

Wind and the villages in Rincón de Ademuz, Spain

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Abstract

This study focuses on a sustainable system which makes it possible for the villages in the region of Rincón de Ademuz to have stood within their natural environment for over two thousand years. For this analysis the study has focused specifically on the wind factor. The dry weather and the wind trajectory make it possible to create a comfortable living environment in the villages. This research analyzed the position of a building unit in order to offer a clear representation of the relationship between wind and these villages.

Keywords: Sustainable system; Micro-climate; Comfortable environment;

1. Introduction

The purpose of this article is to try and explain the conditions in which building complexes control wind, creating a comfortable environment in a given village. The villages studied, located on mountainous terrain in the region of Rincón de Ademuz, have not altered their original form because of limited land use, even after the civil war and the villages continues to be inhabited (Rodrigo, 1998). The difference between suburban new towns and vernacular villages is that new towns are based on regional policy, whereas vernacular villages have been built up by the inhabitants themselves over many years. Their trial and error and extensive feedback have shaped the village in its current form (Mileto, Vegas, 2006; 2007; 2008). Therefore the traditional village is not decided by a single top-down regional policy (Alexander, 1966). This study focuses on vernacular buildings, found in large numbers in villages. In turn, these vernacular buildings incorporate interconnected dwellings, designed to take wind into account.

2. The method of research

Initial fieldwork was carried out in the villages of Torrebaja, Casas Bajas and Castielfabib to give an accurate account of their present condition. The villages are composed of dwellings, different facilities and barns. Thus, the type of building and the position of public facilities such as the church, village hall, bar, and pharmacy were researched. In addition, water places (fountains, laundries, etc.), benches, and trees in public space were plotted. Supplementary interviews carried out with inhabitants who still remember past conditions in the villages provided valuable information on how the inhabitants use the central square at each time and in each season.

3. Composition of villages

The three villages studied, Torrebaja, Casas Bajas and Castielfabib, are built on different types of terrain, influencing how the buildings are built in each location. Basically, buildings built on flat land are composed as blocks, defined as “block units” in this study. Buildings are also built

continuously along the street. Some give onto two different streets and are defined as “line units”. This is particularly apparent in the case of Torrebaja, built on flat land. The streets are straight, forming block units and long line units. In contrast, where buildings are built on sloping land four or five buildings are connected to compose short line units, as in the case of Castielfabib. One of the main reasons for this difference is the way in which the inhabitants walk through the streets. It is easy to build straight streets on flat land. However, on sloping land steps or sinuous streets are needed to climb the slope. This is why the inhabitants built the way they built, incorporating short lines of buildings and sinuous streets. Another reason for these sinuous streets may have been the need for protection from enemies. Villages were built on the mountain for protection, despite the difficulties entailed.

Torrebaja is on flat land, Casas Bajas is halfway up a mountain and Castielfabib is on top of the mountain. If focusing on each village in detail the different locations should be considered. For example, dwellings in mountainous terrain are built on sloping land in Torrebaja. Some buildings built around the central square are on the flat land in Castielfabib. In these villages the buildings have different positions, as detailed below.



Fig. 1. Torrebaja

The eastern parts of the village are on flat land in Torrebaja. Some dwellings are built as block units while others are built as long line units along the straight wide streets. The streets to the east of the village are narrower than the others due to the difference in the level of the terrain,

which makes it difficult to build a block. In the western part of the village there are two flights of steps. The sinuous streets and buildings in short lines are due to its proximity to the mountain.



Fig. 2. Casas Bajas

Part of Casas Bajas was built halfway up the mountain; the southern part is on flat land close to the river, whereas the northern part is built on the mountain slope. Therefore, Casas Bajas is characteristically a mix of flat and sloping land. There are no clear lines separating the two locations but there are some dividing features. The streets are straight on the flat land toward the mountain, where locations are changed. The buildings are connected to form long line units in the west part of the village. Some units give onto two streets with an inner courtyard, typical of buildings built on flat land. Here there are no differences in level and the village spreads further up the slopes.



Fig. 3. Castielfabib

Although Castielfabib is built on the mountain there are relatively few sets of steps. Unlike Casas Bajas, the central square of the village is surrounded by sinuous streets. The west part of Castielfabib is new, as can be seen from the

presence of steps, which are considered a more modern way of configuring the village than sinuous streets. On the other side of the village there is flat land around the central square. The single block unit found in the east of village indicates that this is where the village began to grow. It is therefore essential to focus on the detail of each building location, as this provides information on the construction of buildings complexes in villages.

