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A study of the importance of vernacular architecture in the formation of contemporary construction (Case study: Rural residential types of Guilan)

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Abstract
Guilan is a province situated in northern part of Iran with moderate and humid climate. Diversity of livelihood and vicinity to forests, mountain and sea, resulted in the formation of varied rural residential types which are built with the usage of local materials and indigenous techniques.

Although mentioned dwellings have achieved sustainability and harmony with their surroundings gradually over a long period of time, however, in recent decades, impression of contemporary urban architecture lead to fading their valuable role in their dwellers' view due to the lack of dwellers' knowledge about vernacular architecture and their trend to modern architecture. As it is observed, a fraction in the development and promotion process of vernacular architecture has made them weak in response to their inhabitants' demands compared to their modern counterparts.

For identification of the importance of vernacular architecture in future buildings, a thorough assessment of their merits and demerits can play an effective role in recognition and formation of an adequate contemporary architecture with the usage of rural heritage. An accurate research on available indigenous types, relying on filed study and related texts, can be a clue for upgrading, simplification and sustainability of future modern construction.

Keywords
Vernacular architecture, Contemporary architecture, Sustainability, Indigenous techniques, Development

1. Introduction

Iran is one of the Middle East countries which borders with Azerbaijan, Armenia, Turkmenistan and Caspian Sea in the north, Pakistan, Afghanistan in the east, Turkey and Iraq in the west, Persian Gulf and Oman sea in the south. Iran is situated in the dry area of the world; however as an in-depth climatic division, diverse weather situations in this country are observable.

Guilan is one of the northern provinces of Iran that has moderate and wet climate which can be divided into three micro-climates: plain, hillside and mountain. This region is one of the rainiest and most verdant provinces of Iran which is located between Alborz mountain range and coastal area of Caspian Sea.

Heavy rainfalls, high humidity, low temperature fluctuation and vast green coverage resulted in creation of different indigenous types which are varied from plain to mountain. (Figure 1)

