

RESEARCH ARTICLE

# A typological, environmental and socio-cultural study of semi-open spaces in the Eastern Mediterranean vernacular architecture: The case of Cyprus



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## KEYWORDS

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Typology;  
Environmentally  
responsive design;  
Socio-cultural aspects

**Abstract** Semi-open spaces – largely incorporated in vernacular dwellings in Cyprus during the 19th and 20th centuries – formed diachronically significant socio-cultural, functional and environmental features of the vernacular architecture of the area. The climate of the Eastern Mediterranean region, i.e., hot summers and mild winters, encouraged the use of open weather protected spaces, thus leading to the widespread incorporation of such spaces in the vernacular architecture of the region. This paper focuses on the interconnections between architectural forms and human comfort, convenience or pleasure in relation to the semi-open spaces found in the vernacular architecture of Cyprus – an island in the Eastern Mediterranean region. For the purpose of this research, characteristic traditional settlements found in the coastal, lowland and mountainous areas – which represent three different climatic regions and topographies of the island – were selected for an in-depth investigation. The findings confirm a high frequency of semi-open spaces, as well as the existence of a remarkable richness of typologies. Although semi-open spaces constitute a fundamental part of the structure of these vernacular dwellings in all climatic regions examined, they dominate in the lowland regions due to the particularly hot climate, as well as the specific activities of the inhabitants of these areas. The prevailing architectural forms and constructions of these spaces in each climatic region under investigation was found to be closely adapted to the local resources, terrain and climate, while also being related to the social, household and agricultural needs of the inhabitants, thus underlining their sustainable and locus-specific conception. Research findings can contribute towards critically re-thinking semi-open spaces and their inherent value in rehabilitation projects, as well as in contemporary residential architecture.

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## 1. Introduction

Semi-open spaces (i.e., open spaces with a roof) constituted a fundamental design element of vernacular residential architecture in the Eastern Mediterranean over the last centuries (Achenza et al., 2014; Malaktou et al., 2016; Sinou, 2007). These passive design elements reflect genuine parameters of the societies and cultures of the region, as they respond to the mild climatic conditions, the lifestyle patterns and the mentality of the locals (Sadanand & Nagarajan, 2020). Rudofsky, in his book *Architecture without Architects, an Introduction to Non-pedigreed Architecture*, underlines the environmental and cultural qualities of traditional semi-open spaces (Rudofsky, 1964). The design of these spaces was based on a deep understanding of nature, climate and available resources, as well as on the prevailing lifestyle attributes and values of the inhabitants. According to Foruzanmehr (2015), traditional semi-open spaces are perhaps more suitable for a wide range of social and personal activities, compared to open air spaces.

Semi-open spaces were initially introduced in various dwelling typologies in the Eastern Mediterranean region during the Prehistoric period. In Ancient Greece, (specifically in the Classical and Hellenistic domestic structures of the period) these spaces were often found in the form of a colonnade, i.e., an open space with a roof supported by a small number of posts or columns. Also called *pastas*, these spaces were usually south-oriented (Nevett, 2001). In Late Hellenistic and especially Roman domestic buildings, they appeared in the form of a peristyle, i.e., an open space with a roof supported by a series of columns, bordering the central internal courtyard of the villas of the wealthy (Watkin, 2005). It is noted that semi-open spaces were not only prevalent in ancient domestic architecture but were also widely implemented in nearly all types of public and communal buildings of the period, such as commercial and meeting spaces known as *agora*, religious complexes and administrative structures.

Cyprus, like other countries of the Eastern Mediterranean region, has a long and continuous tradition of using semi-open spaces. Such spaces appeared for the first time during the Prehistoric period in the domestic architecture of the settlement of *Kalopsida* (Philokyprou, 1998). They later become widespread in Roman dwellings in the form of a peristyle (Wright, 1992). During medieval times, a semi-open pass-through space called a *portico*, was popularised (Enlart, 1987). The main function of the *portico* was to provide direct access from the street to the internal courtyard of the dwelling. Other semi-open space types were also encountered throughout antiquity, in the form of arcades (i.e., an open space with a roof supported by arches) or colonnades (i.e., an open space with a roof supported by a series of columns), which predominantly

faced the dwelling's internal courtyard. In the 19th and the beginning of the 20th centuries, both ancient and medieval semi-open space design prototypes were assimilated into the vernacular architecture of Cyprus (Papacharalambous, 2001; Sinos, 1976).

Despite their proven advantages and long-lasting presence throughout the centuries, semi-open spaces are not often incorporated in contemporary architecture, indicating a decline of this well-suited traditional architectural feature. In recent decades, semi-open spaces have been systematically undervalued and replaced by alternative non-environmentally responsive design features, often unsuited to the local social, environmental, economic and cultural context (Michael and Phocas, 2012).

Scientific research on traditional semi-open spaces has been very limited until today. When examining the traditional built forms of Cyprus, researchers predominantly pay attention to historical, architectural, typological, constructional and structural issues (Chadjimichali, 1967; Chrysochou, 2014; Cyprus Civil Engineers and Architects Association (CCEAA), 2003; Demi, 1997; Illampas et al., 2011; Theodosiou and Pitta, 1996). These studies mainly aim at the listing, classification and characterisation of traditional design features in terms of typology and construction. However, little attempt has been made to relate the design and construction of semi-open spaces to the environmental, socio-cultural, psychological and economic attributes (Philokyprou, 2011); aspects which could reveal the challenges and opportunities that semi-open spaces have to offer in the rehabilitation of vernacular architecture, as well as in contemporary architecture.

More recently, a number of studies of the environmental sustainability of vernacular architecture in Cyprus (Andreou and Axarli, 2012; Michael et al., 2017; Philokyprou et al., 2014; Philokyprou et al., 2017; Sozen and Gedik, 2007; Thravalou et al., 2018) and the Eastern Mediterranean (Florides et al., 2001; Rapoport, 2006; Salman, 2018; Yannas and Weber, 2014) have investigated the thermal performance of traditional dwellings, as well as the human comfort conditions derived from the application of passive design features such as open and semi-open spaces. These studies have proven the environmental values of vernacular architecture, usually focusing on the effectiveness of open courtyards (Das, 2006; Hinrichs, 1989; Petruccioli, 2005; Philokyprou and Michael, 2016; Rapoport, 2007; Reynolds, 2002) and more rarely of semi-open spaces (Malaktou et al., 2016; Michael et al., 2013; Philokyprou and Michael, 2020), as passive cooling design features. Nevertheless, the investigation of the thermal behaviours of semi-open spaces without considering other important parameters such as user behaviours, habits and perceptions, does not allow for a holistic understanding or assessment of their significant roles and values. Among other researchers, Foruzanmehr and Velinga (Foruzanmehr, 2015; Foruzanmehr and Velinga,

2011) have highlighted the significance of adopting an integrated and holistic approach that engages the different variables of traditional built forms, and would thus allow for solid conclusions about their long-term viability and sustainability to be drawn. Rapoport (2008) also underlines the significance of culture–environment relations and the need for resilient environments.

The research presented herein aspires to fill this research gap by systematically examining and critically and holistically reviewing the various forms of traditional semi-open spaces in Cyprus, in terms of their variable socio-cultural and psychological meaning as well as their environmental performance. More specifically, this research attempts to relate their spatial, typological and constructional characteristics (tangible values) with environmental, functional and socio-cultural concerns (intangible values). It examines representative traditional dwellings in different climatic and topographical areas of the island. The analysis is based on a comparative assessment which can provide insights on how the varying local conditions, i.e., climate, topography, resources and lifestyle profiles, impacted parameters such as the frequency, architectural form, construction, typology and use of semi-open spaces in the different climatic zones and topographies of the island. In this way, this study reveals the various values of semi-open spaces, which can directly influence the quality of new and existing living environments. Taking into consideration the threat of a gradual disappearance of these design elements, we anticipate that this study will raise awareness for their protection.

The research described in this paper was carried out in the framework of two research programmes with the acronyms BioCultural and BioVernacular, funded by the University of Cyprus and the Republic of Cyprus through the European Regional Development Fund, respectively. The BioCultural research programme focuses on the sustainable design elements of vernacular architecture and their implementation in the rehabilitation of traditional rural buildings. The BioVernacular research programme focuses on innovative methods for the protection and conservation of bioclimatic design elements in traditional buildings in the historic urban centre of Nicosia. The current research paper constitutes the very first systematic and scientific attempt to analyse semi-open spaces in varying topographies and climatic regions of Cyprus using a multi-criteria assessment approach. The results derived from this research can also be applied to other countries of the broader Eastern Mediterranean region which feature similar climatic and typological characteristics.

## 2. Research methodology

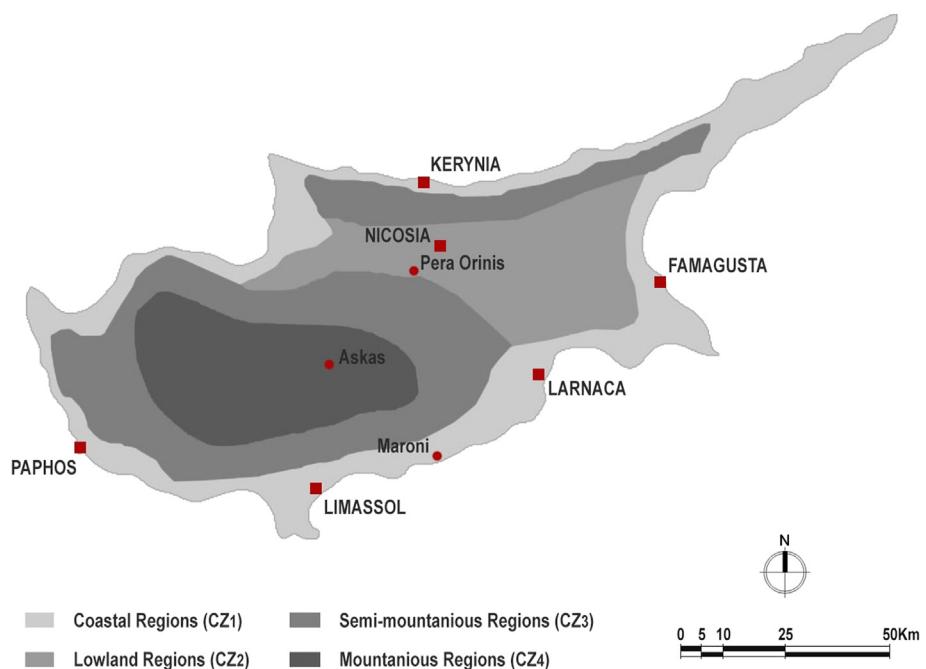
The investigation of traditional semi-open spaces in Cyprus is part of a wider research undertaken on the environmental features of vernacular architecture in the different climatic and topographical regions of the island (Philokyprou et al., 2017b; Savvides et al., 2016). For the purpose of this study, three representative climatic regions, i.e., coastal (southern coastal region), central lowlands and central highlands, were selected (Fig. 1). Vernacular settlements situated in these different regions

were initially surveyed through topographical and cadastral maps. Different types of semi-open spaces were identified and marked on the cadastral maps, aiming to provide insights into the extent and manner in which their frequency, distribution and size is shaped or influenced by local context, i.e., local climate, topography, available resources and lifestyle patterns, as well as agricultural and house hold activities.

