodian, 2020)
		Use of healthy ventilation (Soltandoost, 2015)
		Creating a space for relaxation (Roumiani et al., 2018)
Toilet separation from the living space (Raheb, 2015)		
Separation of livestock and poultry space from living space (Mahdian & Sartipipoor, 2013)		
Economic aspect	Easy and low-cost building and maintenance	Reduce construction costs (Rappaport, 1983)
		Easy maintenance (Rappaport, 1983)
		Employment of local labor for house construction (Fathy, 1976)
	Correlation of life and livelihood	Vegetable and summer garden (Mahdian & Sartipipoor, 2013)
Warehouses of agricultural products (Zargar, 2014)		
Socio-cultural aspect	Focusing on the residents' needs of the day	Livestock and poultry breeding spaces (Raheb, 2015)
		Construction of houses by residents to adapt to daily needs (Zargar, 2014)
		Formation of the house based on daily activities (Cooking, washing, etc.) (Raheb, 2015)
	Preserving cultural values and traditions	Residents' sense of belonging to the house (Khakpour et al., 2015)
		The influence of religious beliefs on house architecture (Zargar, 2014)
		The effect of privacy on the architecture of the house (Zargar, 2014)

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To ensure that the study captured a representative sample of rural vernacular houses across the Gilan plain, 23 houses were selected (seven from the western region, four from the central

region, and 12 from the eastern region). Old houses in Gilan are constantly at risk of destruction due to climate conditions and the use of non-durable materials. The houses observed in this study ranged from 60 to 200 years. There were also

Table 2: List of the case studies of vernacular rural houses of Gilan plain

Geo-graphic area	Row	House title	Year of construction (SH)	Location of construction	Image of house	Current location
Gilan eastern plain	1	Pormehr	1214	Lahijan		Gilan Rural Heritage Museum
	2	Montazeri	1252	Lahijan		Gilan Rural Heritage Museum
	3	Mirsayar	1296	Lahijan		Gilan Rural Heritage Museum
	4	Chancho	1314	Lahijan		Gilan Rural Heritage Museum
	5	Rafiei	1324	Lahijan		Gilan Rural Heritage Museum
	6	Kochalam	Almost 1300	Lahijan		Gilan Rural Heritage Museum
	7	Safari	1305	Astaneh		Astaneh
	8	Ahmadi	1340	Astaneh		Astaneh
	9	Foushazdeh	Almost 1340	Astaneh		Astaneh
	10	Ghorbandoost	1349	Astaneh		Astaneh
	11	Sheshkal	Almost 1350	Astaneh		Astaneh
	12	Roudbaneh	Almost 1350	Lahijan		Lahijan

Continuue of Table 2: List of the case studies of vernacular rural houses of Gilan plain

Geo-graphic area	Row	House title	Year of construction (SH)	Location of construction	Image of house	Current location
Gilan central plain	13	Mohammadi	1260	Someh sara		Gilan Rural Heritage Museum
	14	Moradi	1324	Sangar		Gilan Rural Heritage Museum
	15	Amini	1326	Sangar		Gilan Rural Heritage Museum
	16	Mangoodeh	1349	Rasht		Rasht
	17	Mohtashamtab	1190	Fuman		Gilan Rural Heritage Museum
	18	Moosavi	1280	Shaft		Gilan Rural Heritage Museum
Gilan western plain	19	Moosazadeh	1290	Talesh		Gilan Rural Heritage Museum
	20	Haghighati	1327	Talesh		Gilan Rural Heritage Museum
	21	Hassani	1340	Fuman		Gilan Rural Heritage Museum
	22	Asefi	1345	Talesh		Gilan Rural Heritage Museum
	23	Mahmoudi	1350	Talesh		Gilan Rural Heritage Museum

instances where the houses had been preserved or protected from deterioration by cultural centers (Table 2).

In the next phase, the weights of influential components in vernacular rural housing in Iran were extracted from the literature and compared with the influential components in vernacular rural housing in Gilan, which were ranked based on experts' opinions. The results indicated differences between the influential components in vernacular rural housing in Gilan

and those in the entire country, as extracted from the literature.

RESULTS AND DISCUSSION

One hundred experts in architecture with research experience in Gilan Plain architecture completed the questionnaire. Of these participants, 53% were women, and 47% were men. Thirty percent had a bachelor's degree, 59% had a master's degree, and 11% had a Ph.D. degree. Sixty-four percent of the

participants were in the 20-30 age group, 27% were in the 30-40 age group, and 9% were over 40 years of age.

