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A study into the sustainable system between the wind and the villages in Rincón de Ademuz, Spain

Doctoral Thesis

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Resumen

Este estudio se centra en el sistema sostenible que hace posible que los pueblos de más de dos mil años de antigüedad del Rincón de Ademuz hayan permanecido en el mismo lugar adaptándose a su entorno natural. Con el fin de analizar el sistema sostenible, este estudio se centra en el factor del viento. En función de su corriente, es posible crear un ambiente confortable en las aldeas en un clima tan seco como el del Rincón de Ademuz. El viento ayuda a la eliminación del humo que se crea en las chimeneas de las casas. En aras a aclarar la relación entre el viento y los pueblos, este estudio analiza la relación entre la dirección y orientación de las chimeneas así como la relación que subyace entre el viento y la disposición y orientación del conjunto de edificios que configuran el pueblo. Por ejemplo, existen dos maneras de orientar la chimenea: La primera es cuando ésta encara al viento, esto es, cuando la chimenea está orientada en dirección norte-sur. Considerando que el viento sopla en la dirección norte-sur en el Rincón de Ademuz, esta posición de la chimenea permite que el humo salga de manera más fluida. La otra opción es la chimenea en una posición que sortea al viento, esto es, cuando está orientada en dirección este-oeste. En este caso, la chimenea no está situada según el viento, pero el salón prevé una trayectoria fluida para el viento. Por lo tanto, en este caso se establece la prioridad en el paso del viento a través del salón. En función del viento, las chimeneas se disponen de una manera u otra para una mejor adaptación al lugar. Los edificios también funcionan de manera similar a la chimenea. La composición de los edificios forman calles y patios que favorecen las entradas y salidas del viento. Cada elemento, como la chimenea o el edificio cambia su posición y dirección para adaptarse a cada ubicación y crear una corriente de viento en las viviendas y en el pueblo. Se trata de un sistema para controlar el viento y crear un microclima en el pueblo. Con el fin de crear un ambiente confortable, a lo largo de muchos años los habitantes construyeron poco a poco este sistema de microclima para adaptarse a la naturaleza del terreno montañoso. Además de poner de manifiesto el microclima del Rincón de Ademuz, este estudio también hace referencia al estilo de vida sus habitantes, y cómo éstos cambian de espacio, están en casa o salen a la calle, en función del momento del día y de la estación en la que se encuentran. Por tanto, el sistema de control del viento no sólo crea un microclima en el pueblo, sino que también funciona como un sistema para que los habitantes se reúnan en ciertos lugares. Dependiendo del microclima, un lugar es confortable o no a tenor del tiempo que se está en él en cuestión. El carácter extrovertido de los habitantes facilita la comunicación con la familia y los vecinos protegiendo a los mismos de la desintegración de la comunidad local, creando un microclima que protege a la aldea de los desastres naturales.

Resum

Este estudi se centra en el sistema sostenible que fa possible que els pobles de més de dos mil anys d'antiguitat del Racó d'Ademuz hagen romàs en el mateix lloc adaptant-se al seu entorn natural. A fi d'analitzar el sistema sostenible, este estudi se centra en el factor del vent. En funció de la seua corrent, és possible crear un ambient confortable en les aldees en un clima tan sec com el del Racó d'Ademuz. El vent ajuda a l'eliminació del fum que es crea en les ximeneres de les cases. Per a deixar clara la relació entre el vent i els pobles, este estudi analitza la relació entre la direcció i orientació de les ximeneres així com la relació que hi ha entre el vent i la disposició i orientació del conjunt d'edificis que configuren el poble. Per exemple, hi han dos maneres d'orientar la ximenera: La primera és quan esta està encarada al vent, açò és quan la ximenera està orientada en direcció nord-sud. Pel fet que el vent bufa en la direcció nord-sud en el Racó d'Ademuz, esta posició de la ximenera permet que el fum isca de manera més fluida. L'altra opció és la ximenera en una posició que sorteja al vent, açò es dóna quan està orientada en direcció est-oest. En este cas, la ximenera està situada a favor del vent, esta posició fa que hi haja una bona trajectòria del vent en el saló. Per tant, en este cas s'establix la prioritat en el pas del vent a través del saló. En funció del vent, les ximeneres es disposen d'una manera o una altra per a la millor adaptació al lloc. Els edificis també funcionen de manera semblant a la ximenera. La composició dels edificis formen carrers i patis que afavorixen les entrades i eixides del vent. Cada element, com la posició de la ximenera o com està posicionat l'edifici crea una corrent de vent en les vivendes i en el poble que permet l'adaptació al lloc. Es tracta d'un sistema per a controlar el vent i crear un microclima en el poble. A fi de crear un ambient confortable, al llarg de molts anys els habitants van construir poc a poc este sistema de microclima per a adaptar-se a la naturalesa del terreny muntanyós. Este estudi, a part de posar de manifest el microclima del Racó d'Ademuz, també fa referència a l'estil de vida els seus habitants, i en com estos canvien d'espai, estan a casa o ixen al carrer, en funció del moment del dia i de l'estació en què es troben. Per tant, el sistema de control del vent no sols crea un microclima en el poble, sinó que també funciona com un sistema perquè els habitants es reunisquen en certs llocs. Depenent del microclima, un lloc és confortable o no depenent de l'espai de temps en qüestió. El caràcter extravertit dels habitants facilita la comunicació amb la família i els veïns protegint als mateixos de la desintegració de la comunitat local, creant un microclima que protegix a l'aldea dels desastres naturals.

Abstract

This study focuses on a sustainable system that makes it possible for the villages of more than two thousand years old in Rincón de Ademuz to have remained in the same place adapted to their natural environment. In order to analyze the sustainable system, this study focuses on the wind factor. Due to the dry weather and the wind-path it is possible to create a comfortable living environment in the villages. Moreover, the wind helps to eliminate the smoke from the fireplace. In order to make clear the relation between wind and villages, this study analyzed the direction of fireplace and building-unit.

For instance there are two ways of orienting the fireplace. One of them is the fireplace "catching the wind", when the fireplace is facing the north-south direction. Blowing the wind in the north-south direction in the Rincón de Ademuz, this position of the fireplace allows "catching the wind", and helps the smoke out more smoothly. The other position is the fireplace "dodging the wind", when the fireplace is facing the east-west direction. In this case the fireplace does not face the wind direction, but the living room shows good wind-path conditions. Therefore, in this case the priority is set to the passage of wind through the living room.

Both cases are ideas to adapt to different locations. Building-units also work in a similar way to the fireplace. Compositions of building-units create streets and courtyards favoring the inputs and outputs of the wind. Each element, such as the fireplace and building-unit, changes the direction in order to adapt to locations and to create the wind-path in the dwellings and the village. It is a system to control the wind and create a micro-climate in the village. In order to create a comfortable living environment, over many years the inhabitants gradually built up this system of micro-climate to overcome the nature of mountainous terrain.

Besides, this study makes clear that the micro-climate also makes a great influence on the lifestyle of inhabitants. They change flexibly spaces to stay in the dwellings and villages depending on the season and time. Therefore, the control system of wind not only creates a micro-climate in the village, but also works as a system for inhabitants to gather in certain places. Depending on the micro-climate, a place is comfortable or not depending on the length of time involved. The repetitive cycles of outgoing behavior give opportunities to communicate with family and neighbors and protect from disintegration of the local community. This is the sustainable system to protect the village from natural disasters and create a micro-climate. Moreover, internally, it protects from the destruction of the local community in Rincón de Ademuz.

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Introductory chapter

Introductory chapter

0.1 The abstract of this study

0.1.1 The background and the purpose of this study

When considering a sustainable rural society for the future, the plan needs to include effective utilization of available resources and re-use of the existing buildings without destroying the natural environment through a convenient mass production method. In Spain, old historical buildings are reformed because they are less likely to be subject to natural disasters such as earthquakes and typhoons. Many architects restore the structure of the buildings and apply modern, convenient facilities inside of them. In particular, the villages that are located on the mountainous terrains have maintained their original forms relatively well, because of the limited land use and its capability to expand, despite the minor damage received during the civil war. This enabled inhabitants in the villages to continue to live their life more or less in the same way as they have before. Unlike suburban new towns that are built based on regional policies, villages were built by the inhabitants' knowledge that was discovered through the process of trial and error over centuries, which unconsciously accumulated and created the current village form. According to Christopher Alexander, villages that were created over a long period of time feature a semi-lattice structure (*0.1). The semi-lattice means several factors have interactive relations with each other that make up a complex system. Traditional villages were not built by one top-down regional policy.

Rincón de Ademuz, which is the target village area in this study, located on a mountainous terrain in the province of Valencia, is known to have been built at least a few hundred years ago. As for Castielfabib, it originated in the Iberian period, with a history of more than two thousand years. Villages were not planned and constructed by an architect in an organized manner. However, it is also true that villages do not originate in a natural, coincidental way, for such villages would not be able to maintain their structure under severe conditions. Therefore, it becomes clear that there always exists an elaborate system within a village. The system not only protects its village from the menace of nature, but also the local community from collapsing, thus making it possible to sustain the community and leading it to the present situation. Two same villages never exist in this world. Each village is located in a different topography, climate, river system and vegetation. Inhabitants came to understand the natural conditions and created the current system over many years. Villages were able to sustain their existence until today because of the system that functioned well.

Based on these principles, this study focuses on a sustainable system, which makes it

possible for the villages to exist for more than two thousand years in the same place, as well as the structure of the village, which adapted to the natural environment of Rincón de Ademuz. The adaptive and co-existent system suggests an important concept of sustainable lifestyle in a local rural area for the future with a reduced energy consumption.

(*0.1) ALEXANDER C.: “A city is not a tree”, Reprint from the Magazine Design, London: Council of Industrial Design, No.206, 1966

0.1.2 The method of the research of this study

The analysis of this study is based on data mainly obtained by observation. The methods of observation vary. For example, when it comes to the observation of actions of a person, afterwards, it is possible to ask him or her when, where and what did he or she do. However, since the most people act unconsciously, they do not clearly remember their actions when they are asked about their behavior, what makes their answers blur. This is why it is difficult to acquire detailed information about the every day life behavior in a dwelling and village through the direct asking.

Therefore, instead of being asked about the actions, the target inhabitants were interviewed about furniture and installation, as well as, about their usage, which are located in the dwellings and villages. Because when the interview is focused on the usage, as well as, on the time and purpose of the usage of concrete objects, it is possible to take out more detailed information from the interviewed inhabitants. For example, in the second section of this study, there is a part, in which the dwellings and the villages are analyzed by paying attention on chairs. There are many types of chairs in the dwellings, such as table chairs, long chairs, sofas, etc. The sofas are comfortable to sit on, so usually they are located in the spaces for a long stay. Also, there are many foldable chairs in the dwellings, which are light and easy to carry. Thus, the question is where do the inhabitants carry them. In many cases, the foldable chairs are put in the entrance hall and are used outside during festivals or when inhabitants have a chat with their neighbors, what means that these chairs are used for a short stay.

In this way, asking about objects allows to describe the lifestyle of inhabitants. Nonetheless, this kind of asking has certain problems. One of the problems is that the furniture and its location vary in each dwelling, that makes difficult the extraction and unification of data. Another problem is that the questions hugely depend on the researcher's point of view. Therefore, to resolve this kind of problems, instead of increasing the number of the dwellings for the research, a certain number of dwellings were chosen. This certain dwellings were visited for multiple times and during each of these visits the inhabitants were interviewed. Because of doing a narrow and deep investigation, it was possible to find out the common matters and rules in every dwelling and every village. There were no fixed questions and during each visit the inhabitants were asked about several things inside the dwelling. Thus, the purpose of this study is to analyze the data obtained from five years of investigation (*0.2).

As mentioned before, there are various methods of observation. One of the attention points of this study was the observation of domestic objects. These objects, apart of dif-

ferent usages in daily life, have a numerous ways to be placed. For example, in this study, the direction of fireplace caught attention. When a fireplace is not placed in the center of the room, but along a wall, it folders inhabitants to think on which side of the room the fireplace should be installed. A similar problem comes out by the installation of the cover of a chimney, which is analyzed in the first section. Since, generally, chimneys are covered by two ceramic tiles joined together, inhabitants have to think if the tiles should be joint together by long or short edge. And even if all this sorts of choices are made by inhabitants unconsciously, there always is some kind of intention. That is why the observation and analysis of all the target dwellings of this study were made in a such way as if the researcher was the builder of all these dwellings.
Therefore, the observational research of this study does not exclusively focus on the dwellings and villages, but also on the objects and small details, that can be find all around the dwellings and villages and that form an important part of daily life of inhabitants. Thus, it is important to notice all these fine characters and to obtain a deeper understanding of them. Moreover, in an observational study, it is important to have a previous hypothesis, such as the hypothesis about the wind in this study, so that during the research the attention will be paid on the details, objects and characteristics, which can prove or disprove it. The interior features vary in every dwelling and all the visible things are object of observation. However, it is impossible to analyze all of these things, because there are just too many of them. Therefore, it is necessary to make a limit of objects to be observed. In this way, the hypothesis adjusts this limit and allows to find the universality in the villages by noticing and analyzing small incongruities.

Moreover, the selection of candidates for the interviews of this study depended on the municipal offices of the selected villages. Because the collection of necessary data for the research of the dwellings, such as make drawings and take pictures, requires entering in inhabitants' homes. However, people usually do not like to allow an outsider to enter their dwellings to do a direct survey. Therefore, the municipal offices were asked to help out to find as many dwellings as possible for the research. Besides of the help of the municipal offices, to increase the number of dwellings for the research, it was essential to visit the selected villages for several times to try to become friends with the inhabitants and, in this way, to obtain a permission to do a research in their dwellings. As a consequence, in order to investigate the rural society from the inside, many years were needed.
Nevertheless, there were limitations to obtain the data. To complete the study and to find the information, that is impossible to obtain through the field research, books were consulted. However, in contrast to big cities, there are not so many books about histori-

cal information of small villages, like those that were chosen for this research. Thus, the analysis of this study is mostly based on the data obtained from the observations made in the 6 villages and 31 dwellings.

(*0.2) The *in situ* research and documentation was made in 70 days between 2007 and 2012.
13th – 30th. September. 2007
12th – 21st. September. 2008
25th – 28th. July. 2009
16th–18th. August. 2010
11th – 19th. September. 2010
13th –17th. November. 2010
28th. August – 03rd. September. 2011
29th. November – 01st. December. 2011
31st – 17th. August. 2012
24th – 29th. September. 2012

0.2 The composition of this study

The composition of the study is structured in six chapters each one with an introduction, main issue and conclusion, as the figure 0.1 presents.
The purpose and method of the study is explained at the introduction chapter and it's also referred in the previous studies in order to characterize this study.
The first chapter includes two important topics of this study, i.e. the reason for choosing these villages and the reason of focusing on the wind in this study. These reasons constitute the basis to analyze the village.
The second and third chapters explain the relation between the wind, dwelling and village. The characteristics of both chapters are compared similar sections like wind-path, passive design and lifestyle. The purpose of two chapters is to make clear that dwelling and village have similar characteristics. At first, it is explained some general information and the current state and characteristics of the dwelling and village from the point of view of composition, differences in each location and transformation in the last century. Secondly the wind-path in dwelling and village is analyzed. It is important the relation between the direction of wind and the fireplace, in the building-unit. In addition, both chapters are separated into two parts: tangible and intangible. Tangible part deals with the dwelling and village and intangible part concerns the thermal environment, living style and local community. In terms of both parts, the relation between wind and village appear very clearly.
The fourth chapter is based on the findings of the second and third chapters. This chapter explains the system how the village controls the wind to create a comfortable living environment, and how inhabitants' living style and local community are adapted into the environment. Moreover it's referred the structure of village, which is able to keep inhabitants' life still in the same place for more than two thousand years.
The fifth chapter is a conclusion where each chapter is summarized and it clarifies a sustainability of village.

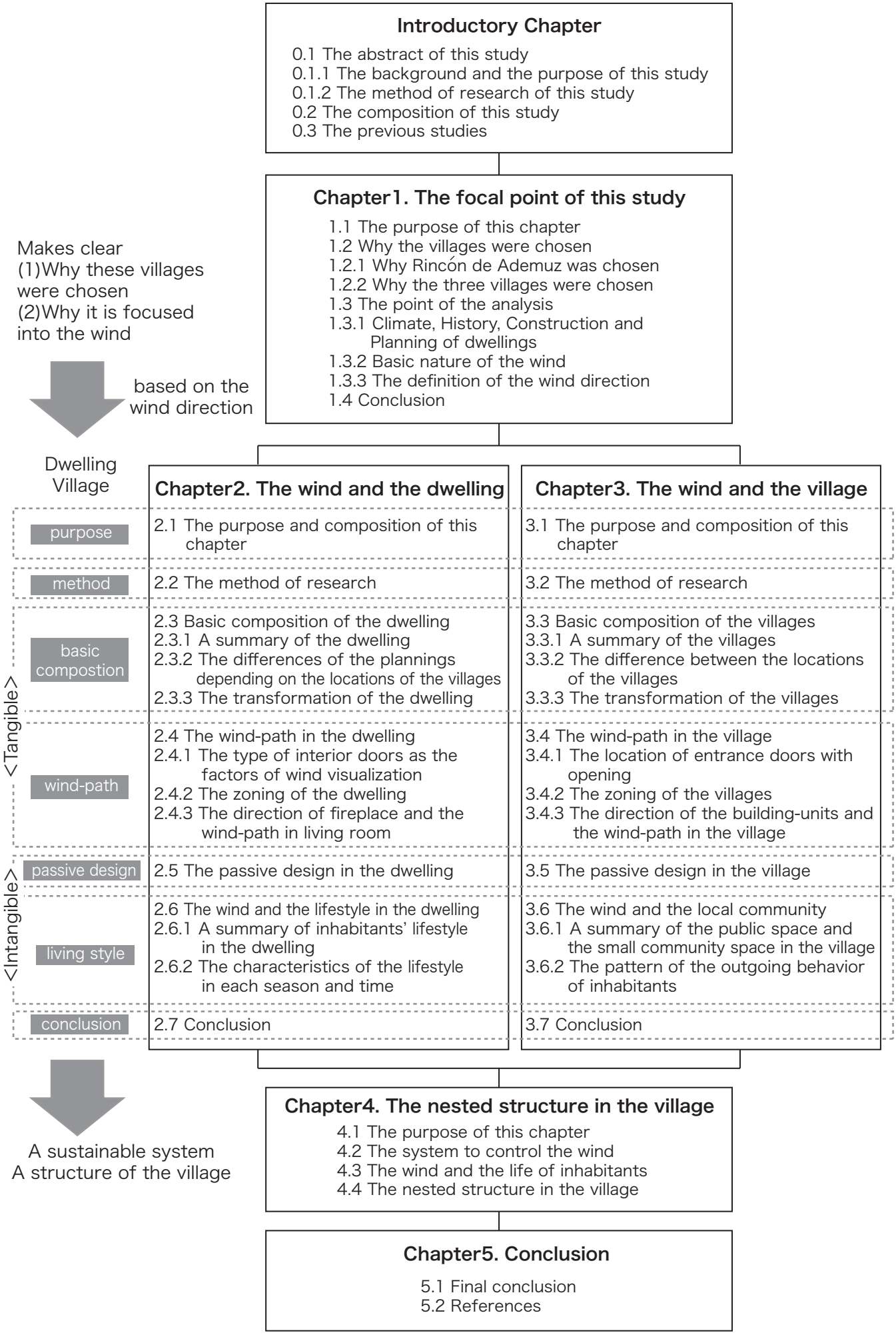

Fig.0.1 The composition of this study

0.3 The previous studies

Historic architecture, such as Romanic, Gothic, etc. was studied in detail and depth as the main line of the European ancient architecture. In contrast to historic architectures, Bernard Rudofsky was one of the first to focus on the anonymous architecture in the world. The book called "The Prodigious Builders" (1977) deals with vernacular architecture from all over the world. In this book, the relationship between the architecture, climate and culture are explained as factors that have an influence on vernacular architecture (*0.3, *0.4).

Based on Bernard Rudofsky's work, Paul Oliver is known for his careful research about the relation between the climate and vernacular architecture. "Encyclopedia of Vernacular Architecture of the World" (1997) consists of three volumes. In this publication, he divided the world into seven areas, analyzed several villages located in different climates, and created a systematic reference of the vernacular architecture (*0.5).

In addition, the works of Luis Feduchi and Carlos Flores, who researched the vernacular architectures in Spain, should be noted. The book "Itinerarios de Arquitectura popular española" (1976), written by Luis Feduchi, introduces many rural villages in Spain. Rincón de Ademuz, the village included in this study, was also investigated by him (*0.6). Carlos Flores, who wrote the book "Arquitectura popular española" (1973) mentions more details about the villages of Spain. The notable characteristics of his works are the plans of dwellings that were hand-drawn by him, as well as the precision of the plans (*0.7).

Many researchers have studied the vernacular architecture all over the world, however, they all focused on introducing and recording it. Though there was relatively more depth to it, Carlos Flores' work also remains a matter of introduction.

On the contrary to the papers and books with merely a general introduction to vernacular architecture, there are studies that focus on specific elements of vernacular architecture. The book "*Masies* que cal conèixer" (2006), which is written by Anna Borbotet, focuses on the traditional dwellings, called *masies*. *Masia* refers to a rural dwelling especially in the Cataluña region (*0.8). Borbotet analyzes its history, structure, material and restoration. *Masies* usually represent large houses for wealthy households, in contrast to the small rural households that are the focus in this study.

Additionally, the book "La arquitectura vernácula patrimonio de la humanidad" (2006), written by José Luis Martín, deals with traditional Spanish vernacular architecture (*0.9). The word "patrimonio" means heritage in Spanish, thus the target is on the important buildings in villages. The references are made not only on dwellings but also on monas-

teries, water wheels or even abandoned villages. As the title suggests, it focuses only on the heritage in the villages of Spain without paying attention to the structure of the villages and inhabitants' lifestyle.
As far as Rincón de Ademuz is concerned, there are researches made on its linguistics and geography (*0.10, *0.11). Furthermore, there are architectural studies about this village, including the series of studies by Camilla Mileto and Fernando Vegas, which deals with traditional architectures that include not only dwellings but also churches, patrimonio, fortress and so on (*0.12-*0.22). Their focus is especially on historical buildings, and they look closely into details about the materials and construction of the buildings in order to estimate the year built, as well as the traditional techniques in masonry buildings. The purpose of the studies is for repair and restoration of the historical buildings.
In this way, many researchers have investigated the vernacular architecture all over world. However, each study aims to introduce only the core essence of the general topic, and no studies focus on one village or a region to analyze its sustainability and the structure of the village. The detailed analysis of the rural village named before (see the case study of the *masia*, for example) focuses on historical and symbolic architecture, and they do not target normal rural dwellings. Given the fact that there exist only a few studies that focus on inhabitants' lifestyle in a rural village, this study intends to target such normal rural dwellings.

There are many studies in Japan, which focus on the analysis of inhabitants' lifestyle, because of its historical background. After the World War II, Tokyo city had been destroyed. During the period of high economic growth that followed, many people moved from rural areas and started to live in Tokyo city. The problem was that the population of Tokyo city was experiencing an exponential increase, therefore Japanese government needed to provide efficient dwellings. Under such circumstances, the studies of human lifestyle began in Japan. Uzo Nishiyama, who wrote "The house in future" (1947), researched the details of traditional Japanese lifestyle. Traditional Japanese dwellings have no separation of spaces, such as living room and bedroom, as found in a modern dwelling. Yet, his work makes it clear that Japanese people conventionally made a distinction between eating and sleeping spaces in the traditional dwellings. Based on his studies, he suggested the current dwelling style with a living room, bedroom and a kitchen (*0.23).
At the same time, Yasumi Yoshitake established architectural planning studies as a field of study, deriving from his studies of the use of space (*0.24). The purpose of architectural planning studies is to explain the logic of human behavior and psychology for the planning of the architecture. This theory is mainly applied to hospitals, theaters and dwelling

complexes, which are used as public buildings.

Based on the inhabitants' lifestyle studies, the relation between the human behavior and environment was analyzed more in depth, in order to improve the quality of life. "The design of People-Environment relations" (1997) was written by Teruyuki Monnai, Takashi Takahashi and others, and it investigates the studies of Environment-Behavior-Design thoroughly. The purpose of Environment-Behavior-Design studies is to understand the interactive relations between the human scale and physical environment, so it can be applied to environmental policy, planning, design and education for better quality of life (*0.25). The Environment-Behavior-Design subject is also studied by American researchers, such as Moore Gray, Sandra Howel and Irwin Altman, who are psychologists (*0.26, *0.27). Thus, inhabitants' lifestyle is researched widely in Japan and America. In Spain, however, there are only a few studies related to this topic, and specifically, there has not been any that focuses on the inhabitants' lifestyle in villages.

Given such a condition in the studies of lifestyle and Environment-Behavior-Design, we can find some cases of investigations in the cities and villages around the Mediterranean Sea. For instance, Hidenobu Jinnai, who is a Japanese researcher, has researched in Spain, Italy and North African villages (*0.28-*0.34). His focus was especially on the inhabitants' lifestyle and the structure of the cities in Italy. In terms of his studies about Spain, he focused on the ruins in order to investigate the cities and inhabitants' life during the periods of Arabic rule.

In addition, Masayuki Irie is a Japanese researcher, who investigated the *Masia* in Cataluña, focusing on repair and restoration (*0.35-*0.38). The difference between Irie's work and that of Anna Borbotet, who has written "*Masies* que cal conèixer", is that Irie referred to the lifestyle of the inhabitants.

There are also series of studies by Akira Fuji about the villages (*0.39-*0.46). He researched villages all over the world, including Asia, Europe, South America, Middle East, and Africa. His work is especially centered around Southeast Asia. He used mathematical quantification theory as a method to analyze the form of village. As for Spain, he makes a reference in his book about the cave houses in the Andalucía region, which is different from the region investigated in this study.

Thus, some researchers have investigated the villages around the Mediterranean Sea, however, there has not been a solid study in Spain, especially about the villages, the lifestyle, sustainability and the structure of the village.