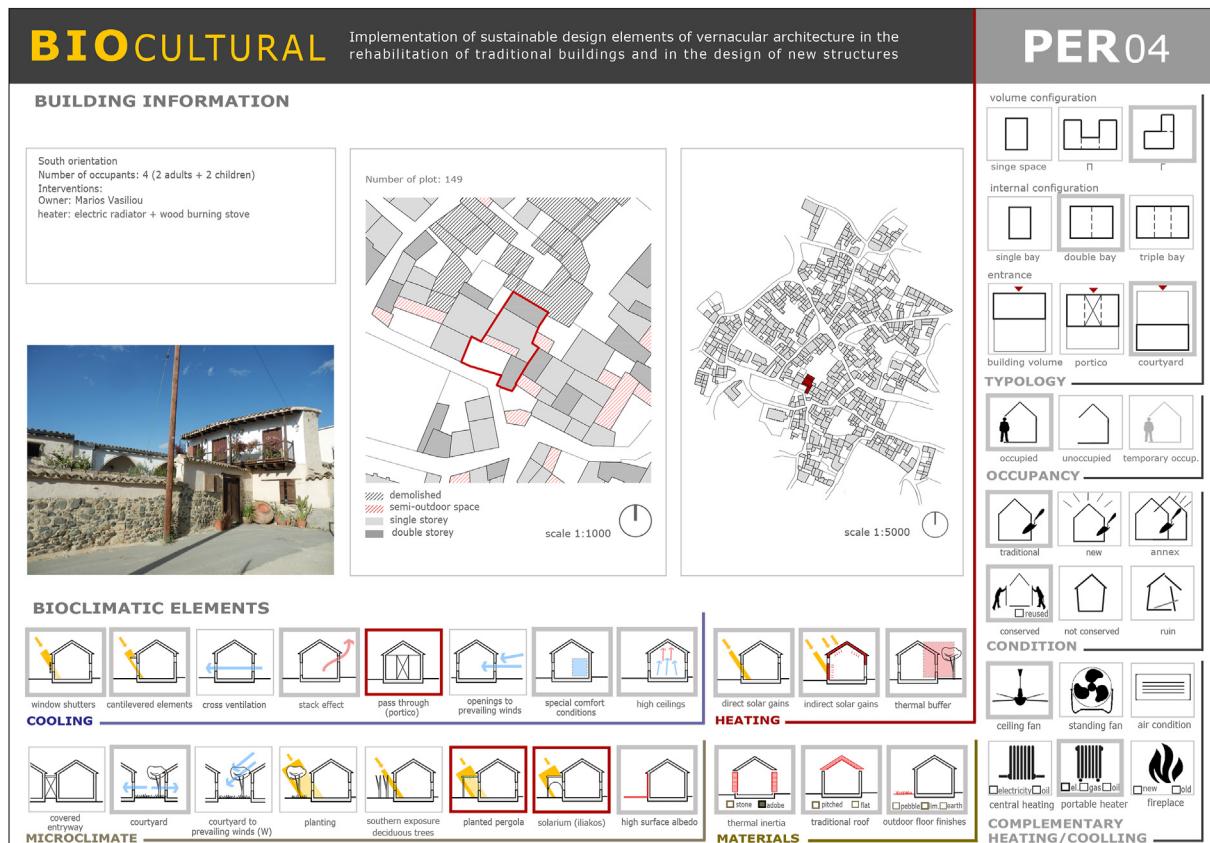
The map survey was followed by the selection of a sample of three representative case study settlements in three different climatic zones, for detailed in-situ field observation and analysis. More specifically, a representative rural vernacular settlement in the coastal region (southern coastal region) – i.e., Maroni settlement; in the lowland region – i.e., Pera Orinis settlement and in the mountainous region (central highlands - Troodos mountains) – i.e., Askas settlement, were selected for further analysis. The information from the three case studies derived through field observations, in-situ documentation and architectural drawings, verify the data derived from the topographical and cadastral maps that preceded.

The field observations were mainly based on the detailed architectural study and documentation of 30–50 selected representative traditional dwellings in each of the three case study locations. This was followed by a socio-cultural investigation (covering social, cultural, economic, psychological, emotional and spiritual aspects) through in-situ observations of the inhabitants' everyday life at different times of the day and the year, as well as the use of non-structural questionnaires and the study of old photographs. The main criterion for the selection of the 120 case study dwellings was the incorporation of a rich variety of authentic and representative typologies of traditional semi-open spaces. Data sheets that provided information on the spatial, architectural and construction characteristics of semi-open spaces, were prepared for each dwelling under study. Special reference was made to the plan layout, typology, morphology and materiality of semi-open spaces. Recorded data were summarised in tables for each climatic region examined (Figs. 2 and 3). Fig. 2 shows the selected data for each vernacular dwelling under study, focusing on its environmental features; whereas Fig. 3 presents the detailed investigation of semi-open spaces. Based on the data selected from the field observations, the study focuses on the way in which the built characteristics of semi-open spaces are intertwined with and reflect specific environmental, socio-cultural and psychological concerns.

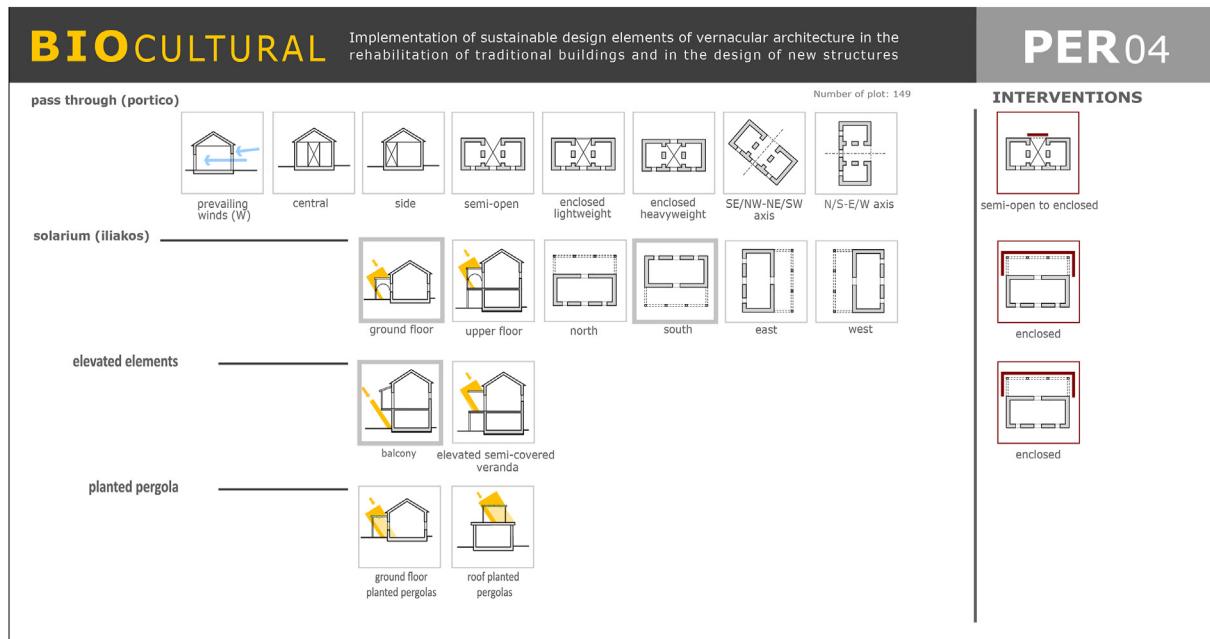
The research results presented in this paper were mainly derived from comparative analysis between the selected case studies from the different climatic regions and topographies of the island. Comparisons were carried out both on the settlement level and the building level. On the settlement level, comparisons focused on the distribution, frequency and size of the semi-open spaces, mainly based on the initial phase of analysis of the current study. On the building level, a more detailed comparative analysis was followed, which included direct juxtapositions between the three case studies with respect to the semi-open typology, geometry, plan layout, spatial relation to other spaces such as courtyards and adjacent rooms, as well as with respect to construction techniques and materials used. Comparison tables, one for each different architectural parameter



**Fig. 1** The three rural traditional settlements under study, located in three different climatic areas, Cyprus.



**Fig. 2** Data sheet for the investigation of passive design strategies (including semi-open spaces indicated in red) applied on each vernacular dwelling under study, as well as other architectural characteristics.



**Fig. 3** Data sheet showing detailed information about the different types of semi-open spaces applied on each vernacular dwelling under study.

investigated, including data for the three different climatic areas, were also prepared. In addition, a summary table was prepared where all relevant information regarding environmental, cultural, functional, psychological and emotional data for all different semi-open space typologies were inserted, aiming to lead to a holistic/comprehensive evaluation of all different parameters under study. The comparisons of semi-open spaces in varying climatic regions revealed the specific way of adaptation and response of the structures under study to diverse local environmental, social and cultural context.

### 3. Research results

#### 3.1. Climatic data and built fabric of vernacular settlements

Cyprus, an island in the Eastern Mediterranean region, is characterised by a subtropical climate, i.e., a combination of semi-arid and Mediterranean types (*Csa* and *BSh*), with intense solar radiation, high summer aridity and predominantly clear skies. The climate can be considered warm with large diurnal temperature fluctuations, hot summers and mild, rather rainy winters. Nonetheless, the climate varies according to the distance from the sea and altitude. Based on these variations, the island of Cyprus is divided into distinct climatic regions (Fig. 1), i.e., coastal, lowland, semi-mountainous and mountainous (European Parliament and the Council of the European Union, 2002).