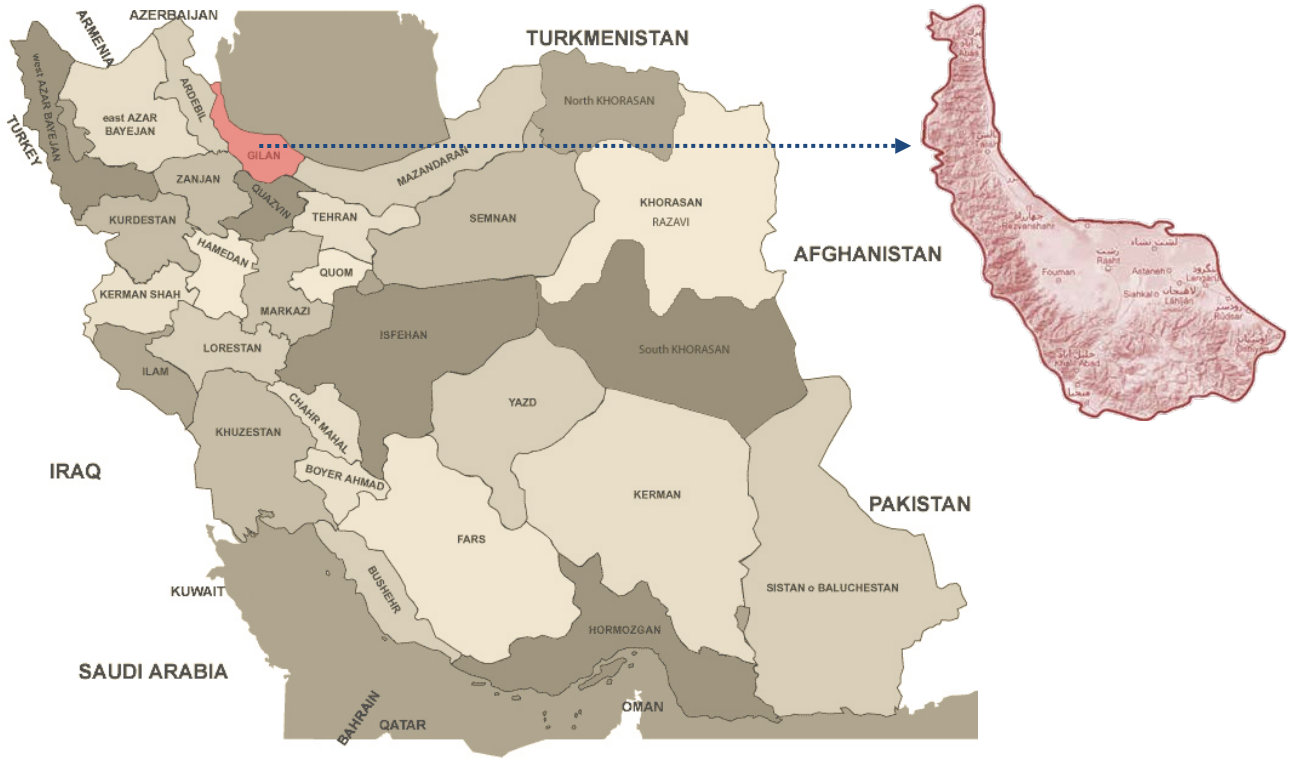


Figure 1: Location of the study area

Location of Guilan province in a region between sea and mountain resulted in different micro-climates and geographic characteristics. This diversification leads to gradual formation of varied rural and indigenous settlements in every part of this province in sustainability with their surroundings.

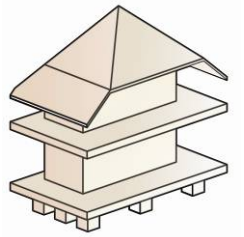
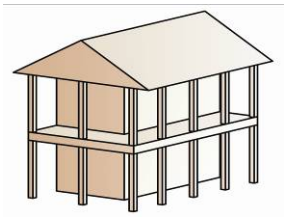
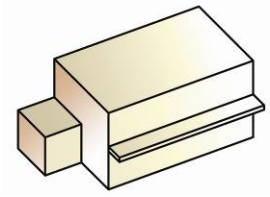
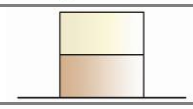
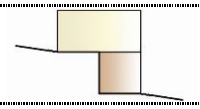
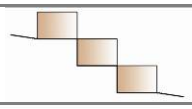
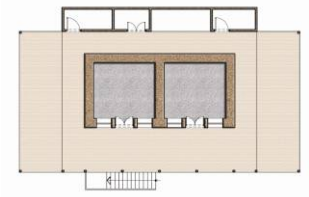
2. Typology

Northern part of Iran is an exceptional area of the country due to its climatic variations with other regions. Variation of micro-climatic zones of Guilan beside livelihood resulted in diverse rural and traditional buildings with the use of natural materials that are available in the environment, like soil, stone, wood and plants. Despite the limited number of construction materials, their implementation techniques are totally varied (e.g. there are different types of walls that are constructed by wood and straw- earth mixture).
As a general and integrated classification, this region can be divided into three main categories which are plain, hillside and mountain.

By the reason of achieving more appropriate implementation techniques among the existing types, three of the most popular and adequate ones, by comparing them with each other, were selected from each of the three mentioned categories. Selection of these three types was in a way which attempted to be integrated and cover every common implementation technique and local material.

Introduced rural dwellings are the most common ones in each region and in the first look clear differences in their appearances are standing out. These differences are because of the diversity of environment features that exist in the area. Although the availability of rural materials is mostly the same in the whole province, environment characteristics have great effects on their different usages.