Furthermore, the focus of this study is the wind, as a key to the investigation of the sustainable system of the village. The reason for focusing on the wind is noted in the first chapter. This chapter will introduce the investigations done by other researchers regard-

ing the relationship between the wind and inhabitants' lifestyle.
First, Ryo Ando researched about a fishing village with a strong wind condition in Shikoku, Japan (*0.47). He studied details such as the zoning of village, planning of dwelling, lifestyle, and materials used for dwelling. He then focused on the wind as an element that had an influence on the inhabitants' lifestyle. The idea is similar to this study because of wind is the focal point that makes a reference to inhabitants' lifestyle.
Yoichi Ito researched the relation between the placement of the fences as a protection from the wind and snow and the local communities in Aomori, Japan (*0.48). From factors such as the placement of the fence, the direction of wind, the community zone and inhabitants' lifestyle, his research concluded that the fences were not the only protection for each dwelling, rather, the entire planning of the village served as a protection from wind and snow.
Moreover, Naoki Ichikawa referred in his paper about the layout of the floating houses that provide a comfortable lifestyle with respect to the wind, in a high-density floating village in the sea of the Philippines (*0.49). He measured the wind in order to analyze the relation between the wind condition and the inhabitants' lifestyle on the sea in each season and time of the day. Thus, we can see that there exist investigations about the wind and inhabitants' lifestyle. In terms of the focal point of analysis, some studies that were done in Japan are similar, because the reference is made to the system that aims to control the wind, as well as to the local communities.

According to Prof. Akira Fuji, there are two different ways to investigate the villages (*0.50). One is observation as a passenger, whereby researchers make a comparison among a wide range of villages. This is a cross-cultural comparative approach. The other is to engage in the village as close to it as possible, in order to gain understanding about its rural society from within. This is an approach of anthropology studies. It is necessary to stay for a couple of months in the village in order to understand the structure of a particular society. Needless to say, the understanding of the local language is also required in this case.
Looking at the studies of the Spanish villages done in Japan, it becomes evident that all of them use the approach of cross-cultural comparative studies. There are methods to analyze the lifestyle and the structure of the village, but in reality, it is difficult to investigate a village thoroughly without having spent months and years. The originality of this study is precisely this point. In order to gain understanding about the rural society from within, this study spends 70 days over a span of five years to conduct a close communication with the inhabitants and to collect the data gradually. This type of study that uses an anthropo-

logical approach to investigate Spanish villages from an architectural point of view has not been made in the past.

Until today, many researchers have investigated the vernacular architecture all over world. Each study aims to summarize the general characteristics, and no studies focus specifically on a village or a region to analyze its sustainability and the structure. The detailed analysis of the rural village named before focuses on historic and symbolic architecture, and do not target ordinary rural dwellings. Given this background, the originality of this study is the focus on ordinary rural dwellings in a specific village called Rincón de Ademuz in Valencia, the lifestyle of the inhabitants, as well as the sustainability and the structure of the village itself.

(*0.3) RUDOFSKY B.: “The prodigious builders”, American Heritage Publication Co., Inc., USA, 1977

(*0.4) RUDOFSKY B.: “ARCHITECTURE WITHOUT ARCHITECTS”, Kajima Institute Publishing Co., Ltd. Japanese translation rights arranged with Doublr & Company, Inc., New York through Charles E. Tuttle Co., Inc., Tokyo, 1984

(*0.5) OLIVER P.: “Encyclopedia of Vernacular Architecture of the World”, Cambridge university Press, 1997, vol.1

(*0.6) FEDUCHI L.: “Arquitectura popular española”, Editional Blume, Barcelona, 1976, vol.3, pp.348-356

(*0.7) FLORES C.: “Arquitectura Popular Española”, Aguilar, España, 1973

(*0.8) BORBONET A., PLADEVALL A., et al.: “Masies que cal conèixer”, Editorial Baecanova, S. A., Barcelona, 2006

(*0.9) MARTÍN J.: “La Arquitectura Vernácula Patrimonio de la Humanidad”, Departamento de Publicaciones de la Diputación de Badajoz, 2006, vol.1, pp.601-632

(*0.10) Entique J.: “Habla y cultura popular en el Rincón de Ademuz”, Consejo Superior Investigaciones Cientificas, Madrid, 2004

(*0.11) RODRIGO C.: “El Rincón de Ademuz. Análisis geográfico comarcal”, Asociación para el Desarrollo Integral del Rincón de Ademuz, 1998

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Chapter 1
The focal point of this study

Chapter1. The focal point of this study

1.1 The purpose of this chapter

The purpose of this chapter is to clarify the focal point of the analysis of the study, which are the chosen villages, as well as the wind.

The second section explains the reasons why this region and the three villages were chosen. There is a limitation to the number of villages to be investigated, because of the fieldwork research method used. Therefore it is necessary to choose the villages efficiently, so that an analysis can be made from a limited amount of information to find the general characteristics of the entire region.

The third section aims to investigate into the focal point of the analysis, which is the wind. In analyzing the sustainable system of the village, it must have not only contributed to the structure of the dwelling and the village, but also influenced the inhabitants' lifestyle. Therefore, several factors such as the climate, history, building materials, construction and planning of dwelling were taken into consideration and used as the basis of study in the following chapters.

1.2 Why the villages were chosen

1.2.1 Why Rincón de Ademuz was chosen

Rincón de Ademuz is a region in the province of Valencia. It is located between the provinces of Cuenca and Teruel. It is composed of 18 villages and the population is 3,011 inhabitants (1996) (*1.1). The name of 18 villages are as follows; Ademuz, Mas del Olmo, Sesga, Val de la Sabina, Casas Altas, Casas Bajas, Castielfabib, Arroyo Cerezo, Cuesta del Rato, Mas de Jacinto, Mas de los Mudos, Los Santos, Los Pajares, Puebla de San Miguel, Torrealta, Torrebaja, Vallanca and Negrón (Fig.1.1).

The total area of Rincón de Ademuz is 370.47 km2. The altitude ranges from 690 m of Casas Bajas to 1,836 m of Monte Calderón. The village located in the highest point is Arroyo Cerezo. It has an altitude of 1,300 m from the sea level. Turia river passes through all of the villages and arrives to the sea in Valencia city. There are Ebrón and Boilgues rivers which are tributaries of Turia. The vegetations mainly consist of restocking pines, junipers oaks, scrubs, almonds on the slopes of the rivers. Castielfabib is one of the villages in Rincón de Ademuz. This village is older than Valencia city, maybe one of the oldest uninterrupted inhabited villages in Spain, as there are remains of a prehistorian Iberian settlement (*1.2). Nowadays many inhabitants abandon the village and move to bigger cities such as Barcelona and Valencia. This village is also an aging population like the other villages around.

Rincón de Ademuz was chosen in this study in order to determine the sustainable system of the villages in Spain that have existed for many centuries. Spain and Portugal, which

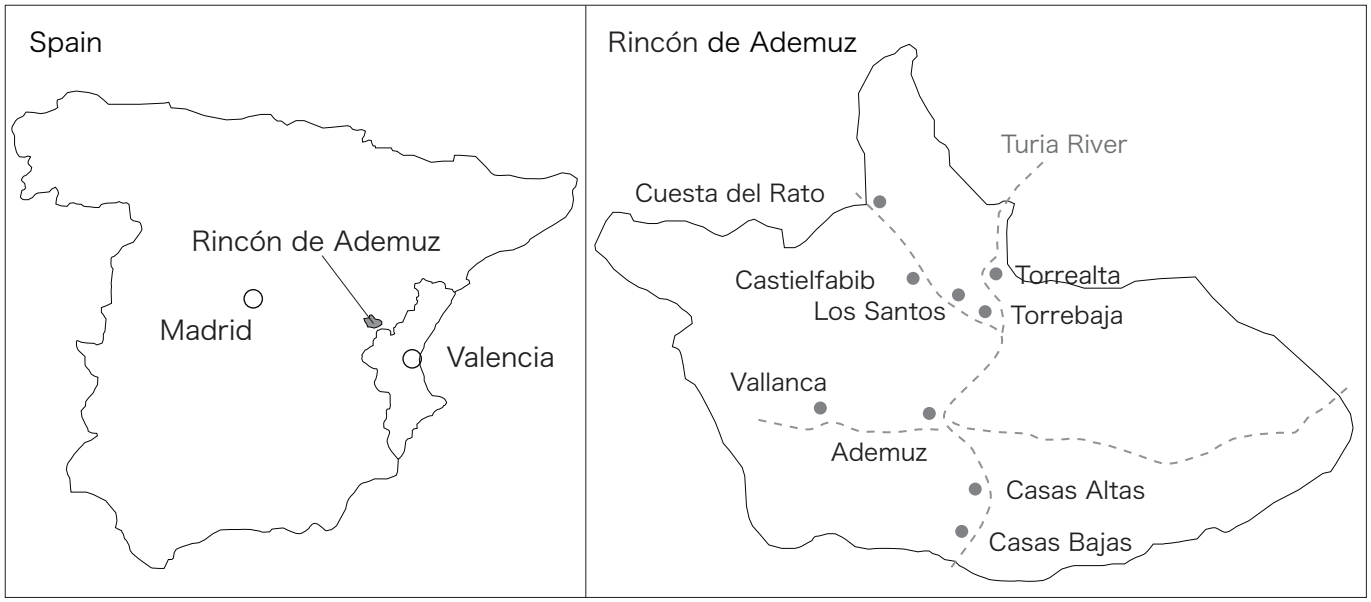

Fig.1.1 Map of Rincón de Ademuz

are located in the Iberian Peninsula of the extreme western part of Europe, had come under the control of the Islam for 500 years before Reconquista of Jaime I. Therefore the southern region of the Mediterranean had been profoundly influenced by the Islamic culture, which led to the region's distinctive living culture. The Islamic culture has a long history with a wide area of distribution. Typically it spread to the dry climate areas, such as Spain. It had adapted to the local climate and formed its own culture in each region. Therefore the Islamic living culture had a strong influence over the Spanish living culture in the process of becoming what it is today.

Furthermore, Turia river is one of the most important rivers in Iberian Peninsula. Generally villages were developed along rivers in the ancient time. For instance, Tajo river runs through Spain and Portugal, and is the longest river in Iberian Peninsula. The former capital Toledo, which is one of the oldest cities where human life began, is also located along a river. In dry regions such as Iberian Peninsula, villages were always developed along rivers. The same applies to Rincón de Ademuz. It is located in the upstream of Turia river, and the location is typical of where people historically started to live. Needless to say, people also lived in larger cities such as Barcelona or Valencia. These cities were located on the flat lands, with enough space to grow their industries. This eventually led to a rapid population growth in these cities during the last two centuries, and the old farmers' dwellings were rebuilt to residential complex. Traditional lifestyles were abandoned and city lifestyles evolved. This was not the case in Rincón de Ademuz, where no industry grew because of the limited space on the mountainous terrain. In addition, it is not a famous tourist destination such as the former capital Toledo. This is why Rincón de Ademuz makes a suitable choice for investigating the sustainability of the village, with its typical location in the Iberian Peninsula and the traditional lifestyle of the inhabitants.

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1.2.2 Why the three villages were chosen

Of the 18 villages in Rincón de Ademuz, Torrebaja, Casas Bajas and Castielfabib share similar characteristics for their population, industry and history, despite differing characteristics of their locations. The following details the reasons for choosing the three villages:

(1) Population

These villages have an aging population like the other surrounding villages. Young generations have been moving to bigger cities such as Barcelona or Valencia. There are only seven villages with a population of more than 100 people out of the 18 villages. The names of these villages are as follows: Ademuz, Castielfabib, Torrebaja, Casas Altas, Casas Bajas, Los Santos and Vallanca.

(2) Industry

Agriculture is the main industry in all of the villages except in Ademuz. Ademuz has the largest population, and commerce such as shops and banks developed during the last century. Because this study focuses on farmers' dwellings, Ademuz is not suitable as a subject of the investigation.

(3) History

Of the above mentioned seven villages, Los Santos had a rapid population growth in the late 19th century, which makes it relatively newer than the others. In order to investigate the sustainability of the village, this aspect is not suitable for analysis. Literature sources

Photo1.1 Torrebaja

predicting the populational changes confirm that the other villages have been in existence since the 17th century (*1.3).

Thus, these 5 out of the 18 villages, Castielfabib, Torrebaja, Casas Altas, Casas Bajas and Vallanca, have similar characteristics in terms of the population, industry and history. The following topics will analyze further on the locations of the five villages.

(4) Riverside

Torrebaja, Casas Altas and Vallanca are located on a riverside, and water is more easily accessible than in the other villages. Torrebaja is located on a flat land close to the river, while Casas Altas is on a small hill by the river and Vallanca is on a slope that passes from the riverside to the mountain.

(5) Mountainside

Casas Bajas is located on a mountainside. It was not easily accessible to water, as there was no fountain in the village. Thus a fountain which was on the riverside was used.

(6) Mountaintop

Castielfabib is the only village, which is located on top of the mountain. Water was not easily accessible, as in the case of Casas Bajas. The only fountain was located at the bottom of the mountain. The village was developed on a steep slope as a cluster of dwellings.

The purpose of the study is to define the general characteristics of the villages that can be observed throughout Rincón de Ademuz, from limited sources of available data. Given

Photo1. 2 Casas Bajas

this objective, Casas Bajas and Castielfabib are suitable subjects, due to their distinctive characteristics of the locations. As for the three villages on the riverside, further details of topography were noted: Torrebaja is on a flat land, Casas Altas is on a small hill, and Vallanca is on a slope. When the three villages were compared with Castielfabib and Casas Bajas, it became evident that there was a distinctive characteristic about the location of Torrebaja, which is on a flat land. Thus after considering all of the above six observations, Torrebaja, Casas Bajas and Castielfabib were chosen for this study. Each village has a similar background, yet the geographical conditions of the locations are different. In this study, three typical location settings were chosen in order to find out the general characteristics of Rincón de Ademuz.

The population, industry and history of the three villages can be summarized as the following: The populations of Torrebaja, Casas Bajas and Castielfabib are 458, 311 and 554, respectively. An old literature source confirms that 131 inhabitants lived in Castielfabib in 1572. Additionally in 1681, 70 inhabitants lived in Torrebaja and 120 in Castielfabib. Finally in 1775, 42 inhabitants were recorded in Torrebaja, 92 in Casas Bajas and 260 in Castielfabib (*1.4).

Inhabitants mainly cultivated almonds, cereals, olives, grapes, other fruits and vegetables. Specifically, fruits, corns and vegetables were cultivated on irrigated lands, while almonds, corns, olives and grapes were cultivated in dry lands. These are the characteristics of the agriculture in Rincón de Ademuz.

Torrebaja originally started as a part of Castielfabib. The tower in the central plaza served as a watchtower of Castielfabib. For this reason, the west part of Torrebaja belonged to

Photo1. 3 Castielfabib

Castielfabib until 1995 (*1.5). The village is located on a flat land between Turia and Ebrón rivers. Because of its location near the rivers, water was abundant in the village. In the old days, the dwellings that were around the central plaza even had their own wells inside. There was also a small river on the west side of the village, which was used to wash clothes and dishes, but it has become a culvert that passes under dwellings nowadays.
The origin of Casas Bajas is said to have been built by Muslims (*1.6), however, it is not known when it was built. The village started in a sunny area in the middle of the mountainside. Water was not easily accessible because of its location. Currently there are four public water fountains, but in the past, there was no fountain within the village. The fountain found on the opposite side of the river was used for drinking, as well as washing clothes. There is also a dry wash on the west side, which divides the village in two parts. Castielfabib is estimated to have been built during the Iberian period, and is the oldest village in Rincón de Ademuz. The ruins found on the cliff in the Northeast part of the village proves the long history of Castielfabib. There was a castle wall around the village until the 19th century, making it a fortress village in the old times. This is what distinguishes Castielfabib from the others villages. Today, a part of the castle wall, the castle ruins and three towers remain in the village. The three towers were used as watchtowers in the past. While the well at the bottom of the mountain was the only source of water in the old time, nowadays there are four public fountains in the village, which are all located along the valley (*1.7).

In this way, Torrebaja, Casas Bajas and Castielfabib were chosen. Due to the fact that sufficient amount of data concerning dwelling planning could not be obtained through fieldwork research from these three villages, the dwellings of three additional villages, Casas Altas, Torrealta and Cuesta del Rato were also investigated. Casas Altas and Torrealta are located on the riverside, while Cuesta del Rato is located on a mountainside.

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1.3 The point of the analysis

1.3.1 Climate, History, Construction and Planning of dwellings

The objective of this section is to clarify the sustainable system of villages through investigating the climate and culture of Rincón de Ademuz. This process will allow the point of the analysis on Rincón de Ademuz to manifest itself.

(1) Climatic Characteristics (Fig.1.2)

The annual average temperature of Rincón de Ademuz varies depending on where it is measured. For instance, the annual average temperature of Torrebaja, a municipality of Rincón de Ademuz situated near the riverside, is 15.7 C°, and that of Vallanca, another municipality which is a little more inland than Torrebaja is 13.1 C°; in addition, that of Arroyo Cerezo, in the heart of mountains of Rincón de Ademuz is 9.2 C°. In Rincón de Ademuz, the more inland and the higher altitude it gets, the colder it becomes. The average minimum temperature in January of Torrebaja is 4.9 C°, and the average maximum temperature in July is 31.3 C°. The temperature in winter does not go down below the freezing point.

Rincón de Ademuz is considered to be a remarkably dry region when we compare its annual average precipitation with that of Japan. The annual average precipitation of Torrebaja is 374.4 mm and that of both Vallanca and Arroyo Cerezo is about 600 mm; meanwhile, that of Japan is 1700 mm.

Monthly Average Temperatures

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Average
Arroyo Cerezo	3.1	3.3	4.5	6.5	9.1	15.1	18.6	16.5	15.3	9.4	4.9	3.5	9.2
Torrebaja	8.1	8.8	11.8	14.0	16.8	21.6	25.5	24.2	21.5	16.4	11.0	8.5	15.7
Vallanca	5.0	5.6	8.2	10.3	13.7	18.8	23.1	23.2	20.2	14.9	9.0	5.6	13.1

Average High Temperatures

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Average
Arroyo Cerezo	5.8	6.0	7.0	10.0	13.2	19.6	23.9	21.3	19.8	12.7	8.6	7.0	12.9
Torrebaja	11.4	12.5	16.7	19.0	21.7	27.0	31.3	29.7	27.0	21.7	14.8	11.3	20.3
Vallanca	10.1	10.5	14.2	16.3	20.4	26.2	31.7	31.8	28.5	22.1	15.2	10.7	19.8

Average Low Temperatures

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Average
Arroyo Cerezo	0.4	0.6	1.9	3.0	4.9	10.5	13.3	11.7	10.7	6.0	1.3	0.0	5.3
Torrebaja	4.9	5.1	7.0	8.9	12.0	16.3	19.6	18.6	16.1	11.2	7.2	5.8	11.0
Vallanca	-0.1	0.6	2.3	4.3	7.0	11.3	14.6	14.7	12.0	7.6	2.9	0.5	6.4

Fig.1.2 Annual and monthly average temperatures

(2) History

The buildings and the dwellings of Teruel, which is the nearest city to Rincón de Ademuz are famous for their Mudejar style, influenced by the Islamic culture. Moreover, the Cathedral of Teruel is listed as a World Heritage site by UNESCO. This is because this area was strongly influenced by the Islamic culture from about 700 to 1200 A.D. It is believed that the dwellings in Rincón de Ademuz had the same level of influence by the Islamic culture as in Teruel, being that Teruel and Rincón de Ademuz are next to each other.
According to Köppen climate classification, the countries of the Islamic culture are distributed in the desert and Mediterranean climates. Both climates are characterized by the hot and dry summer. Thus, the environment in Spain, with its Mediterranean climate, was able to easily accept the Islamic living culture.

(3) Construction materials and method

In Rincón de Ademuz, masonry construction dwellings with jack arch floors, which disperse the load on the joists by making numerous vaults are commonly found. This conventional construction method is suitable to hold a heavy load such as stones. The thickness of the outerwalls of the dwellings surveyed was about 450 mm. In most conditions, it is known that the transfer of heat has a time lag of eight hours, when the thickness of an outerwall of dwellings is designed to be 250 mm (*1.8). Consequently, there is a time lag of more than eight hours for the heat to reach the inside of the dwellings in Rincón de Ademuz. This is a notable characteristic of dwellings in a dry and hot area. Due to the fact that there is always a risk of flood by the waterside in mountainous climates, residential buildings are constructed neither near the valleys where the cold air flows nor in the mountain ridge exposed to cold winds. Moreover, multi-storey dwellings are constructed. Looking at these characteristics of the dwellings of Rincón de Ademuz; it can be said that Rincón de Ademuz has the features of dry mountainous terrain.

In addition, the roofs are built in the roof frame by filling them with reed and Spanish roof tiles. Some dwellings are exposed to the winds because the attic room has no outer walls. Gusts from the side create buoyancy and destroy roofs. In windy areas, roofs are protected from gusts by deepening the front, sealing the attic room with stones and constructing stonewalls as windscreens (*1.9). However, this type of dwellings are not found in Rincón de Ademuz, which indicates that Rincón de Ademuz is located in an area where there are no strong gusts such as typhoons and foehn phenomena.

(4) Planning construction and way of living

Generally, fireplace is used as a heating appliance in winter. In the past, fireplace was used as a kitchen appliance regardless of the season until gas became common. The positions of the fireplaces were rarely on the south side of the dwelling, as only 5 out of the 31 investigated cases had a fireplace and its opening positioned on the south side (Fig.1.3). Comparing the heat of summer with the cold of winter, it became apparent that the heat of summer was a bigger concern for the inhabitants. The winter, however, is relatively cold with a temperature of about 0 C°, and the dwelling needs to be heated with the fireplace. The fireplace produces a lot of smoke when used. While in summer it is possible to ventilate the dwelling by opening the windows and the doors completely, in winter, the air needs to be ventilated to eliminate the smoke by taking in some winds.

In the living culture of the Islamic world situated in a dry zone, a comfortable living environment was achieved through methods such as: thermal storage and heat dissipation by masonry construction, creating sunny and shady spots with a courtyard in the dwelling that generate air natural convection. The residents knew how to control the ascending current of air heated by light, and descending current of heavy air cooled by thermal radiation at night and transpiration. This type of wisdom came to Spain by sea during the Islamic era, and formed the present Spanish culture, which is ultimately a fusion of Islamic and Spanish cultures. It is possible to observe a vernacular response towards the climate conditions from the historical background, building materials, construction methods, the placement of the fireplaces, and how the dwellings are used.

In Rincón de Ademuz, it is relatively hot in the summer because of its Mediterranean climate, cold in winter due to its mountainous climate, and dry with little rain throughout the year. Because of the dryness, it is comfortable in the shades with some breezes even in the summer. Shades are purposely made in order to take in cooler winds, which are found near the surface of the earth. Meanwhile, in winter, in order to guard against the low temperature of around 0 C°, heat is stored by taking sun lights into the dwellings dur-

Village	TB1	TB2	TB3	TB4	TB5	TB6	TB9	CB1	CB2	CB3	CF1	CF2	CF3a	CF3b	CF4	CF5
Place of the fireplace	N-W	N	S	W	S-E	N-E	N-W	E	W	N	S-E	N	S-E	S	S	N-E
Direction of the window	N	N-E	S	S*	W	N	N-E	N-E	N	N-W	E	N&E	S	N	E	N

Village	CF6	CF7	CF8	CF9	CF10	CF11	CA1	CA2	CA3	CR1	CR2	CR3a	CR3b	TA1	TA2	
Place of the fireplace	S	N	W**	E	N-E	S-W	S	S	N**	W	W	E	E	S-E	S	
Direction of the window	S-W*	W&S	S	W	E	S	E	E	S	E	S	E	S-E	E	S-W	

The fireplace is located in a suuny spot *small window **The fireplace is far from the windows

Fig.1.3 The location of fireplace and the direction of windows in the living room

ing the day time and a fire place is used as an only heating appliance. Fireplace requires an adequate ventilation system that eliminates the smoke, while avoiding to let in the cold air into the dwelling. Thus, it is necessary to control the winds in both summer and winter to suit the climate of Rincón de Ademuz and create a comfortable environment.

(*1.8) OLIVER P.: “Encyclopedia of Vernacular Architecture of the World”, Cambridge University Press, 1997, pp.125-139

(*1.9) NAITO H.: “環境デザイン講義 (The lecture of environmental design)”, Okokusya, 2011

1.3.2 Basic nature of the wind

The Westerlies blow in the sky above Spain from the west to the east. However, the Westerlies do not have strong effects on the winds at the ground level because they are jet steams that blow far above the ground. In Valencia, there is a local wind that greatly affects human life on the ground. It is called Levante and it blows from the east.

It is said that there are two major influences of geographical features that generate local winds. One is a thermally generated wind caused by the difference of temperatures in two places, due to differing radiation heating or radiation cooling in each of the places. Land and sea breeze is classified as this type of wind and Levante is also equivalent (*1.10).

The other is a dynamically generated wind, due to a gathering of the air in one place while the geographic formation of a mountain becomes an obstacle. Thus, generally speaking, winds are produced by both thermal and dynamic causes.

In Rincón de Ademuz, which is located inland, there is a wind called mountain and valley breeze, in addition to the land and sea breeze. The mountain valley breeze is a wind generated by the difference of the temperatures, as is the land and sea breeze. The mountain valley breeze can be divided into mountain breeze and valley breeze.

The mountain breeze is a descending wind, whereby the air is cooled due to radiation cooling of the slope at night and it becomes relatively heavy. On the other hand, the valley breeze is an ascending wind, in which its air becomes heated along the slopes and becomes lighter (*1.11).

In the referenced villages, Torrebaja, Csas Bajas, and Castielfabib, the valley runs near the villages approximately from the south to the north. Therefore, from a macro point of view, during daytime, Levante, which blows from the east, ascends from the south of the channel along the geographic formation of the mountain to the north, and at night it descends in the opposite direction. From a micro point of view, the villages located on the south side of the slope of the mountain receive upward winds from the southern valley during daytime, and at night receive downward winds from the northern part of the mountain. Hence in a mountain region such as Rincón de Ademuz, winds do not always blow from one direction between the south and north, but it changes depending on the time of the day, depending on the geographic formations of the mountains and valleys. This is the mechanism of the winds in Rincón de Ademuz.

In analyzing winds in a mountain region, in addition to the mountain and valley breeze, references about a cold air lake must also be made. A cold air lake is a condition in which cold air stagnates in a basin or valley. In the valley, the mountain breeze pushes cold air to the sea along the valley, but in the basin, the cold air stagnates and forms a layer over

the area. This layer of cold air can threaten lives, damaging agricultural crops. This is why many poplar trees are planted as a windbreak forest along the Turia river, all the way to Teruel, to prevent winds from directly hitting the villages. In severely cold regions, it is an important task to protect from gusts and cold so as to sustain the villages (*1.11).