4. The zoning of the villages

Like trees, the non-dwellings also work as windbreaks. In the case of Torrebaja, the non-dwellings are located in the northern part of the village, protecting the village from the cold northern wind. It is particularly cold in the villages located on flat land, where the cold air stays on the flat terrain and reduces the temperature of the ground. Therefore, the inhabitants need to protect themselves and their village. In the past, inhabitants built a door on the street on the north side of the old part of the village. Although these doors have now been

removed, they were mentioned repeatedly in interviews. Currently there is no need for a door on the street outside the town walls. However, in this case, a door is normally not a protection against cold wind, but a weak point, a possibility for the cold wind to enter the dwellings. And it is clearly divided the space between living quarters and the cultivation zone. For the same reason the non-dwellings create line units in the north part and on the mountainside in Casas Bajas. They are especially found on the northeast side, in the older area of the village, just as in Torrebaja. However, the case of Castielfabib is different as it grew around a castle found there in the past, alongside a castle wall. The village was designed for protection against the enemy. There are only a few non-dwellings in the village, some of them in the northern part. However, they do not appear in line units unlike in Torrebaja and Casas Bajas. Sheds for domestic animals can also be found in Torrebaja. In the western side of the village inhabitants keep cows and sheep. The wind changes direction and blows from the north or south, depending on the season so that the west side is not leeward, protecting the village from

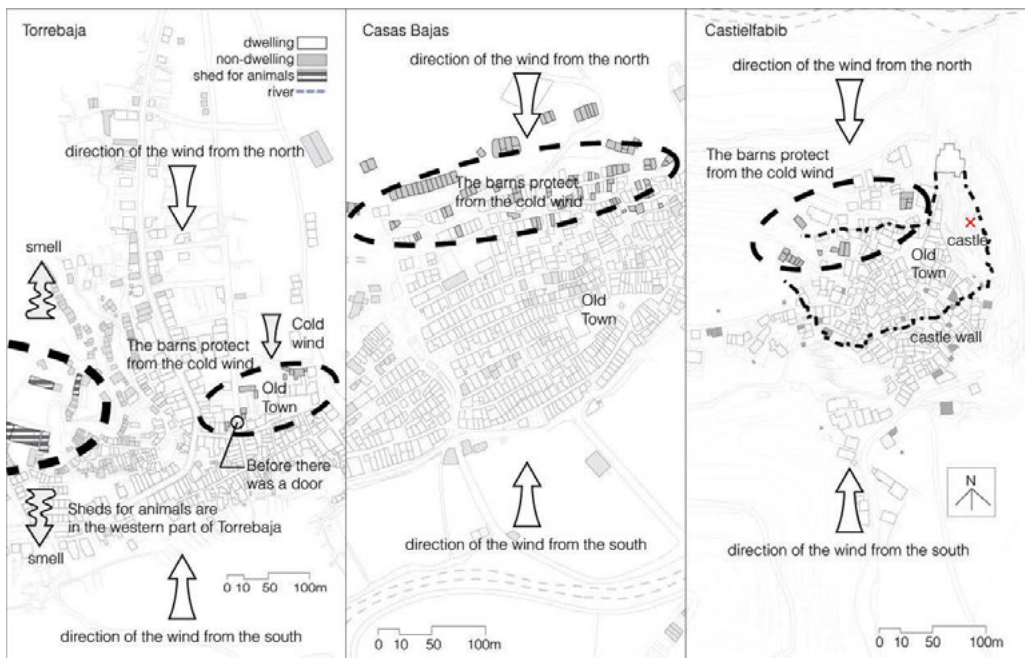


Fig. 4. The zoning of the villages

unpleasant odors. This is presumably the same logic applied in the village of Ademuz where sheds for domestic animals are distributed in the eastern side of the village, despite the difficulties of providing water on the mountainside. However, there are no sheds for domestic animals in the northern or southern parts of the village. The wind has a strong influence on where inhabitants establish buildings for domestic animals. Trees and non-dwellings protect the residential areas in all three villages. In addition, inhabitants take wind direction into account when building sheds for domestic animals in order to avoid unpleasant odors. This is why the composition of the villages and the residential areas can be explained by studying wind direction.

5. The direction of the building units and the wind-path in the village

Rincón de Ademuz is on mountainous terrain and many dwellings are built on slopes. As a rule,

inhabitants build their dwellings parallel to the contours of the slope to avoid construction problems. If they built perpendicular to the contour lines, they would have to dig up more earth. This would require not only special technology, but would also increase construction costs. This is why the dwellings are always built along the contour lines, making the line units follow the slope. When dwellings are built on flat land, the inhabitants build them in streets forming long line units in the village. Some dwellings are built as block units. This is the most noticeable difference between the dwellings on flat land and on sloping ground. However, all the buildings are interconnected and form units, regardless of where they are located. This section focuses on how these units function and adapt to the environment, controlling the wind.