Detailed meteorological data is presented in Tables 1–4. This data was collected close to the three case study locations (the settlements of *Maroni*, *Pera Orinis* and *Askas*) which represent coastal, central lowland and central highland regions. The data is based on weather station

recordings of the Department of Meteorology of Cyprus. Generally, coastal regions suffer from high humidity levels due to their proximity to the coast. These regions exhibit cool winters and mild summers. It is noted that the prevailing winds in the coastal settlement case study are northeasterly during the cool and intermediate periods and northeasterly – southwesterly during the warm period. The central lowland inland regions present quite large diurnal temperature fluctuations and experience hot summers and relatively cold winters. These regions are characterised by the predominance of westerly winds throughout the year. Mountainous regions are characterised by mild summers and relatively cold and wet winters with lower humidity levels compared to the coastal regions. Wind directions with the greatest frequency for the selected case study settlement in the mountainous region are both north and south.

The coastal settlements of Cyprus are most commonly situated on plain or hilly terrains. In terms of planning patterns, they are characterised by a relatively dispersed built fabric (Fig. 4). The traditional dwellings of the coastal region are developed with one or two floors and are configured by single-banked rooms arranged around spacious central courtyards. Lowland settlements are characterised by a rather semi-compact built fabric (Fig. 4). Dwellings are single or double storey and are configured with single- and double-banked rooms arranged around central courtyards. Mountainous settlements are characterised by terraced and split-level configurations due to the sloped morphology of the area. Dwellings are developed with two or more floors, compactly attached to each other, with limited open spaces (Fig. 4).

Regardless of the climatic region, the vernacular settlements of the island exhibit an introverted planning character, i.e., dwellings or boundary walls are built along

**Table 1** Mean maximum, average and minimum relative humidity levels for the selected case study regions, Meteorological data (1984–2003), Department of Meteorology, Cyprus.

	Coastal Region (Maroni Settlement)			Lowland Region (Pera Orinis Settlement)			Mountainous Region (Askas Settlement)		
	Relative Humidity (%)			RH <sub>max</sub>	RH <sub>avg</sub>	RH <sub>min</sub>	RH <sub>max</sub>	RH <sub>avg</sub>	RH <sub>min</sub>
Jan	100	76	39	99	73	32	100	71	9
Feb	100	74	34	99	69	24	99	68	12
Mar	99	73	19	99	65	17	99	62	7
Apr	99	70	18	98	56	12	99	52	6
May	98	67	15	96	50	9	98	48	5
Jun	96	67	19	96	45	8	96	42	7
Jul	94	68	20	91	44	9	94	39	7
Aug	92	69	22	90	49	9	92	41	7
Sept	93	66	23	94	51	9	96	45	6
Oct	97	65	19	96	57	9	98	54	7
Nov	99	70	31	99	65	19	99	63	8
Dec	100	76	36	98	73	35	100	72	7

**Table 2** Mean maximum, average and minimum temperatures and mean temperature fluctuations for the selected case study regions, Meteorological data (1984–2003), Department of Meteorology, Cyprus.

	Coastal Region (Maroni Settlement)				Lowland Region (Pera Orinis Settlement)				Mountainous Region (Askas Settlement)			
	Temperature (°C)				T <sub>max</sub>	T <sub>avg</sub>	T <sub>min</sub>	T <sub>fluct.</sub>	T <sub>max</sub>	T <sub>avg</sub>	T <sub>min</sub>	T <sub>fluct.</sub>
Jan	17.3	12.0	6.8	10.5	13.4	9.7	5.9	7.5	10.1	6.7	3.2	6.9
Feb	17.6	11.9	6.1	11.5	14.1	9.9	5.7	8.4	10.4	6.7	3.0	7.4
Mar	19.8	13.4	7.1	12.7	17.0	12.1	7.2	9.8	13.3	9.1	5.0	8.3
Apr	23.5	16.8	10.0	13.5	22.5	16.7	10.8	11.7	18.3	13.6	9.0	9.3
May	27.4	20.4	13.5	13.9	28.0	21.6	15.1	12.9	23.3	18.4	13.4	9.9
Jun	30.8	23.8	16.8	14.0	32.5	25.9	19.3	13.2	27.8	22.6	17.5	10.3
Jul	33.2	26.4	19.5	13.7	35.5	28.8	22.1	13.4	30.9	25.7	20.6	10.3
Aug	33.6	26.8	20.0	13.6	35.2	28.5	21.8	13.4	30.9	25.6	20.2	10.7
Sept	31.8	24.8	17.8	14.0	31.7	25.3	18.9	12.8	28.0	22.5	17.0	11.0
Oct	28.6	21.9	15.1	13.5	26.5	21.0	15.5	11.0	23.0	18.1	13.1	9.9
Nov	23.2	17.3	11.5	11.7	19.9	15.3	10.8	9.1	16.7	12.6	8.5	8.2
Dec	18.7	13.6	8.4	10.3	14.8	11.1	7.4	7.4	11.6	8.1	4.7	6.9

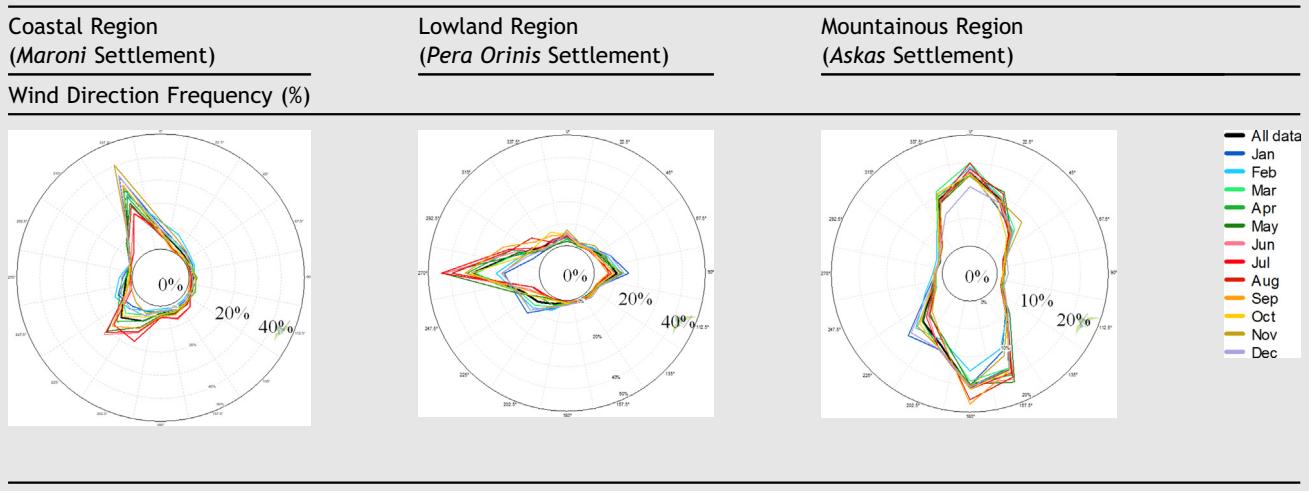
the street, enclosing the open spaces which have the form of an internal courtyard invisible from the public sphere. As a rule, semi-open spaces are connected to the central yard (Fig. 5 a and b). In addition, openings and especially windows are limited in number and size. The various conquerors who have passed through the island, on top of the conservative social nature and cultural background of the inhabitants, have influenced the prioritisation of security and privacy in the design of buildings and settlements. By extension, vernacular settlements feature narrow, windy streets and limited open public spaces for social interaction and exchange. Buildings in each settlement are mainly domestic, whereas other buildings (e.g., churches and schools), constitute the sole public or communal edifices.

### 3.2. Settlement scale analysis: frequency and size of semi-open spaces

The overall investigation of the island's vernacular architecture conducted in the framework of this research has shown that semi-open spaces constitute a common spatial feature and an integral part of the traditional dwellings. However, these spaces vary in terms of their frequency in different settlements across the island. More analytically, semi-open spaces are more prevalent in the context of settlements in the lowland region (at a percentage 50%–75%). In most lowland rural settlements, more than 50% of vernacular dwellings incorporate one and, in some cases, even two semi-open spaces. The frequency of semi-open spaces in the coastal regions remains high (15%–30%) but is

**Table 3** Mean monthly precipitation for the selected case study regions, Meteorological data (1984–2003), Department of Meteorology, Cyprus.

	Coastal Region (Maroni Settlement)	Lowland Region (Pera Orinis Settlement)	Mountainous Region (Askas Settlement)
	Precipitation (mm)		
Jan	67.7	48.8	111.4
Feb	54.5	58.9	100.0
Mar	49.3	40.4	90.3
Apr	17.7	17.5	37.5
May	6.5	17.3	17.5
Jun	2.6	8.2	22.6
Jul	1.2	2.5	15.6
Aug	0.4	4.4	12.3
Sept	0.9	5.4	9.1
Oct	19.9	16.6	32.7
Nov	58.7	49.8	94.0
Dec	104.7	72.4	155.5