(*1.10) ARAKAWA S.: “局地風のいろいろ (Various local winds)”, Seizando kisho books,

(*1.11) YAMAGISH Y.: “天気予報のための風の知識 (The basement acquaintance of wing for weather forecast)”, Ohmsha, 2003

1.3.3 The definition of the wind direction

In order to prevent rainwater from entering in the living room, all the chimneys have covers. The cover of the chimney was traditionally made by joining two ceramic tiles together to form an inverted V. Conventionally, the fire place, which was used as a kitchen, was placed in the living room with no exceptions. Therefore, the roofs of all the dwellings had a chimney. However, due to recent changes in the lifestyle, the existence of dwellings with no fire place has been confirmed. Conversely, dwellings with an additional fire place constructed outside of the living room were also found.

It is a chimney effect that ventilates smoke from the fireplace. Chimney effect is a natural phenomenon whereby hot air ascends in direct ratio to the density difference between hot and cold air, when there is a pillar of air with a higher temperature inside than the outside. The hot air that ascends is drawn and discarded by the wind that is blowing above the chimney. Therefore, in order to eliminate the smoke effectively, constant ventilation is required in the opening of the cover of a chimney. That is to say that the direction of the opening of the cover of a chimney should capture the direction of wind. In other words, the direction of the opening of the cover of a chimney is a key to finding out the direction of invisible wind. In recent years, the chimney of a fireplace has changed in accordance with changes in the heating system. In particular, by installing steel fireplaces and steel chimneys, it has become possible to cope with winds from all sides. However, because the purpose of this section is to clarify the direction of wind in the villages, it will focus only on the covers made by the traditional way of putting two ceramics together. The arrow in the figure indicates the direction of wind going through the opening of the cover of chimneys.

The most logical way to attach a cover to a rectangle chimney is to place a ceramic onto the short-edge of the chimney. Doing so creates a bigger opening in the cover of a chimney. The black arrows in the figure indicate the direction of the opening of the cover. It was found that the direction of the black arrows depends on the locations and many of them are placed along the contour lines. However, the investigation also revealed that some of the dwellings had the ceramics placed onto the long-edge of the chimneys. Applying the ceramics onto the long side of the rectangle means that the cover of the chimney is inevitably smaller than that of the chimneys with ceramics installed on the short-edge. Nonetheless, the residents purposely installed the covers on the chimneys to make the opening smaller in such cases. The possible reason for this is that the direction of the small opening of the cover precisely captures the wind. The residents understand the winds from their life experiences, and therefore it can be estimated that the cover of

the chimney is installed according to the direction of the wind. The white arrows in the figure are the direction of the small opening which is installed onto the long hand of the chimney. The investigation showed that most of the arrows pointed to the direction of north-south. The opening of the cover of the chimneys indicated that the wind in the three target villages constantly blows in the direction of north-south.

In order to confirm the hypothesis, statistical data of Institution of national geography was used as a reference. According to the data, the wind blows in the direction of north-south in Teruel, the nearest village to the three target villages, located in the upstream of Turia river. Thus, the literature data also verifies the results from the opening of the covers of the chimneys. Based on the findings from this chapter, the following section analyzes the relationship between wind, dwellings and housing culture, with a definition that the wind blows in the direction of north-south.

Photo1.4 The cover onto the short-edge of the chimney

Photo1.5 The cover onto the long-edge of the chimney

Fig.1.4 The direction of the covers of chimney in Torrebaja

Fig.1.5 The direction of the covers of chimney in Casas Bajas

Fig.1.6 The direction of the covers of chimney in Castielfabib

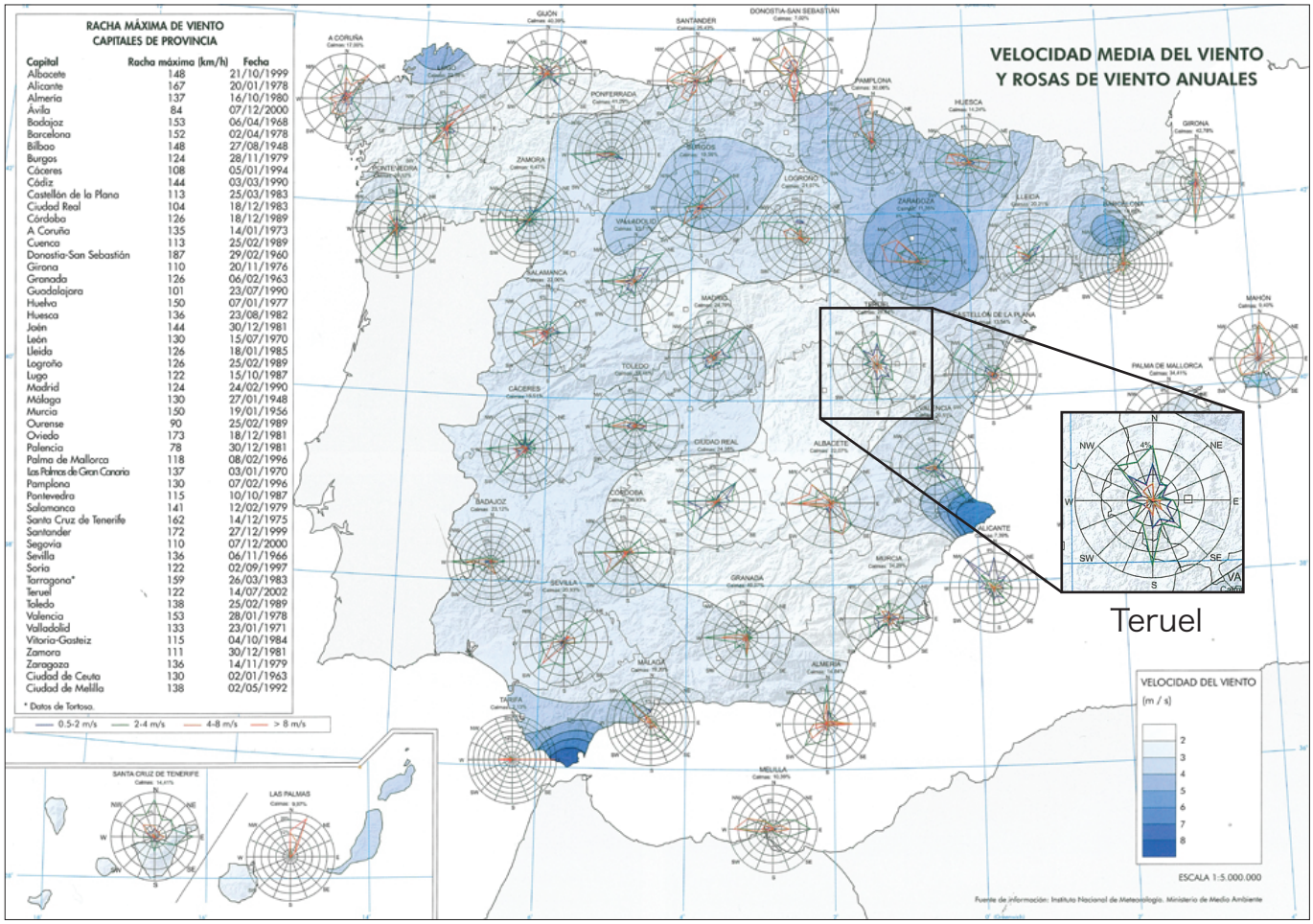


Fig.1.7 The directions of the wind in Spain

SERENO A., MAS S., et al.: “ATLAS NACIONAL DE ESPAÑA Grupo 9 CLIMATOLOÍA” Instituto Geográfico Nacional, 2004, pp.20

1.4 Conclusion

This chapter has focused on the reasons for the selection of the villages as well as the point of the analysis. To determine the sustainability of the village, Rincón de Ademuz, which developed in a mountainous terrain along the rivers, was chosen as the subject. The villages on a mountainous terrain do not expand easily and they tend to go through little changes. For this reason, they are more suitable for investigating the sustainability than the villages that are located on plain lands. Three villages, Torrebaja, Casas Bajas, and Castielfabib, were selected out of the 18 villages for their population, industry, history, and geographic features. Each of these three villages are situated on top of the mountain, mountainside and riverside, which are typical locations seen in Rincón de Ademuz. Therefore, despite being only three villages, it is conceivable that they capture the general characteristics of entire Rincón de Ademuz.

In addition to the geographic features, the point of analysis on the wind was derived from its climatic characteristics, historical background, building materials, construction methods and planning, as well as the lifestyle. In summer, wind is necessary to live comfortably, and in winter it has an important role of eliminating smokes from the fireplace. At times wind can also threaten lives, thus it was considered essential to effectively utilize the wind to sustain the village life for many centuries in Rincón de Ademuz.

First of all, in order to define the directions of the winds, a meteorological standpoint was addressed. In Valencia, a seasonal wind called Levante blows from the sea to the land. Additionally, in a mountainous terrain, the mountain breeze and the valley breeze blow, each taking turns. In Rincón de Ademuz, its valley approximately runs from the north to the south. Rincón de Ademuz is situated in a location, where Levante ascends softly from Valencia along the valley. Moreover, the mountain breeze and the valley breeze take turns by day and night along the valley in its mountainous region.

In addition to the meteorological conditions, the direction of the chimney cover was studied in order to define the invisible wind. Traditionally, two ceramic tiles are joined together to create a cover for a chimney. The opening is always placed to the direction of the wind, and this is a way to visualize the wind. From this analysis, it can be concluded that the wind blows approximately in the directions of north-south. The result of the analysis that discovered the wind blows between north-south in Rincón de Ademuz matches with the directions of the winds in Teruel, which is located at the upper stream of Turia river, thereby proving the hypothesis correct.

Such relations between winds and villages have been confirmed throughout the world. For

instance, in Tibet, inhabitants display many flags on the roofs of their dwellings. The flags waving in the wind have the same holy meaning as a Buddhist chanting sutra (*1.12). Moreover, in Hyderabad, Pakistan, huge ventilation openings in dwellings called Bad-gir are a notable characteristic of this city (Photo1.6). It is made in each room because of the hot and dry weather, with a temperature reaching to 50 C° in summer. Through these openings inhabitants let the dry wind into rooms for ventilation. Each Bad-gir faces the same direction because the wind always blows from the same direction (*1.13).
In this way, many ideas exist in the villages of the world. In the old days, inhabitants made good use of winds in their life. In the case of Rincón de Ademuz, the direction of the cover of the chimney is a clue for the relation between the wind and the village. It is, however, not only the cover of the chimney but also the entire structure of the village, as well as the planning of the dwellings that are decided according to the wind. The details of such are discussed in the following chapters.

(*1.12) FUJII A.; “集落探訪 (touring various villages)”, Kenchi-kushizai laboratory, 2000

(*1.13) RUDOFSKY B.: “The prodigious builders”, American Heritage Publication Co., Inc., USA, 1977, pp.286-287

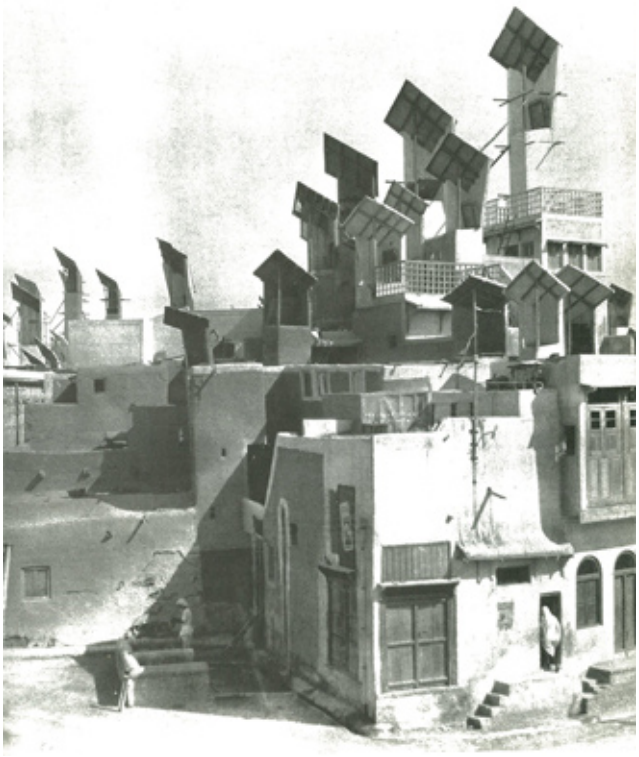


Photo1.6 The Bad-girs in Hyderabad

Chapter 2
The wind and the dwelling

Chapter2. The wind and the dwelling

2.1 The purpose and composition of this chapter

The purpose of this chapter is to make clear how inhabitants control wind to create comfortable living environment in dwelling. Wind has distinct characteristics as part of dwelling and lifestyle. In order to analyze the relations with wind more deeply, this chapter is roughly separated into two parts: tangible and intangible. Tangible part is about dwelling and intangible part is about lifestyle. Exactly from these two point of analyze it is possible to grasp the essence of dwelling in Rincón de Ademuz and to clear up how inhabitants' lifestyle is adapting to the wind.

The composition of this chapter is as follows. The research method is explained in the second section. And the third section explains the composition of dwelling. Because there are some characteristic plannings, the analysis is focused on the differences of planning in each village. Also new inhabitants' demand shows the way of transformation of dwelling. The fourth section is about the wind-path in dwelling. Because the wind is invisible, in order to analyze it, some characteristic openings and furniture in the dwelling should be clarified. The openings show the wind-path in dwelling. Besides, the wind makes potent influence on zoning of dwelling, because it carries the smell of domestic animals. That is why the farm accommodation should be separated from the living room. Furthermore, the fireplace is also related to the wind because of the smoke elimination. Thus, the inhabitants need to find a way to take the wind into their dwelling. The fifth section is referred to thermal environment in dwelling because of passive design. The natural air convection works well in vernacular architecture. And the sixth section is about how the wind has influence on the inhabitants' lifestyle. In order to understand their lifestyle, the analysis is focused on some furniture. Furniture shows the mode of using rooms. Moreover the relation between the wind and the inhabitants' life in dwelling is analyzed. Inhabitants know the most comfortable place in each season and each time. Thus, they change some spaces to stay in dwelling. The lifestyle also has a relation with the environments of dwelling.

Because of all this, this chapter is focused on the relation between the wind and dwelling. The wind makes the stay comfortable inside the dwelling in summer. Besides, the wind leaves outside the smoke from fireplace in winter. There are many ways to control the wind inside the dwelling and, also, it is possible to explain the inhabitants' lifestyle from the wind.

2.2 The method of research

This study is focused on research in Torrebaja, Casas Bajas and Castielfabib in El Rincón de Ademuz, because of their different geographic characteristics. In order to make clear the characteristics of dwelling planning, 23 dwellings in three villages were exterminated. But this alone does not give enough data to analyze how inhabitants live. Thus, additional eight dwellings in Torrealta, Cuesta del Rato and Casas Altas were studied. Torrealta is located on riverside. This village is similar to Torrebaja. Casas Altas and Cuesta del Rato are located between riverside and mountain, like Casas Bajas. A total of 31 dwellings were researched for the analysis. However, 2 of the 31 dwellings were originally barns, but in recent years were reformed as dwellings. That is why these two dwellings were excluded from the analysis. But their dates are used as case for the study of transformation.
Besides, 2 of the remaining 29 dwellings are a case when two different dwellings are connected to a single dwelling. These connected dwellings remain individual planning and two families are using each dwelling. The inhabitants only connected two dwellings with a corridor to be able to come and go from one building to another. That is why these connected dwellings are analyzed separately in the fourth section. But 1 of these 2 dwellings is a case when inhabitants only use the bathroom and toilet in the connected dwelling. No family lives in this part. But inhabitants are still keeping this connected dwelling. Then, this case was excluded from analysis in the sixth section, because the purpose of this section is to clarify the inhabitants' lifestyle.
The research method is hearing and observation. Furthermore, to support analysis, whole dwelling plans were drawn up by hand and pictures were taken. In particular, same dwellings were visited several times and inhabitants were interrogated about how they used the places and furniture to learn about their lifestyle in their dwellings.

2.3 Basic composition of the dwelling

2.3.1 A summary of the dwelling

Next figure shows a summary of dwellings (Fig.2.1).

Torrebaja, Casas Altas and Torrealta are located on riverside. The family size is greater than in other villages. The average of family size is 3.6 and it is the largest number among all the researched dwellings in this study. There are no families who continue farming. Six families are still living in village. And the others six families are living in city. This is a case when inhabitants' use the village dwellings as summer house. The average of total floor space and floor height are also larger and higher than in other villages, especially in Torrebaja. In total the average of floor space is 460.78 m2 and floor height is 3.86m. The common factor about the dwellings located on riverside is that the dwellings have larger floor space and more inhabitants.

Casas Bajas and Cuesta del Rato are located on the middle of the mountain. These villages are spread on the slope. The averages of family size are 2.3 in Casas Bajas and 2.0 in Cuesta del Rato. Two families are still farming and one family is retired. The other three families are living in city. In total the average of floor square meters and floor height are the smallest. This result contrasts with the riverside dwellings.

Castielfabib is the only village located on the top of the mountain. The average of family size is 2.3. Only one family is farming and three families are retired. The other eight families are living in the city. This tendency is same as in the others villages. The average of floor space is 206.29 m2 and floor height is 3.75 m.

Village		Torrebaja	Casas Bajas	Castielfabib	Casas Altas	Cuesta del Rato	Torrealta
Location		Riverside	Middle of mountain	Top of mountain	Riverside	Middle of mountain	Riverside
Number of dwellings		7	3	12	3	4	2
Average family size		3.6	2.3	2.3	3.6	2	3
Life style	Farming	0	0	1	0	2	0
	Farm retirement	6	1	3	0	0	0
	Living in city	1	2	8	3	1	2
Average total floor square (㎡)		460.78	168.27	206.29	244.61	193.38	306.54
Average floor height		3.86	3.3	3.75	4	3	3.5

Fig.2.1 A summary of dwellings

Thus, 17 of 30 families are using their dwellings as a summer house or weekend house. It is more than a half of all. Totally three families are still farming and the others 10 families are already retired. Nowadays many young families have a job in other villages or cities, such as Ademuz or Teruel. Besides, the dwellings situated on riverside are bigger than on mountain, because of the difference of location. But the height of the dwelling does not have much difference as well as total floor space. Almost all dwellings are composed of three or four floors. However, some of them have five floors, especially if they are located on the mountain. Therefore, the difference is not only the locations themselves, but also these locations have a potent influence on the dwellings size, family size and lifestyle in the dwelling.

2.3.2 The differences of the plannings depending on the locations of the villages

Usually, dwellings are not built at the bottom of the valleys, due to flooding and cold air drainage. Ridges also are difficult to build because of the wind. The wind runs fast on the ridges. Furthermore, to maintain the population, the land must be arable. However, the mountainous terrain has its limitations when it comes to create farmland. It is therefore dwellings in mountainous areas should be compact and high density. Thus, the dwellings located on the higher altitudes are always built as multi-storey houses with farm accommodation and living-quarters under one roof (*2.1).

The multi-storey house in Rincón de Ademuz consists of three layers. The bottom was farm accommodation in the past time (Photo2.1). Nowadays only two families, who participated in this study, are keeping domestic animals. The mechanization of agriculture has a strong influence on the planning. Almost all families reformed farm accommodation into a storeroom or garage. In addition, the farm retirement increases with aging of population. Dwellers have a small agricultural land to grow vegetable for themselves. Residents usually work in regional urban centers such as Teruel. Only a few inhabitants have agricultural work. This also causes the transformation of dwelling. In the second layer living quarters are located. Generally the inhabitants use the first floor as living quarters. However, in some dwellings, the living room and farm accommodation are coexisting on the ground floor. The most important characteristic of the living quarters is fireplace.

Photo2.1 Farm accommodation

The fireplace is always set in the living room. In the past, living room was also a kitchen, inhabitants not only used the fireplace for heating the dwelling, but also for cooking. Nowadays gas use in dwellings becomes widespread. Inhabitants begin to reform their dwelling to reconstruct kitchen space along with the living room. Furthermore, the gas and electricity are also used for heating system. The fireplace lost the necessity. Yet, the fireplace is still kept in dwellings for use. Some families even make a second fireplace in another room. The last layer is the attic. Nowadays inhabitants use the attic as the storeroom or reform it as the bedroom. However, in past times, the attic was used as the workspace (Photo2.2). Inhabitants there dried cereal to make bread. Additionally, in some dwellings chickens were kept in the attic. Even now, some dwellings have bird-room. In such a way the attic supports inhabitants' life in rural area.

Therefore, the dwelling is composed of three layers, but the planning is different depending on the location. There are two characteristic locations in mountainous terrain: flat land or slope. Torrebaja is located on the flat land at riverside, Casas Bajas is on the slope in the middle of the mountain and Castielfabib is on the slope on the top of the mountain. However, in order to focus on the details of the location, it should be noted that there exist various terrains. For instance, in Castielfabib, almost all the dwellings are on the slope, but some of them are placed on flat land, such as on the mountaintop. One village can be located on various terrains.

It is possible to understand the characteristic differences of planning from a corridor. The dwellings, that are located on flat land always have the corridor inside. Each room is connected to the corridor. In this study this type of dwellings is defined as "flat land-type". In contrast, the dwellings located on the slope do not have the corridor. The site area is small

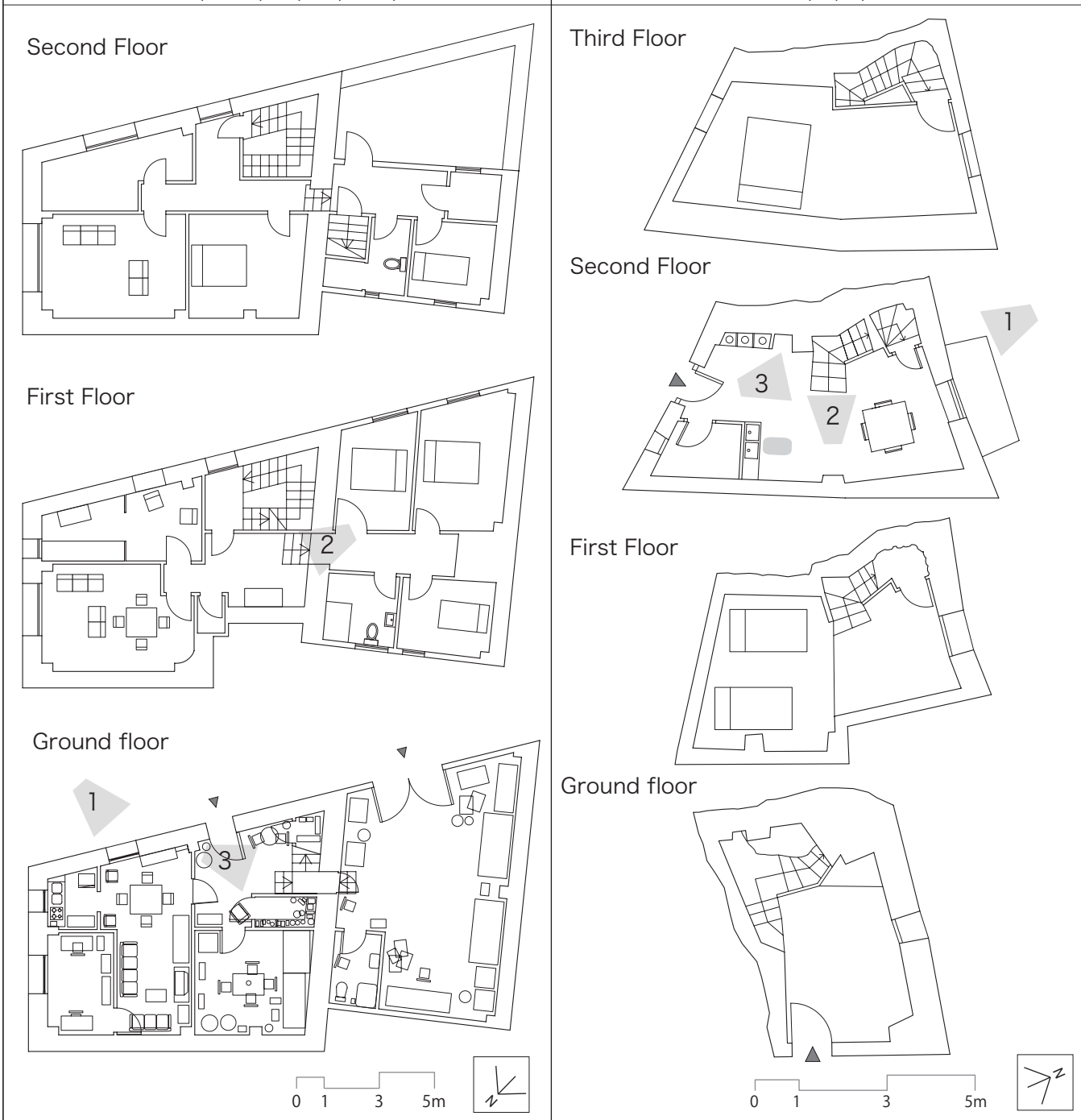
Photo2.2 Attic

and the dwellings are built with high density. There is no space for the corridor. The stairs directly connects the rooms. Each room is compact and concentrated in the small area. This type of dwellings is defined as “slope-type” (Fig.2.2).

The flat land-type is built on the wide area. There are entrance hall, corridor and stair hall in dwelling. 17 of 31 dwellings fall into this category. Normally, the dwellings are composed of three or four floors with many rooms. The number of rooms of this type of dwelling is larger than in the “slope-type”. In contrast, 14 of 31 dwellings fall into the slope-type category. Inside there is no corridor, entrance hall or stair hall. Dwellings are composed of four or five floors and each floor has a different shape. Normally, one dwelling has two entrances. One entrance faces the street that passes below the dwelling and the other is above the street. The height of the dwelling is controlled until the second floor, counting up from the street, because there is a rule, that the dwelling should not give the shadow to the backyard of the dwellings. Such is the way of dwelling construction in Rincón de Ademuz.

(*2.1) OLIVER P.: “Encyclopedia of Vernacular Architecture of the World”, Cambridge University Press, 1997, pp.125-139

Flat land-type	Slope-type
TB1, 2, 3, 4, 5, 6, 9, CB1,2 CF1, 3a, 3b, CR1, 3a, 3b, TA1,2	CB3, CF2, 4, 5, 6, 7, 8, 9, 10, 11, CA1, 2, 3, CR2



1. Exterior	2. Corridor	3. Stair hall	1. Exterior	2. Stair in living room	3. living room
					

Square measure	497.33 m^2	Number of rooms	18	Square measure	112.88 m^2	Number of rooms	5
Floor height	3 floors + Atic	Square of each floor	Same	Floor height	4 floors	Square of each floor	Different
Corridor	Exist	Stair Hall	Exist	Corridor	Do not exist	Stair Hall	Do not exist. The stairs are connected with the living room.

