Research Paper: Comparative Typology of Sustainable Rural Housing; A Climatological Approach (Case Study: Dulab and Ramkan Villages of Qeshm Island in the South of Iran)

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Citation: Tavana, S. H., Mofidi Shemirani, S. M., & Pournaseri, Sh. (2022). Comparative Typology of Sustainable Rural Housing; A Climatological Approach (Case Study: Dulab and Ramkan Villages of Qeshm Island in the South of Iran). *Journal of Sustainable Rural Development, 6*(1), 139-150. **https://dorl.net/dor/20.1001.1.25383876.2022.6.1.11.2**

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Article info:
Received: 20 June 2021
Accepted: 06 Dec. 2021

Keywords:
Typology, Climate, Rural housing, Qeshm Island, Dulab and Ramkan villages

ABSTRACT

Purpose: Rural housing as a safe means of living is also considered a part of the necessary space for economic activity in fields of agriculture and pastoralism. Therefore, the rural environment and community will be formed according to the environmental, social, and economic conditions. The typology of rural housing is done in two spatial-physical and climatic dimensions. The current research seeks to answer the following question to identify the climatic typology of rural housing: What is the form of the rural housing in Dulab and Ramkan villages of Qeshm Island?

Methods: This research is conducted using a descriptive-analytical method, library research, and field surveys along with tools of observation, photography, and construction survey, as well as the inductive reasoning method.

Results: The results show that the climatic typology of rural houses on this Island has convergence in some aspects such as materials, windows proportions, number of floors, porch floor height, roof shape, color, and building volume. But are divergent based on the proportions of rooms, the location of the element of windcatcher or porch, porch shapes, and the proportions of open, semi-open, and closed spaces.

Conclusion: In general, the findings show that the design of the buildings in this region due to the hot and humid climate of the studied villages has its characteristics; however, based on the taste and views of the architect and the employer, divergence also occurs.

1. Introduction

Identifying and preserving the precious heritage of rural architecture are considered a country's historical national assets protection, which helps us flow the sustainable principles. The remainder of the past is on the new structure through discovering hidden mysteries and secrets, marks and symbols, and preserving the architectural authenticity and

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identification of rural settlements (Sartipipour, 2009). The rapid expansion of new ways of life and imitation of urban lifestyle in most villages can rapidly bring about unprincipled changes in the shape and physical body of rural housing, formed through centuries of fixed methods of rural living. Since the culture of villagers considers imitating cities appropriate, low-value patterns of urban housing become prevalent in villages and pose significant problems, especially in its texture (Rahimipour et al., 2020). Rural housing, unlike urban housing, is not just a place for families to live or rest but is formed based on the climate and families' livelihood patterns. Thus, recognizing the current housing condition is the first and critical approach in the design process of rural architecture. The unsustainability of rural residential buildings and the bitter disasters of unexpected events in Iran has made the necessity of technical organization of housing architecture based on cultural and environmental roots the requisite. Rural dwellings typology is, therefore, a matter of course (Arianfar, 2016).

The existence of representative samples of rural vernacular housing and the need for knowledge about characteristics and preservation of sustainability values in new housing intensifies the great importance of architectural housing studies, especially the typology. Nowadays, an increasingly critical fact is that rural communities are becoming more complex. Therefore, in this space-based framework, human groups and people transform the environment and create spaces through activities that can either develop or deteriorate. Understanding these concepts and applying them in every spatial decision-making provides an ideal platform to reach the ultimate goals of human dignity (Saidi, 2010). On the other hand, according to the history of Iran's architecture, construction in the first Pahlavi era was based on centuries of experience and was also compatible with the climate. But, afterward, the buildings were constructed relying on the discovery of oil and petroleum products and the import of mechanical cooling devices without considering crises such as air pollution and high fuel consumption. Thus, the importance of energy conservation emphasizes the necessity of construction on the climatic criteria of each region. The rural vernacular architecture of southern Iran has gradually evolved; moreover, it contains theoretical components associated with its structure, which is secure and maintains its originality against foreign invasion. The villages of this region have a specific architecture based on the region's climate that Qeshm Island villages take on particular importance. Hence, new patterns can be achieved through detailed scientific research and adequate knowledge of all current needs of rural life, in addition to a sufficient understanding of traditional patterns of rural housing (Memarian, 2005).