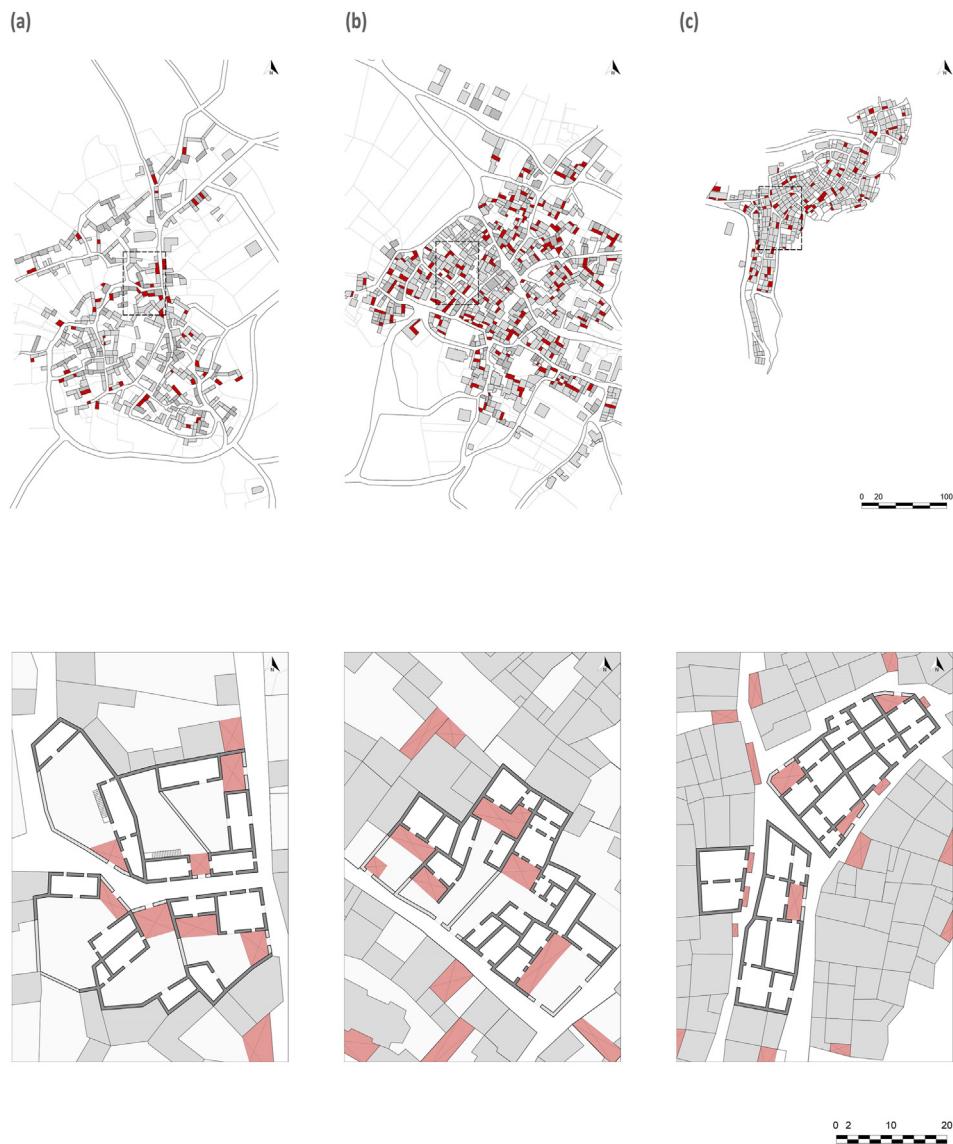
**Table 4** Monthly wind direction frequency for the selected case study regions, Department of Meteorology, Cyprus.

lower when compared to the lowland region. In the mountainous region, semi-open spaces present an even lower comparative frequency rate (10%–15%) and are more sparsely distributed. The high built density of the mountainous settlements makes this observation less recognisable in plan level (Fig. 4).

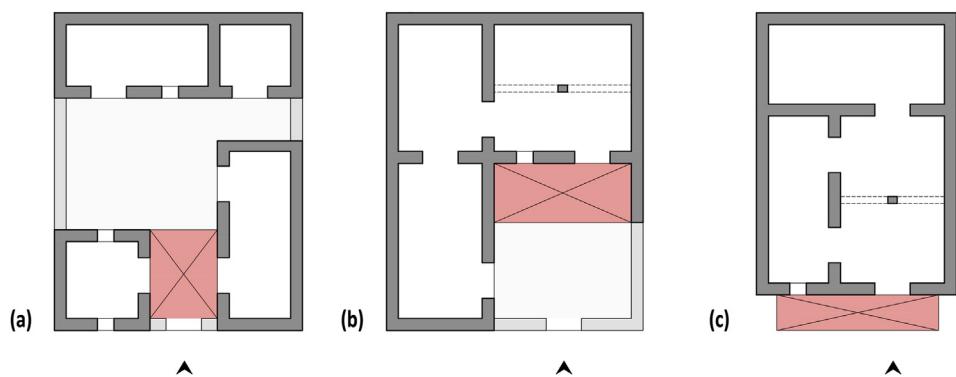
In terms of the area covered by the semi-open spaces, the research showed that these spaces vary in size depending on each climatic region, while simultaneously always following an appropriate proportion and a human scale. These variations of size could be associated with the topographical characteristics, planning and design patterns of the settlements, e.g., level of compactness of the built fabric, local climate, or the role of the semi-open spaces in the everyday life of the inhabitants (allocated functions and use of spaces). In the lowland region, semi-open spaces cover an extensive area (15%–25% of the entire plot area), whereas in the coastal settlements, semi-open spaces cover a smaller area (10%–15%) despite the semi-dispersed configuration of the settlements in this region (Figs. 4 and 5). Finally, in the

mountainous regions, semi-open spaces occupy only a limited area (often less than 10%) (Figs. 4 and 5).

The prevalence of a large number of spaciously sized semi-open spaces in the lowland areas can be explained by the multifunctional character of semi-open spaces in these areas, as well as their fundamental role in the everyday life of the inhabitants, e.g., serving social and functional needs. This can be also related to the abundance of land and the particularly harsh summer climatic conditions, which enforced the extensive design and building of such intermediate spaces. The limited size of semi-open spaces in the coastal regions compared to lowland areas, can be attributed to the fact that everyday activities in these areas mainly took place within the spacious courtyards of the dwellings due to the milder climatic conditions of the region (Fig. 5). Semi-open spaces in the coastal region mostly serve transitional purposes, e.g., entrance, access and circulation. The lower frequency and smaller size of semi-open spaces in the mountainous areas is mainly due to topographical constraints, such as the limited availability of



**Fig. 4** Topographical plans of the three rural settlements under study and plans of typical neighbourhoods of each settlement, i.e., (a) coastal settlement, namely *Maroni*, (b) lowland settlement, namely *Pera Orinis* and (c) mountainous settlement, namely *Askas*. Semi-open spaces are indicated in red.



**Fig. 5** Typical dwellings in each rural settlement showing different typologies of semi-open spaces (indicated in red), i.e., (a) coastal area, (b) lowland area and (c) mountainous area.

land as a result of the sloping terrain, the dense and compact configuration of the mountainous settlements, as well as the mild summer climatic conditions which did not necessitate the extensive application of this specific design feature (Figs. 4 and 5).

### 3.3. Building scale analysis: dominant architectural typologies and use of semi-open spaces

Traditional semi-open spaces located in different topographical and climatic regions all over the island share some common design features. Simultaneously these spaces demonstrate diversity in terms of their spatial, typological, morphological and constructional characteristics, offering adaptation opportunities (Ionas, 1988; Sivitanidou and Nikolopoulou, 2019). Research results indicate that in terms of typology, the semi-open spaces of the vernacular architecture of Cyprus can be classified in five main types: (a) the *iliakos*, a longitudinal shallow space; (b) the *portico*, a pass-through space; (c) the *hayati/balcony*, a longitudinal space in the upper floor of the dwelling; (d) the *entrance-stegadi*, a lightweight structure facing the street and covering the entrance of the dwelling; and (e) the *pergola*, a plant covered lightweight structure (Fig. 6).

In the lowland region, i.e., the *Pera Orinis* settlement, the most distinctive semi-open typology, is the *iliakos*, which is rather more limitedly observed in the mountainous and coastal regions. The *iliakos*, mainly found on the ground level of the dwelling, is a rectangular space (about 3 m in depth and 5–9 m in length) and has a wide open frontage, usually extending along the main indoor living area of the dwelling. The *iliakos* has at least one of its long sides open and appears almost exclusively in the elevation of the dwelling that faces the internal courtyard.

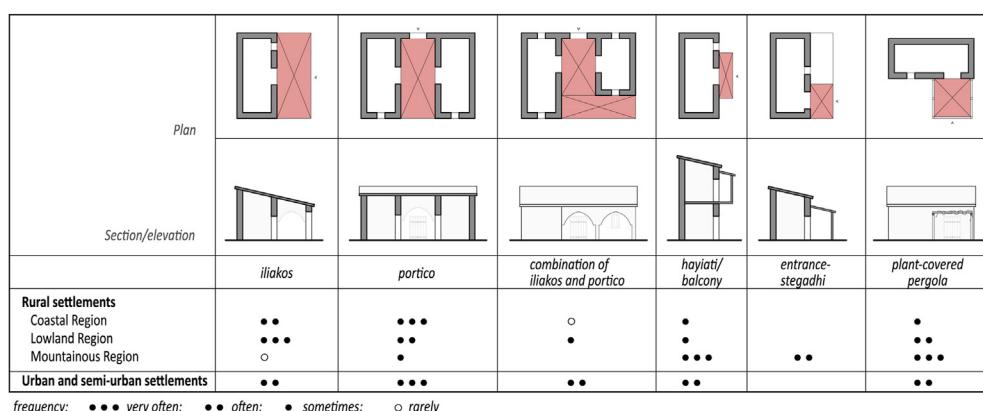
The space adjacencies and spatial hierarchy created between indoor, semi-open and open spaces achieve functionality, convenience and comfort. The spatial connection of the *iliakos* with the main indoor and outdoor living spaces facilitates optimal function and practicality. The *iliakos* forms an essential, well-lit space for the everyday activities of the occupants, e.g., agricultural (storage of crops, crop drying) and household (cooking, weaving and washing). It is also used as a transitional space

(circulation, connecting the area between indoor and outdoor spaces). As a main living and working area the *iliakos* is characterised by highly efficient use of space, i.e., serving multiple purposes and functions, while also offering flexibility to accommodate seasonal and daily activities. It is not uncommon that the *iliakos* would incorporate a series of functional elements that were of value to the everyday life of the inhabitants – such as traditional ovens, water basins and staircases – under climatically protected conditions (Fig. 7 a).