Table 1: Typology of Guilan's rural settlements

Category		Plain	Hillside	Mountain
Appearance of type				
Pattern		Open textile, houses scattered on the ground far from each other	Semi-open textile situated with rational distance	Massive textile
Architectural characteristics	Form			
	Position on the ground			
	Spatial Organization			
	Number of stories	One or two stories	Mostly two stories- Ground storey is usually allocated to services	Mostly two stories
	Orientation	Usually facing southward	Facing southward	Mostly facing southward
	Openings	Limited windows in winter part facing southward	Big openings in southern side and small ones in others to avoid inappropriate wind	Big openings in southern side and occasionally small ones in others to avoid inappropriate wind
Construction materials		Wood, Thatch, Straw-earth mixture	Wood, Galvanized iron sheet, Straw-earth mixture, Stone	Wood, Stone, Straw-earth mixture, Adobe
Construction techniques	Foundation	"Shakili" foundation made of wood	Wooden structure called "Pakooneh" filled with stone or straw-earth mixture	Stone and/or adobe platform with or without mortar
	Wall	"Orojeni"- made of log and straw-earth mixture or "Zigali"- board filled with straw-earth mixture	"Zigali" for all stories and in some cases "Orojeni" just for the ground storey	Coursed or random rubble wall with wooden reinforce and "Zigali" for upper stories
	Roof	Four-sided thatched roof- slope 200% with wooden structure	Two or four-sided pitched covered by Galvanized Iron Sheet	Flat roof with wooden structure covered with straw-earth mixture

3. SWOT analysis of types

In order to have a thorough assessment of the studied types of Guilan, SWOT analysis is selected to discover the strengths and weaknesses of types (as internal parameters) and the observed opportunities and threats (as external parameters) in each category. In this way identification and analysis of the mentioned types becomes much accurate which leads to prepare an appropriate base for further and deep studies on upgrading and implementing indigenous techniques in contemporary constructions.

3.1 SWOT analysis of the plain type

Placement of the plain area of Guilan in the vicinity of the Caspian Sea and low altitude beside high level of annual rainfall and humidity has led to the formation of a special type which is resistant to heavy rainfalls and high humidity as well as a complete harmony to the natural environment and climatic characteristics of the region. In the plain, fertile earth resulted in nurturing a variety of plants. Rural construction adequately exploits this plant diversity by the means of using each kind of wood proportionate to its rigidity or softness and its tolerance against loads and decay in the specific part of the house. In the plain type, wood and fibre are used in all parts of the structure from foundation to roof.

Table 2: SWOT analysis of the plain type

Plain Type	
Strengths	1. Indigenous materials, 2.Simple implementation techniques, 3.Construction rate, 4.Linear organization, 5.Orientation, 6.Open textile, 7.Modular design, 8.Being situated above the ground (around 1.5m for avoiding humidity and probable floods), 9.Suitability to residents' needs (both livelihood and living), 10.Spatial organization (division of the house to winter and summer parts), 11.Adequate climatic characteristics, 12.Pin joints of the structural elements.
Weaknesses	1. Limited durability of construction materials (mostly roof and plastering), 2.Inability to meet dwellers' contemporary needs, 3.Unindustrialisation of construction techniques, 4.Sewage drainage system, 5.Low level of hygiene, 6.Low accessibility to latrine, 7.Limited number of openings due to structural restrictions, 8.High level of dead load, 9.High consumption of construction materials (Log, mud and Straw)
Opportunities	1. Simple accessibility to construction materials, 2.Simple expertise and equipments, 3.Low cost of maintenance, 4.Recyclable construction materials, 5.Accessibility to local workforce, 6.Availability of welfare services, 7.Adaptation to contemporary services, 8.Low-interest loans for retrofitting existed buildings, 9.Availability of suitable and flat grounds for construction.
Threats	1. Socio-cultural conversion and its impacts on spatial needs of residents, 2. Limited accessibility to local experts, 3.High cost of some indigenous materials, 4. Vermin attack, 5.Negative effects on the natural environment due to irregular use of local materials, 6.Lack of appropriate guidelines for rural construction, 7.Negative attitude towards rural construction among related officials, 8.The impact of the family income on the quality of construction, 9.Lack of suitable timber in the area, 10.High impact of urban construction on rural types due to short distances between rural and urban areas, 11.Simple accessibility to modern construction materials as a result of closeness to adjacent cities, 12. Low-interest loans which lead to the replacement of rural types with their modern counterparts.