The unique architecture of the residential complexes of Persian Golf can be seen on Qeshm Island, especially in its villages. This type of architecture is the same as other vernacular ones formed based on an economic response to extreme weather conditions (muggy weather), executive functioning skills, and material availability. On the one hand, most villages of Qeshm Island, due to the communication limitation, have not faced the controversial aspects of modern life; thus, it has remained safe and protected from radical changes. So, the vernacular architecture can still be seen in the region. Moreover, the rural architecture of Qeshm Island is a precious heritage that deserves to be preserved from damage. This complex is the cultural and national identity of islanders that needs more recognition. Rural housing and typology, in terms of experience and application, have more than two centuries of scientific literature history (Memarian & Dehghani Tafti, 2017: 22).

2. Literature Review

In this part, it is first necessary to explain concepts such as typology, rural housing, and climatology of the studied area:

Type and typology

Typology, individual theory, and a comprehensive school in architecture can be used simultaneously in education, research, and design fields (Cataldi, 2003: 20). In Muratori's perspective, the cultural heritage of the past architecture had typological values of a collective culture where individualism and personal taste had no place. Value can, in this context, be defined as a rich heritage of past experiences at different scales that can be observed in types. One of the essential foundations of the Muratori school is typology (Caniggia, 1982: 43).

In the past, architects used to transfer the typological values in the concept of type and created a link between past and present based on recognizing such types. This link turns into an interconnected chain that is evolved throughout history. Since the current construction is also a link in that chain, recognizing other chains is necessary (Cataldi, 1977:13). Muratori conceived a typology process as learning to read architecture from the beginning of its history until now. Accordingly, the starting point is a "Tipo base"; whatever happens in the present finds its roots in that. After recognizing the base type, its growth pattern will be investigated. This growth is

subject to rules, and different factors affect it. Moore's law was incorporated into the physical development of the base type. Arguably, economic factors and the occupation types of house residents profoundly affected the expansion of spaces. The main framework of Muratori is the reconstruction of the typological process. This process is represented by a horizontal line indicating time. From Muratori's perspective, the investigation of "type" includes the current status that can be derived from an older situation. At this stage, that is, after determining the location of the city or town (type) formation, different field studies will be conducted (Memarian & Tabarsa, 2013: 105).

Various life cycles of a "building type" is drawn on a timeline table from the base to the evolutionary type. The horizontal line represents time expansion, and the vertical line represents the vertical expansion of the building. Canigga, in his book, compares the typology process of dwellings in the cities of Genoa, Florence, and Rome (Caniggia, 1979: 44). The root or genealogy of the three places had a similar base type. In all these three places, a small room conceived as a single-room house was the root or base type. From Muratori's perspective, a type can be defined based on its physical features. Type represents a collection of objects. A type of building consists of four elements of materials, structure, space, and form (on a two-dimensional perspective, it covers most of the building façade). In determining the primary type or the historical root of a building type, an object called 'building' that is consisted of the four mentioned elements will be found. Throughout history, in the growth and evolution of the primary type, these four elements have developed and become the common aspects of the mentioned type in every era. Throughout history, this building type has had a physical journey, and similar to a living creature, it strives to survive on earth (Memarian, 1994: 49).

References to typology in ancient writings from about two thousand years ago can be seen in the works of architects and other scientists. Vitruvius in his famous work entitled "Ten Architectural Books" (from about 2000 years ago), grouped different types of Greek buildings into houses, temples, and public buildings. Moreover, each building type is divided into sub-groups (Taheri Sarmad et al., 2019: 154). For instance, houses are classified into with and without courtyards groups or are grouped based on their location in the city or village. Courtyard houses are classified into five types, and temples based on the outer columns and the four classical Greek systems are classified into specific types. For centuries, Vitruvius's work was the leading model for Italian architects.