The Friedman test was conducted using SPSS 26 to rank the influential components in vernacular rural housing in the Gilan plain. The significance level (Asymp. Sig.) was less

than 0.05, indicating that the assumption of the equality of factors was rejected, and there was a meaningful difference in the influential components in vernacular rural housing in the Gilan plain. The test results and the components' ranking are presented in (Table 3).

Table 3: Ranking of influential items in vernacular architecture in the Gilan Plain according to experts

Row	Item	Mean Rank	Component	Macro aspect
1	Vernacular materials	25.67	Using vernacular resources	Physical body
2	Warehouses of agricultural products	25.65	Correlation of life and livelihood	Economic
3	Vegetable and summer garden	25.08	Correlation of life and livelihood	Economic
4	Use of favorable north and the northeast wind	23.92	Climate adaptation	Environmental
5	Protection of the living space against the penetration of rainwater	23.76	Climate adaptation	Environmental
6	Livestock and poultry breeding spaces	23.61	Correlation of life and livelihood	Economic
7	Using local manufacturing methods	22.67	Using vernacular resources	Physical body
8	Employment of local labor for house construction	22.46	Easy and low-cost building and maintenance	Economic
9	Toilet separation from the living space	22.39	Health and hygiene	Environmental
10	Use of materials with a suitable thermal capacity	21.24	Climate adaptation	Environmental
11	Non-pollution of air for heating, cooling, and cooking	20.90	Preservation of natural resources	Environmental
12	Cooling through natural ventilation	20.82	Thermal and visual comfort	Environmental
13	Harmony with the natural appearance of the village	20.67	Harmony with the rural landscape	Physical body
14	Use of natural light	20.39	Thermal and visual comfort	Environmental
15	Orientation based on the angle of the sun	19.92	Climate adaptation	Environmental
16	Residents' sense of belonging to the house	19.68	Focusing on the residents' needs of the day	Socio-cultural
17	Reduce construction costs	18.89	Easy and low-cost building and maintenance	Economic
18	Use of healthy ventilation	18.80	Health and hygiene	Environmental
19	Formation of the house based on daily activities	18.79	Focusing on the residents' needs of the day	Socio-cultural
20	Natural methods of reducing relative humidity	18.47	Thermal and visual comfort	Environmental
21	Construction of houses by residents to adapt to the daily needs	18.26	Focusing on the residents' needs of the day	Socio-cultural
22	Coordination of house and yard with topography	17.65	Harmony with the rural landscape	Physical body
23	Separation of livestock and poultry space from living space	16.25	Health and hygiene	Environmental
24	Optimum use of natural materials	15.93	Preservation of natural resources	Environmental
25	Creating a space for relaxation	15.04	Health and hygiene	Environmental
26	The use of dominant decorations arising from the culture of the environment	14.97	Harmony with the rural landscape	Physical body
27	The adjacency of related spaces	14.77	Adapting spaces to functions	Physical body
28	The effect of traditional heating on house architecture	14.60	Thermal and visual comfort	Environmental
29	The proportion of dimensions with the function of spaces	13.34	Adapting spaces to functions	Physical body
30	Resistance of materials against climatic conditions	13.05	Climate adaptation	Environmental
31	The effect of privacy on the architecture of the house	9.66	Preserving cultural values and traditions	Socio-cultural
32	The influence of religious beliefs on house architecture	8.88	Preserving cultural values and traditions	Socio-cultural
33	Water resources management at home	8.77	Preservation of natural resources	Environmental
34	Providing a sufficient number of rooms based on the size of the household	8.49	Adapting spaces to functions	Physical body
35	Wastewater management at home	6.64	Preservation of natural resources	Environmental