Fig.2.2 The differences of planning in each location

2.3.3 The transformation of the dwelling

There are six dwellings reformed into a two-family dwelling. In some dwellings the farm accommodation is reformed into a second living room. In spaces for the elderly, the floor level difference was eliminated. On the other hand, in some dwellings, the third floor or attic is reformed for a young family. Despite the phenomenon of depopulation in rural areas, inhabitants contrive to find out ways to continue their lives in the village. Besides, in Torrebaja, some inhabitants even reformed the barn into the dwelling (Photo2.3). The owners hope to be able to rent these dwellings to city residents as a summer house. When the owners reformed the barns, they made fireplace in living room. Nowadays there are heating appliances in every dwelling, but they rebuilt it again. It means that the fireplace is not only the heating appliance, but also the symbol of dwelling.

Furthermore, 18 homes investigated in this study are only used as a summer house. In recent years, because of work, inhabitants begin to live in big cities such as Barcelona and Valencia. But they continue to maintain their dwellings as summer and weekend houses. In many dwellings, the farm accommodation and attic are reformed into living spaces to adapt to new inhabitants' demands. Inhabitants come back to the village in Christmas, Easter and summer vacations. They do not frequently return to the village. However, even so, they do not leave their dwellings for many years. It is important for the village that each inhabitant maintains his dwelling.

The most characteristic transformation is that inhabitants separate or connect their dwell-

Photo2.3 The case that inhabitants reformed the barn into the dwelling

ings with neighbor dwellings. Dwelling is more important thing that a child inherits from his parents in disadvantaged rural area. Parents divide their dwelling for the transfer the property to their children. Sometimes they divide their dwelling into two or three parts. Residents use bricks to separate the corridor, as well as, they make a new entrance door in another place. Moreover, when the dwelling is divided inhabitants rebuild fireplace in the living room. In many cases, the dwelling with the original fireplace becomes the property of the eldest son. This is the way of inheriting the dwelling, although when parents are still alive.

In contrast, in some cases inhabitants connect the neighbor dwelling. For example, when a neighbor left the village to live in the city and the dwelling was put up for sale, dwellers buy and reform his dwelling as the space for bedroom and toilet. Figure shows the case in which the inhabitants bought the sister's dwelling and reformed it as a bedroom and toilet (Fig.2.3). Such separation and connection helps to avoid self-destruction of the villages. The dwellings are not built independently, each dwelling shares the interior wall with neighbor dwelling without any gap between them. This construction method supports the idea of a flexible frontiers of dwellings. According to audience research, the ancient inhabitants gambled even their living quarters. They devolved their living quarters to neighbors, such as in a case when the dwelling was divided to assign it for a family. Thus, the initial appearance of many homes has been modified to adapt the new inhabitants' demand. Dwellings change their shape, like plants or fungi. The common factor in the transformation of dwellings is that the inhabitants, through their living behavior, maintain the building. The farm accommodations, barns and empty houses are often reformed into living space. This is one part of the system of sustainability in the village.

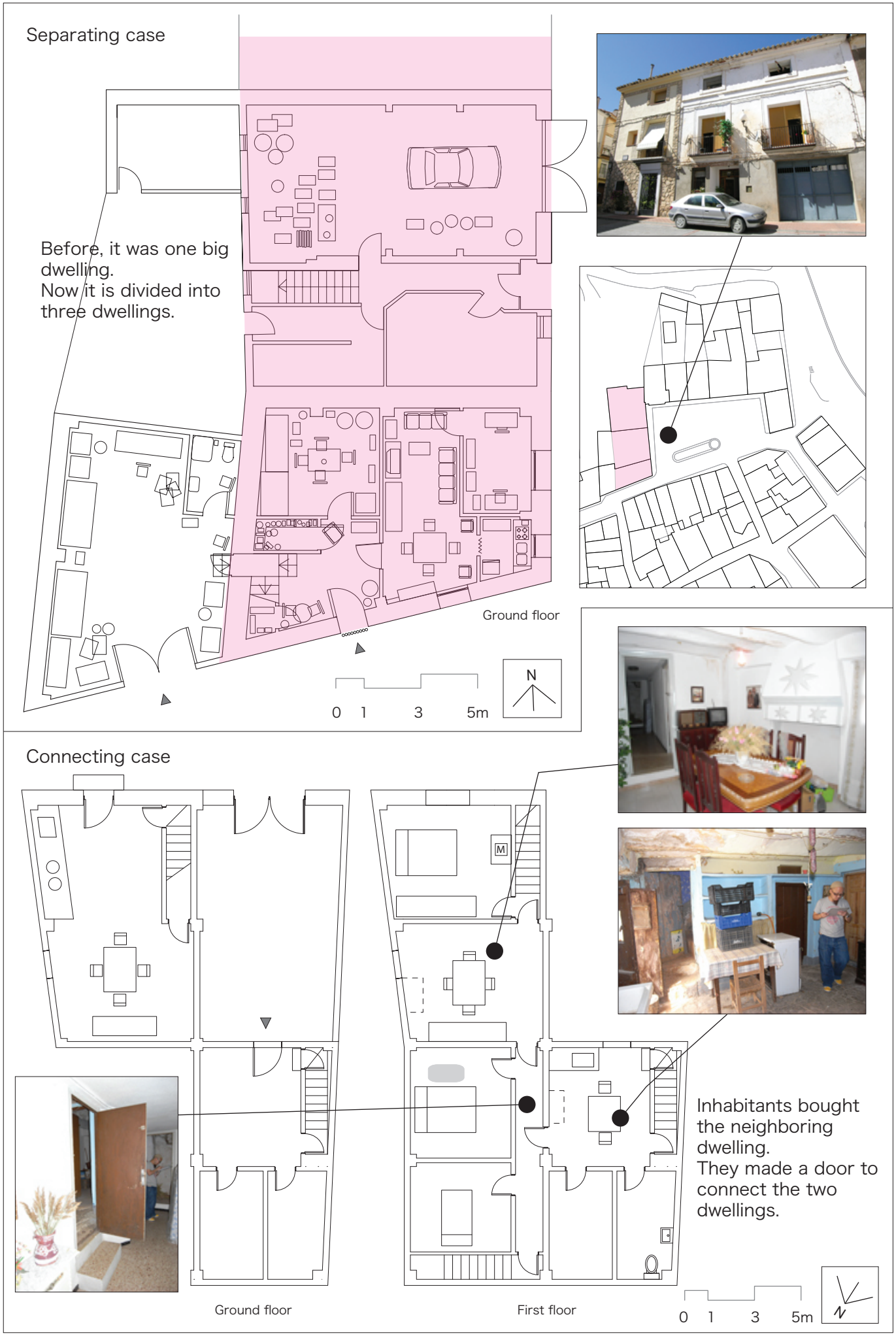


Fig.2.3 The transformation of dwellings

2.4 The wind-path in the dwelling

2.4.1 The type of interior doors as the factors of wind visualization

The door is an element that is determined to separate the space. The doors not only provide inhabitants' privacy, but also separate the indoor environment elements like air, light, sound, smell and atmosphere inside the dwelling. The inhabitants of Rincón de Ademuz have had an interesting idea to adapt indoor environments. It appears on the interior doors. The next figure shows the types of interior door (Fig.2.4). There are five types of interior doors. Traditionally, the doors are made of wood and they are determined to separate the space. Nevertheless, sometimes also glass material is used for doors, because the glass can pass light inside the dwelling. Besides, in order to pass the light inside, some interior doors have transom window. Moreover, some doors have several holes. Generally, these

Fig.2.4 The types of interior doors

holes are on the entrance door, but sometimes even interior doors have holes. In addition, some rooms are only separated by a curtain. In this way, the details of interior doors show the characteristics of the space.

Next figure shows the distribution of five types of interior doors (Fig.2.5). In total there are 505 doors in 31 dwellings. There are 324 doors made of wood. This is a most common type of doors in dwellings and it accounts 64 percent of all. In second place is the interior door with glass panel and it accounts 21 percent, it is 103 doors. In addition, 27 doors are interior doors with transom window. This is 5 percent of all. Especially interior doors with glass panel and transom window are distributed in the flat land-type dwelling. In Torrebaja, there are 186 doors in seven dwellings. On average, one dwelling has 26.5 doors. The number of doors shows the size of dwelling. It means that each dwelling has more than twenty rooms. This is the largest number of rooms in one dwelling of all. Generally, the corridor is nestled inside the dwelling to connect each room. Thus, the sunlight does not reach some of the corridors. The interior doors with glass panel and transom window are used to illuminate the corridor. For the same reason, there are some top lights in the corridor (Photo2.4). Besides, some rooms are also difficult to reach for the sunlight. In this case, inhabitants use the corridor and stair hall to take indirect light, the corridor and stair hall work as a courtyard. This is why the interior doors with glass panel and transom window are distributed in the corridor and stair hall. Especially this kind of doors can be

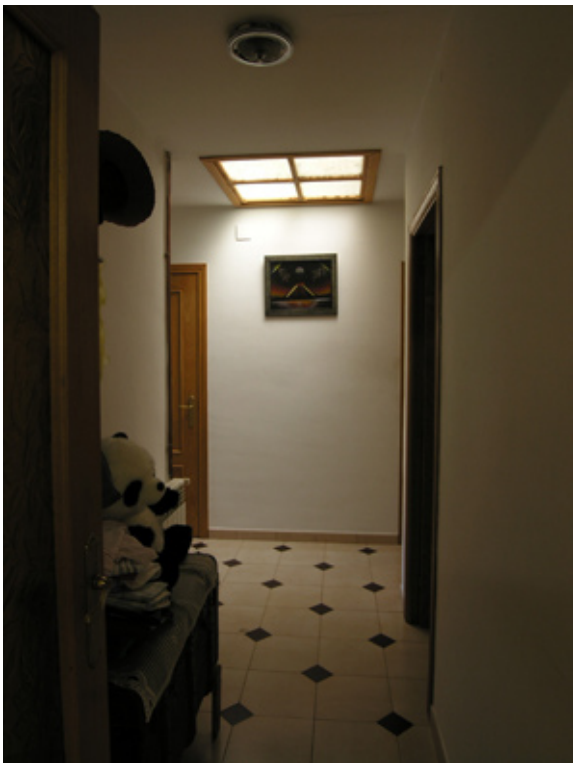


Photo2.4 Top lights in the corridor

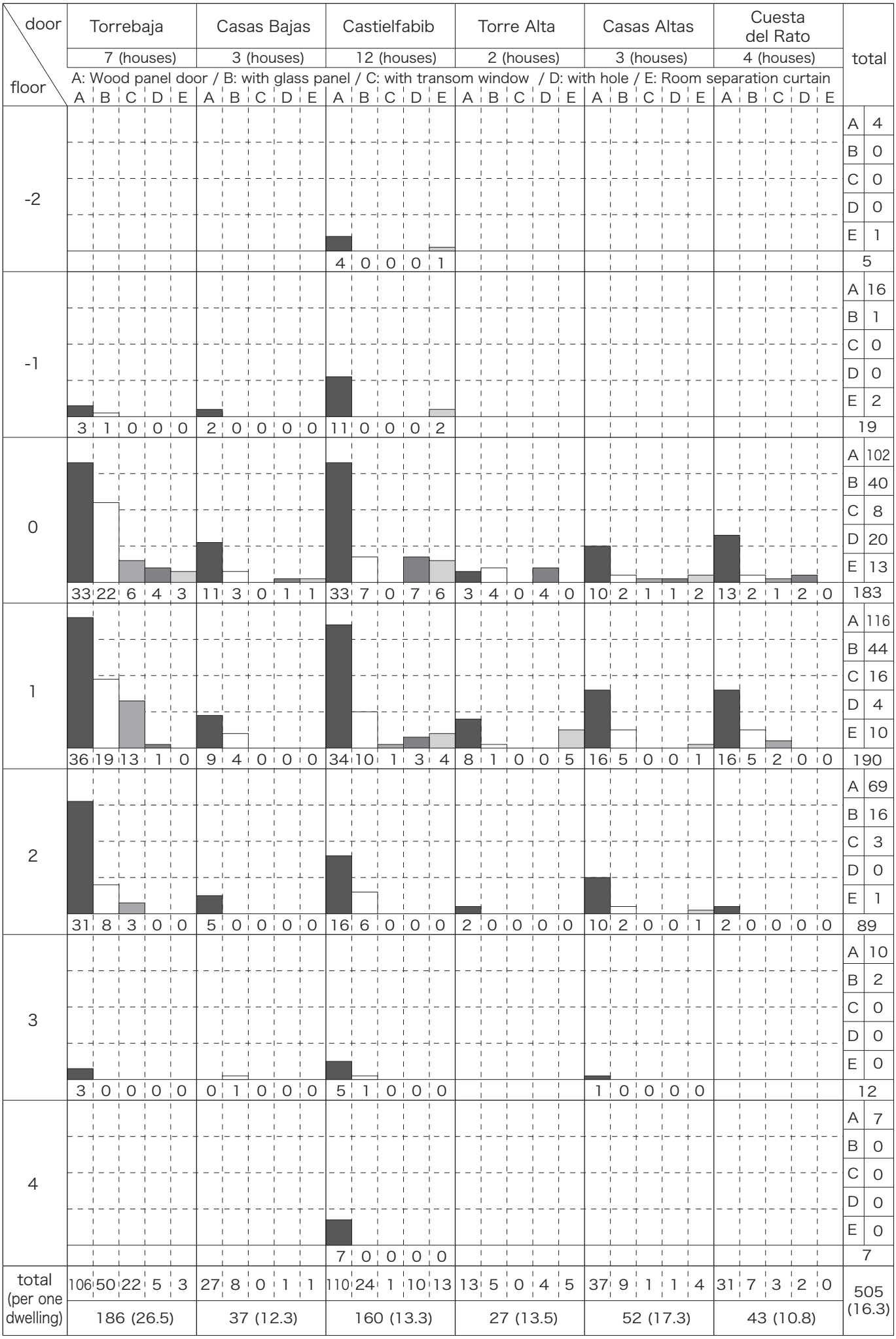


Fig.2.5 The distribution of interior doors

found in dwellings located on flat land, on the ground and first floor where many inhabitants have their living quarters. Thus, these doors are not distributed all over the dwelling. This is an idea to receive indirect sunlight into interior spaces that do not face the outside, such as the corridor and interior rooms. And this is why almost 50 percent of the interior doors with glass panel and transom window are concentrated in Torrebaja.

On the other hand, during the research were also found interior doors with holes. Especially this kind of doors is used in the storeroom to protect food from mold. But there is another type of doors, in that inhabitants make many holes by hand. The purpose of doors is the separation of spaces. Then why are there holes in the wooden panel door. The inhabitants say that the purpose of these holes is to pass the wind. This type of door can be found on the ground and first floor where the fireplaces are.
Moreover, some inhabitants made small window in the entrance door. When someone visits the family, it is possible to see who came out of the window in the entrance door. On the other hand, it is also possible to let in the wind. Then, during the further study of front doors, it was noticed that often entrances are provided with long blind made of plastic strips or tubes, that works as protection against flies. There are a lot of flies in rural area. The anti-flies blinds mean that inhabitants always open the entrance door during the summer, with this blind it is possible to let in the wind by opening the entrance door without letting flies come inside the dwelling. The interior door with holes also corresponds pretty much to the anti-flies guard. Thus, this is an idea how to let the wind into the dwelling, preventing the passage of insects inside.
Finally there are 10 cases, where inhabitants use the curtain for the room separation. Most often, the curtains are used on stairs and corridors. These curtains are working in a similar way as the interior door with holes. The curtain is a material that indistinctly divides the space. All the environment elements can pass through it inside the room. Besides, the curtain also works as the blinder. In some case inhabitants use the curtain even in the bedroom. Especially this kind of room division is distributed Castielfabib where dwellings are located on the slopes. This idea, which softens the sense of pressure from a small room.

This is why, according to the location of the dwelling, the distribution of interior doors is different. The flat land-type dwellings have interior doors with glass panel and transom window because of the long corridors. In contrast, the slope-type dwellings have interior doors with holes. Besides, in some case the curtains are used as the room separation, what makes possible to let pass the environment elements into the dwellings.

2.4.2 The zoning of the dwelling

Traditionally the wind makes the potent influence on the inhabitants' lives. The food is also affected by the wind. Raw ham, called "Jamón Serrano" in Spanish, is one of the most typical food products in Spain. Jamón Serrano is a salted and dried pork ham. Serrano means mountainous. In ancient times it was an important preserved food product in the mountainous terrain. Traditionally, each family made their own ham in their dwelling. Inhabitants dried the ham in the northern part of the attic, because the sunlight is rotting food. Furthermore, apples and tomatoes were dried in the same space, too. In Rincón de Ademuz many farmers cultivate almonds and the attic is also used as a place for drying the nuts. Thus, the loft is always used as a space for drying food. Nowadays inhabitants are buying the raw ham in a supermarket, but the attic is still working as a place for drying fruit.

In the southern part of the attic is the biggest opening. The inhabitants of Rincón de Ademuz call it "Solanar". The details of solanar are described in the section 2.5. Through solanar can go a lot of sunlight and it helps to raise the room temperature to dry the foods in the attic. Furthermore, inhabitants also dry their laundry in solanar, where it exposed to the direct sunlight. During a more closely study of the openings in the attic, it was noted that the opening of the southern part is bigger than in the northern part. The northern opening is for the outlet of the wind. The wind flow helps the drying process.

Thus, this is the reason why the attic has openings at both ends, this place is used for drying food and laundry and for better drying the wind flow is essential. That is why the windows are always open, to let the wind pass through and create conditions similar to those on the outside. Furthermore, in the past, the attic was also used for the processing of cereals. Thus, the attic is the place where the farmers do their agricultural work. Therefore the attic has the characteristic of a semi-outdoor space. The attic door is always set in front of the stairs, for the obvious separation of living quarters. This door is opened in the summer, to pass the wind into living quarters, and closed in the winter, to keep the heat inside. The next figure shows the relation of the zoning (Fig.2.6).

On the other hand, the farm accommodation of the dwellings located in mountainous terrain are always situated on the ground floor. Traditionally, in the past, inhabitants kept the domestic animals. Since the domestic animals have smell, the farm accommodation must to be separated from living quarters. Normally inhabitants separate the entrances. In some cases to separate the entrances inhabitants use the elevation differences. In other cases, there are two entrances without elevation and the entrance for inhabitants is directly con-

nected to the stair leading to the first floor. Thus, inhabitants are able to create obvious separation between the farm accommodation and the living quarters. This is an idea to protect the living quarters from the bad smell flow.

Over the past 40 years, the majority of dwellings were provided with water and sewerage systems. 30 of the 31 studied dwellings have toilet inside. When inhabitants are reforming the dwelling, they set the bathroom next to the living room and bedroom. But in the case when only the toilet should be installed, they set it in the farm accommodation. In the farm accommodation there is enough space, because inhabitants do not keep domestic animals, anymore. Besides, it is separated from the living space. Besides, it is separated from the living space and the bad smell does not flow into the living quarters.

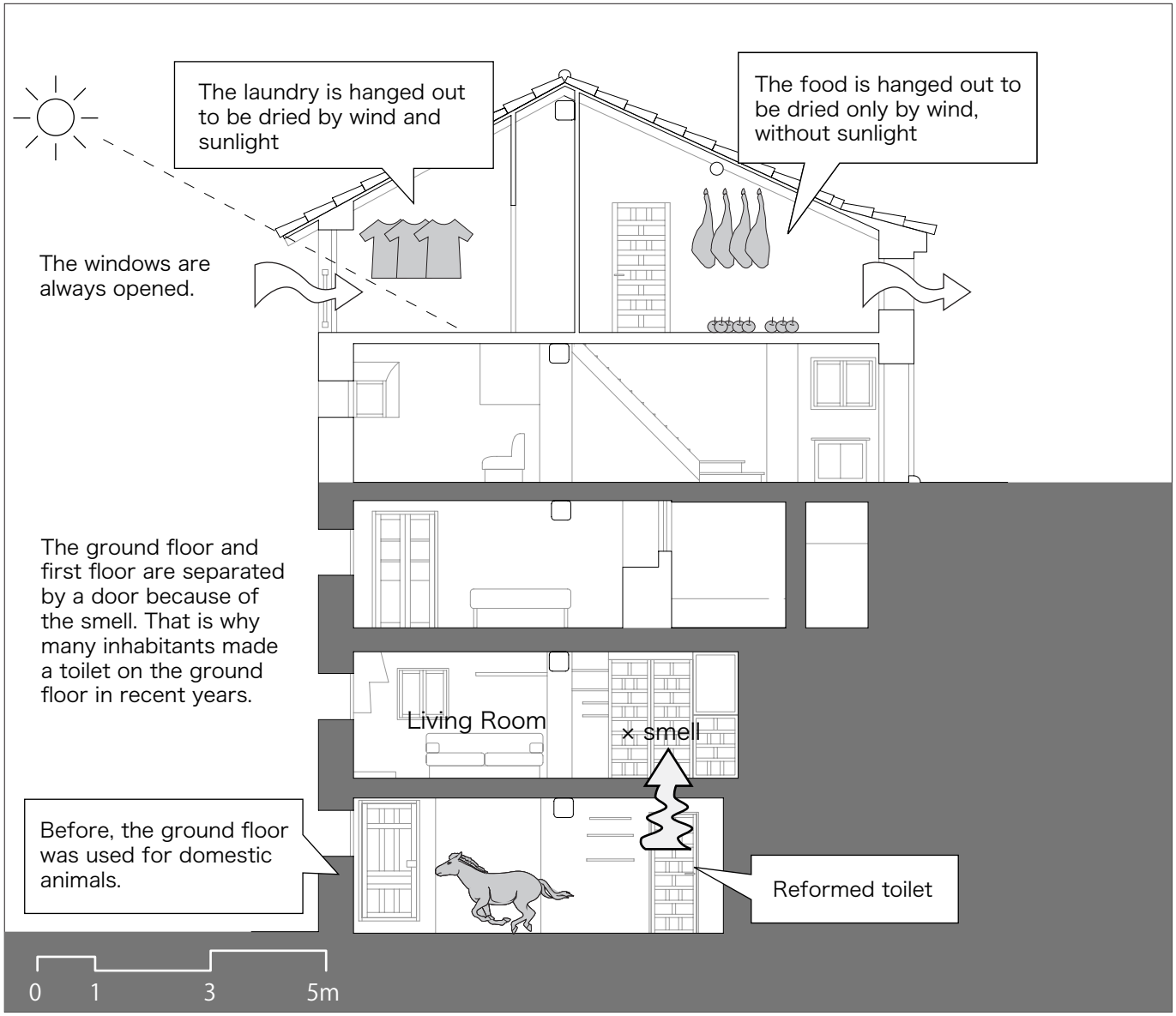


Fig.2.6 The zoning of the dwelling

For all these reasons, the dwelling is composed of three layers. The upper layer is the place for drying. There are openings at both ends. Inhabitants set the door before the stairs to the attic, and the wind can pass through the space in spite of the seasons. The bottom layer is the place with the smell. Inhabitants make several entrances to separate the bottom space. Thus, it is possible to say that the wind makes a potent influence on the zoning of dwelling. Inhabitants control the wind in their life. And it is needless to say that the living quarters are also affected by the wind. This subject is explained in the next section.

2.4.3 The direction of fireplace and the wind-path in living room

In order to analyze the relation between the wind and dwelling, it is necessary to clarify the properties of fireplace, because the fireplace is always in need of wind to eliminate the smoke. In the old days, the fireplace was used as a kitchen, and it was the only source of heat in the dwelling, what is explained in section 2.3.2. In addition, the fireplace represented a symbol of the family, it was first carved and decorated with ceramic tiles (Photo2.5). It is a place to where inhabitants invite the visitors and where they all together have some meal. The details of the invitation manners are explained in section 2.6.1. Therefore, the living room is a space not only to enjoy the company of family, but also serves to receive visitors. The fireplace has always been the center of the family and represented a happy home. Therefore, it not only shows the relationship with the wind, but also shows the lifestyle.

But nowadays the circumstance of fireplace has changed. Almost all of the inhabitants have made a new kitchen. Because new heating system came. Besides, some inhabitants have started to use steel stove and equipped the chimney so that the smoke is led directly to outside. Thus the living room is warming up, and the smoke does not need to be eliminated by the wind. Furthermore, some inhabitants removed the fireplace from the living room. Therefore, the use of the living room is starting to change because of the new lifestyle. But the purpose of this study is to make clear how the inhabitants adapted to the climate and continue their life in the village. Of course, new technologies come, but the dwellings still continue to be in the same climate. Therefore, the analysis focuses

Photo2.5 The fireplace in the living room

on the original fireplaces, which are related to the ancient village. The original situation of fireplaces and way of using them is confirmed by hearing research. It was impossible to find out the original situation of fireplace in 4 of 31 dwellings. Therefore in this section only 27 dwellings are proper for analyzed.

In order to analyze the fireplace is necessary to clarify the construction of dwelling. Traditionally, inhabitants use a gypsum-poured vaulted floors construction for dwelling building. The gypsum-poured vaulted floors construction is a structure that holds the weight of many joists that receive the vaulted shape. It is named jack arch floor (Photo2.6). It is a traditional structure in the Iberian Peninsula, where the climate is dry and there is no risk of an earthquake. The characteristic of the gypsum-poured vaulted floors construction is the plural number of joists. The joists are bridged in a span of approximately every 0.3-1.0 meters to support the weight. Normally, this construction goes in the same direction with roof slant and rafters. However in some cases there can be found different direction of the joists in the same dwelling, especially in large dwellings. Inhabitants change the direction to bridge the beam because of many rooms. Furthermore, there are cases when the roof slant has multiple directions, as in dwellings built in the corner of the street. For example, in the case of CF6 there are two different directions of the roof, because it is built on the corner of the street (Photo2.7). One direction is facing toward the square and the other toward the street. Correspondingly, the living room and the corridor have differ-

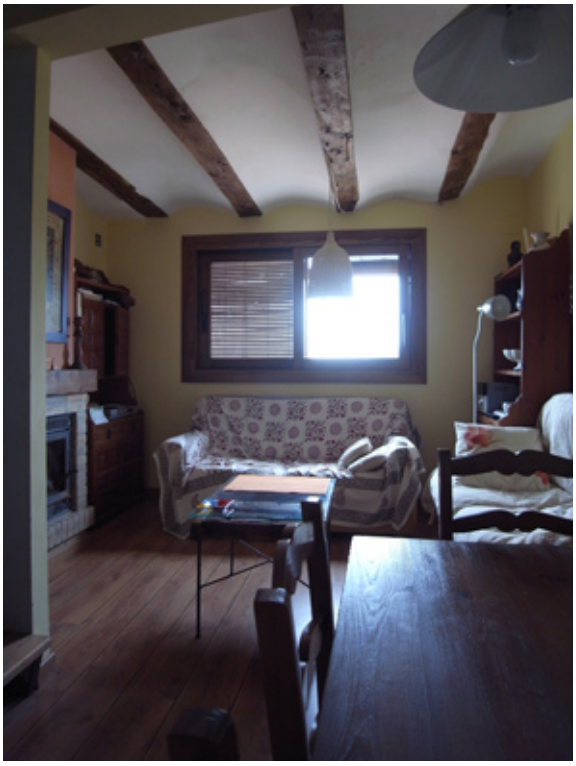


Photo2.6 Jack arch floor

ent directions of the joists. Thus, some dwellings have different directions of the joists. But the common factor about the direction of beam is that the beam in living room and the direction of slant of roof and rafters have same directions, because chimney needs to pass through until the top of the roof.