Utilizing typology in understanding architecture continued until the beginning of the 20th century. Both Sidney Addy, in his book entitled "The evolution of the English house," and Muthesius, in the book entitled "The English House," used typology in their work. Modern architects expressed strong opposition to the idea of type and typology. Type and its application could not be used in designing because of posing a significant obstacle to the creativity of architects and architecture students. Giancarlo De Carlo called this the "Stereotype." However, when it comes to the mass production of a trend design in the modern architectural era, typification becomes a matter of the subject and is utilized by its architects.

Yet, two different areas of architecture can be considered for type and typology application in architecture. Southern Europe and countries such as Italy and France have discussed the theoretical aspect of the subject. On the contrary, northern Europe or Anglo-Saxons have considered it a formal concept and applied the numerical analysis method (Memarian, 2014: 48). In the late modern era; some modern architects returned to the historical record of architecture. For instance, Rob Krier and Leon Krier interpreted typology as a method for the unity of cities' architecture form, destroyed by the modern movement. Type is used to explain the continuity of form and structure. According to the Krier brothers, typological reconstruction is derived from the form composition, styles, forms, and types of classical architecture independent of the evolution-based development and concept. Typology is interpreted according to the eras approaches regarding the type. Aldo Rossi defines type as the morphology of a structure. For Rossi, form is the essence of architecture. The ideologies of the Modern Movement are infused in Rossi's interpretation of typology. He has implied an anti-historicist stance in his form types and pursuance of universal spatial types (Ornelas, 1995: 191). While Rossi sees typology as the mediating tool for formal analysis, Aymonio is more interested in its functional component. He sees typology as an instrument, not a category. It is understood at two levels: the first is formal (independent typology), where it is seen as a means of classification for identifying formal differences, and the second is functional (applied typology), in which it is used to understand the endurance of a specific type in the transformation of the city. Aymonio condemns the 'naive results' of those who believed it possible to assemble urban morphologies from typological analyses (Bandidi, 1984: 75).

Rural Housing

Housing in villages is formed based on the rural community's environmental, social, and economic conditions, having similarities and differences with housing in cities. Today, with high expectations of housing, different criteria are proposed for determining adequate housing; however, some of them, including building strength, the availability of additional facilities and services, and the area and the number of rooms, are crucially more important. Based on the rural community's diverse needs and expectations of housing, and the social, economic, and cultural characteristics of the country's villages, the rural community uses various structures for settlement. Kapar, tents, gazebos, and wooden, brick, stone, and block buildings are different settlements for villagers' households in Iran, and their total number has changed over time. Currently, resistant houses with building specifications form a large part of structures (Akrami, 2010: 19).

Housing in villages is an essential issue for meeting the living and economic needs of the rural community. Rural housing, a safe means of living, is also a part of the necessary space for economic activity in agriculture and pastoralism. The agricultural warehouses and spaces for keeping livestock are part of the residential units of villages that bear limited similarity in cities. The need for humans to the adequate housing that provides sufficient space to meet their basic needs and essential activities and provides comfort for the residents is almost the same in all urban and rural communities. Villages have always been deprived of the necessary facilities, services, and good life (Ghafari & Miri, 2017: 118).