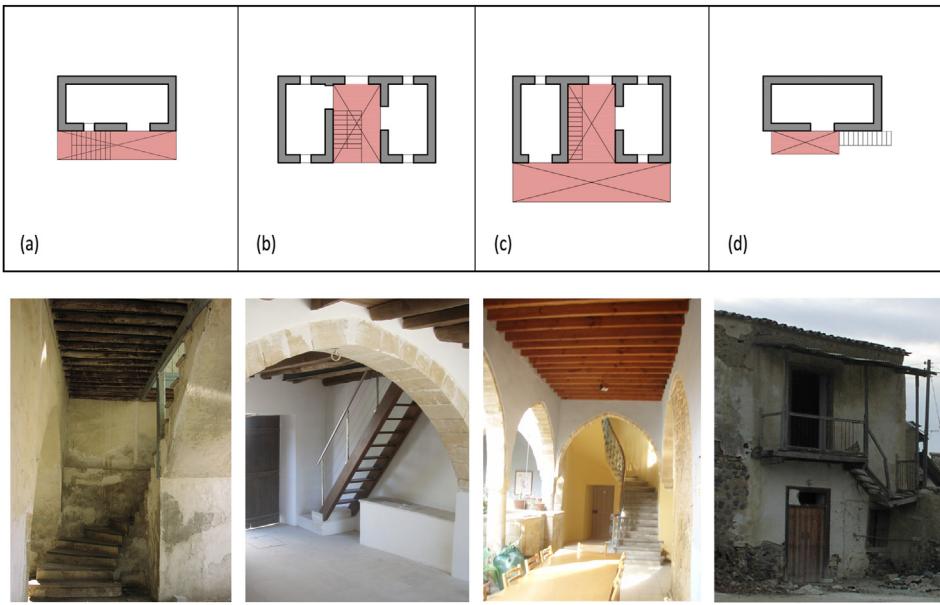
At the same time, the *iliakos* acts as an ideal gathering space for social events and religious celebrations, as well as for the everyday activities of the residents, i.e., as a sitting and dining area. Moreover, as females spent most of their time in the domestic sphere due to the conservative nature of the time, the *iliakos* further forms a private place for interaction between women where they could converse and socialise. The introverted design of the *iliakos* (facing the internal courtyard) reflects the importance of privacy, security and control over social interaction. The concept of privacy is a major factor in the spacial design of Cypriot traditional dwellings, hugely influencing the lifestyles of the local inhabitants and catalysed by the turbulent history of the country and subsequent cultural backgrounds of its people.

In some cases, two or more linear *iliakoi* could be traced, either interconnected in an L- or even a U-shaped plan layout adjoining the indoor living spaces of the dwelling (Fig. 8 a). Only in a limited number of cases *iliakoi* were not attached to indoor spaces, but were instead found in the courtyard, usually attached to the boundaries of the plot. There are also examples where the *iliakos* appeared both on the ground-floor and first-floor level in the case of two-storey dwellings, giving an elaborate function and creating architectural interest. In contrast with other regions, in the case of mountainous region, the *iliakos*, when present, is mainly incorporated on the first-floor level of the dwelling.

In the coastal region, i.e., *Maroni* settlement, the *portico* forms a dominant semi-open spatial configuration (Fig. 6). This feature is rather limitedly applied in the mountainous settlements. The *portico* often has the form of an almost square-shaped (from 3 m × 3 m up to 5 m × 5 m) and sometimes of a more elongated-shaped pass-



**Fig. 6** Semi-open space typologies in residential vernacular dwellings.



**Fig. 7** Incorporation of staircases in different typologies of semi-open spaces, i.e., (a) *iliakos*, (b) *portico*, (c) combination of *iliakos* and *portico* and (d) *hayiati/balcony*.

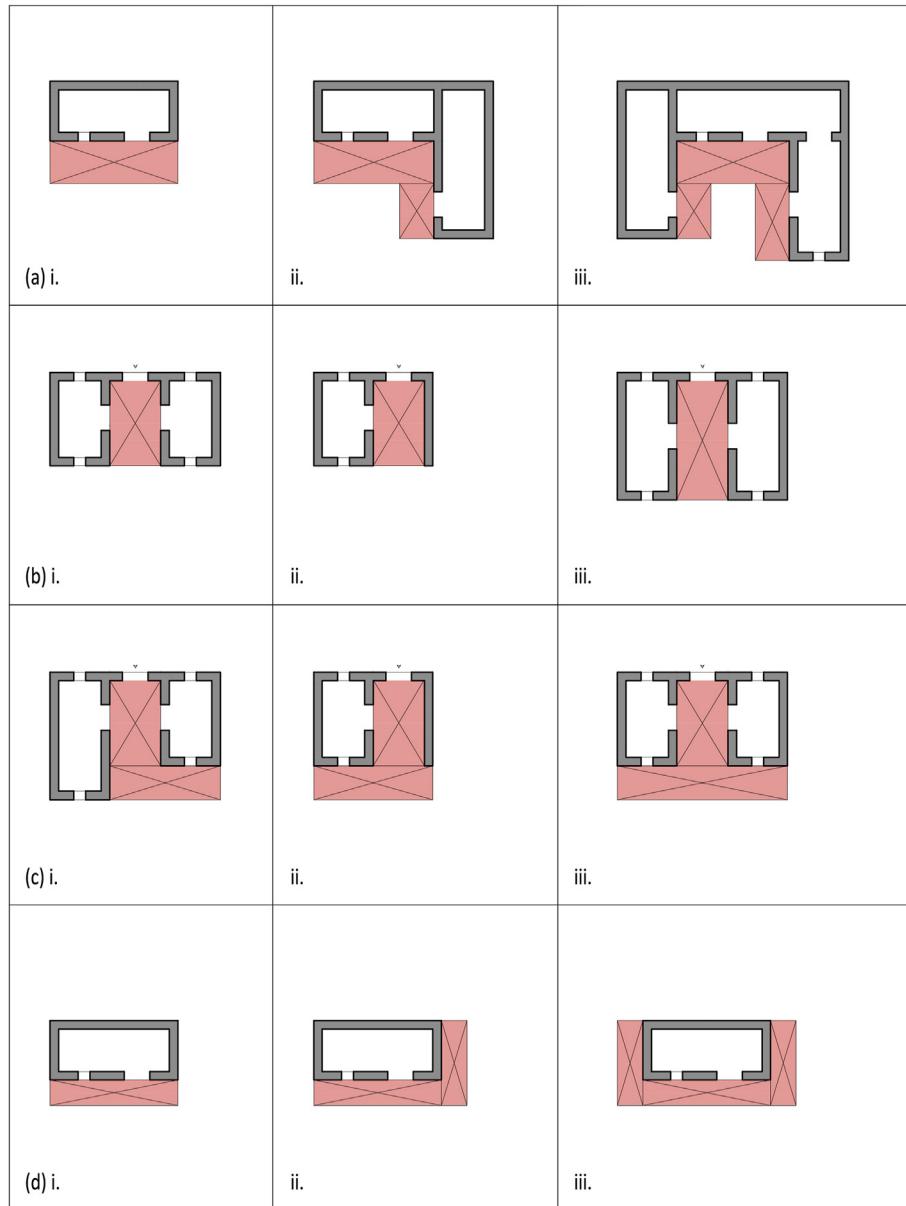
through space ( $3\text{ m} \times 5\text{ m}$  up to  $7\text{ m}$ ). It appears at the main part of the dwelling facing the street. The *portico* is permanently open only on one of its small sides. More specifically, its back side towards the internal courtyard is open, while its front side towards the street is configured by compact masonry and a double timber door forming the main entrance of the dwelling from the street. This space mainly acts as a transitional space, i.e., an entrance and circulation space, connecting the public street directly to the internal courtyard and indoor spaces of the dwelling. Other functional features, such as the staircase (Fig. 7b), are commonly placed within the *portico*, indicating the enhanced response of the space to transitional purposes. The front side of the *portico* ensures privacy when the entrance door is shut, or views and interaction with the public sphere when the door towards the street is open. This spatial feature, which is based on the principle of inter-relativity, space adjacency and complexity reflects the interaction of the users and their needs.

Since the end of the 19th and beginning of the 20th centuries, the *portico* has been widely integrated in the design of dwellings in urban regions, as well as in rural areas situated close to the urban regions. This is mainly due to prevailing planning and design trends, which led to the siting of the building volume at the street front. The *portico* turned into a dominant special element used mainly to provide direct access from the public area to the indoor spaces and the courtyard. The frontage of this space towards the street and the courtyard, as well as its decorative elements, often express the social and financial status of the owner. The *portico* is usually arranged between two main indoor living spaces and less often an indoor space is attached only on one side of the space (Fig. 8 b). In this way, the *portico* becomes a vital space of the dwelling, forming a linking space between the street, the main living spaces and the courtyard.

Free-standing *porticos*, mainly of a small size (almost square in plan), i.e., with no connection to indoor rooms, are not uncommon, especially in the rural coastal vernacular architecture where the building volume of the dwelling is mainly attached to the rear of the land and not to the street front as in the case of the urban and semi-urban vernacular architecture.

It is interesting to note that in some cases the semi-open spaces of the *iliakos* and the *portico* can be found in a combined form leading to a more complex space arrangement (Figs. 6 and 7 c, 8 c). These spatial arrangements and relationships satisfy the needs of their inhabitants in terms of hosting diverse activities and functions, thus underlining the strong link between traditional spacial design and socio-cultural aspects.