On the other hand, the slant of the roof is decided by the direction of the storm drainage. Inhabitants prefer that the storm drainage do not flow into other dwellings. Therefore the direction of the roofs always faces toward the street. Next figure shows the relation between the location of streets and the direction of joists in the living room (Fig.2.7). Seven types of locations can be classified in 27 dwellings. There are 17 dwellings are attached to street and courtyard at the both ends. This is 63% of all. Usually, the slope-type dwellings are built along the contour line to compose the line building unit. The dwellings are located between two streets and the both sides of the walls are shared with neighbor dwellings. On the other hand, the flat land-type dwellings compose block units with courtyards. The dwellings are situated between courtyard and street. These are the most typical dwelling situations in Rincón de Ademuz.

Generally, dwellings found in mountainous terrain are not built independently, they are connected with each other. Only one dwelling, under the number CR3a, does not fit in these cases. However, it is not built independently. The dwelling is located at the corner of the building unit. Besides, the neighboring dwelling is set in the back of the facade. Therefore, the roof above the living room can drain the water in all directions. Besides, there are five dwellings attached to three streets. This type of dwellings is located at the

Photo2.7 In case that the roof slant has multiple directions

end of the line building unit. In addition, there are two dwellings, that are attached to the streets around the corner. These are the flat land-type dwellings that compose building units and are located on the corner of the unit, such as in Torrebaja. Finally, there are two dwellings attached only to one street. There are a few cases when a dwelling is built on a slope and right behind it is built another dwelling.
Therefore, as can be seen from the research, the slope of the roof and joists of the living always face in the same direction. Besides, the roof slant should face the street because of the storm drainage. Therefore there is an obvious relation between the direction of the joists and the streets around the dwelling.

Furthermore, the direction of the fireplace and chimney is also important. In this study, in order to clarify the direction of the fireplace, the east-west line is defined as 0-180 degrees and north-south as 90 degrees. And the long side part of the chimney is defined as basement side. Thus, if the chimney has 0-45 degrees, this means that its long side is faced to

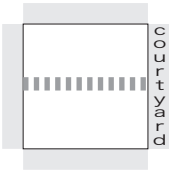
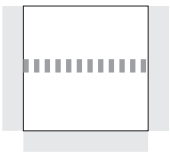
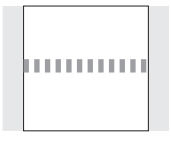
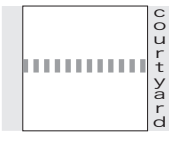
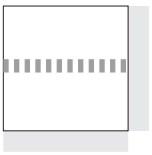
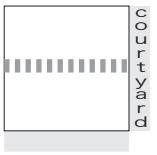
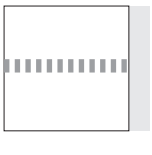
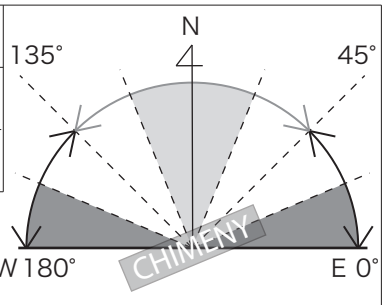
Four Faces	Three Faces	Two Faces				One Face
Attached to three streets + courtyard	Atached to three streets	The streets are attached to both ends of dwelling		The streets are attached to one corner of dwelling		Atached to one street
		Atached to two streets	Attached to one street + courtyard	Attached to two streets	Attached to one street + courtyard	
						
CR3a	TB4 CB1 CF1 CF6 CR1	TB1 CF5 CR3b TB6 CF8 TA1 TB9 CF9 TA2 CB2 CF11 CB3 CA2 CF2 CR2	CF3a CF3b	TB3	TB5	CF4 CF7
1 dwelling	5 dwellings	15 dwellings	2 dwellings	1 dwelling	1 dwelling	2 dwellings

Fig.2.7 The relation between the joists in the living room and the location of the dwelling

TB1	16°	CB1	123°	CF3b	176°	CF9	79°	CR3b	113°
TB3	20°	CB2	138°	CF4	144°	CF11	72°	TA1	13°
TB4	2°	CB3	117°	CF5	61°	CA2	44°	TB2	12°
TB5	124°	CF1	31°	CF6	12°	CR1	25°		
TB6	118°	CF2	5°	CF7	176°	CR2	91°		
TB9	30°	CF3a	86°	CF8	94°	CR3a	138°		



The chimney intersects with the joists

Fig.2.8 The gradient of chimney in each dwelling

the south-southeast. Based on this definition, next figure shows the slant of chimney in 27 dwellings. The chimneys of 11 dwellings have 0-45 degrees, 11 dwellings 45-135 degrees and 5 dwellings 135-180 degrees (Fig.2.8).

Fireplace and chimney are always rectangular shaped and go along with the form of the wall. Besides, the chimney must pass through the top of the roof. The rectangular-shaped chimney is the rational form to pass through the spaces between the joists formed by the brick vaulted floors construction. This is why the joists and rafters have the same direction. If the joists and rafters would have a different direction, it would be impossible for the fireplace to pass right through the living room and the top of the roof, because of the structural problems. Thus, the chimney must be parallel to the direction of the joists and rafters.
However, in five dwellings the joists and chimney are crossed (Fig.2.9). These are dwelling under the numbers CF1, CF2, CF6, CR1 and CR3a. It is logically, that the structure has failed at the point of the intersection. The joists do not support any weight from above. There have to be some reason, why inhabitants intersected the joists when installing the chimney in their dwelling.

Each chimney has a cover to protect the living from the rainfalls. Traditionally inhabitants join two ceramic tiles together to form an inverted V, as the cover. Therefore, the wind can pass through only one way, as explained in first chapter. The wind supports smoke elimination. Best cover on the top of the chimney should have a huge hole so the wind can flow through without any obstruction. That is why the cover opening must face the direction of the wind for a better smoke extraction.
Thus, the joists must to be parallel with the rafters, and the chimney must face the wind. Each direction has its reason. The common factor of the five crossing chimneys is that they are all facing the north-south direction. This is the same direction as that of the local wind. In particular, the dwellings under the numbers CF1, CF2, CF6 and CR1 have the gradient of 5-31 degrees. Besides, the dwelling numbered CR3a has the gradient of 138 degrees. This corresponds to the direction of the wind in the Rincón de Ademuz. Thus, it is possible to say that inhabitants of these five dwellings have a priority to catch the wind. Since the chimney must be installed in the correct direction, this means that inhabitants did not build it wherever they wanted. Inhabitants have to determine the direction of the fireplace depending on certain restricted factors such as the street, the slant of the roof, rafters, joists and wind.

On the other hand, there are other important factors, windows and doors in the living room. It is obvious that the openings have a powerful influence to promote ventilation. The best possible condition is when two openings are set on both ends of the living room. But each dwelling situated on a different location. The setting of the fireplace requires a certain part of the wall area and consequently in this area can not be installed openings. In other words, the fireplace is a factor that reduces the available space for the openings. Needless to say that the inhabitants prefer to keep the wind flow through the living room. They have to make some openings so the smoke can get out of the living room.

In order to analyze the wind-path to the living room, it is needed to determine the situation of the openings (Fig.2.10). The most important characteristic for wind is that the space has inputs and outputs. The best wind passage is when the openings are located at

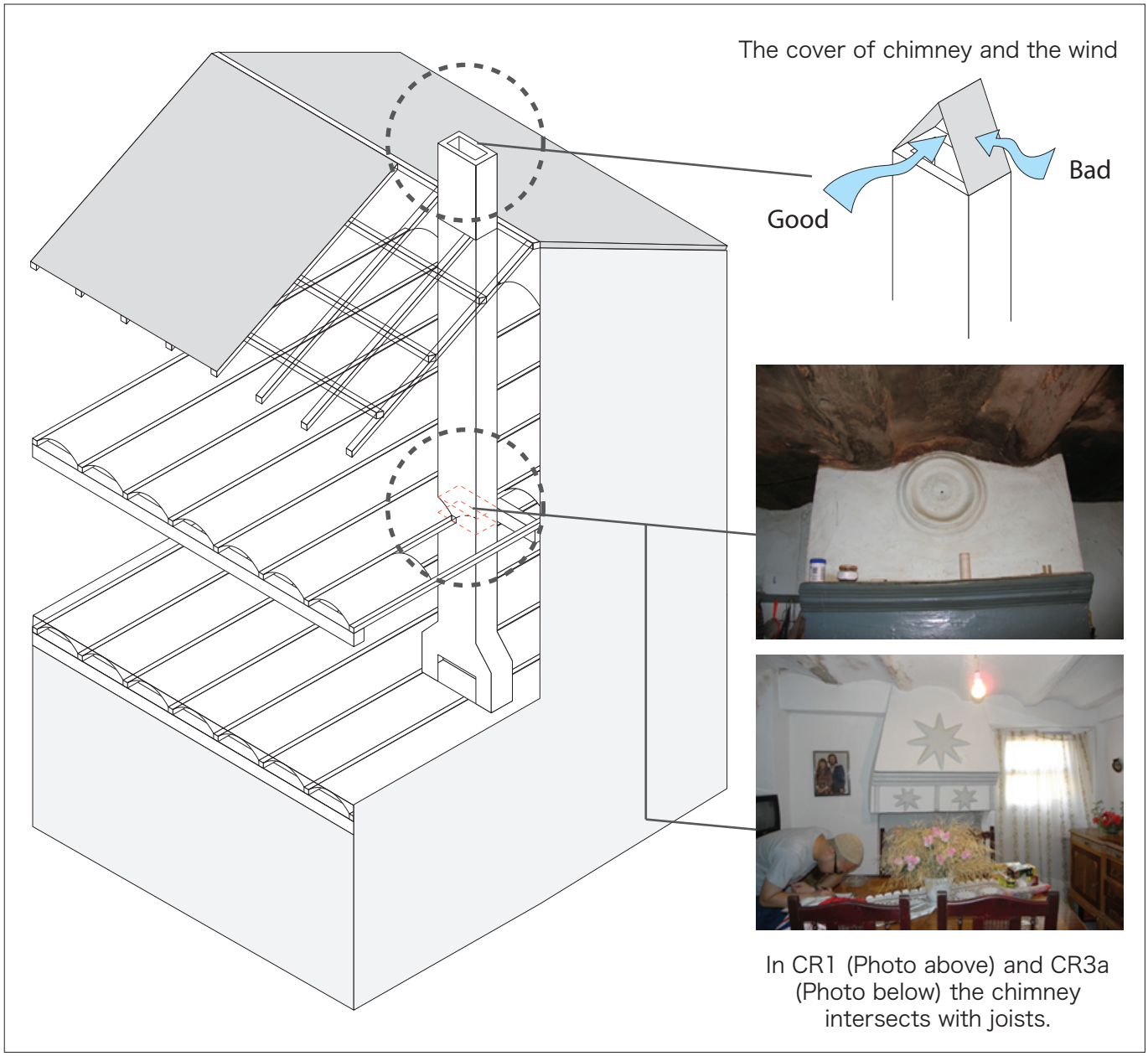


Fig.2.9 The relations between the joists, fireplace and chimney

both ends of dwelling. Therefore, in this study, when the living room has openings at both ends of the wall, it is defined as “good wind-path”. In addition, there are cases when some windows are set at both ends of the dwelling on the same floor and the wind flow extends through the interior doors into the living room. Especially when these windows are set in a common space, such as an entrance hall, stair hall and corridor. These cases are also defined as “good wind-path”, because the windows in the other rooms support the good ventilation in the living room. On the other hand, when the living room has openings only on one side of the wall or in one corner, it is defined as “poor wind-path”. In addition, the interior doors are not directly connected to the street. Also in this case, there are occasions when there are windows in other rooms, as in the case of a good way of wind. But the difference is that the other windows are in bedrooms and the most people do not like when the smoke and smoky smell pass through their bedroom. At last, the “bad wind-path” is also defined when the openings are only on one side of the wall and there are no interior door to support the ventilation on the same floor.

Based on the definitions, next figure shows the relationship among the fireplace, the joists and the condition of openings in the living room (Fig.2.11). This figure categorizes the direction of the wind-path in the living room. 15 of 27 living rooms have “good wind-path” condition. 8 of 15 fireplaces are facing the north-south direction. These are the most rational smoke elimination conditions. Besides, 7 of 15 fireplaces are facing the east-west direction. In this case, the fireplaces do not have to face the direction of the wind, because the wind-path of living room supports smoke elimination. The priority for the buildings is a good wind-path in the living room. That is why there are many kinds of directions in a good wind-path dwellings. However, 8 of 27 dwellings are in poor wind-path conditions, because of their locations. 7 of 8 fireplaces are facing the north-south direction and only 1 of 8 is facing the east-west direction. And at last, 4 of 27 dwellings have bad wind-path. All of these dwellings are located on a slope and it is impossible to make two openings

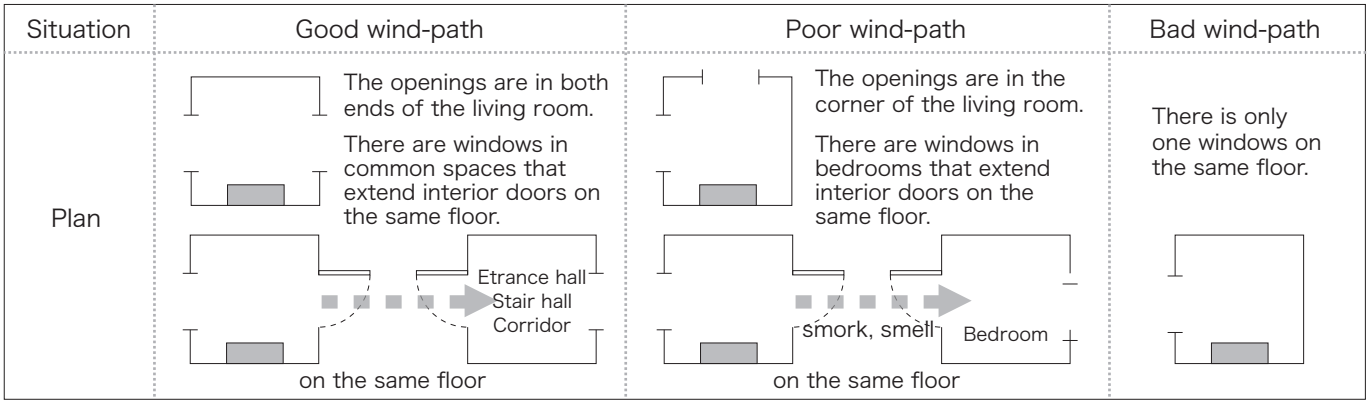


Fig.2.10 The definition of wind-path in the living room

opposed to each other in the living room because one wall is a rock. Therefore the living rooms are in a bad location. 2 of 4 dwellings are facing the north-south direction and the other two are facing the east-west.

In this way, 17 of the 27 fireplaces are facing the north-south direction. Moreover, 6 of 10 fireplaces that are facing the east-west direction are in a good wind-path condition. There are only 4 fireplaces that are facing the east-west direction and are in a poor or bad wind-path condition. Obviously, this result shows inhabitants were aware of the direction of the fireplace. However, they were unconscious to understand how to take the wind in their lives.

In addition, in order to focus on the crossing fireplaces, it was noted that all of these fireplaces are facing the north-south direction. Moreover, 3 of 5 fireplaces are in a poor or bad wind-path condition. Besides, 2 of 5 fireplaces were in a bad wind-path in the past. It means all these fireplaces were in a poor or bad condition in the past. When inhabitants set the fireplace, they understood that the conditions of this dwelling are bad for taking the wind out of the living room. Then they began to look for the optimal place for the fireplace and, in some cases, it had to cross the joists for better supporting of the smoke elimination.

Thus, it is possible to say that the direction of fireplace have two options. One of them is the fireplace “catches the wind”, as in the case when the fireplace is facing the north-south direction. The fireplace faces the direction of the wind for smoother letting out of the smoke. The other is the fireplace “dodges the wind”, as in the case when the fireplace is facing the east-west direction. In this case the fireplace does not face the wind direction, but the living room has a good wind-path conditions. Thus, in this case the priority is set on the passage of the wind through the living room. Both cases are ideas to adapt to different locations.

In addition, there is a close relationship between the direction of fireplace and the type of interior doors. The bottom part of figure 2.11 shows the characteristics of interior doors that are related to the section 2.4.1. The dwellings under the numbers CF2 and CF7 have interior doors with a hole. These doors are set in the living room. In case of CF7, the living room has a poor wind-path, because of the location of the dwelling. That is why inhabitants made a hole in the door to let in the wind from different floors. But in case of CF2, the dwelling has a good wind-path location. The question is why they opened a hole in an interior door. CF2 was reformed in 1965. Inhabitants bought neighboring dwelling, and connecting it with their own made one big dwelling. The hole was made before this year. Since the original dwelling had no openings opposed to each other in the past, the hole in the interior door was needed for ventilation. Besides, there are six dwellings in

which the curtains are used as a separation in the stair hall and corridor. These curtains are working only as blinds. 5 of 6 curtains are set in dwellings with a poor or bad wind-path conditions to support the ventilation in the living room.

The dwellings are not always situated in a good location. Therefore inhabitants living in dwellings with poor or bad wind-path conditions need to have some idea how to let pass the wind through the living room. The crossing fireplace and the holes in the door are some of these ideas to improve ventilation.

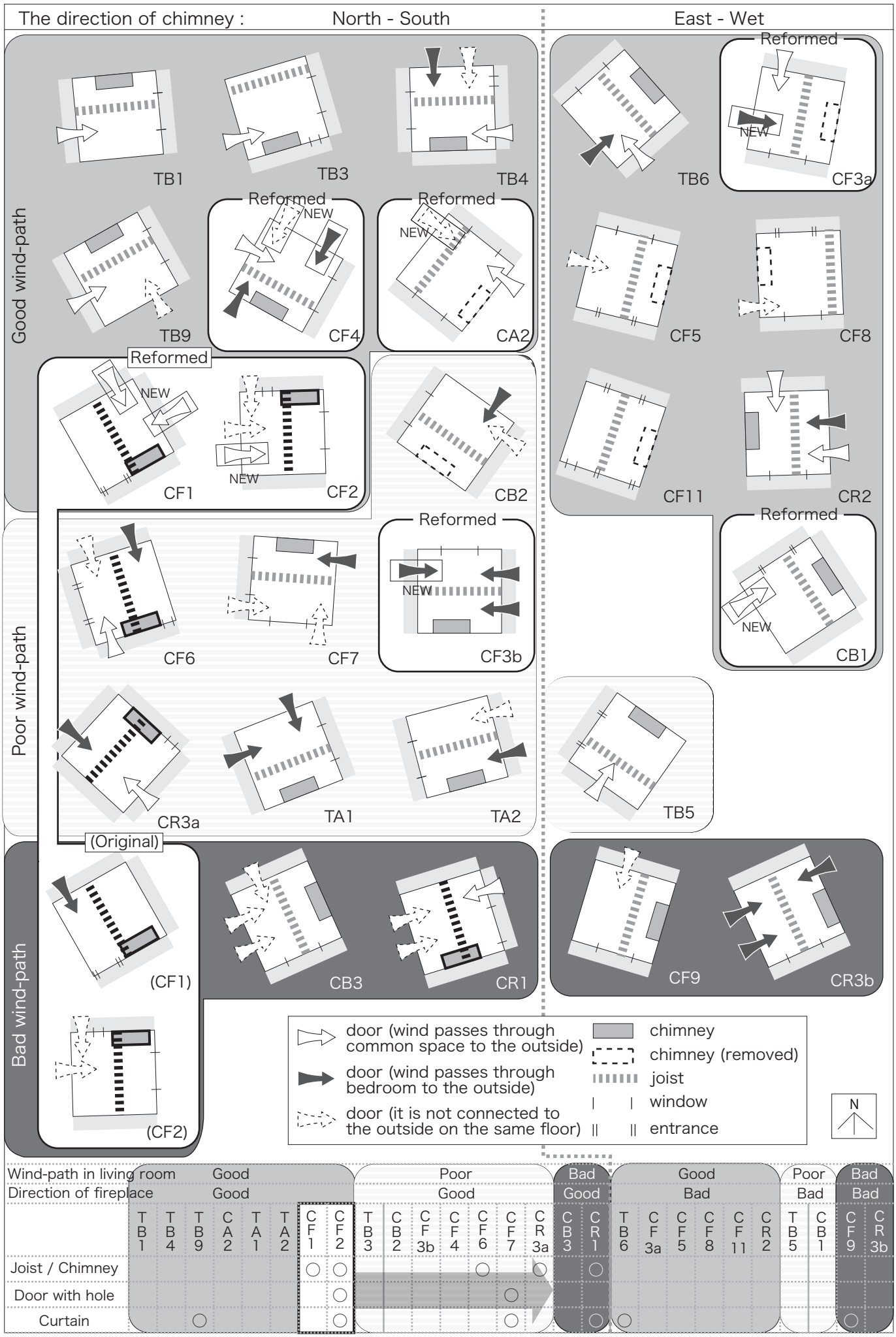


Fig.2.11 The relation between the direction of fireplace and wind-path in the living room

2.5 The passive design in the dwelling

This section is focused on the thermal environment in dwellings. The walls of the masonry construction are good thermal storage. According to "Encyclopedia of Vernacular Architecture of the World" by Paul Oliver, walls must be at least 25 cm thick to provide an eight-hour thermal lag, but more common are walls of 50 cm or thicker (*2.2). The thickness of the walls in Rincón de Ademuz is equal to 45 cm and because of this the masonry construction creates comfortable environment. During the daytime inside is fresh and during the night the opposite. Furthermore inhabitants support the thermal environment by opening and closing the doors and windows. In summer during the daytime, doors and windows of every dwelling are closed to keep the fresh air inside. But at the night, every window is opened to take fresh air from the street. In winter this cycle turns around. In the daytime the windows are opened for ventilation and closed at the night to keep the heat inside the dwelling. More specific details of this behavior are described in section 2.6.2. The wind and thermal environment have a great influence on inhabitants' life.

By the way, some inhabitants of Rincón de Ademuz are digging cliffs to make a space inside the rock. It is similar to the cave dwellings. In general the cave dwellings are dwellings that are completely under the earth. A comfortable environment is created in the cave dwellings. The cave dwellings are common in the eastern and southern Spain around the Sierra Nevada mountains (*2.3). The earth is easy to dig, but at the same time, it is not too soft. Only this situation gives possibility to build cave dwellings and allows people to live under the earth. Looking at the situation of the cave dwellings in the world, it is possible to see that they are widespread in Huangtu Plateau in China, Cappadocia in Turkey and Matmata in Tunisia. The common factor of these places is the dry weather. In case of Rincón de Ademuz inhabitants create only one or two rooms in the rock. Especially these spaces are used as bedroom and called "Alcoba" in Spanish. Sometimes, however, these spaces are also used as a storeroom, because they are well suited to store wine.
10 dwellings have space inside the rock. 4 of these 10 places are used as alcoba. The rest is used as a storeroom or toilet. Inhabitants reformed storeroom to the toilet, because in the last 40 years running water came to the dwellings, and they needed a room to convert it into a toilet, so for that was chosen storeroom. Thus, there are three storerooms and two toilets. Alcoba has only one entrance and no other openings. However alcoba has comfortable environment because the constant temperature is kept in this room. In the past, the fireplace was the only heating system in dwelling and it was located in the living room. But the bedroom is the second space in the home where inhabitants spend a lot of

time. Therefore they made alcoba.