It is necessary to understand the changes in rural housing, respecting past development trends and the needs and existing problems to estimate future needs. Rural housing has complexity like any other developmental phenomenon arising from its multidimensionality. Since rural housing can be investigated from the economic, social, physical, and cultural dimensions or be examined taking different historical perspectives (type of settlement and culture, and civilization), geographical perspectives (space types), sociological perspectives (institution types), and architectural and engineering perspective (building and structure types). Thus, a comprehensive and holistic approach is required to understand the place of rural housing in the residential and spatial planning system with a sustainability approach. In other words, dimensions of rural housing include all symbolic, natural, physical, aesthetic, and spatial aspects, etc. Rural housing is not only for living and shelter needs but has also changed by the type of culture, civilization, and structures. Rural housing has had various forms in different stages of history according to the economic, social, and environmental systems. Therefore, rural housing enjoys history, geography, philosophy, religion, aesthetics, architecture, naturalism, and culture. Hence, rural housing's most important functions include residential, livestock, and livelihood (Haji Ibrahim Zargar, 2011: 43).

Residential function manifests in the residents' living, rest, and sleep spaces or other spaces that are related to them indirectly. In rural housing, the livestock function reflects in places, such as pens, stables, corrals, etc., for keeping cattle and domestic animals. The additional housing functions take place in spaces such as the back part of shops, warehouses, woodsheds, etc., and offer the necessary services to other residential and livestock operations. The livelihood function devotes to places related to the household economy (Ali al-Hasabi & Abd Mujiri, 2011: 40). With the increase in the country's urbanization and the urban lifestyle promotion in villages, these functions have gradually changed. So that the livestock function in rural residential units is decreased, and the spatial independence of this function with the residential and livelihood ones has increased to improve hygiene. The characteristics of rural housing are construction materials, architectural patterns, the size and spatial dimensions of residential and non-residential functions, and home ownership that follows the natural, economic, cultural, and indigenous factors, as well as government policies. These factors influence the formation of architectural patterns, the strengths and vulnerability status, and the availability of facilities and equipment. Housing architecture in Iran has a considerable difference based on the condition of the built environment respecting the wall thickness, the size of doors and windows, windows' direction, roofing materials, and roof shapes concerning the weather characteristics (Qarenejad, 2003: 39).

Climatology of hot and humid regions of Iran

According to the Koppen classification, Qeshm Island has been classified into the AF group. Qeshm Island has a hot and humid climate during the hot part of the year. The key factors affecting Qeshm climate are the local factor and the Arabian Desert as an external factor. The latitude directly affects the incidence angle and the duration of sunlight; consequently, since Qeshm Island is located at low latitude, the incidence angle strikes vertically, and it has more daylight. During the hot part of the year, the Iranian sky is cloudless due to the subtropical high pressure over the Azores in Iran. The resultant warmth creates low-pressure centers on the Persian Gulf.

These centers suck the air of Arabia into Iran and cause hot and humid weather on the southern coasts when heated Arabia air flows over the warm sea (Alijani, 2009: 44). Notably, the absolute maximum and minimum temperatures in Qeshm Island are recorded 46° C and 0° C (Saidi, 2001: 12).

The main features of the climate in Qeshm Island are very little annual precipitation in autumn and winter, high humidity in four seasons of the year, hot and humid weather in summer and moderate weather in winter, the temperature difference between day and night, the salinity of groundwater, and little vegetation cover. Providing comfort in the hot seasons by utilizing climatic factors is challenging in this region. In most cases, the air conditioner only achieves thermal comfort; however, it can also be achieved through the shadow, air currents, suitable materials, and the proper building orientation (Lilian, 2010: 25). Table 1 shows the effects of climate on the formation of Qeshm Island architecture.

Among the recent research conducted on this topic, the studies of Raheb (2014); Molanaei & Soleimani (2016); Akbari & Jahed Barandagh (2016); Firuzian & Ahmadizadeh (2016); Yufeng Zhang & Ling Jin (2017); Rahimipour et al. (2020); Beyti et al. (2020); Kharabati & Nikmard (2022); and Heydari et al. (2022) investigated the typology of rural housing in different cities and climate. The results of their study suggest that the housing construction pattern in villages is a general scheme heavily affected by the surrounding environment. Builders have no obligation to maintain geometric rules. And the implementation of this scheme framework is defined by the needs, limitations, and personal tastes. According to previous studies, no comparative research has been conducted regarding the climatic typology of rural housing in Qeshm Island, especially in the Dulab and Ramkan villages. Therefore, the current research in the scope of the studied area is new primary research that seeks to explain the climatic typology of rural housing in Qeshm Island by utilizing the climatic dimensions of rural housing in the villages of Dulab and Ramkan in Qeshm Island. Thus, this study seeks to answer this question: what is the form of the Dulab and Ramkan villages of Qeshm Island?