SWOT analysis of the plain type has shown numerous positive and negative characteristics. Although this type has developed gradually over time, as the house has met its residents' needs in every generation, however in recent years a gap in this gradual development resulted in making weaknesses in this type and the rejection of it by the inhabitants. Simple clever changes can fill this gap and make it much more appropriate for fulfilling the residents' demands. (Figure 2) As a general view, the assessment of the positive and negative characteristics clearly indicates the weight and value of strengths compared to the weaknesses, as the weaknesses can be omitted simply and by little changes.

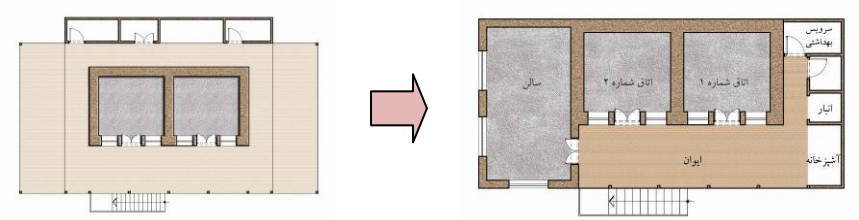


Figure 2: Modifications of the spatial organization due to the changing residents' demands

As the table shows there are strong threats which make challenges for the existence of the plain type. Despite opportunities which are mentioned for this type, it is going to be extinct as a result of short distances between rural and urban areas in the plain and also proposed low-interest loans. It is necessary to explain that the government proposes low-interest loans for replacing indigenous structural systems (wood structure) with modern and urban ones (reinforced concrete or iron structure) which accelerated the process of extinction. Although giving financial helps for retrofitting is very important and effective in developing rural construction, the general belief behind this program seems not to be clever and organized enough. It is needed to make basic changes in this general belief among officials and even the residents of the area.

3.2 SWOT analysis of the hillside type

Hillside area of Guilan is located between the plain area in the north and mountain in the south. The villages of this area are laid on a slight slope. In this region micro-climate is very similar to Guilan's general climate which has mild summers and winters. The hillside is mostly covered with forests and paddies. The available houses of this region exploit the wood of indigenous trees which has affected the material usage and building techniques. In this region wooden sheets are more used than logs or fibers which resulted in increasing the construction rate. These types were built in a particular way in order to resist against probable landslides.

Table 3: SWOT analysis of the hillside type

Hillside Type	
Strengths	1. Indigenous materials, 2.Simple implementation techniques, 3.Construction rate, 4.Developed spatial organization, 5.Orientation, 6.Being situated above the ground (around 0.3m filled with random rubble for avoiding humidity), 7.Suitability to residents' needs (both livelihood and living), 8.Spatial organization (separation of the living and livelihood parts in different stories), 9.Adequate thermal capacity of walls, 10.Pin joints of the structural elements, 11.Low level of dead load, 12.Proper consumption of construction materials, 13.Adequate area of openings for absorbing solar heat and air circulation, 14.Semi-open textile (thermal conservation)
Weaknesses	1. Low thermal capacity of roof, 2.Inability of roofs to resist against wind, 3.Lack of harmony between contemporary and indigenous materials, 4.Sewage drainage system, 5.Low level of hygiene, 6.Semi-open textile (repelling moisture)
Opportunities	1. Simple accessibility to construction materials, 2. Simple expertise and equipments, 3.Low cost of maintenance, 4.Recyclable construction materials, 5. Accessibility to local workforce, 6. Availability of welfare services, 7.Adaptation to contemporary services, 8.Low-interest loans for retrofitting existed buildings, 9. Accessibility to local experts
Threats	1. High cost of some indigenous materials, 2.Vermin attack, 3.Lack of appropriate guidelines for rural construction, 4.Negative attitude towards rural construction among related officials, 5.Limited availability of suitable flat grounds for construction and inappropriate modifications in land use (From orchards and paddies to residential areas) 6.The impact of urban construction on rural types due to short distances between rural and urban areas, 7.Low-interest loans lead to the replacement of rural types with their modern counterparts.