There are eight attics without wall. Inhabitants have removed the outside wall to create space. In Rincón de Ademuz this space is called “solanar”. Terrace is the space outside the building, but solanar is semi-outdoor space. Solanar is often used for drying laundry. It protects from the rain and is always set to the south. As explained in section 2.4.2 inhabitants also use the attic for drying food. Solanar has a large opening to pass wind and sunlight into the attic. Therefore, the attic, which is open to sunlight is always warmer than the bottom of the dwelling. And because of this, the upper part of the dwelling is relatively warmer than the lower part. Alcoba and solanar are two ideas that people use to take advantage of characteristics of nature. Moreover, the temperature difference of these two spaces creates a natural convection of air in the dwelling. Because the air heated at the ground level rises. This is a passive design system in the dwelling. Location stair is

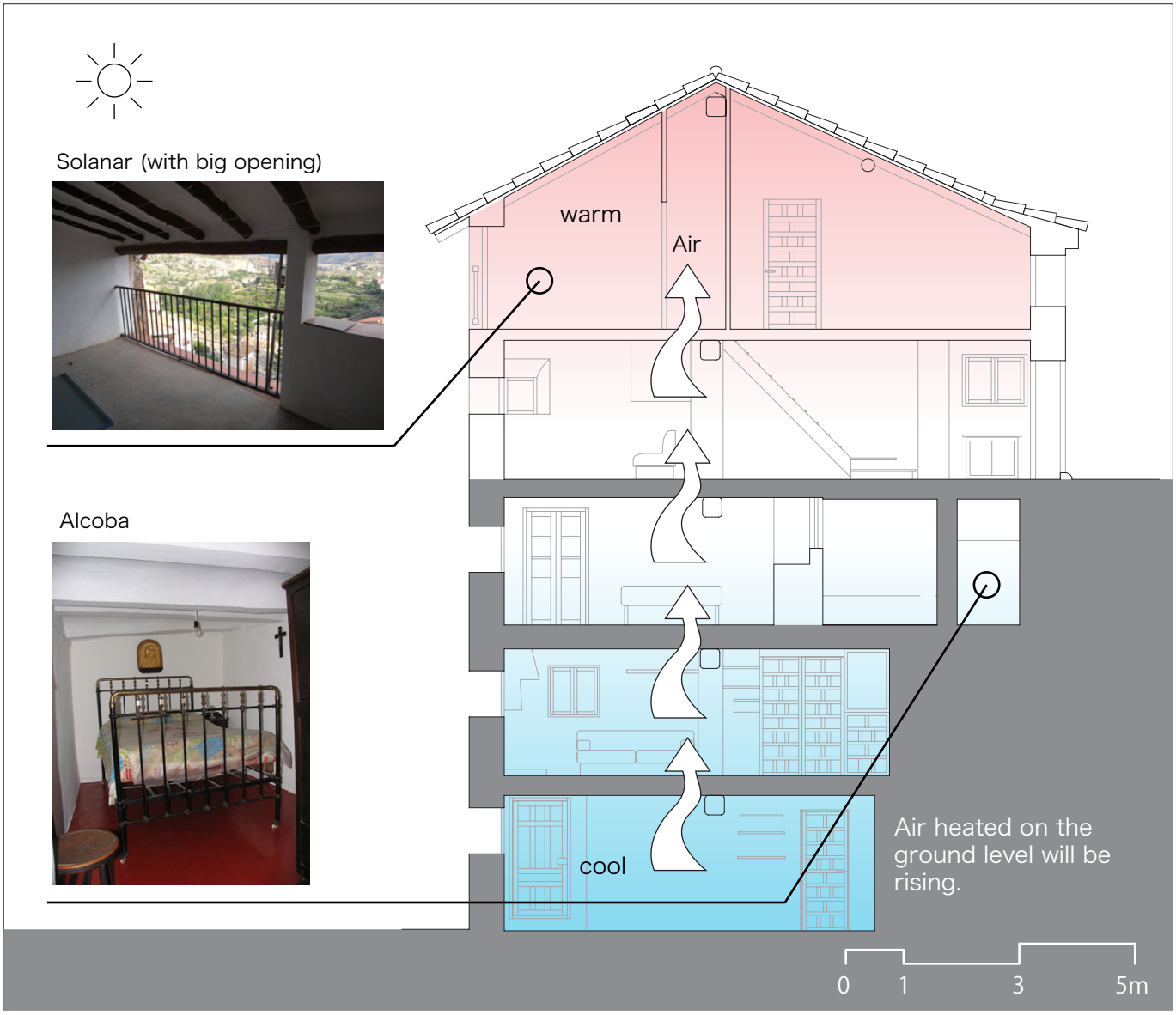


Fig.2.12 The diagram of the passive design

important to support the natural convection of air. The following part of this section analyzes the passive design in the dwelling (Fig.2.12).

In order to focus on the passive design, this section analyzes the vertical ventilation. Rational planning is when stairs are built in the same location on each floor, so the wind can pass through the entire dwelling. The figure shows the location of stairs (Fig.2.13). 8 of 27 dwellings have a stair hall and in this study this planning is defined as “stair hall-type”. Especially these stair halls are distributed in flat land type dwellings. Besides, in 14 of the 27 dwellings the stairs are built in the same location on each floor. However, the stairs do not form hall such as in the stairs hall type. Inhabitants must pass through other rooms to go up to the next floor. It is defined as “same place-type”. Both types of stairs are located

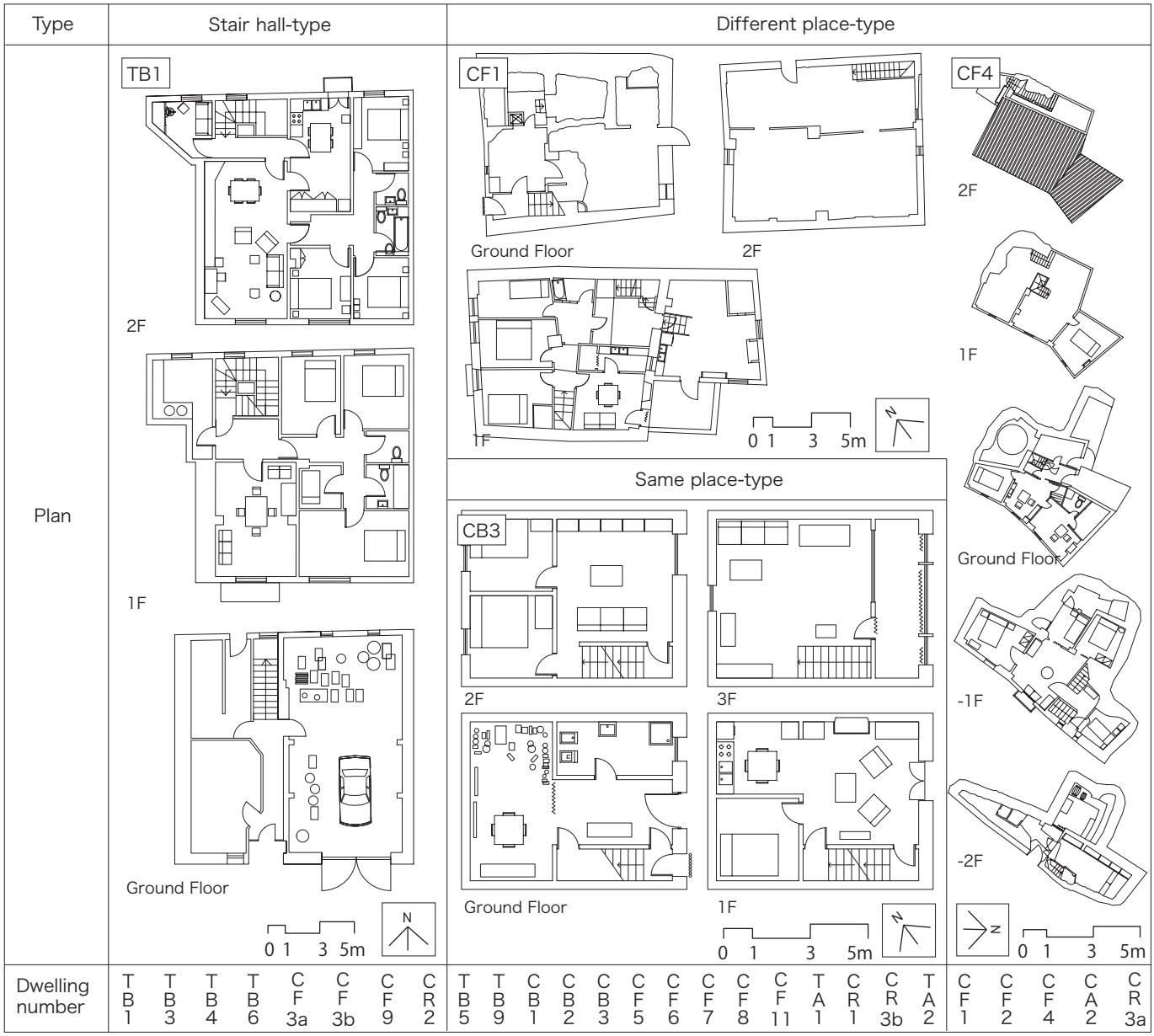


Fig.2.13 The location of stairs

in the same place on each floor. Totally in 22 of 27 dwellings the stairs are located in one place. This is 81% of the total. This planning is suitable for the air to rise from the ground floor to the attic. Finally, in 5 of 27 dwellings the stairs are distributed in different locations and this planning is defined as “different place-type” in this study. 3 of 5 dwellings had original plannings of same place type. Inhabitants reformed the stairs to the current place. The common factor of these five dwellings is that the stairs are directly connected with living room. Living room is always close to the entrance and stairs in any type of dwelling. Because traditionally it is a guest room and it should be near the entrance. Therefore, the air can always get to the living room from the ground floor.

The horizontal ventilation is analyzed from the wind-path in the living room. Thus, the previous section is focused only on the planning and location of openings on the floor where is the living room. In contrast, this section focuses on the vertical ventilation based on the location of the stairs. In order to compare the difference between the horizontal and vertical ventilation, the following figure shows both relations (Fig.2.14).

Both types of ventilation work well in 11 of the 27 dwellings. Living rooms have openings at both ends and the stairs are built in the same place on each floor. This means that these dwellings have good ventilation. 4 out of 27 dwellings have good horizontal ventilation, but their vertical ventilation is not good, because the stairs are built depressively throughout the dwelling. Besides, the case of the other 11 of the 27 dwellings is that they have horizontally poor or bad wind-path, but vertically good conditions. Only 1 of 27 dwelling has both conditions bad.
It should be noted that in the case of different place type all the fireplaces are facing the north-south direction. This planning is not suitable for vertical ventilation and it is possible to imagine that inhabitants are installing fireplaces in a good direction to support smoke elimination. Besides, more than a half of stair hall type and same place type dwellings are located in the poor or bad wind-path in living room. It could be said that inhabitants aim on the vertical ventilation. Characteristically, all living rooms with bad wind-path have good vertical ventilation.

As a result, we see that people use the combination of horizontal and vertical ventilation to facilitate the passage of the wind into the living room. The common factor about the direction of the fireplaces is the fact that when the horizontal and vertical ventilation of dwelling are in bad conditions, all the fireplaces of these dwellings are facing north-south direction. This is the idea of how inhabitants control the wind in their dwelling.

(*2.2) OLIVER P.: “Encyclopedia of Vernacular Architecture of the World”, Cambridge University Press, 1997, pp.132

(*2.3) FUJII A., HATA S.: “東アジア・東南アジアの住文化 (Living culture in East and South-east Asia)”, The society for the promotion of the open university of Japan, 2003, pp.46-89

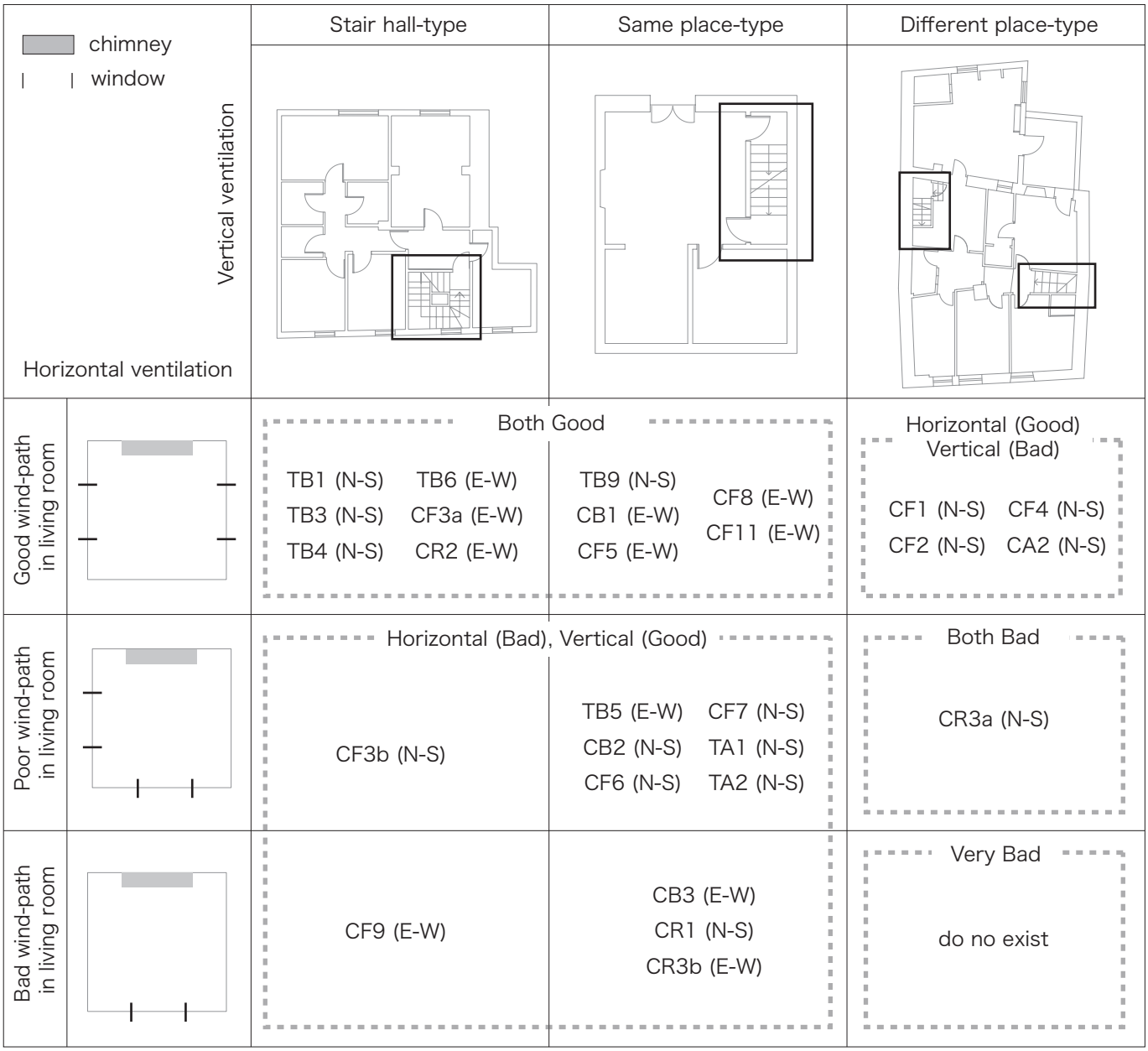


Fig.2.14 The relation between the horizontal and vertical ventilation

2.6 The wind and the lifestyle in the dwelling

2.6.1 A summary of inhabitants' lifestyle in the dwelling

The purpose of this section makes clear the inhabitants' lifestyle in the dwelling. But normally they are unconscious how they live. Therefore this section is focused on the furniture and the fixture, because they show us the characteristics of spaces. For example, the chairs give a lot of information about the way of using one room. Most of the chairs are concentrated on the ground and first floors. It means inhabitants use these floors as main living quarters. In the whole of the studied dwellings, there are 781 chairs (Fig.2.15). 701 of these 781 chairs are movable such as table chair. The other 80 are fixed chairs such as sofa and bench. Regarding the position of chairs, 257 chairs are placed in the living room. This means a 33% of the whole. In addition 47 of 257 are the sofas in living room.

	number of persons per family	Entrance Hall	Stair Hall	Corridor	Living Room	Bed-Room	Study / Work-Space	Common Sun-Room	Kitchen	Bath-room / Toilet	Terrace	Wine Cellar	Garage/ Storage Room	Total
TB1	6	3			21 (5)	8			6	0			0 (1)	38 (6)
TB2	4	0 (1)	0	0	4 (2)	4		6	7	0	4	3	1	29 (3)
TB3	6	3	1	1 (2)	12 (4)	10	2	1 (2)	8	0	2	4	5	49 (8)
TB4	3	3 (1)		1	9 (4)	13	14 (1)	6 (1)	1	0			2	49 (7)
TB5	4	4			14 (5)	1	7 (1)		6	0			0	32 (6)
TB6	1	3 (1)	0	1	11 (2)	14		3 (2)	5	0	2		2	41 (5)
TB9	1	6		1	5 (2)	3	0	3	4	0			7	29 (2)
CB1	1			4	4	0 (1)			0	0			5	13 (1)
CB2	4				4 (1)	2			0	0			2 (1)	8 (2)
CB3	2				2 (2)	2	3 (1)	2 (1)	3	0	3		7	22 (4)
CF1	1				6 (1)	2	4		0	0				12 (1)
CF2	2				4 (3)	13	2	6 (1)	19	0	7			51 (4)
CF3a	3	13	2		8 (1)	4			1	0				28 (1)
CF3b	3				4	2			0	0			2	8
CF4	5				8	10		3	4	1			7	33
CF5	1				8	1			0	0	1			10
CF6	1				7	3			0	0			1	11
CF7	3				5 (1)	4		1	0	0			6 (1)	16 (2)
CF8	4				6 (2)	1			5	0	3		5	20 (2)
CF9	2				7	1	1 (1)	6 (2)	0	0		0		15 (3)
CF10	3	1			7 (3)	2			0	0				10 (3)
CF11	4				7 (1)	5			0	0	13		4 (1)	29 (2)
TA1	3	4		1	4	1		4 (3)	0	0			2	16 (3)
TA2	3	1 (1)		6	5	4	5	8 (2)	0	1	4		2	36 (3)
CA1	3				10 (3)	10			0	0			2	22 (3)
CA2	5			2	3 (2)	4		13 (2)	1	0			3	26 (4)
CA3	3				4 (2)	2			0	1				7 (2)
CR1	1				6 (1)	8		1	0	0	1			16 (1)
CR2	2	1			8 (2)	3			0	0				12 (2)
CR3	3	6			7	0			0	0				13
Total	84	48 (4)	3	17 (2)	210(47)	137(1)	38 (4)	63 (18)	70	3	40	7	65 (4)	701(80)
percentage		7 %	0.5 %	2 %	33 %	18 %	5 %	10 %	9 %	0.5 %	5 %	1 %	9 %	100 %
Rate of fixed chair		8 %	0 %	11 %	19 %	0.7 %	10 %	21 %	0 %	0 %	0 %	0 %	6 %	10 %

: do not exist ( ) : number of fixed chair

Fig.2.15 The distribution of the chairs

This number is the half of all sofas in dwellings. Furthermore 18 sofas are in the common space and sunroom. The fixed chair always set up at the places where the family is gathering.

In contrast, there is no furniture of this type in the bedroom (Photo2.8). The bedroom in an urban area is more personalized than in a rural area. In an urban bedroom normally, there is a computer on a desk and a bookshelf is beside a wall, the bedroom has many functions and it is used to stay alone. But in a rural area, usually bedrooms do not have a desk, the bedroom is a specialized place to sleep. It means the inhabitants always stay in living room with family. But, strangely enough, there are 138 chairs in the studied bedrooms that are nevertheless used as a rack to put bags and clothes on them. Normally people don't take off the shoes in dwelling. The floor is unclean space for them. This is one of the reasons of having so many chairs in bedroom.

In addition, the chairs are set up in the entrance hall and the corridor. 13 studied dwellings have set up 52 chairs in the entrance and eight of them had 19 chairs in the corridor. Even six fixed chairs are found in these spaces (Photo2.9). In general, the entrance hall and the corridor are spaces of activity. But inhabitants use this space for staying, too. Moreover when the summer festival is held, they take out these chairs to the outside. It is possible to say that the active using of the entrance hall support the local communities. In this way

Photo2.8 Bedroom

the furniture shows us the characteristics of the space. But, at the end, the living room works as the most important place for the inhabitants in Rincón de Ademuz. Therefore this space must not only have chairs but also must be comfortable from a climatic point of view, so there should be always the possibility of having cross ventilation through it.

On the other hand, the ceramic tiles also show us the characteristics of the space. Traditionally ceramic tiles decorate the fireplace, entrance hall and stair hall. The inhabitants decorate important place in the dwellings. For example the fireplace is most important thing because it was the only heating system in past time. The fireplace is always decorated with ceramic tiles to invite visitors. It works as a family symbol.
Ceramic tiles are distributed at 128 places in 31 dwellings. In particular they are in entrance hall, stair hall, corridor, living room, kitchen and bathroom. Ceramic tiles are decorating the living room and the activity spaces that are thought for visitors. Besides, the decorated bedrooms are used for visitors as guest room. It is possible to say that the ceramic tiles show the status of a family same as the fireplace. Furthermore, the kitchen and the bathroom are also decorated with ceramic tiles. It is for the protection from water and mold.
The different locations of the dwellings have a certain influence of the ceramic tiles distribution as well as in the way of inviting or receiving a guest at home with the distribution of the chairs. As a matter of fact, dwellings located on flat land consist of many rooms and therefore have more possibilities of specializing them. Thus, next figure show the relation between ceramic tiles and chairs (Fig.2.16).

Photo2.9 Fixed chair in entrance hall

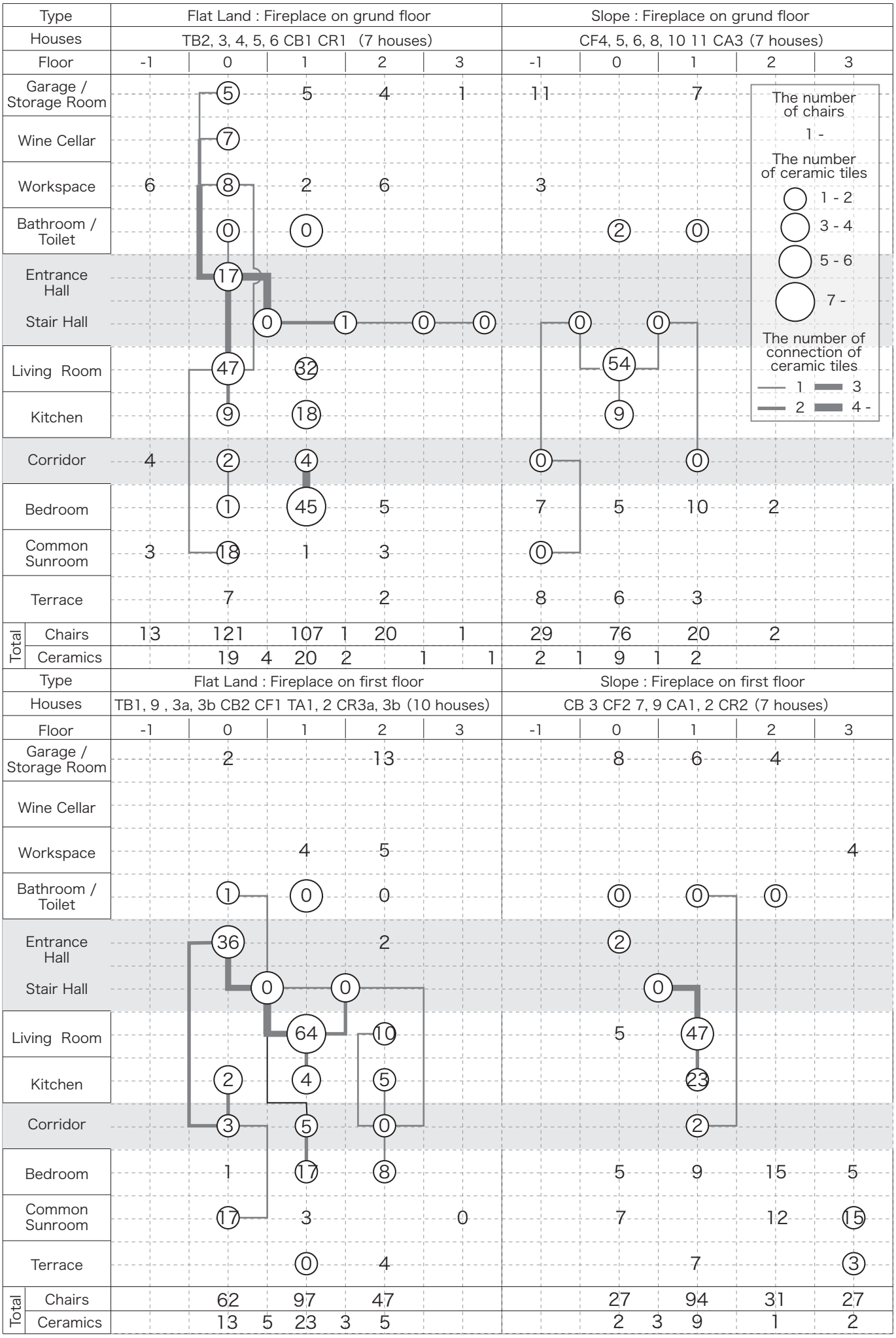


Fig.2.16 The distribution of the ceramic tiles and chairs

The numbers on the figure show the chairs. The lines and size of circles show the ceramic tiles. There is a big difference between the flat land type and slope type of houses. Generally the dwellings on flat land have many decorated rooms with ceramic tiles. In addition, the entrance hall is always well set up, with many chairs and ceramic tiles. In particular, the houses with living rooms located in the first floors have more chairs and ceramic tiles in the entrance hall than other type of houses, as the living room is further inside. In this case the inhabitants use the entrance hall to invite visitors. It means this space does not only represent an activity space, but also works as guest space. Therefore, it could be said that the location of the living room makes a big influence in the distribution of ceramic tiles and chairs.

In order to focus on the connection of the decorated rooms, the entrance hall works as the centre of it. Most of the connections of ceramic tiles are concentrated between entrance hall and living room. To compare with the locations: the largest number of ceramic tiles is distributed in flat land. In case when the living room is on the ground floor, many ceramic tiles are on the same floor. The more the living room is hidden inside, the more the ceramic tiles decorate a dwelling. This is the reason to explain that more chairs and ceramic tiles may be found in several floors in the type of living room on first floor.

In contrast, the dwellings on the slope are only decorated in the living room. The living room is the only place to invite visitors into the dwelling. The composition of dwellings is simple on slope, but the way of using rooms has more variety. The living room supports many activities. Therefore, the welcoming ways are different in the flat land type and in the slope type houses.

The common factor about the rooms that are decorated with ceramic tiles is the connection to the activity spaces such as stair hall and corridor. Furthermore, the tiles are concentrated in the activity spaces from the entrance hall until the living room. This kind of spaces is the guest area in the dwellings. Thus, it is possible to say that the living room works as the buffer space between public and private. Therefore many chairs are in the living room and the fireplace is beautifully decorated in this room.

2.6.2 The characteristics of the lifestyle in each season and time

It becomes clear from hearing research that inhabitants change the room to stay in each season and time. For example in some cases inhabitants set up one living room in the north and the other in the south, so they are able to choose the place to stay. It has a relation with the movement of the sun. Inhabitants know exactly when each of the spaces is the most comfortable. Besides, the opening and closing of the doors and the windows control the living environment. In summer nights the airflow cools down the temperature in rooms and in winter it helps to let out the smoke caused by fireplace. Thus, the purpose of this section is to clarify the characteristics of how the inhabitants are living in the dwelling. In order to analyze the lifestyle in this study we define the dwellings that have two living spaces, such as living room and sunroom on the same floor as “same floor-type”, on different floor as “different floors-type” and the rest as “one living room-type”. Next figure is the detail of the inhabitants’ living way in the dwelling (Fig.2.17).

(1) Same floor-type

Three of the analyzed dwellings have the sun room on the same floor as the living room. All of them are in Torrebaja. Since the dwellings on flat land have a larger floor space inhabitants are able to use different spaces on the same floor. Many of the dwellings have long and narrow planning. The living room is located in the north and the sun room in the south. The dwelling under the number TB6 has a living room in the north part. Besides it has the sun room in the south part. It is located along the current main street and is adjoined to two different streets. In this dwelling is living one single woman. There are television, radio and books in the sun room. These things show that she passes a lot of time in the sun room. Normally, in summer, she stays in the living room in the north part of her dwelling. But in winter, she moves to the sun room, because there it is possible to take direct sunlight. Sometimes she watches the television, listens to the radio, reads a book or eats a lunch in this space. When the sun goes down, she moves to the living room to warm up by the fireplace.