3. Methodology

The current research initially examines the theoretical foundations and extracts the targeted components through qualitative, descriptive-analytical, applied, and library research methods and approaches with data extraction tools. Moreover, content analysis was used to analyze the qualitative data. Then, observation tools, local and regional surveys, construction surveys, and photography of rural houses' conditions were used that were drawn in AutoCAD software. After that, damaged dwellings or houses of the same type were purposefully removed. Finally, two houses from each village were selected as the sample. The chosen houses were classified in terms of form type, spatial relation, the location of open and closed spaces in houses, functional pattern in rooms, location of the windcatcher, windows proportion, materials type, porch, orientation, angle of incidence, and wind, using the comparison method.

Table 1. The effects of climate on the formation of Qeshm Island architecture

Building design strategy	Reason
Constructing all buildings, whether a residential house or shop, at least 1.5 m above the surrounding ground.	Protecting buildings from heavy rains
An open-air central courtyard on four sides of it	Achieving two-way air ventilation in the room
Building a pillared porch	Preventing direct sunlight
The thick building walls consisting of gypsum stone, covered with gypsum mortar	Preventing heat from penetrating the building and strengthening its flood resilience
Avoiding building basement	The presence of high heat and humidity
The entrance door is not directly open to a hallway, but taking a sharp turn leads to the hallway.	Preventing direct sunlight into hallways
Designing relatively small windows with holes in the top and bottom of it	Minimizing heat penetration into buildings
Using false ceiling	Making shadows on the ceiling and providing excess air in the space between the two roofs to prevent heat penetration
High rooms ceiling	Proper ventilation and thermal comfort for residents.
Building a large platform near the building	Used for daily activities in the evenings and during hot seasons
Using high-heat capacity materials	Reducing the heat transfer coefficient

The studied area of this research is the Dulab and Ramkan villages of Qeshm county, located in the hot and humid region. Dulab is a village in Harra district, Qeshm county, Hormozgan province, Iran. In this village, through a field survey, two types of rural housing typologically different from other village housing were selected as the sample of rural housing.

Ramkan is a village in the central district of Qeshm county, Hormozgan province, south of Iran. This village is located 28 kilometers southwest of Qeshm city. Ramkan is known as the heart of the Island and is located almost in the center of Qeshm Island. It is also located on the north-south and east-west corridors. The map and rural housing location of these villages are shown in Figure 1.

In these villages, two types of houses typologically different from other houses in this village were selected as the sample of rural housing. The characteristics of these houses, including plan, name, and area of micro spaces, are shown in Table 2.

4. Findings

The investigation of the selected houses in Dulab and Ramkan villages (Table 2) suggests that these houses are rectangular in the plan due to taking advantage of favorable environmental and climatic conditions, taking advantage of the region's winds, and preventing dazzling light penetration into interior spaces. In Master Mohammad's house, the entrance is opened to the yard that leads to the porch and windcatcher room. However, in Master Reza's house, the entrance is directly connected to the bathroom and yard and through it to other parts of the house. It can be concluded that the only difference between the spatial relations in these houses is the connection of the entrance with the toilet. On the other hand, in the selected dwellings of Ramkan village, for instance, in the Firuz's house, the entrance is directly connected to the toilet and the yard, then through the latter part to the porch and the windcatcher room. However, in Heydar's house, the entrance is directly connected to the toilet, drawing room, and yard, then through the latter part to other parts of the house. Thus, in terms of access to the sample houses of this village, there are two types of rural housing.