In the mountainous region, i.e., Askas settlement, semi-open spaces can be found in the upper-floor levels which serve the main living functions of the dwellings (Figs. 6 and 7 d, 8 d). They appear either in the form of *iliakos*, or more frequently as extended covered balconies (*hayiati*) (Fig. 9). Balconies very often appear in cantilever form and more rarely additional vertical elements support their structure (Fig. 9). The appearance of such spaces in the coastal and rural lowland regions is rather sparse. These balconies are found mainly along the front elevation of the dwelling. It is interesting to note that despite the cultural background of the local people which enforced the concept of introverted design to ensure high levels of privacy and security, these semi-open spaces face the public street, exhibiting an extroverted design model. This oxymoron can be explained by the fact that these features are not considered as places for social interaction, which is indicated from their rather limited width. Nevertheless, these spaces allow views and informal observation of the public space. It is noted that the main use of these spaces is related to agricultural activities such as crop drying. Generally, the appearance of



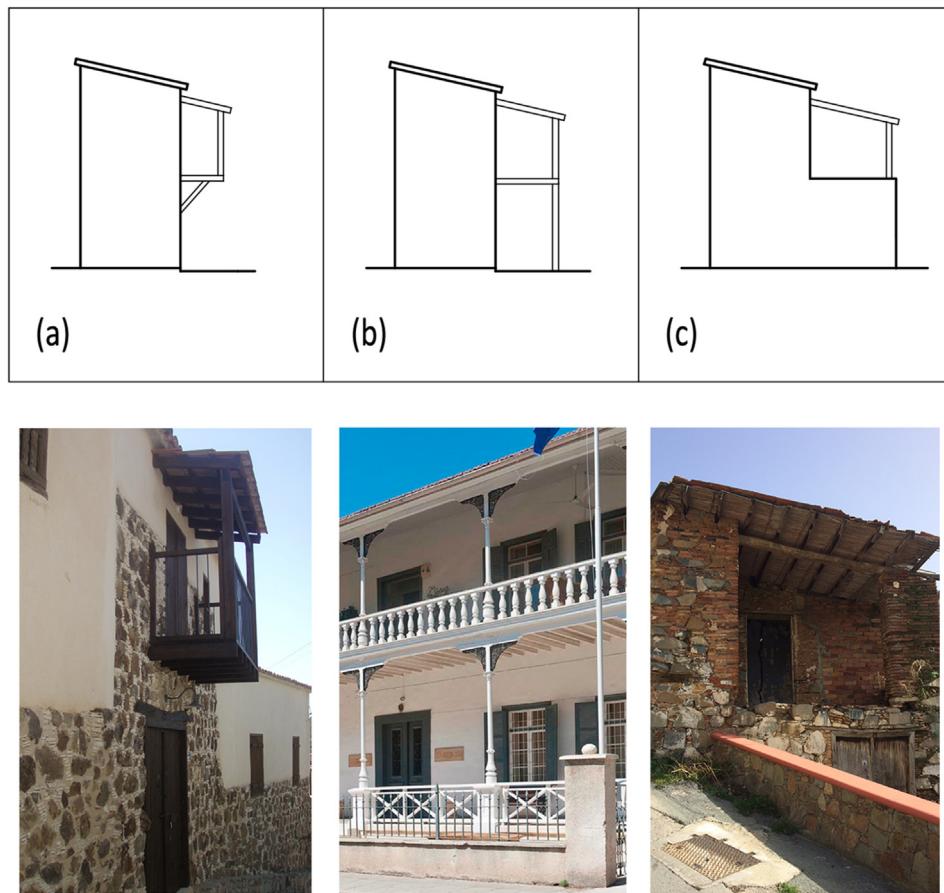
**Fig. 8** Different arrangements of semi-open space typologies i.e., (a) *iliakos*, (b) *portico*, (c) combination of *iliakos* and *portico* and (d) *hayiati/balcony*.

the vast majority of semi-open spaces in the upper floors in the mountainous region is due to the limited availability of land and the fact that ground-floor rooms had a secondary use, e.g., storage and shelter for livestock.

Apart from the *hayiati*, another distinctive semi-open design feature mainly found in the mountainous regions is the so-called entrance-*stegadi*, i.e., a lightweight covered porch attached to the main entrance space facing the street (Fig. 6). The entrance-*stegadi* is shallow in plan and is characterised by a limited length. It acts as a protected space prior to the main entrance of the dwelling. Despite its limited size, the entrance-*stegadi* also provides space for storage (e.g., of firewood), and for cooking. Indeed the traditional oven for cooking was often located in this space. This underlines its multi-functional character and ability to optimise the use of space. One could claim that the

entrance-*stegadi* is mainly used for functional purposes and activities, although it also provides a point of informal meeting and interaction with neighbours and others.

Another semi-open space type based on the classification of the current study, is the plant-covered *pergola*, which is quite common in all three of the climatic regions examined (Fig. 6). The plant-covered *pergolas* in the form of free-standing deciduous vine *pergolas* are located either in the internal courtyard of the rural lowland and coastal dwellings, or on top of the flat roofs in the dwellings found in the mountainous settlements. Based on the sample investigated, vine *pergolas* are primarily identified in the mountainous region. However, according to relevant references (Philokyprou et al., 2017a; Sinos, 1976) and archival photographs, vine *pergolas* constitute common design elements of the vernacular architecture in all



**Fig. 9** Different types of elevated semi-open spaces, i.e., (a) *hayati/balcony*, (b) *hayati* and (c) *iliakos*.

climatic regions and topographies of the island. Nevertheless, the lack of preservation and maintenance, as well as the rapid change of the lifestyles and needs of inhabitants, led to the gradual decrease in the appearance of this semi-open space type. Vine *pergolas* have been used for both household and social activities (i.e., sitting, dining and resting for family members), as well as social gatherings with guests. This design feature also empowered the role of the courtyard as the cornerstone of the traditional dwelling.

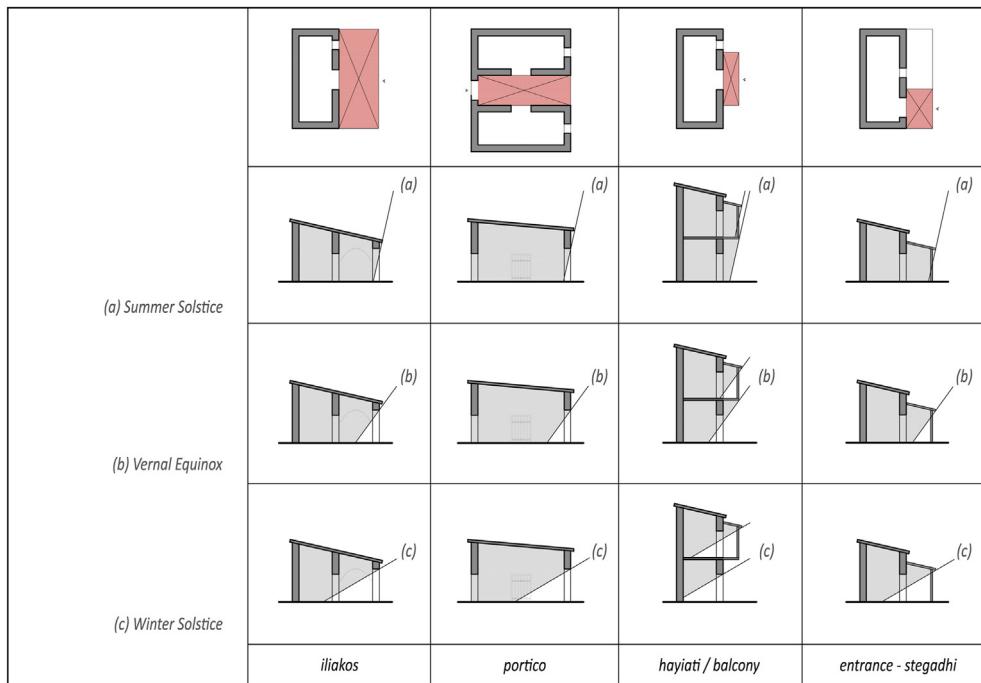
### 3.4. Bioclimatic design of semi-open spaces in varying climatic regions and topographies

The analysis of the research results indicates that the dominant different typologies of semi-open spaces identified in vernacular residential architecture across the various climatic regions of the island are strongly connected to environmental aspects by way of exploiting the desirable attributes of the climate and offering protection from the undesirable ones.

In the lowland region – where solar control and mitigation of temperature extremes is of significant importance due to high temperatures and intense solar radiation during summer periods – shaded and naturally ventilated semi-open spaces in the form of *iliakos* are widely employed as passive cooling design features (Fig. 6). Additionally, the *iliakos*, situated

mainly at ground-level, enables inhabitants to conduct various activities in a naturally lit space, away from the dark and unlit interiors. During warm climatic conditions, which last most of the year in lowland areas, occupants could enjoy the favourable microclimate of the *iliakos*. The *iliakos* often constitutes a high-ceilinged space, which, due to hot air rising to the roof space, allows air thermal stratification within the space, and thus offers better thermal comfort conditions during the hot summer period.

The research results of the current study have shown that the majority (often more than 50%) of semi-open spaces in the form of *iliakoi* in the lowland region are oriented towards south, east or southeast. The east *iliakos* is exposed to the morning light, stimulating the circadian rhythm of the inhabitants. The south or southeast *iliakos*, due to its shallow plan (i.e., approximately 3 m deep), allows for maximum exploitation of solar heat gains during the heating period when the solar latitude angle is lower, and efficient solar control during the cooling period when the latitude angle is higher (Fig. 10). On the other hand, the prevailing west winds of this area did not seem to affect the orientation of the *iliakos*. Despite the fact that the preferred orientations of the *iliakos* are definitely linked to bioclimatic concerns (solar latitude angle), other parameters such as the topography, the built fabric pattern, the direction of the streets, the shape, size and orientation of



**Fig. 10** Solar altitude angles at solar noon for 36° north latitude (36° N) on (a) Summer Solstice, i.e., June 21st, (b) Vernal Equinox and Autumnal Equinox, i.e., March 21st and September 21st respectively and (c) Winter Solstice, i.e., December 21st.

the plots, significantly affect the spatial arrangement and orientation of the *iliakos*.

In the coastal region, where ventilation is a design priority due to the high humidity levels, a widespread use of the *portico* is observed (Fig. 6). Its plan layout – double-side openings at its opposite ends and high floor-to-ceiling height – allow for effective shading and enhanced natural cross-ventilation, leading to the reduction of high temperatures and to the removal of high humidity levels. The investigation regarding the *portico* did not show any trends in terms of orientation, which can be attributed to the fact that the thermal performance of the *portico* is less dependent on its orientation (Fig. 10). In addition, the direction of the prevailing winds did not play any significant role on the layout and orientation of the *portico*. More specifically its geometry, i.e., its deep plan layout, restricts the penetration of sunrays within the space. Thus, other parameters such as the built fabric pattern, the direction of the streets and the shape, size and orientation of the plots, seems to have more impact on the orientation of the *portico* compared to the *iliakos*.

In the mountainous region, the primary importance of maximising solar radiation and protecting against rain due to the cold and wet winters, explains the predominance of the *hayiati/balcony* and the *entrance-stegadi*; rather shallow spaces compared to the *iliakos* (Fig. 6). The appearance of the *hayiati/balcony* in the upper floor of the dwellings, and the terrace/split-level configuration of the buildings, derived from the sloped terrain allowing for the maximum exploitation of solar heat gains during the heating period. In addition, the limited width of the *hayiati/balcony* allows for maximum solar penetration to the indoor spaces' underneath (Fig. 10). It is noted that the main function of the *entrance-stegadi* is related to the need for

providing adequate protection to the front door from rain and snow, rather than from solar gains.