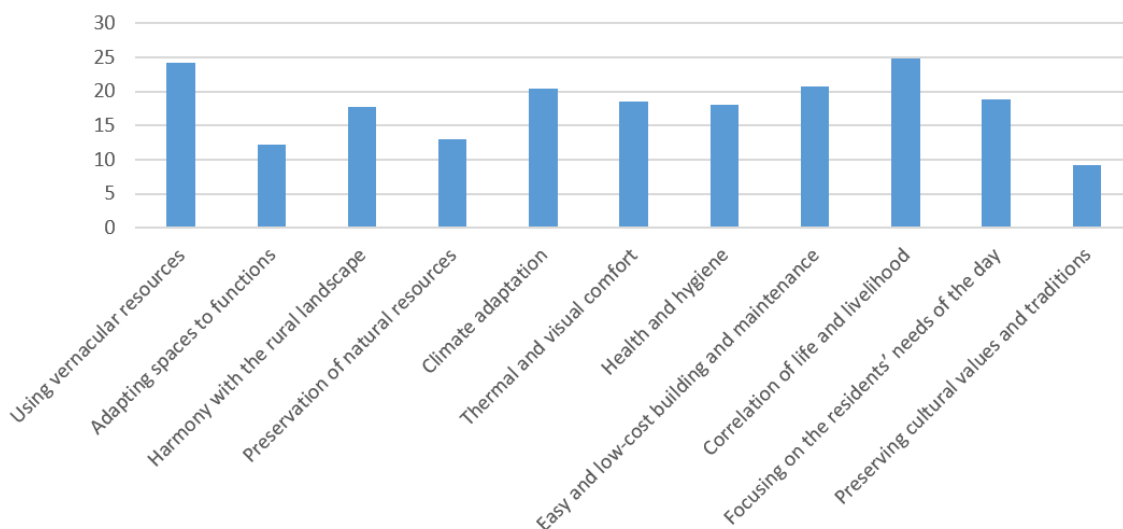


Fig. 3: The diagram of the influence of the effective components on the architecture of native rural housing in Gilan plain according to the Friedman test

As shown in the table, each component has several items. The average score of the items in the corresponding component was determined to calculate the components' score. (Fig. 3) depicts the diagram of the scores of the influential components in vernacular architecture in the Gilan Plain.

According to the results, the most influential components were as follows:

- 1- Correlation of life and livelihood;
- 2- Using vernacular resources;
- 3- Easy and low-cost building and maintenance;
- 4- Climate adaptation;
- 5- Focusing on the residents' needs of the day;
- 6- Thermal and visual comfort;
- 7- Health and hygiene;
- 8- Harmony with the rural landscape;
- 9- Preservation of natural resources;
- 10- Adapting spaces to functions;
- 11- Preserving cultural values and traditions.

CONCLUSION

The comparison showed a difference in influential components in the rural vernacular architecture in the whole country (extracted from the literature) (Table 4) and the influence of these components in rural housing in the Gilan Plain (Table 5).

Based on the results of the comparison, the commonalities and differences of these components were analyzed:

Correlation of life and livelihood: This component was the most influential in the rural vernacular architecture in the Gilan Plain. However, although it was influential in the vernacular rural housing of the whole country, it ranked lower. Therefore, it

can be concluded that the livelihood of households in the Gilan Plain, which is based on cultivating rice, has a greater impact on the region's vernacular architecture than other regions in Iran. In other words, livelihood and residential architecture are intertwined in villages in the Gilan Plain. This component is physically manifest in the Gilan Plain's rural houses through crop storage areas, livestock and poultry farms, and cotton and vegetable farms (Fig. 4).

Another space for livelihood is the "Zemestan Neshin," which is a winter living room with wooden beams used for hanging rice clusters to dry. (Fig. 5).

Also, in the western and central areas of Gilan plain, it has been common to install a Livestock space next to the western side of the house, which indicates the close connection between livelihood space and living space (Fig. 6).

Using vernacular resources: This was one of the most influential components in vernacular rural housing in Gilan, while it had a medium influence on the vernacular rural housing in the whole country. It includes using vernacular materials and methods of construction.

In the Gilan Plain, the frequency of using timber as a main building material was different from other parts of Iran. Carpenters would obtain timber from local woods to construct houses. The straw used to make cob walls and the rice stems used for roof coverings were often obtained from the owner's paddy field products. As a result, the materials used for building houses in the village or neighboring villages were mostly obtained from nearby resources. In contrast, in other parts of Iran where vernacular architecture is prevalent, procuring materials such as bricks, mountain rocks, and adobe would

Table 4: Ranking of influential items in vernacular architecture of Iran according to the literature (Shannon entropy)