Both climatic houses of Dulab and Ramkan villages are in a semi-open space between an open and closed space to prevent heat and dazzling light penetration to the interior spaces and create a so-called microclimate. Notably, the shape of open, semi-open, and closed spaces in these houses are rectangular, with north-south and east-west extensions. The width and depth of open spaces are always more significant than those of the other two spaces to introduce beneficial outdoor air and provide thermal comfort. The air will flow for a longer time if the width of the open spaces gets greater. The selected rural housing of this research will be analyzed in Table 3. This Table investigated the spatial diagram, plan, the studied area houses' climatic function, and these houses' open, semi-open, and closed spaces.

As shown in this Table, the functional patterns and proportion of the selected houses of Dulab village suggest that rooms have a higher extension on the south side than on the other sides. Most rooms have greater southern exposure length; the area of the room is higher on this side to reduce the sunlight glare. The average width and length of rooms are 4 and 6 meters, respectively. These numbers in Master Mohammad's house are calculated regarding the ±1.2 meter variation. These proportions are to increase the relation of rooms with the outside space and yard; as a result, it can improve ventilation and introduce beneficial outdoor air. In both houses, rooms are rectangular shaped, their length is higher than their width, and their average area is 24 square meters. Furthermore, the windcatcher rooms are on the north side.

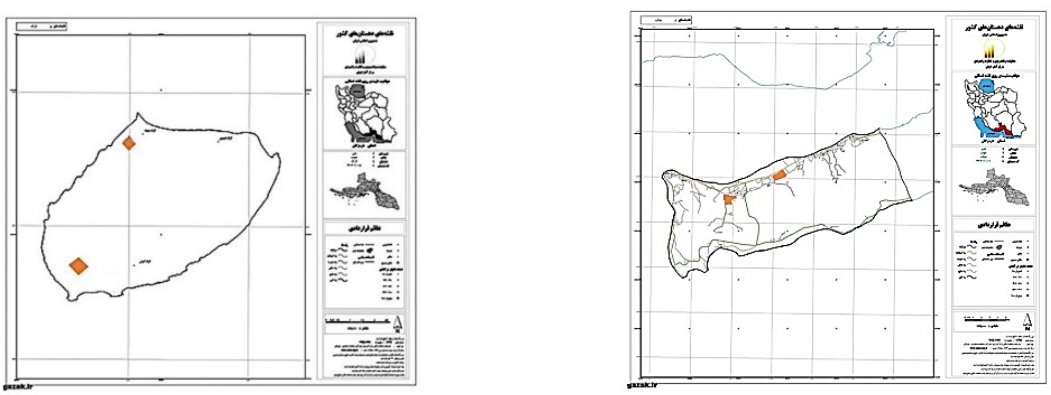
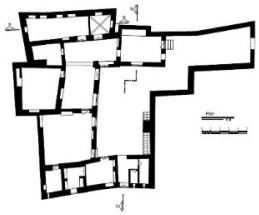
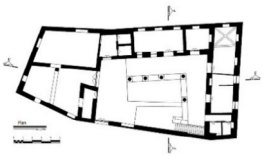
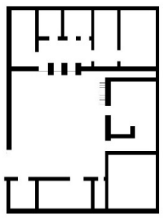
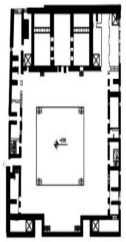


Figure 1. The map and rural housing location of Dulab and Ramkan villages (country's countryside map, 2021)