Deciduous vine *pergolas* are found in the internal courtyards mainly of lowland and coastal areas, or on top of flat roofs in the case of the mountainous region, offering an environmental response throughout the entire year (Figs. 6 and 2). More specifically, vine *pergolas* provide adequate shading and cooling via evapotranspiration of leafage during the cooling period, while at the same time, they allow solar penetration during the heating period. The shading provided by the vine *pergolas* reduces the heat absorbed by the roofs' or courtyards' materials and minimises glare issues. In this way, the vine *pergola* becomes a microclimatic regulator of the courtyard's microclimatic conditions. The preference of vine *pergolas* compared to other permanent semi-open spaces in the mountainous region may be linked to the importance of solar exploitation in the specific climatic region.

### 3.5. Dominant building techniques and morphological features of semi-open spaces

The building techniques and materials used in the construction of semi-open spaces, as well as their morphological features, vary across the different regions of the island. This variation is attributed to locally available building materials, structural concerns and the know-how of builders in each region, in addition to aesthetic and socio-economic aspects.

#### 3.5.1. Vertical support structure

The main building materials used for the vertical support structure of traditional semi-open spaces are natural,

Materiality and form	timber posts	stone-built arch	stone-built opening	stone columns or pillars	fired brick-built arch	fired brick pillars
	Timber		Stone		Fired Brick	
Rural settlements						
Coastal Region	•	••	••	○	○	○
Lowland Region	•••	○	••	○	○	○
Mountainous Region			•		•	•
Urban and semi-urban settlements	••	•••	••	•	○	○

frequency: ••• very often; •• often; • sometimes; ○ rarely

Fig. 11 Different materiality and form of semi-open spaces.

locally sourced and climatically suitable, e.g., timber, stone and brick (Fig. 11). The use of local materials reflects the eco-friendly concept and approach of vernacular architecture. Timber is found in different frequencies in all three examined regions, while stone appeared in lowland and coastal regions, whereas traditional fired brick is almost exclusively used in the mountainous region. The traditional semi-open spaces of Cyprus are generally characterised by small-scale structures and simplicity in terms of construction techniques.

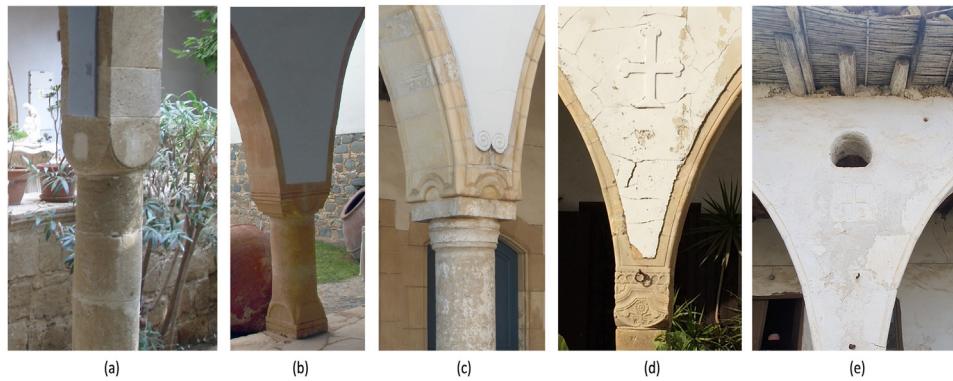
More specifically, in the coastal and lowland regions, the *iliakos* is mainly configured by one arch or a series of stone-built arches forming arcades, which creates aesthetic appeal and in environmental terms, increases shading patterns (Figs. 11 and 12 a, b). The *iliakos* is most commonly configured with two pointed or circular arches and more rarely with additional arches. In some areas of the island, semi-open spaces with three or more arches have appeared, giving an elaborate appearance to the dwellings. It is interesting to note that the appearance and decorative elements incorporated in semi-open spaces, and especially in the columns of the arches, constitute an important aspect of the construction of the *iliakos*, indicating at the same time the wealth and socio-economic status of the dwelling owners (Fig. 13). Very rarely the *iliakos* appears as

a colonnade, configured with stone pillars instead of arches in lowland regions. Light-coloured, easy-to-work sedimentary stone that reflects solar radiation is mainly used for the construction of arches and pillars. In these regions, timber post structures forming an *iliakos* are not uncommon. At a certain height on these timber posts, horizontal and sometimes additional inclined timber brackets are inserted to enforce structural stability.

Timber post structures appear either on the ground-floor (Fig. 12 e), or more frequently on the first-floor level of dwellings. This is for structural reasons, as their lightweight construction reduces the load of the structure (Fig. 12 f, g). As previously mentioned, the *iliakos* could extend along both the ground- and first-floor level of the dwelling. In this case, the *iliakos* could either be formed by timber posts (Fig. 14 a), or stone-built arches on both floor levels. More often, in lowland areas, the *iliakos* could be formed by arches or more rarely by pillars made of stone on the ground-floor level and by timber posts on the first-floor level (Fig. 14 b, c). The *iliakos* in the mountainous region, as a rule, follow a simpler construction. It is mainly constructed by one or more timber posts, while brick pillars or low bow brick arches appear only in a limited number of cases (Fig. 11). The local dark-coloured igneous stone of the mountainous region was not used as a building material



Fig. 12 Different typologies of semi-open spaces, i.e., (a) and (b) *iliakoi* with one or two arches, (c) and (d) *porticos*, (e) *iliakos* with timber posts, (f) and (g) *hayati/balcony* and (h) planted *pergolas*.



**Fig. 13** Decorative elements of the columns supporting arches of semi-open spaces.

for the construction of arches or pillars, as it is hard and difficult to carve.

The opening of the *portico* towards the courtyard in the coastal and lowland regions often incorporates a stone-built arch (Fig. 12 c, d), similar in construction to those of the *iliakos*; whereas in the mountainous region its opening is constructed by a main timber beam, seated on the building's masonry (Fig. 11). The supporting structure of the *hayati/balcony* consists of horizontal timber brackets that rest on the traditional masonry. The inclined roof of the *hayati/balcony* is supported by a series of timber posts (Fig. 12 f, g). It can be noted that generally the structure of all the upper-level semi-open spaces are mainly made up of vertical timber elements. The entrance-*stegadi* is, as a rule, a lightweight structure that incorporated supporting timber elements. *Pergolas* constitute the only lightweight semi-open structure of vernacular dwellings usually made of metal elements (Fig. 12 h).

One of the key features of the construction of semi-open spaces is the embellishment of the structural components. For example, notable decorative elements and characteristics are identified in the construction of the stone arches of the *iliakos*, where special care was given to the columns supporting the arches. The timber brackets of the *hayati* and the *iliakos* are also often carved and decorated. The carving designs are mostly based on organic or geometrical forms, as well as on religious patterns (Fig. 13). These embellishments, which created visual interest and enhanced aesthetic value, also reflect the lifestyle, customs and religion of the locals, as well as the socio-economic status of the owner. Of special interest is the appearance of small circular, and more rarely, square

openings in the space between the two arches of the *iliakos*. These openings either serve ventilation purposes or create a space for the insertion of domestic items (Fig. 13 e). Nevertheless, these openings create an elaborate and interesting appearance on the facades of the *iliakos*.

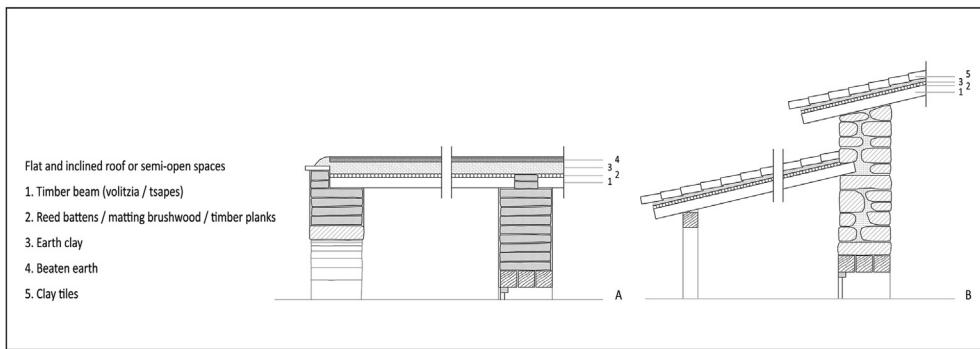
### 3.5.2. Roof structure

The roof structure of semi-open spaces follows the same form and construction as the roof structure of the indoor spaces of the vernacular dwellings. The roofs of the semi-open spaces in the coastal and lowland regions are usually flat with a very slight inclination for water drainage. Considering the limited amount of precipitation in coastal and lowland regions, flat roofs form an appropriate design solution for these climatic areas. In mountainous regions, the predominant roof structure design features inclined roofs with large inclination angles and wide projected roof eaves, which effectively address heavy rain and snowfall.

The building materials used and construction techniques followed for the horizontal support structure of semi-open spaces are similar to those implemented in traditional indoor space roofs and show similarities between the varying climatic regions (Figs. 9–11, 13 e). The main materials used are timber, clay and ceramic tiles. Flat and tiled inclined roofs are multi-layered. Timber rafters, locally called *volitzia* or *tsapes*, are seated on a main timber beam, locally called *nefka*, or on stone arches which form the open end of the semi-open space. As a rule, the roof is supported by timber rafters covered with reed battens, matting brushwood or timber planks, earth clay and an additional layer of clay tiles for protection from rainy and snowy weather conditions (Fig. 15). Flat roofs follow similar



**Fig. 14** Two storey semi-open spaces with different materiality and form.



**Fig. 15** Structural section details of flat (A) and inclined roofs (B) of semi-open spaces.

structural techniques and construction details, without the upper layer of ceramic tiles (Fig. 15). In order to protect the roof from water, a thick layer of beaten earth is added seasonally. Due to the earth mass, the roofs are characterised by a high thermal mass that provides thermal stability and helps towards the maintenance of interior temperatures at a comfortable level during the hot summer period.