Row	Component	W_j
1	Climate adaptation	0.055
2	Easy and low-cost building and maintenance	0.054
3	Correlation of life and livelihood	0.052
4	Focusing on the residents' needs of the day	0.051
5	Thermal and visual comfort	0.051
6	Using vernacular resources	0.050
7	Preservation of natural resources	0.049
8	Harmony with the rural landscape	0.048
9	Preserving cultural values and traditions	0.047
10	Health and hygiene	0.046
11	Adapting spaces to functions	0.046

Table 5: Ranking of influential items in vernacular architecture in the Gilan Plain according to experts (the Friedman test)

Row	Component	Mean Rank
1	Correlation of life and livelihood	24.78
2	Using vernacular resources	24.17
3	Easy and low-cost building and maintenance	20.67
4	Climate adaptation	20.38
5	Focusing on the residents' needs of the day	18.91
6	Thermal and visual comfort	18.57
7	Health and hygiene	18.12
8	Harmony with the rural landscape	17.76
9	Preservation of natural resources	13.06
10	Adapting spaces to functions	12.20
11	Preserving cultural values and traditions	9.27

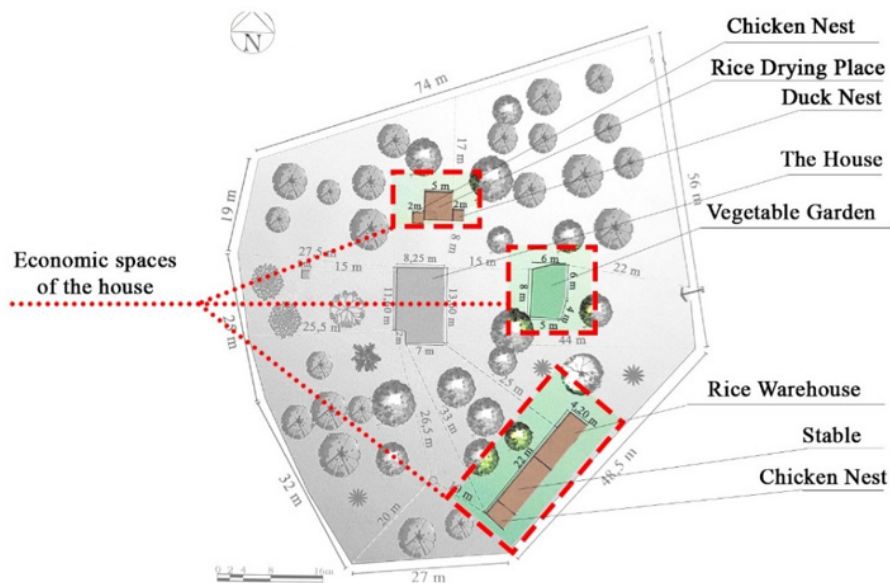


Fig. 4: Spaces for livelihood in the landscape of rural houses in the Gilan Plain

require traveling long distances dominant building method of rural houses in the whole country was based on environmental, economic, and cultural conditions and in a large scale, which was not so different in the Gilan Plain.

Overall, the strong influence of "using vernacular resources" in vernacular housing in the Gilan Plain can be attributed

to the extensive use of vernacular materials and, in some cases, agricultural products (such as using rice stems for roof coverings) (Fig. 7).

component was highly influential in vernacular architecture in the Gilan Plain and other urban areas of Iran. This can be attributed to the financial limitations of rural people and their



Fig. 5: Winter living room in rural houses in the Gilan Plain used for drying rice. (Remade model of PorMehr House at Gilan Rural Heritage Museum)



Fig. 6: Livestock farm at ground level at the west side of the rural house located in the Gilan Plain (remade model of Mousavi House at Gilan Rural Heritage Museum)



Fig. 7: Using timber and soil in building houses and rice stems for the roof covering in the Gilan Plain rural houses (remade model of Mousavi House at Gilan Rural Heritage Museum)

tendency to build low-cost houses. Most rural houses are built based on function and with minimal costs, thus resulting in no significant difference in the ranking of this component between the Gilan Plain and other rural regions of Iran.

Climate adaptation: According to the literature, this component ranked first in influencing vernacular architecture, but it ranked fourth in influencing the vernacular architecture of the Gilan Plain, lower than in other rural parts. This is due to the climate of the Gilan Plain, which is moderate and humid, without extreme heat or cold. Creating airflow or using semi-open spaces leads to comfort during most of the year, so houses in this region are not required to withstand extreme climate conditions, as is the case in northwestern, central, or southern regions of Iran. Additionally, observations and expert opinions indicate that the materials used in the villages in the Gilan Plain are relatively vulnerable to climate conditions (humidity and heavy rain). Nevertheless, they are adapted to the climate through other factors, such as the optimal use of air currents and sunlight.