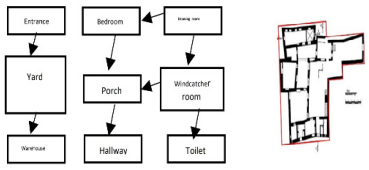
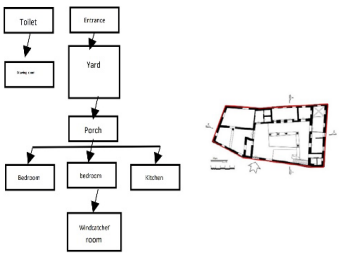
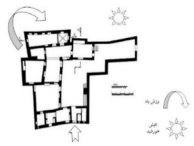
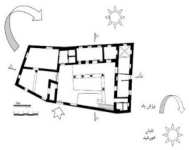
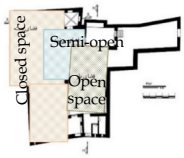
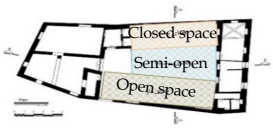
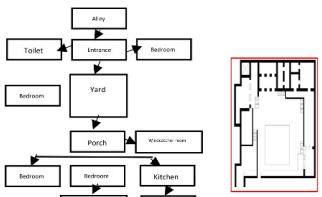
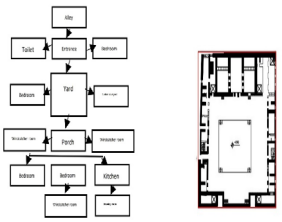
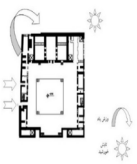
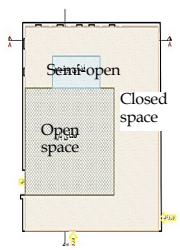
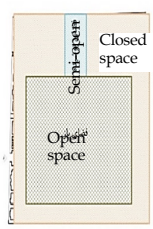
Table 2. Introduction of sample houses of the research

Master Mohammad	Master Reza	Building name
 1-Alley 2-Yard 3-Porch 4-Windcatcher room 5-Drawing room 6-Bedroom 7-Entrance 8-Cistern 9-Ruined 10-Bathroom 11-Kitchen 12-Shop 13-Toilet 14-Hallway 15-Warehouse 16-Shabestan 	 1-Alley 2-Yard 3-Porch 4-Windcatcher room 5-Drawing room 6-Bedroom 7-Entrance 8-Cistern 9-Ruined 10-Bathroom 11-Kitchen 12-Shop 13-Toilet 14-Hallway 15-Warehouse 16-Shabestan 	Plan
The area of the yard: 53 sq m The area of bedrooms: 45 sq m The area of the entrance: 3 sq m The area of service spaces: 24 sq m	The area of the yard: 35 sq m The area of bedrooms: 72 sq m The area of the entrance: 3.5 sq m The area of service spaces: 38 sq m	The total area of spaces
Saleh Abid	**Kuwaiti**	**Building name**
 1-Alley 2-Yard 3-Porch 4-Windcatcher room 5-Drawing room 6-Bedroom 7-Entrance 8-Cistern 9-Ruined 10-Bathroom 11-Kitchen 12-Shop 13-Toilet 14-Hallway 15-Warehouse 16-Shabestan 	 1-Alley 2-Yard 3-Porch 4-Windcatcher room 5-Drawing room 6-Bedroom 7-Entrance 8-Cistern 9-Ruined 10-Bathroom 11-Kitchen 12-Shop 13-Toilet 14-Hallway 15-Warehouse 16-Shabestan 	Plan
The area of the yard: 35 sq m The area of bedrooms: 45 sq m The area of the entrance: 3 sq m The area of service spaces: 24 sq m	The area of the yard: 38 sq m The area of bedrooms: 62 sq m The area of the entrance: 3.5 sq m The area of service spaces: 38 sq m	The total area of spaces

Dulab village

Ramkan village

Table 3. Analyzing the selected rural housing houses of Dulab and Ramkan villages

Master Mohammad	Master Reza	Dulab village
		Plan and diagram of spatial relations
		
		Open, semi-open, and closed spaces
Firuz's house	**Heydar's house**	**Ramkan village**
		Plan and diagram of spatial relations
		