#### 4. Discussion

The above analysis of the traditional semi-open spaces found across varying climatic regions and topographies of the island, reveals that the architectural typology, form and constructional aspects of these spaces are fully in line with the everyday activities of the inhabitants, as well as with local environmental characteristics (Table 5). Indeed, the varying types of semi-open spaces are efficiently designed to respond to the specific needs of the users depending on the varying regions of the island and their different climatic and geomorphological conditions. These findings are in line with the work of other researchers (GhaffarianHoseini et al., 2014; Oliver, 1998; Rapoport, 1983), who claim that traditional built forms help in providing thermal comfort, high efficiency of space use, social vitality etc. The existence of these spaces in the residential architecture of various periods since antiquity and the high frequency of their appearance in traditional dwellings all over the island shows the continuation of lifestyle habits, as well as the ability of such spaces to adapt to the local context.

All types of semi-open spaces found in the vernacular architecture of Cyprus (as shown in Table 5) serve various functional (transitional, household, agricultural), socio-cultural, emotional, psychological, aesthetic and environmental purposes. More specifically, in view of the socio-cultural values of the island, the need for social gatherings, privacy and security also has a major impact on the design of semi-open spaces. The above demonstrates that the spatial configuration of semi-open spaces clearly mirrors the cultural background of the locals. Regarding their function, the multi-functionality of the spaces – which serve various activities and circulation purposes – as well as their practicality, also plays an important role in the arrangement of semi-open spaces. Psychological needs such as observation and visual connection with the public

sphere, proximity to nature and the elements and the feeling of being protected, are also satisfied by the design of the specific spaces. In terms of environmental values, the concept of utilising natural resources, as well as the incorporation of various passive cooling and heating strategies which are fundamental for creating sustainable and thermally comfortable living environments, are significant factors affecting the design of semi-open spaces.

Interpreting the research findings, it is evident that traditional semi-open spaces are widely employed throughout the island. However, their typology, spatial arrangement, construction, orientation and size vary greatly, allowing them to adapt to different parameters in terms of settlement planning, building design patterns, climatic conditions, availability of resources, household activities, agricultural needs, as well as to the socio-cultural context of their inhabitants. In addition, aesthetic concerns, as well as technical and economic factors also influence the design and construction of semi-open spaces.

The predominance of particular traditional semi-open typologies in different climatic regions of the island reflects the awareness for the creation of site-, climate- and culture-specific spaces. Generally, semi-open spaces are more widely applied in the lowland region compared to the coastal and mountainous regions, due to climatic conditions (i.e., harsh summers), thus ensuring suitable living spaces for their inhabitants. The *iliakos* is the most prominent semi-open typology in the lowland region, which reflects the importance of privacy, social interaction and exchange, family intimacy, aesthetics, contact with nature, shading and daylight penetration (Ministry of Interiors, Department of Town Planning and Housing, 2005). The *portico*, which prevails in the coastal regions, is linked to accessibility, circulation and environmental aspects. It is noted that the application of the *portico* is particularly effective in terms of natural cooling, allowing significant cross-ventilation possibilities. The entrance-*stegadi* and the *hayati*/balcony which predominate in the mountainous region embody functionality, interaction with the public sphere and environmental significance, allowing solar gains and daylighting, as well as offering protection from the rain. Moreover, the materials used in the specific semi-open spaces are closely connected with the rocky environment of the mountainous region where there is an abundance of timber and a lack of sedimentary rocks.

**Table 5** Table showing the incorporation of different functions and activities (environmental, socio-cultural, functional, psychological, aesthetic) in different types of semi-open spaces.

	<i>iliakos</i>	<i>portico</i>	<i>stegadi</i>	<i>hayiati</i>	<i>vine pergola</i>
<b>Environmental</b>					
Protection against intense solar radiation (shading)	●●●	●●●	●	●	●●
Protection against high summer temperatures (evapotranspiration, shading)	●●	●●●	●	●	●●●
Protection against high humidity levels (ventilation, cross-ventilation)	●●	●●●	●●	●●	●●●
Exploitation of solar radiation (direct solar heat gains)	●●	●	●●	●●●	●●●
Protection against rain	●●●	●●●	●●●	●●●	○
Protection against cold winds	●●	●●●	●●	○	○
Daylight access/filtering	●●●	●	●●	●●●	●●●
Thermal stability (thermal mass materials, high degree of enclosure)	●●	●●●	●	○	○
Use of natural and recyclable materials	●●●	●●●	●●●	●●●	—
<b>Socio-cultural</b>					
Social gatherings (events, religious celebrations, female interaction)	●●●	○	○	○	●●●
Family gatherings (sitting, eating, resting, sleeping, chatting)	●●●	●●	●	○	●●●
Security	●●●	●●●	○	○	●●
Privacy – control over social interaction	●●●	●●●	○	○	●●
Social-economic status of the owner	●●●	●●●	○	○	●
<b>Functional</b>					
Household activities (cooking, weaving, washing, clothes-drying)	●●●	●	●●●	●	●●●
Agricultural activities (crop drying, storage of crops)	●●●	●	○	●	●●●
Shelter for livestock	●●	●●	●	○	○
Entrance to the private property	●	●●●	●●●	○	○
Circulation (horizontal and vertical)	●●●	●●●	●	●	○
Storage space (firewood)	●●●	●●●	●●●	○	○
<b>Psychological, Emotional, Spiritual</b>					
Views (observation and supervision)	●●	●●	●●	●●●	●●
Proximity to nature (planted courtyard and sky)	●●●	●●●	○	○	●●●
Reduction of noise impact	●●	●●●	○	○	●
Feeling of being enclosed	●●	●●●	●●	○	●
<b>Aesthetic</b>					
Elaborate appearance	●●●	●●	○	●●	○
Decorative effect	●●●	●●	○	●●	○
Embellishment of structural components	●●●	●●●	○	●●●	○

Frequency: ●●● very often; ●● often; ● sometimes; ○ rarely.

**Table 5** shows that the *iliakos* compared to all other semi-open spaces under study, better satisfies most of the environmental, socio-cultural, functional, psychological and aesthetic values, and is the most popular and widespread type of semi-open space on the island. The socio-cultural needs of the inhabitants are very successfully satisfied, not only through the use of the *iliakos* but also through the use of *vine pergolas*, especially in mountainous areas where the number and size of other semi-open spaces is rather limited compared to other regions. The rather spacious layout of the two above-mentioned types of semi-open spaces, i.e., *iliakos* and *vine pergolas* could easily host a number of household and agricultural activities, while at the same time satisfying the need for social gathering. According to the functional significance of the different types of semi-open spaces, it is clear that the *iliakos* and the *portico* – closely connected with the indoor areas of the dwellings – have an important role as

transitional spaces, thus playing an essential role within the structure of the traditional dwellings.

On the other hand, the psychological, emotional and spiritual needs of the inhabitants are satisfied in a different way in all types of semi-open structures under study. For example, the *hayiati/balcony* offers views towards the street and the surrounding environment, whereas the *iliakos* and the *portico* satisfy the feeling of being enclosed, while at the same time being in proximity to nature. The proximity to nature is even better satisfied by the *vine pergola*, as this structure is placed in the central area of the courtyard in very close proximity to the plants.

According to the external appearance of the various types of semi-open spaces, the *iliakos* and the *hayiati/balcony* have the more elaborate aesthetic impact on the dwellings, offering a decorative embellishment effect. It can be noted that the *iliakos* with the pointed arches constitutes one of the most elaborate features of

vernacular dwellings all over the island and is connected with the wealth of the inhabitants as its structure often requires the transportation and carving of appropriate sedimentary stones. While the *iliakos* can be only accessed through the internal courtyard, having thus an introverted character, the *hayiati/balcony* lies at the exterior face of the first floor of the dwellings, thus exhibiting an extroverted character. The exposure of the *hayiati/balcony* towards the public street makes it one of the most important elaborate features of vernacular mountainous dwellings.

The study claims that the limited incorporation of semi-open spaces in recent contemporary architecture can be related to a decrease in the prioritisation of creating pleasant natural environments in contemporary buildings and dwellings. In order to enhance the quality of life and user satisfaction, an understanding, evaluation and consideration of semi-open spaces as a vital design element is recommended by architects and designers to effectively address environmental aspects and functional needs, as well as the lifestyle and cultural backgrounds of the inhabitants. However, it is important to note that contemporary lifestyle in Cyprus and other countries in the Eastern Mediterranean region is now influenced by the western culture and way of living. From this perspective, traditional values are systematically questioned, and it is therefore important to start from an approach that is based on the re-integration of these values into domestic architecture, by critically re-thinking the current social, cultural and environmental context. Based on this, the integration of the values of semi-open spaces, in terms of the social, cultural and environmental context is of vital importance, both for the rehabilitation of traditional dwellings, as well as for the development of contemporary Eastern Mediterranean architecture.

## 5. Conclusions

Following a holistic approach, this study identifies and evaluates the positive attributes of the semi-open spaces of the vernacular residential/domestic architecture of Cyprus in varying climatic regions and topographies. The methodology followed was based on the connection between the settlement planning and design patterns, topography, architectural form and construction of semi-open spaces, as well as their spatial relations with outdoor and indoor spaces, as well as the lifestyle, customs and needs of the occupants. The multidisciplinary approach followed can also be useful for the investigation of the semi-open spaces of other areas. This will allow for a more comprehensive investigation, which will lead to further results and concrete conclusions regarding the significance of semi-open spaces to living and environmental conditions of dwellings in the vernacular architecture of the boarder Mediterranean area.

The research findings highlight that traditional semi-open spaces are closely linked to socio-cultural, psychological, environmental and aesthetic values. The prevailing architectural forms and constructions of such spaces was found to be varied between the lowland, coastal and mountainous regions, allowing them to relate and adapt to the local resources, climate, terrain and the specific household, social and agricultural needs of the locals, thus

underlining their locus-specific conception. The diversity of semi-open spaces in terms of architectural forms and construction even in the same climatic area, offer the inhabitants the possibility of selection and adaptation.

The research findings offer a deep understanding of the multiple functions of semi-open spaces in the domestic sphere. The study further underlines the usefulness of investigating and conducting further research on how the traditional design of semi-open spaces can be introduced and adapted in the contemporary architecture of the Eastern Mediterranean region. It is thus clear that the integration of these structures in contemporary domestic dwellings will have environmental and cultural benefits for society as a whole.

## Conflict of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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