Moreover, inhabitants have the cyclic opening and closing of the doors and windows in accord with the season and time. In case of the TB6, in summer during the day time the woman closes the entrance door and windows to shut out the sunlight and to keep the inside cool. In the evening, around 5 or 6 o’clock, she opens the window, because the wind turns to be cool and the building starts to warm up by radiation heat. In summer nights she opens the windows wide to let out the hot air by wind. In contrast, she closes the windows in winter. She just opens some windows for the ventilation. Because she uses the fireplace

in winter, it is necessary to let out smoke from the chimney. She says that the chimney works best to suck out the smoke and it is not necessary to use wind from the street. The chimney is faced to south-west, this is the direction of the wind and this is why she opens the windows only a little during the daytime. At night she closes everything to keep the heat inside the dwelling.

This why in case when the dwelling has sun room the inhabitants change the living space depending on each season and time. Besides, they control the indoor conditions by opening and closing the doors and windows.

(2) Different floors-type

Eleven of the analyzed dwellings have two living rooms on different floors. Of the total, four dwellings are in Torrebaja, one dwelling is in Casas Bajas, two dwellings are in Castielfabib, two dwellings are in Torrealta, one dwelling is in Casas Altas and one dwelling is in Cuesta del Rato. One of the peculiarities of the different floors-type is its distribution in all kind of villages. Obviously, the dwellings located on the slope land are small. The only way to make living space is to situate rooms in different floors. But, also, the buildings built on flat land are reformed to different floors-type for living rooms. The householders reformed or the ground floor, where in the past domestic animals were, or the second floor, where the bedrooms were, to the living room. They reformed the dwellings as two-family house. In some cases along with the dwellings also the fireplace was reformed.

The dwelling under the number TB3 is located on flat land. It is built on the corner of the center square. It has two living rooms on different floors. One is on the ground floor and the other is on the first floor. There live two families. The first family is the householder's family and they live on the ground floor. The second family is their son's family and they lives on the first floor. Each living room has television, table and chairs. It is clear from the hearing research that depending from season the householders change the floor for dining. In summer the ground floor is used for dining, because it is cooler than the first floor. The heated air goes up to the first floor. This is the reason why the first floor is warmer than the ground floor. But it turns around in winter. They use more the first floor than the ground floor.

The cyclic opening and closing of the doors and windows is the same as in dwelling TB6. Householders close all windows and doors during the daytime in summer. After sunset they start to open the windows to let out hot air from the dwelling. In contrast, during the daytime in winter inhabitants open the windows and during the night they close them. These are the characteristics of life in masonry-constructed buildings. The ventilation of

the living room is the only difference between TB6 and TB3. The householders of TB3 said that they have to open the door in the living room to suck the smoke out. This is why even in winter they have to open a little bit the door to let wind inside and ventilate the living room.

(3) One living room-type

On the other side, there are many dwellings that have only one living room. In this case, inhabitants stay in the same living room during every season. They just control the living environment by opening and closing the doors and the windows. This cycle is the same as in the other two cases.

In this way inhabitants change the living space in the same dwelling. In particular, this kind of lifestyle is often found in Torrebaja, because the dwellings have enough space to make second common space. Dwellers know which room is more comfortable in each season and time. However, in case of the single living room, inhabitants are staying in the same living room every time. But, within any type, the inhabitants have the same cycle of opening and closing the openings for creating a comfortable living environment. These behaviors have relation to the radiation heat, the outside air temperature and the wind.

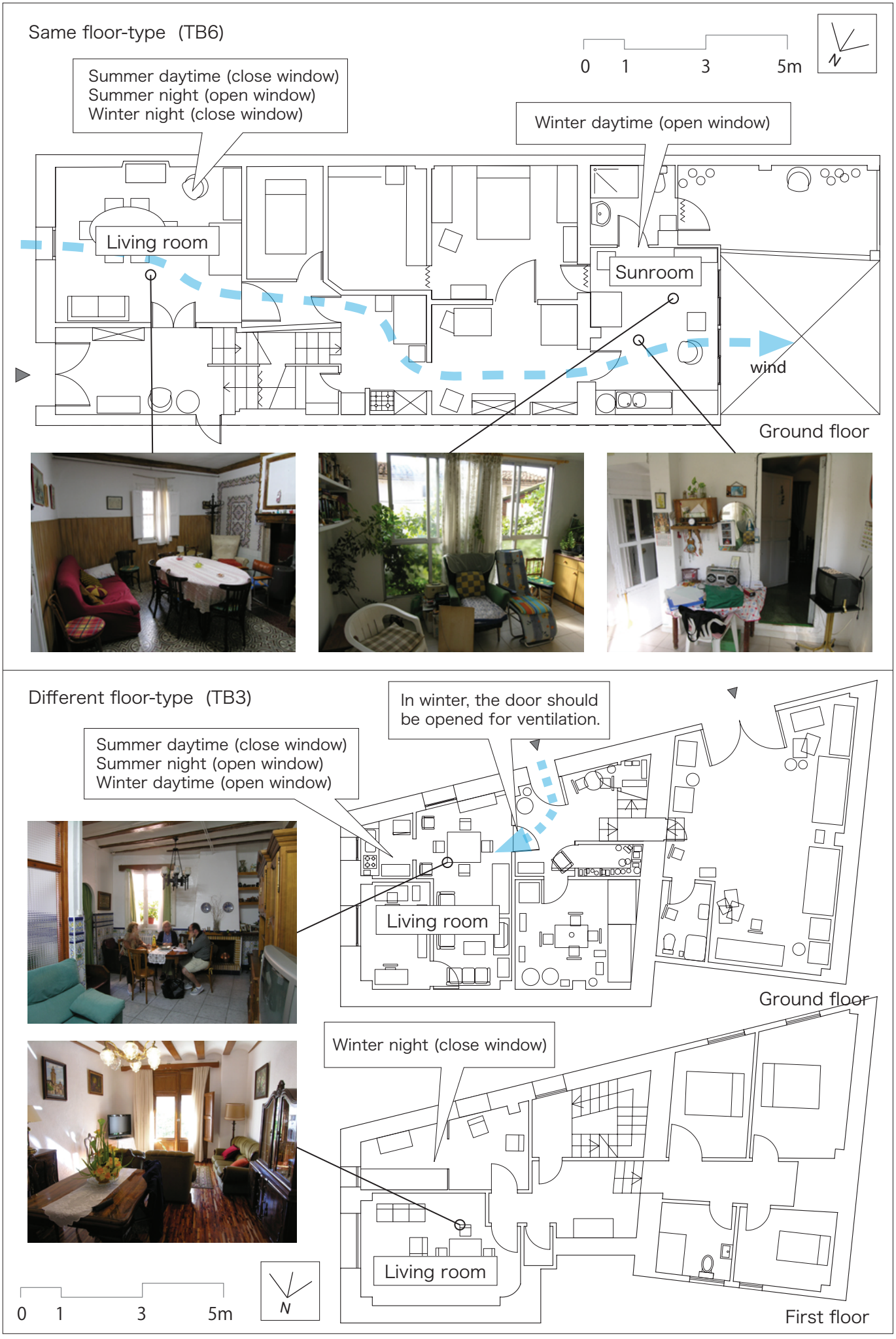


Fig.2.17 Where inhabitants stay in each season and time

2.7 Conclusion

There is a difference between dwellings on flat land and slope. Dwellings located on the flat land have large site area. These dwellings always have indoor corridor and each room is connected to it. In contrast, the dwellings located on the slope have small area of the site and the stairs are connected directly to the rooms. Every room is compact and concentrated on the small site area. Nowadays many dwellings were reformed to adapt to the demands of the new inhabitants. Especially it is characteristic to separate or connect the dwellings. In some cases, one dwelling is separated into several dwellings. In other cases, two neighboring dwellings are connected in a dwelling. This is a system to protect the village from disintegration.

This chapter refers to the relationship between the wind and dwelling. The wind makes powerful influence on the form of dwelling and lifestyle of their inhabitants. The following figure reflects these relationships (Fig.2.18).

Generally, dwellings in rural area are composed of three layers into a multi-storey housing. Farm accommodation and living quarters are under the same roof. The fireplace is the most important domestic object that works as the symbol of the family. Without exception, every dwelling in the past had it installed. Besides, before the gas and electricity came into the dwelling it was the only place where inhabitants could cook. To use the fireplace efficiently, there must be efficient smoke elimination. Therefore there should be a good wind-path in the living room. That is why there are many ideas to make the wind to pass through the dwelling.

The fireplace should be set in a good direction, because of the chimney cover. Traditionally inhabitants join two ceramic tiles together to create a cover for a chimney. Therefore, openings of the cover have only one direction, and it must be the same as the direction of wind. The wind in Rincón de Ademuz almost always blows from the north to the south. This is why a rational direction for installation of the fireplace is the north-south direction. However, in reality fireplaces are facing different directions.

In order to focus on the wind-path in the living room, it was determined three types of wind-path conditions, depending on the location of the openings. In the case of “good wind-path”, fireplaces are facing different directions, because the wind-path in the living room always supports ventilation. But in case of “poor wind-path” and “bad wind-path”, 9 of 12 fireplaces are facing the north-south direction. From these numbers, it is possible to understand that inhabitants aimed set fireplaces in the right direction for the better

smoke elimination.

Moreover it is possible to understand that inhabitants know the direction of wind from the relation between the fireplace and joists. The chimney of fireplace must reach the top of the roof and the joists must be attached on both sides of the structure to support the weight of the upper floors. But in 5 of 27 dwellings fireplace and joists intersect. This is an illogical way to build dwelling. But all the fireplaces of these dwellings are facing the north-south direction. As result it shows that inhabitants aimed to catch the wind for the better smoke elimination. Besides, 3 of 5 fireplaces are located in poor wind-path conditions and 2 of 5 were in bad wind-path conditions in the past. That is why, when the fireplace is in the living room with poor or bad wind-path conditions and must be facing the right direction, the intersection occurs. Moreover, inhabitants of two dwellings made holes in the inner doors. These holes were made by hand after the inner doors have been installed. Both cases are also found in dwellings with poor wind-path in the living room. This is an idea to take the wind from different floors.

Thus it is possible to say that the fireplace is turning around the living room. It has two meanings. One is “dodge the wind” and the other is “catch the wind”. The installation of a fireplace requires a certain part of wall area. Therefore, it is difficult to make openings in the wall where the fireplace is located, especially if the living room is small. Thus, the case “dodge the wind” means that priority for inhabitants is to make openings in both ends of the living room. This is why the fireplaces are facing various directions. The direction of fireplace is not important in this case, because of the good wind-path in the living room. In contrast, the case of “catch the wind” means that fireplaces must be facing the north-south direction. When the fireplace is placed in correct direction, the smoke elimination starts to work well. That is why fireplaces are facing north-south direction, if they are in the living room with poor or bad wind-path conditions. The best condition is when the fireplace is facing the north-south direction and the living room has openings at both ends. But this idea is unfeasible for all dwellings, because they are built on different locations with different characteristics. In this case, inhabitants change the place of fireplace to control the environment of the living room.

The placing of stairs also makes a powerful influence on the wind-path in the living room. 8 of 27 dwellings have stair hall inside. Besides, in 14 of 27 dwellings the stairs are set in the same place on each floor. The temperature difference between attic and ground floor makes natural air convection. This is a system of passive design in the dwelling. The passive design works well in these 22 dwellings. But in 5 of 27 dwellings the stairs are not in the same place. The common factor of these five dwellings is that the fireplace is facing the north-south direction. Inhabitants always set the fireplace in the north-south direction,

if the living room has bad wind-path conditions.

In addition, the controlled environment of living room makes a powerful influence on the lifestyle of inhabitants. In other words, their lifestyle is adapting to the climate in the dwelling. In order to clarify the characteristics of the lifestyle, the analysis in this study is focused on the chairs and ceramic tiles. Chairs show where inhabitants stay in the dwelling and ceramic tiles show where the guest areas. There is a difference between the dwellings on flat land and slope. In the case of a flat land type, entrance hall works as a space for receiving guests. Inhabitants use it as a space to invite neighbors in their daily lives. Besides, the ceramic tiles are distributed in many rooms, and the entrance hall is the center of their distribution and space from the entrance hall to the living room is continuously decorated. But in the case of slope type, all of these functions are concentrated in the living room. The space distribution is smaller than in the flat land type. Decorated spaces are also concentrated in the entrance hall and living room. The common factor between the flat land-type and slope-type is that the living room works as a buffer space between public and private spaces. Therefore, living room works as the center of inhabitants' life. Moreover, if the dwelling has more than two common spaces, inhabitants adapt the living environment by changing space to stay inside the dwelling. They use the northern or lower part of the dwelling in the summer and the southern or upper part in the winter. There is a cycle. Besides inhabitants have similar cycle for the opening and closing openings. In summer, during the daytime they close the windows to keep cool inside the dwelling, and at night they open the windows to let out the heat. In winter it turns over. Inhabitants know what spaces are comfortable to stay in each season and time and they control the environment of living room by opening and closing the openings.

In such a way, the living room works as a center of the dwelling and it is a buffer space between public and private spaces. Therefore inhabitants control the environment in the living room to create a comfortable life there. That is why sometimes, for better smoke elimination, the fireplace in the living room should be turned to dodge the wind, to create a good wind-path and to catch the wind. Besides, the stairs and the hole in the door also are ideas to let pass the wind from different floors. The common factor of these issues is the fact that inhabitants are adapting to the environment. They know how to live in their dwelling and they create some ideas to control the wind in dwelling to overcome the bad wind-path conditions in the living room.

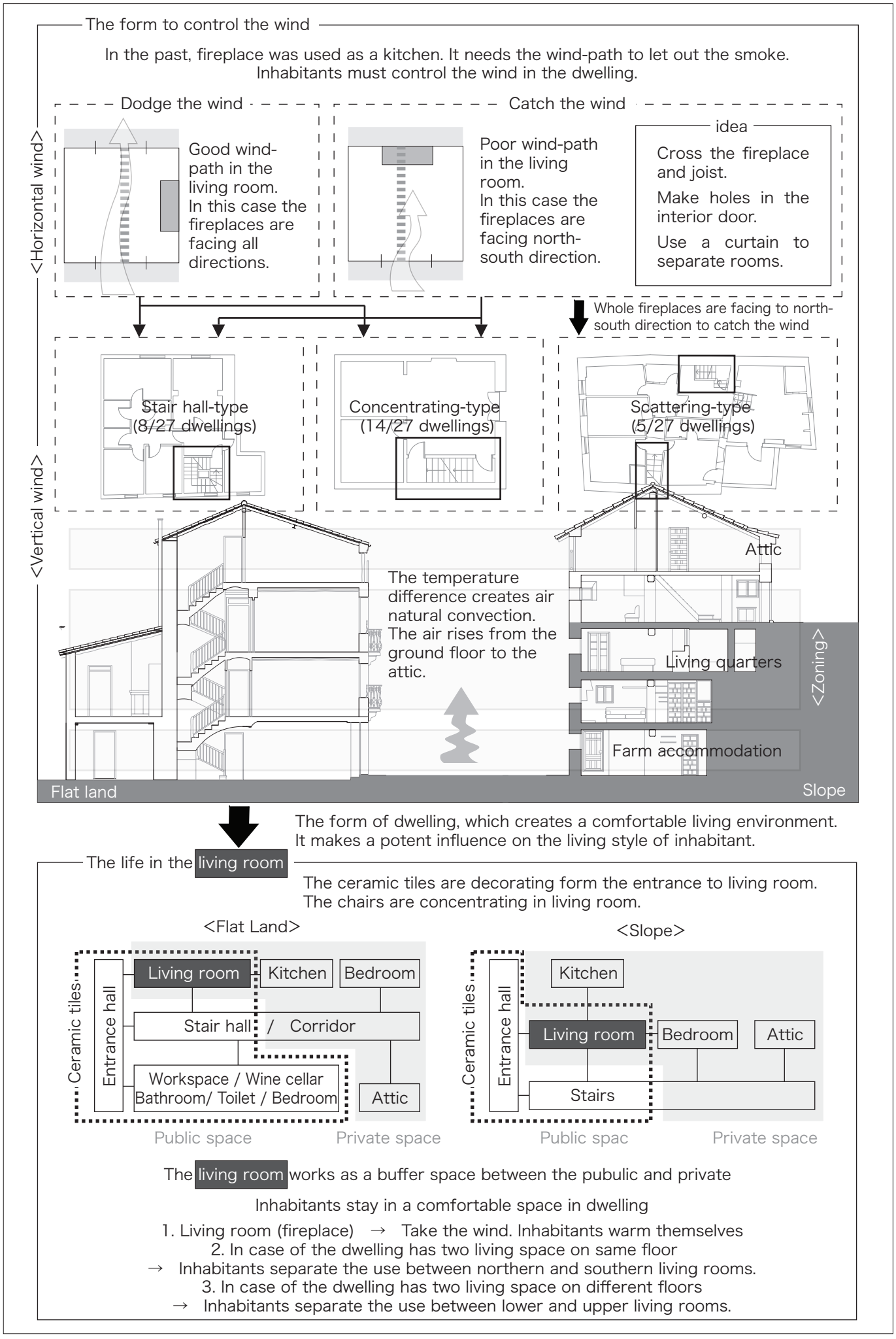


Fig.2.18 The conclusion of the relation between the wind and dwelling

Chapter 3
The wind and the village

Chapter3. The wind and the village

3.1 The purpose and composition of this chapter

The purpose of this chapter is to explain the actual conditions of how the building complex controls the wind and creates comfortable environment in the village. The village consists of many dwelling units, where dwellings are connected to each other. There is an order to control the wind in the dwelling connections. In order to analyze the relations with wind, this chapter is also roughly separated two parts as well as the second chapter. One is tangible part and the other is intangible. Tangible means a village and intangible means a local community. The composition of this chapter is as follows;

This is the first section of this chapter.

The second section explains the method of research.

The third section is about the composition of particular villages. The compositions are different at each location. Furthermore, it is possible to understand how the villages developed from some characteristic buildings. Therefore, this section illustrates the characteristics of these particular compositions of the villages.

The fourth section is about the wind and the village. In summer, the weather is hot and dry in Rincón de Ademuz. The shadow and the wind make inhabitants feel comfortable. However, in the winter the fireplace should be used. In this case, the wind is important to let the smoke out of the living room. Dwellers use the wind to keep up their lives. But in some cases, the beneficial wind turns into cold weather damages. The cold wind bruises agricultural crops. Even buildings are consumed by the wind. Therefore, this section focuses not only on how people take the wind into their lives, but also how they protect themselves from its hazards.

The fifth section is about the passive design in the village. Each village has a different solution to make contrast of sunny and shady spots. This kind of contrast is important to create the temperature difference and thereby the air movement in the village.

The sixth section is about the wind and the community. The wind has an influence on dwellers' communities. The composition of the villages creates squares of various sizes. Every inhabitant tries to choose the best situation to stay in the square. This rhythm of outgoing behavior creates the opportunity to see each other.

The inhabitants are unconscious how the wind has an influence on their behavior and the composition of the village. This chapter proposes the relationship between the wind, the village and local communities.

3.2 The method of research

In order to make clear the situation of the villages, it has been conducted a fieldwork research in Torrebaja, Casas Bajas and Castielfabib. The villages are composed of dwellings, some facilities and barns. Thus, the different types of buildings have been investigated to make clear where are the places of public facilities such as church, village hall, bar, pharmacy, etc. In addition, the objects that are placed in the villages, such as water faucets, benches and trees in public space have been plotted. Also small chairs and planters in front of the dwellings have been checked. These objects show us how the inhabitants use these places. Additionally it has been conducted a hearing research to understand how the dwellers use the center square at each time and each season. Some inhabitants do know the old situation in the villages. Furthermore, there are some books about Rincón de Ademuz where it is possible to find information about how the ancient dwellers lived in the villages.

3.3 Basic composition of the villages

3.3.1 A summary of the villages

Villages consist of many elements. There are dwellings, churches, cemeteries, fountains, village hall, pharmacies, supermarkets, pubs, barns, fodder houses and vine storehouses. In this thesis, barns, fodder houses and vine storehouses are defined as “non-dwellings”. Each village has a church and a cemetery. In front of the church, there is a square. And in the center of this square, there is a fountain. Usually, the village hall, the pharmacy, the supermarket and the pub are built around the square. It means, this place serves as the public space of the community. Among the common factors non-dwellings are built around the village. Because this type of buildings do not need direct access to the water they were mainly built in the mountainside far away from the river, where inhabitants do not usually live. This is why non-dwellings make the external and internal borders of the village.

On the streets can be find a small monument representing Virgin Mary with a cross above her. Travelers pray to the monument for their safety on the road (Fig.3.1). This type of monument is called “casilicio” in Spanish and this word is used in the original language in this study. Casilicios help to define where the old main road was. In Castielfabib and Torrebaja there are two or three casilicios on a street. Normally casilicios are on the same street. As the village grew the inhabitants built new casilicios, as this kind of monument

Torrebaja

Castielfabib

Fig.3.1 Casilicios in Torrebaja and Castielfabib

should be placed at both ends of the village. Because of this these monuments show the territory of the village. And since they are placed on the same street, the old main street is also defined. Nowadays every inhabitant mostly uses the main road by car. However now the casilicios do not put on the main road. The plates with village name are put on each end of the main street to inform travelers. Thus, in this thesis the casilicios have two meanings: on one side, show which street was the main road before and on the other, show how the village changed its shape until the new main road came.
Next figures show the detail about three villages.

(1) Torrebaja (Fig.3.2)
In Torrebaja the village hall is beside the center square and the church is in the south of it. The village did not spread to the north. There was a bar in the central square, but the place was renovated to a garage. Nowadays in the village there are two pubs. One is close to the center square and the other, the new one, is beside the current main road. This new pub also works as a hotel. The pharmacy and the supermarket are also alongside the current main road. It is possible to understand that the life functions were transferred to the current main road since it was developed. As well, there is a small monastery in the west part of the village. Around the monastery many of the non-dwellings were built. There are six fountains in the village. Torrebaja has an easy access to the water because it is on the bank of river and there is a covered conduit under the village.
There are some books written about El Rincón de Ademuz, but the most of them are about the historical, geometrical, sociological and anthropological matters. And only a few authors write about the composition of the buildings in the villages. “El Rincón de Ademuz, analisis geografico comarcal” written by Carles Rodrigo Alfonso is a book about geometry of the villages (*3.1). In this book we can see where the original places are. In Torrebaja, the original places are Rosario street, Herrería street, church, church square and small square where Rosario street and Herreraía street cross. There is a tower in the village. This building is also original and some dwellings around the tower were built in same age. In Spanish “Torre” means tower. The name of the village also shows the origin of village. There are three casilicios in the village. Two are on the northeast of the village and the other one is on the southeast. The three casilicios are located on same street, the former main road.

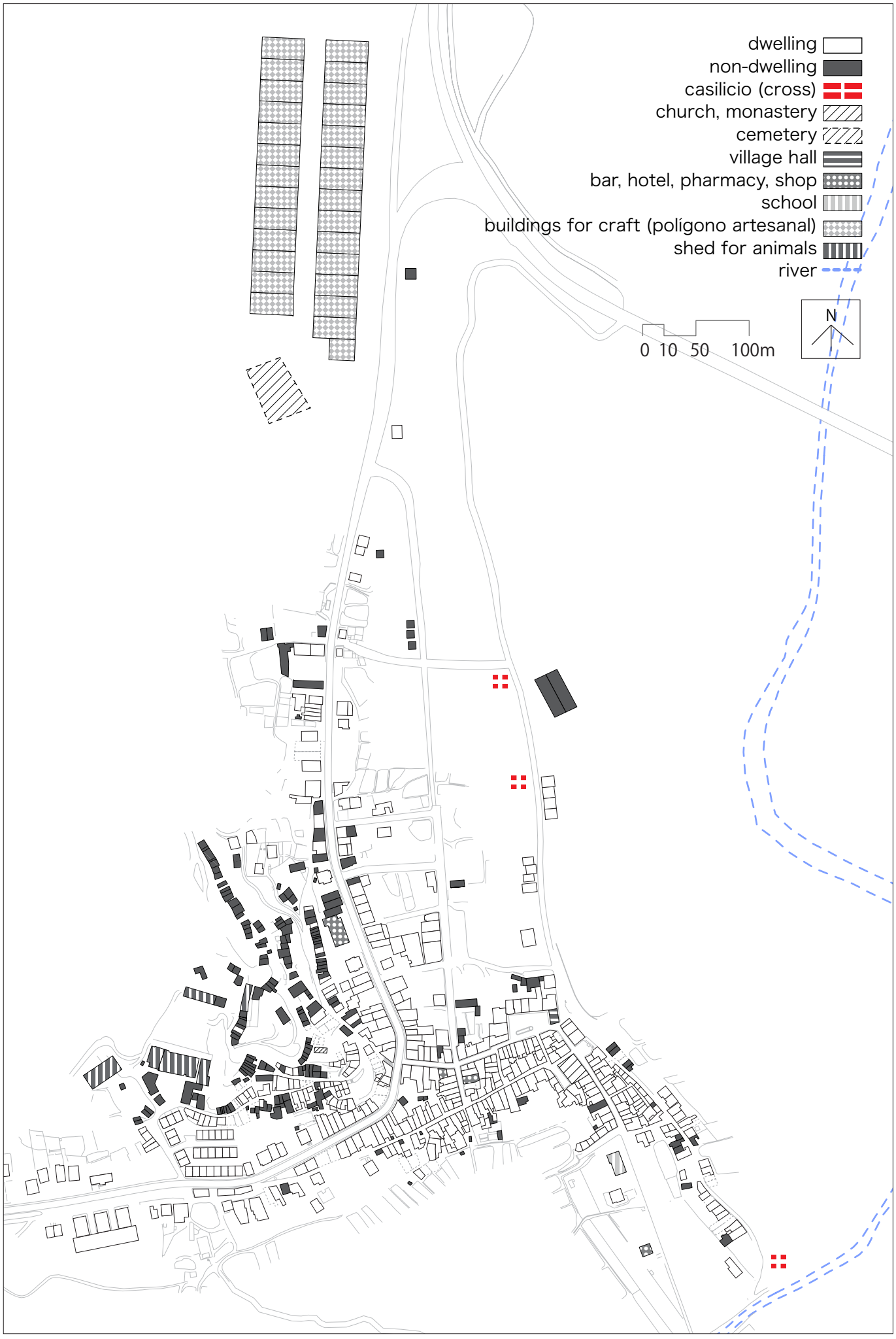


Fig.3.2 A summary of Torrebaja

(2) Casas Bajas (Fig.3.3)

The village hall was built in the north of the central square. It is on the west side of the square where the pharmacy is located. The church is in front of the square. There are three pubs in the village. One pub is across the river and the other two are at the square. There are four fountains in the village. Casas Bajas is spread on the slope of the mountain and it is very difficult to get water. Inhabitants built small building at the other side of the river. They used this building to get water and to wash clothes. In Casas Bajas there are no casilicios, however, there are crosses, the Spanish people call these crosses “Via Crucis”. These crosses are not placed at the ends of the main street, but show the way to the cemetery. When someone of the inhabitants passes away the funeral procession passes all the crosses of “Via Crucis” until reaching the cemetery. There are 14 crosses on the streets and they are located inside the village. Every cross has a different picture (Fig.3.4). These pictures describe the different moments lived by Jesus Christ from the time he was arrested until his crucifixion and burial. There are also “Via Crucis” in Casas Altas, the nearest village from Casas Bajas. It is known that in 1834 the location of cemetery of Casas Bajas was changed to the current place. The old location was next to the church. Now it is the current central square. In addition, dwellings are built aligned to the west part of the village. It’s different compared with the other villages.