		Open, semi-open, and closed spaces

Following, window proportions and dimensions facing the courtyard of the selected houses will be evaluated in Table 4. According to the Table, on the north and south sides of these houses, the courtyard windows proportion is more than other sides. As a result, it can prevent direct sunlight in interior spaces. On the contrary, according to the proportions and functional patterns in the selected houses of Ramken village, the length, depth, and area of rooms on the north side are more than on the other sides; consequently, this lighter the rooms. Additionally, the average depth and length of the rooms are 3.5 meters and 5.5 meters, respectively. These proportions are to increase the relation of rooms with the outside space and courtyard; as a result, it can improve ventilation and introduce beneficial outdoor air. In both houses, rooms are rectangular shaped, their length is higher than their depth, and their average area is 54 square meters. The windcatcher rooms are also on the north side. On the north and south sides of these houses, the courtyard windows proportion is more than other sides. As a result, it can prevent direct sunlight in interior spaces.

In the climatic houses of Dulab and Ramkan villages of Qeshm Island, the depth of main spaces average on the eastern side is extremely low compared to other sides. Furthermore, in the selected houses of these villages, the porch which leads to the room has a height of 0.4 cm above the ground since they are one-floor houses. In contrast, in these climatic houses, the length and width of the porch are 2.5:1 ratio. The Porches are directly connected to the courtyard and through it to the house's main spaces, such as rooms, windcatcher room, and drawing room. Dimensions of the rectangular-shaped porches in Dulab village houses have been taken into account, with an average length of 8 meters and a width of 2 meters, and in Ramkan village, with an average length of 5 meters and a width of 2 meters. Given that, in the selected climatic houses of Dulab and Ramkan villages, the exterior building materials are thatch and wood; and building materials for interiors are plasters for walls and thatch and wood for ceilings.

5. Discussion

Analyzing the typology of the selected rural houses in Qeshm Island showed that the climatic typology of rural homes has convergence in some aspects such as materials, windows proportions, number of floors, porch floor height, roof shape, color, and building volume. But are divergent based on the proportions of rooms, the location of the element of windcatcher or porch, porch shapes, and the proportions of open, semi-open, and enclosed spaces. Thus, the design of the buildings in this region is unique due to the studied villages' hot and humid climate; however, divergence also occurs based on the architect's and the employer's tastes and views.

The findings of this research are in line with the studies of Firuzian & Ahmadizadeh (2016); Rahimipour et al. (2020); Beyti et al. (2020); and Kharabati & Nikmard (2022) on the effects of climate on rural housing construction and the formation of rural housing. Firuzian & Ahmadizadeh (2016), in a study about the types of rural housing in villages of Esfrain city, concluded that the villages' climatic factors and natural barriers have led to differences in the types of rural housing and architecture. Hence, it has influenced the village's orientation and stepped architecture, buildings' yard status, small windcatchers, doomed roofs built of local materials, and use of building materials such as cob, clay, brick, and wood. Rahimipour et al. (2020), in a study of Kuschki-e-Sofla villages' rural housing in Boroujerd county, found that natural factors and climatic features affect the spaces of rural houses form, including building types and yard forms. In the typology of architecture, those features also highlight indicators such as being native, deprivation, and introversion of spaces through spatial rotation at the entrance by the corridor and vestibule and creating the spaces for connection between the porch, terrace, and the central yard.

Table 4. Courtyard windows proportions and dimensions in rural housing of Dulab and Ramkan villages

Ramkan village		Dulab village		Window placement
Windows length average	Window length to yard length	Windows length average	Window length to yard length	
7 m	41%	5 m	39%	Southside
5 m	21%	3.5 m	22%	Northside
3 m	17%	3 m	18%	Eastside
6 m	21%	8 m	21%	Westside

Although the current research was limited to two villages of Qeshm Island, the results can be generalized to the hot and humid climate or other types of it and the other villages in this region. Regarding the different climate types and climatic factors in Iran, it is suggested that other scholars and researchers investigate different types of climate and various villages in different regions to influence the designing and planning of sustainable rural development and to improve rural architecture's quality.

Acknowledgements

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Conflict of Interest

The authors declared no conflicts of interest.

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