SWOT analysis of the hillside type indicates its significant advantages which guaranteed the preservation and survival of this type. It can be firmly claimed that this type is still desirable and popular among local dwellers due to its developed spatial organization which can meet the residents' contemporary needs. In this area distances between villages and cities have led to less impacts of urban architecture on rural housing, however some instances of urban construction methods can be observed in the houses (e.g. utilization of galvanized iron sheets as roof covering). (Figure 3)

Figure 3: Small modifications of the hillside type

As a result of available potentials of the hillside type as well as less risk of inadequate modifications and replacement with urban houses, an appropriate foundation for its preservation and development has formed gradually which needs to be considered and implemented wisely by local and national authorities. It must be considered that every modification in this type should be proportionate to indigenous construction both formally and practically.

3.3 SWOT analysis of the mountain type

Mountainous area of Guilan has the highest altitude in the region and is located in southern border of the province. Micro-climate of this area is different from other parts of Guilan due to the closeness to Alborz mountain range. Heavy snowfalls lead to cold winters and lower level of humidity. The area is consisted of vast pastures. Building materials and form of housing are to some extent different from other villages of Guilan, as flat roofs and stone walls can be observed. Limited access to wood and herbaceous materials in the mountain led to vast usage of stone and adobe in building construction through variable ways.

Table 4: SWOT analysis of the mountain type

Hillside Type	
Strengths	1. Indigenous materials, 2.Simple implementation techniques, 3.Developed spatial organization, 4.Orientation, 5.Suitability to residents' needs (both livelihood and living), 6.Spatial organization (separation of the living and livelihood parts in different stories), 7.Adequate thermal capacity of stone walls, 8.Pin joints of the structural elements in the upper storey (wood structure), 9.Adequate area of openings for absorbing solar heat in southern side, 10.Dense textile (thermal conservation), 11.Utilization of horizontal wood elements for retrofitting stone walls, 12.Flat roof (with high thermal capacity and appropriate for heavy snowfall).
Weaknesses	1. Utilization of load-bearing walls, 2.Sewage drainage system, 3.Low level of hygiene, 4.Construction rate, 5.High level of dead load, 6.Construction of stone walls without mortar which resulted in low level of resistance to lateral forces, 7.Weak joints of structural elements, 8.Limited area of the rooms due to the restrictions of the structural system (stone walls for the ground storey and wood frame for the upper storey), 9.Inadequate combination of different structural systems, 10.Various thermal capacity of different structural systems.
Opportunities	1. Simple accessibility to construction materials, 2. Simple expertise and equipments, 3.Low cost of maintenance, 4.Recyclable construction materials, 5. Accessibility to local workforce, 6.Low interest loans for retrofitting existed buildings, 7. Accessibility to local experts, 8.Low impact of urban construction on rural types due to long distances between rural and urban areas.

Threats	1. High cost of some indigenous materials (mostly wood), 2.Lack of appropriate guidelines for rural construction, 3.Lack of suitable available flat grounds for construction, 4.Difficulty in adaptation to contemporary services in existed buildings, 5.Inappropriate replacement of flat roofs with sloped roofs (climatic negative effects), 6.Difficulty in utilization of modern equipments for construction, 7.Negative attitude towards rural construction among related officials, 8.Extinction of some special species of trees due to their limitation and high consumption in construction.