Focusing on the residents' needs of the day: This is a substantially influential component in the vernacular architecture of the Gilan Plain and the whole country, which makes it a common component in both geographical areas. Rural houses are built mainly to meet their residents' material and spiritual needs.

Thermal and visual comfort: This component moderately influenced vernacular architecture in the Gilan Plain and other rural regions of Iran. In rural houses in the Gilan Plain, wide and deep verandas promote airflow in the living areas, and the houses have good ventilation and light due to the frequent use of semi-open spaces. Furthermore, thermal comfort is achieved through various architectural solutions in vernacular houses in other parts of Iran, which are exposed to extreme heat or cold temperatures.

Health and hygiene: This component had a low influence on vernacular rural houses in Iran but a medium influence on vernacular rural houses in the Gilan Plain, where it ranked

higher. This is due to the vast areas, remote location from healthcare centers, extroverted design, and the use of natural ventilation and sunlight in the rural houses in the Gilan Plain.

Harmony with the rural landscape: This component greatly influenced the vernacular houses in the Gilan Plain and other parts of Iran. The influence is related to the particular type of architecture in each region. Harmony with the rural landscape can be achieved through various means, such as using vernacular materials, the overall design of the building, and architectural details.

Preservation of natural resources: This component ranked seventh in terms of its influence on vernacular rural housing throughout the country. However, its influence was low in the Gilan Plain, ranking ninth. This is mainly due to the region's abundance of rain and timber resources, allowing residents to easily preserve and manage natural resources like wood and water.

Adapting spaces to functions: This component had a low influence on vernacular architecture in the Gilan Plain and other rural parts of Iran. The main reason for this can be traced to structural limitations, as well as the rural lifestyle, which does not prioritize having separate rooms for each member of the family or the proximity of related spaces.

Preserving cultural values and traditions: This component had a lower influence on rural housing in the Gilan Plain than in other rural parts of Iran. Religious beliefs, especially privacy, play a central role in vernacular rural housing. This can be attributed to the vast farms and plentiful vegetation in the surrounding environment of houses in the Gilan Plain. Cultural values and traditions, particularly the emphasis on privacy, are reflected in these rural houses, albeit in different ways. For instance, walls and barriers were necessary to maintain privacy in rural houses in other parts of Iran. Still, in the north of Iran, where women have a greater presence in agricultural fields and are not seen as going against popular culture, separate spaces for women were not required.

Finally, it can be concluded that livelihood played a prominent

Table 6: Commonalities and differences of influential components in rural vernacular architecture in the literature and the Gilan Plain

Commonalities of components' rankings (Iran and the Gilan Plain)	(Differences in components' rankings (Iran and the Gilan Plain)	
	Components that ranked higher in the vernacular architecture in the Gilan Plain	Components that ranked higher in the vernacular architecture in Iran
<ul style="list-style-type: none"> - Easy and low-cost building and maintenance - Focusing on the residents' needs of the day - Thermal and visual comfort - Harmony with the rural landscape - Adapting spaces to functions 	<ul style="list-style-type: none"> - Correlation of life and livelihood - Using vernacular resources - Health and hygiene 	<ul style="list-style-type: none"> - Climate adaptation - Preservation of natural resources - Preserving cultural values and traditions

role in shaping the physical structure of rural houses in the Gilan Plain compared to those in other rural parts of Iran. Additionally, the favorable climate in the Gilan province, with abundant rainfall and vegetation, and the lack of a need for extreme heating and cooling has resulted in limited attention being paid to climate adaptation strategies and the management of natural resources in this region compared to other regions of Iran. Furthermore, the vast fields and vegetation in the area serve cultural functions such as preserving privacy (Table 6).

AUTHOR CONTRIBUTIONS

H. Fathi Saqalaksari performed the literature review, collected and analyzed the data, and prepared the conclusion section. NSS. Monfared revised the literature review, analyzed the data, and prepared a conclusion. SA. Yazdanfar revised the literature review, analyzed the data, and prepared the conclusion section.

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CONFLICT OF INTEREST

The authors declare no potential conflict of interest regarding the publication of this work. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication or falsification, double publication and, or submission, and redundancy, have been completely witnessed by the authors.

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