(1) The building unit façades coincide with the wind

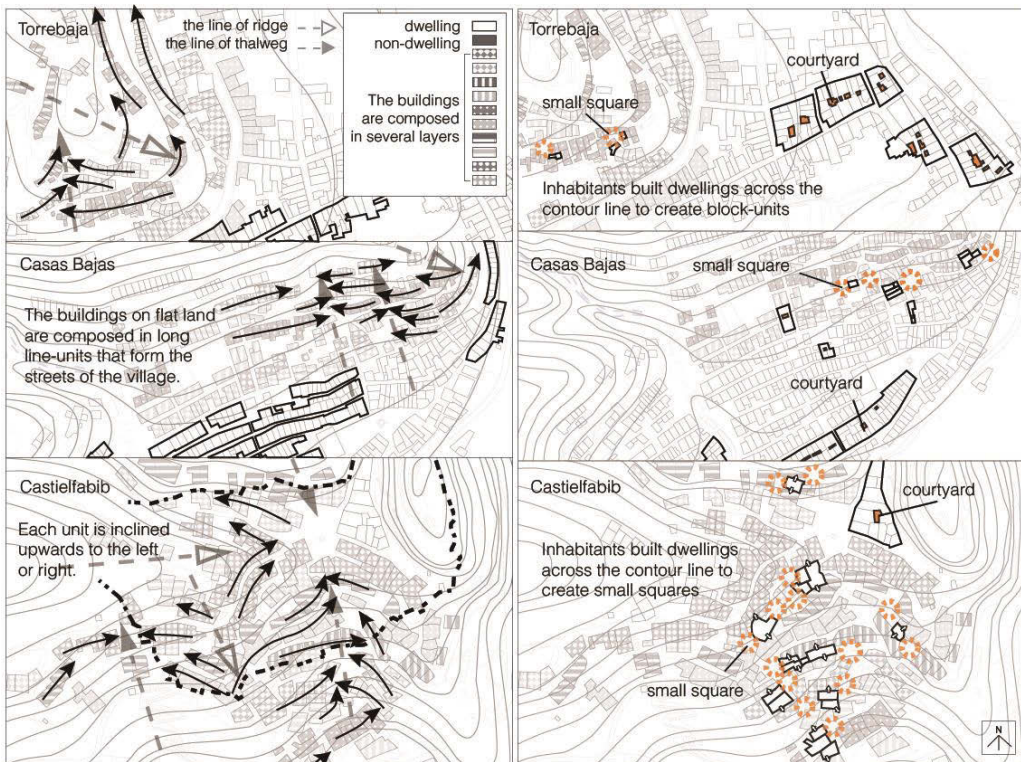


Fig. 5. The directions of the building units and the wind-path in the village

Normally, dwellings compose line units along the contour line in any location although the sizes of the units are different in each location. In general, the units on flat land are composed of more than 10 dwellings in contrast to the units on slopes, composed of less than 10 dwellings. All the villages in Rincón de Ademuz were built on the southern slope of the mountain so that the line units are always south-facing to accommodate the direction of the wind. This in turn allows the line units to "catch the wind" and let it pass through the streets.

In the case of flat land, dwellings are composed in long line units, with streets between them. These line units catch the wind from the south, leading it down the streets. In the particular case of Casas Bajas the line units are built in several layers on a gentle slope to the southwest. This new area is the result of population increase, as the priority was to build a large number of dwellings in a limited area using more modern construction methods.

In contrast, on the slope the composition of line units focuses on irregular forms which are not rectangular. Each unit slopes upwards to the left or right. Theoretically the line units must be connected straight because of construction techniques and, of course, the rectangular shape does make this simpler. However, every building on the slope is constructed in a trapezoidal shape to create curved line units. All these curves follow the contour line of the mountain because of the ridge line and the thalweg. Even in villages on flat land like Torrebaja and Casas Bajas, the ridge line and the thalweg are on the mountainside. In addition, inhabitants passing through the village follow the line of the thalweg, which usually guides them, winding up the mountain. Thus, it can be said that the villages are not only developed on the southern slope of the mountain, but that they also follow the ridge line and thalweg.

Figure 2 shows that depending on the line of the thalweg the line units change direction. As the wind blows through the thalweg it can be seen that inhabitants built the line units to direct the wind along the thalweg. Thus, the inhabitants not only use the thalweg to walk up the mountain, but they also directed the wind to blow through it. The windbreaks in front of the line units are concentrated toward the line of the thalweg. This is most obvious in the case of Castielfabib as there are no buildings that cross the line of the thalweg inside the castle walls.