Despite using indigenous materials which are adequate for the micro-climate of the area, the structural system and high level of dead load lead to the limited area of rooms and vulnerability of the house against lateral forces (especially earthquake). Development and modification of this type is difficult due to its numerous weaknesses and needs to be thoroughly studied and considered by responsible authorities and experts.

By the reason of low level of construction rate in stone load-bearing walls, wood structures imported to the area from neighboring villages (the hillside) which resulted in an inappropriate combination with different structural attitudes. In addition in recent years flat roofs are replacing with sloped ones due to their simplicity and implementation rate that cannot meet climatic needs (is not proper for heavy snowfalls). Unfortunately utilization of various systems and making unsuitable changes are not in a visual and practical harmony with the surrounding natural environment.

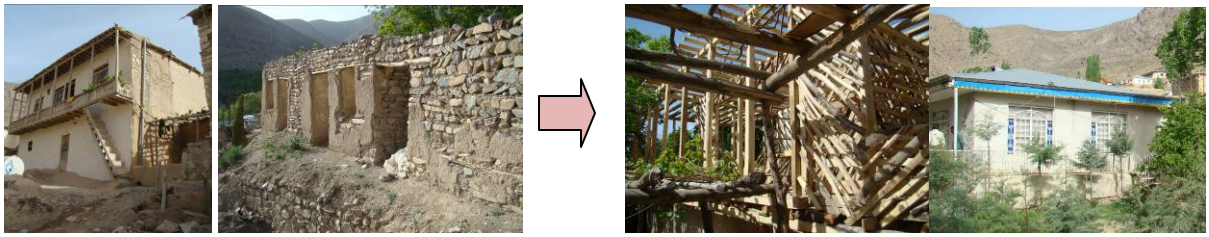


Figure 4: Wood structure and sloped roofs imported to the region

The main opportunity of this type is long distances between villages and cities and consequently difficult accessibility to modern construction materials and methods which lead to the dwellers' attempt in preserving, upgrading and developing local types instead of replacing them with the imported ones.

4. Conclusion

In Iran as a disaster prone country, which always faces many natural disasters and specifically earthquakes, recognition of stable rural types can pave the way for accessibility to sustainable settlements. Proper survey and authentic information of rural residential types, which are gradually developed during centuries and are based on local knowledge, is the main step for conservation of rural dwellings and utilization of their capabilities. Additional research illustrates that these types are adequate for their regions, despite their deficiency in comparison to modern life, and have the ability for conversion to specific types which are appropriate for contemporary constructions. Despite having a rich architectural heritage, the main problem is lack of residents and stake holders' consideration of preserving these valuable types which are going to become extinct.

Thorough and deep identification of rural residential types in each region is based on complete assessment of existed potentials of each type related to its local environment. Utilization of SWOT analysis for proper recognition and classification of strength, weaknesses, opportunities and threats is necessary for discovering and comparing advantages and disadvantages of the studied types (both internal and external parameters) which can be a background for their improvement and development. By

discovering the capabilities, some solutions for utilizing and developing local and traditional techniques, material usages, architecture characteristics etc are found.

Utilization of possibilities of studied types and understanding the value of available opportunities needs to be considered and invested by responsible authorities at local and national levels beside inhabitants of the area. This would not become true unless the general belief of the stakeholders, both authorities and local residents, about the existed types is basically modified to pave the way for further improvements.

Building technologies which are simple, commercially affordable and based on deep studies and local knowledge can be utilized and adapted to the existed situation of the area rapidly and easily, therefore they can be the best and first choice in constructing adequate dwellings for rural residents. Considering the condition and trait of residents' lives and finding effective and affordable methods among local capabilities can be a clue for constructing stable housing which meets inhabitants' needs, exploiting local materials, techniques and resources and encouraging them to participate in construction projects.

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