Thus, the line units on flat land are long, directing the wind down the street. There are two directions of line units on the slope. Each unit slopes upwards to the left or right, creating a front to catch the wind and directing it to the thalweg to pass through the whole village.

(2) Building units built across the contour line to dodge the wind

One of the most important characteristics of the wind is the need for an outlet. In terms of hydrodynamics, for the wind to pass through well, the outlet should be larger than the inlet. However, villages are built outside and the inhabitants efficiently directed the wind through the village, creating outlets everywhere. As each location has its own characteristic way of forming these outlets the analysis focuses on the building units built across the direction of the contour line. In the villages where building units are built across the contour line to create small squares or courtyards, it can be said that dwellings "dodge the wind" creating an outlet for the wind.

In the case of the villages on flat land, inhabitants built the block units across the contour lines on a gentle slope. This is a common way to build dwellings on flat land. In fact, in Castielfabib, there is even a block unit on the flat land on the mountain slope. In general, there are two types of block units. One is the block unit which is almost square, as in

Torre Baja. Another is the block unit composed of several line units, found in Casas Bajas and Castielfabib. The common factor in both these two types is that they have an inner courtyard.

The courtyard functions as an outlet for the wind because of the chimney effect. This is the same system that uses the difference in atmospheric pressure to draw smoke up from a chimney.

In contrast, dwellings built on the slope across the contour line create a small square. Normally, dwellings on the slope are composed in line units along the contour line, as explained in the section "The building unit façades coincide with the wind". Therefore, to create a small square between two line units, inhabitants built some dwellings to connect them. This is why some dwellings are built across the contour line. Three dwellings in Torre Baja and five dwellings in Casas Bajas fit this description. In Castielfabib, there are eight cases of dwellings connected across the contour line to create several small squares inside the village. These small squares - like the courtyards - function as outlets for the

wind. In addition, these small squares also allow sunlight into the dwelling complexes creating comfortable living environments. Furthermore, the sun increases the chimney effect by warming these small squares (Fig.6).

6. Conclusions

In conclusion, the building units have two directions. One of them is when the building units coincide with the wind to "catch" it and direct the wind to the streets and thalweg. The other is when dwellings are connected across the contour line to create courtyards and small squares in the villages. In this case, the units function as outlets to dodge the wind and lead the wind through all the dwellings.

In Rincón de Ademuz the wind blows in a south-north direction. The villages are built on the southern slope of the mountain, facing south, because dwellings need sunlight. The south is also a suitable direction to catch the wind and it is no coincidence that the dwellings face in this direction. This is one of the reasons why the villages have survived up to the present day.

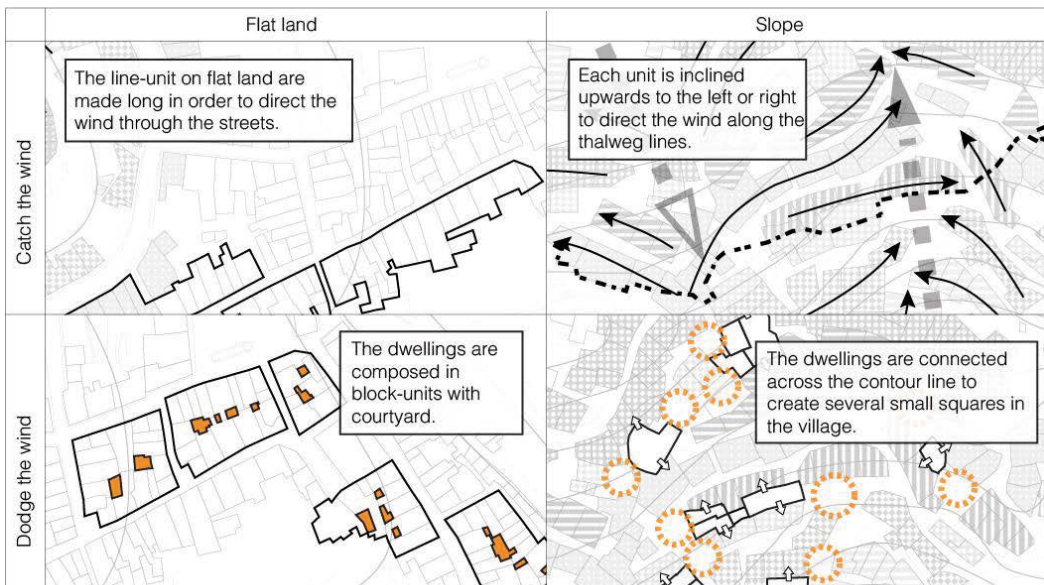


Fig. 6 The directions of the building units and the wind-path in the village

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