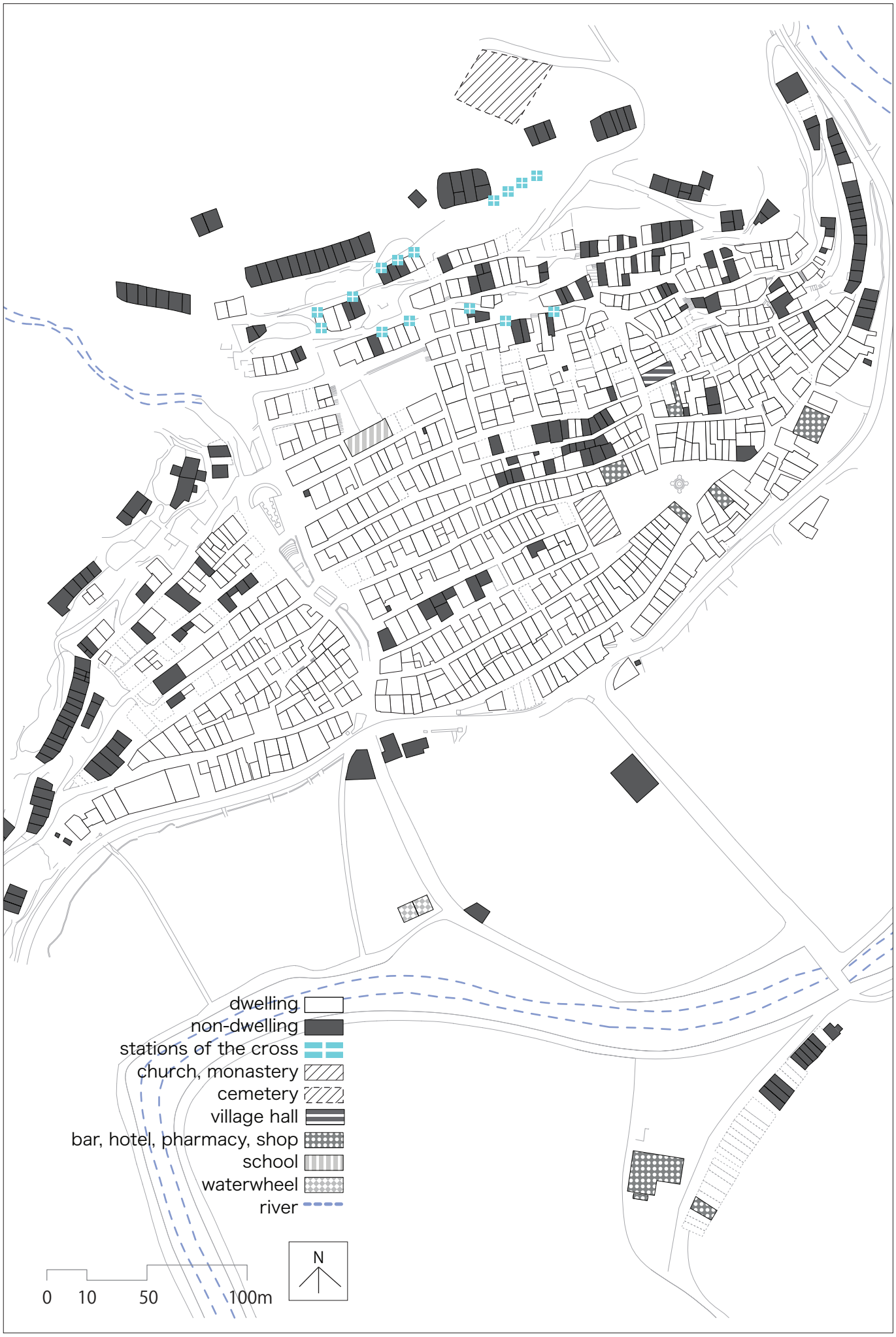


Fig.3.3 A summery of Casas Bajas

1	2	3
4	5	6
7	8	9
10	11	12
13	14	

Fig.3.4 The locations of the crosses in Casas Bajas

(3) Castielfabib (Fig.3.5)

Beside the center square is the village hall. Also, pharmacy, supermarket and pub were built around the square. The church was built next to the castle. There are five fountains in the village. Most of them are located in the south. However, one fountain is built at the bottom of the mountain and is the oldest one. The others were built after the water system came to the village. The castle and the church already existed in 11th or 12th century (*3.2). It is uncertain where inhabitant lived. But there are ruins on the mountain and it is possible that the inhabitant lived there. This study focuses on the current location of the village. One of the oldest buildings at the central square was built in the 16th century. In the past there was a castle wall. It is unknown when inhabitants broke it and begun to live outside the wall. As a matter of fact, no one knows where exactly the castle wall went before. There is no information in any book about its exact place. However, some data is still preserved in the village. There are five towers in Castielfabib. These watchtowers were built to control the possible approach of enemies. Moreover some parts of the wall are reused as dwellings. Thus nowadays some inhabitants are living on the wall. There are two casilicios on the same street that is running to the west part in and one casilicio was built south of the village. They are located on old main road. It is unsure which buildings were built first, but the old main road starts from the center square. Perhaps the dwellings begin to be built around the center square.

(*3.1) RODRIGO C.: “El Rincón de Ademuz. Análisis geográfico comarcal”, Asociación para el Desarrollo Integral del Rincón de Ademuz, 1998

(*3.2) RIERA P., FAURA R., et al.: “Diccionario Geográfico, Histórico; Biógráfico, Postal, Municipal, Militar, Marítimo y Colegiástico de España y sus posesiones de Ultramar”, publicado bajo la dirección de P.P. Reina y Sans, Barcelona, 1884

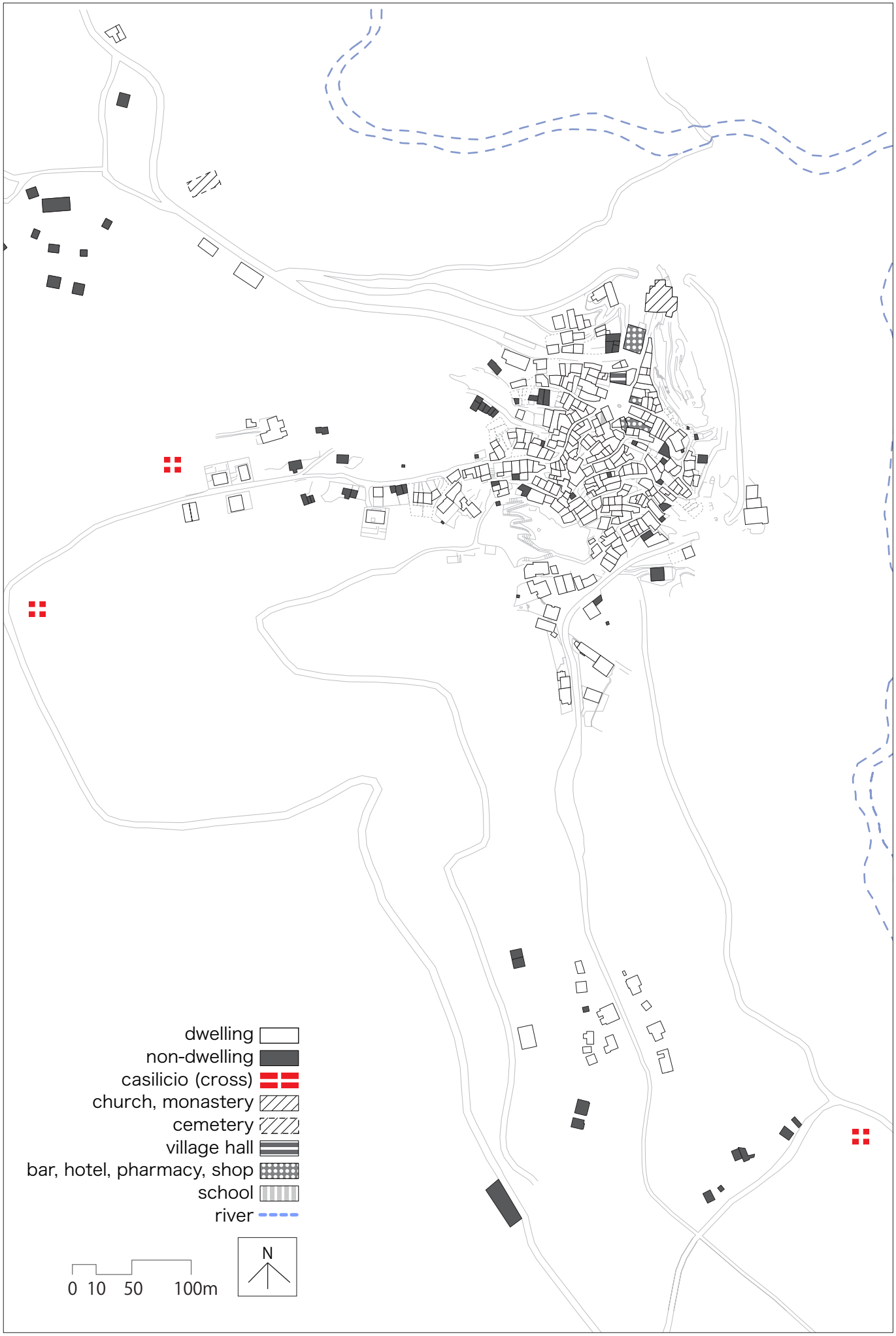


Fig.3.5 A summery of Castielfabib

3.3.2 The difference between the locations of the villages

The three villages selected for this study are placed in different locations. In each of these three locations, buildings are constructed differently. Basically, the buildings that are built on flat land are composed of blocks, defined in this study as “block-unit”. Besides, the continuous buildings are built along the street. Furthermore, some buildings are connected between two different streets, in this case, defined as “line-unit”. Mainly the villages are located on flat land, such as Torrebaja. Because the streets are straight the village is composed of many block-units and long line-units. In contrast, the buildings that are built on the slope are connected with four or five buildings to compose short line-units as, for example, in the village Castielfabib. There are some reasons why these differences occurred. The most important reason is the way in which the inhabitants walk the streets. In the village on the flat land it is possible to make a straight street. But in the case of the slope to reach the top of the village, it is necessary to make stairs or snaking streets. This is why inhabitants need an original idea to build the buildings. They make short connections between buildings and tangled streets, thus the short line units can give a passage to the snaking streets. In addition, in past times, the tangled streets also were protecting the inhabitants of hostile attacks, confusing enemies. The reason why the villages were built in such difficult places was to protect the inhabitants and their belongings from hostile attacks.

Almost all the particulars of the locations of the villages are explained in the previous section. Torrebaja is on the flat land, Casas Bajas is in the mountainside and Castielfabib is on the mountaintop. But looking closely at each of these three villages, it should be noted that each village contains different types of locations. For example, in Torrebaja dwellings built near the mountain are on slope. In Castielfabib some buildings around the central square are on flat land. Therefore, this section will show the location details of each selected village.

(1) Torrebaja (Fig.3.6, Photo3.1, Photo3.2)

East part of Torrebaja is on flat land. Some dwellings are built as block-units and the others are built as long line-units along the street. The streets are straight and wide. However, the streets located at east of the village are narrower than the others. It is because this place has a difference of the level and it is difficult to make a block-unit there. On the other side, there are two stairs on the streets on the west side of the village. The roads are not straight, due to the proximity to the mountains. The streets are snaking and buildings are composed of short lines.

Photo3.1 Long line-unit in Torrebaja

Photo3.2 Short line-unit in Torrebaja

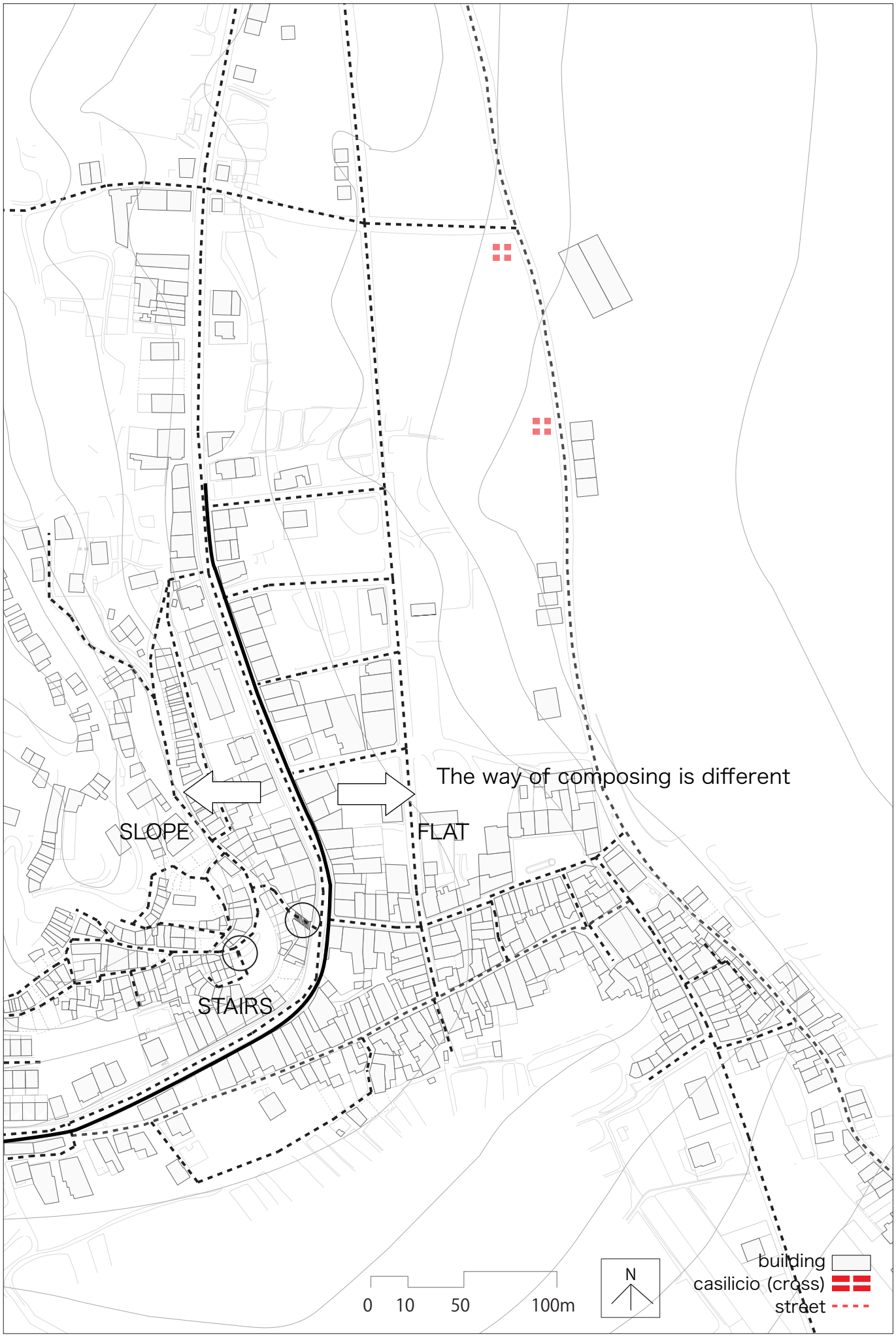


Fig.3.6 The composition of Torrebaja

(2) Casas Bajas (Fig.3.7, Photo3.3, Photo3.4)

Casas Bajas spreads halfway up to the mountainside. This is why the southern part, which is near to the river, is located on flat land. The northern part is closer to mountaintop and, therefore, it is on slope. The characteristic of Casas Bajas is that its location is very uneven between the flat land and the slope. The separation lines of the two types of locations are unclear. However, there are some characteristics of the border between them. On one hand, on the flat land it is possible to pave a straight street. The street runs straight until it reaches the slope of the mountain and then starts to be snaking, it means that there is a border between the locations. Also, the stairs show the border of the locations. On the other hand, in the west part of the village, buildings are connected to make some long line-units. Some units make two lines and inside they have a courtyard. It is characteristic for the buildings that are built on the flat land. And this location does not have level difference, because plain spreads here.

Photo3.3 Long line-unit in Casas Bajas

Photo3.4 Short line-unit in Casas Bajas

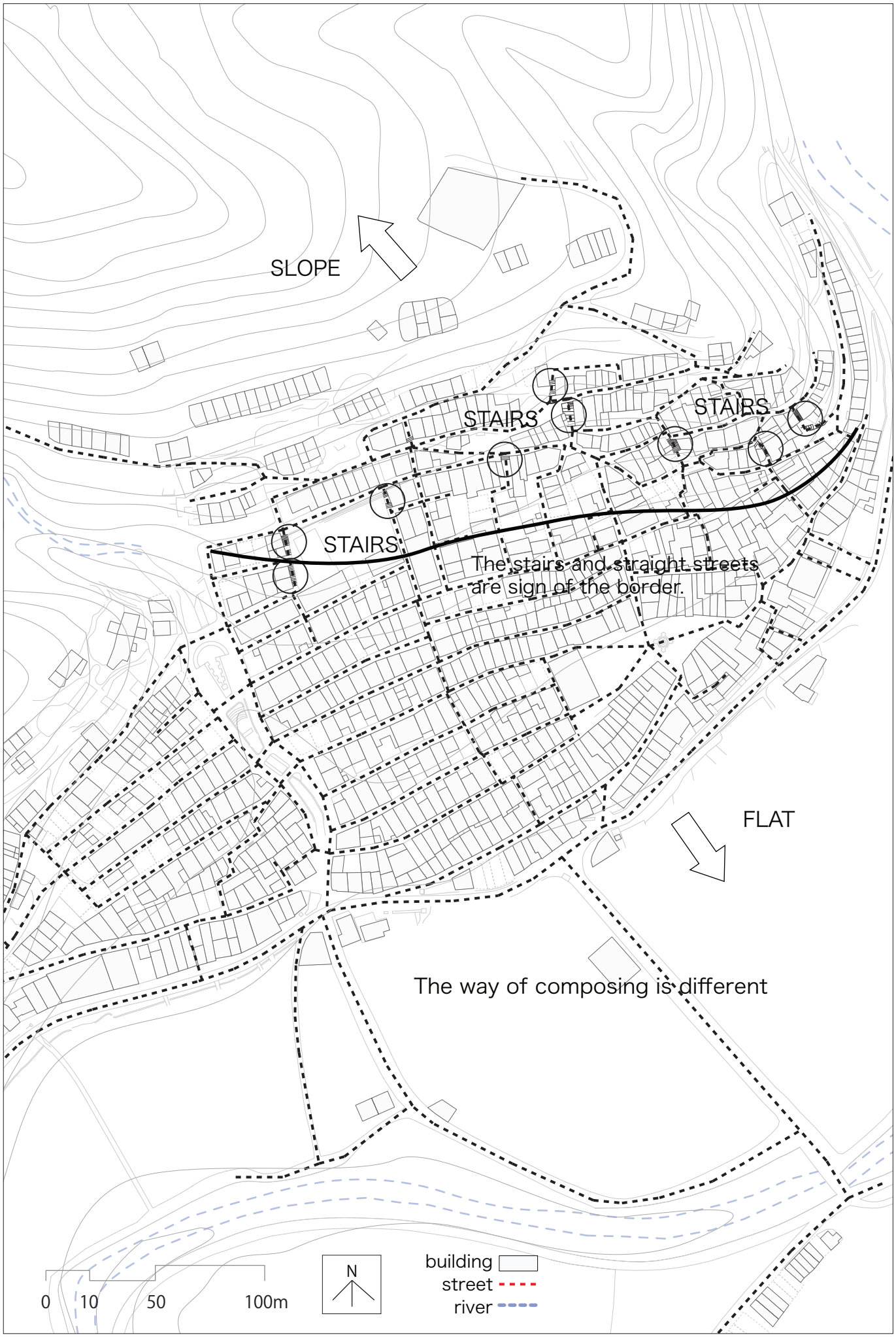


Fig.3.7 The composition of Casas Bajas

(3) Castielfabib (Fig.3.8, Photo3.5, Photo3.6)

Castielfabib is on the mountain and it composed of several short line-units but there are just few stairs. Almost all streets are snaking and adjoin to the centre square of the village, what is different from Casas Bajas. The system of using stairs to compose village is newer than the snaking streets system. This means that the west part of Castielfabib, where the stairs are found, is new. But even so, Casas Bajas is newer than Castielfabib. The old inhabitants do not prefer the stairs. Perhaps it is because of the wind controlling. The analysis about the snaking streets will be explained in the following section. Furthermore, around the centre square of Castielfabib is flat land. There is one block-unit in the east part of the village and it is sure that this place was the beginning of Castielfabib.

The results show us that the general location of the village is not important. The important thing is to focus on the details of each location of the buildings. This determines how the buildings complexes are constructed in the village.

Photo3.5 Line-unit in Castielfabib

Photo3.6 Street in Castielfabib

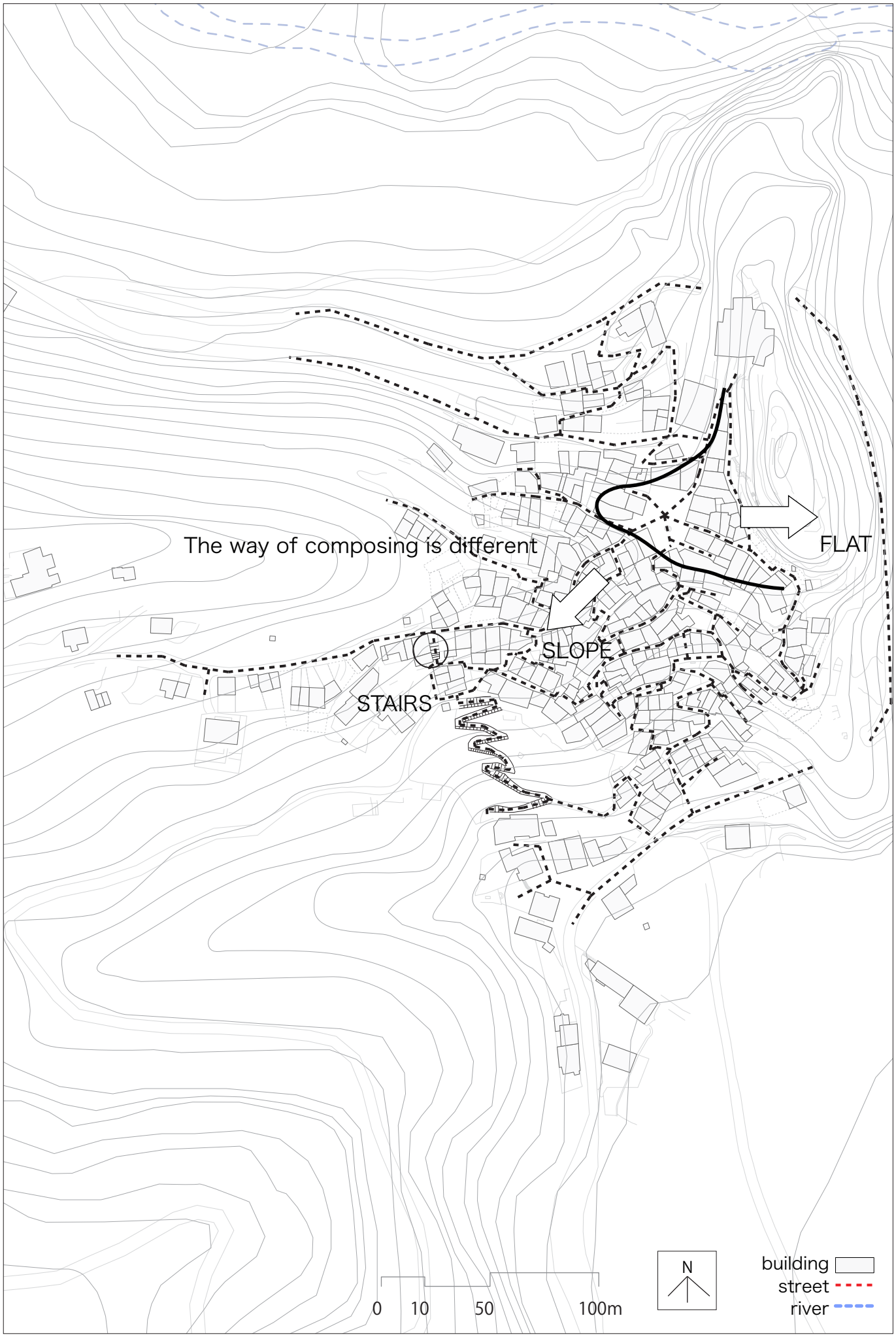


Fig.3.8 The composition of Castielfabib

3.3.3 The transformation of the villages

Old maps are an important source of information in order to make clear how village developed. Presently, there still exist old maps of Rincón de Ademuz (Fig.3.9). But unfortunately, none of the maps show the details of the villages. This is why in this study, it was necessary to find another idea to know how the village developed.

In this study, to analyze how the villages developed, non-dwellings were defined. The non-dwellings are barns, fodder-houses and vine storages. For several reasons, the non-dwellings should be built around the village (Photo3.7). First, a residential area on mountainous terrain should be compact because of land use restrictions. This is why the multi-storey dwellings are built. Second, the dwellings must be built around the fountain. Non-dwellings can be built in places where it is difficult to get water, such as in the mountainside as it explained in section 3.3.1. Third, it is a way of use. It is better to set the non-dwellings between the residential area and the cultivation zone. Therefore, non-dwellings are usually distributed around the village. And this is why non-dwellings theoretically make the border of the village. However, the result of the research shows

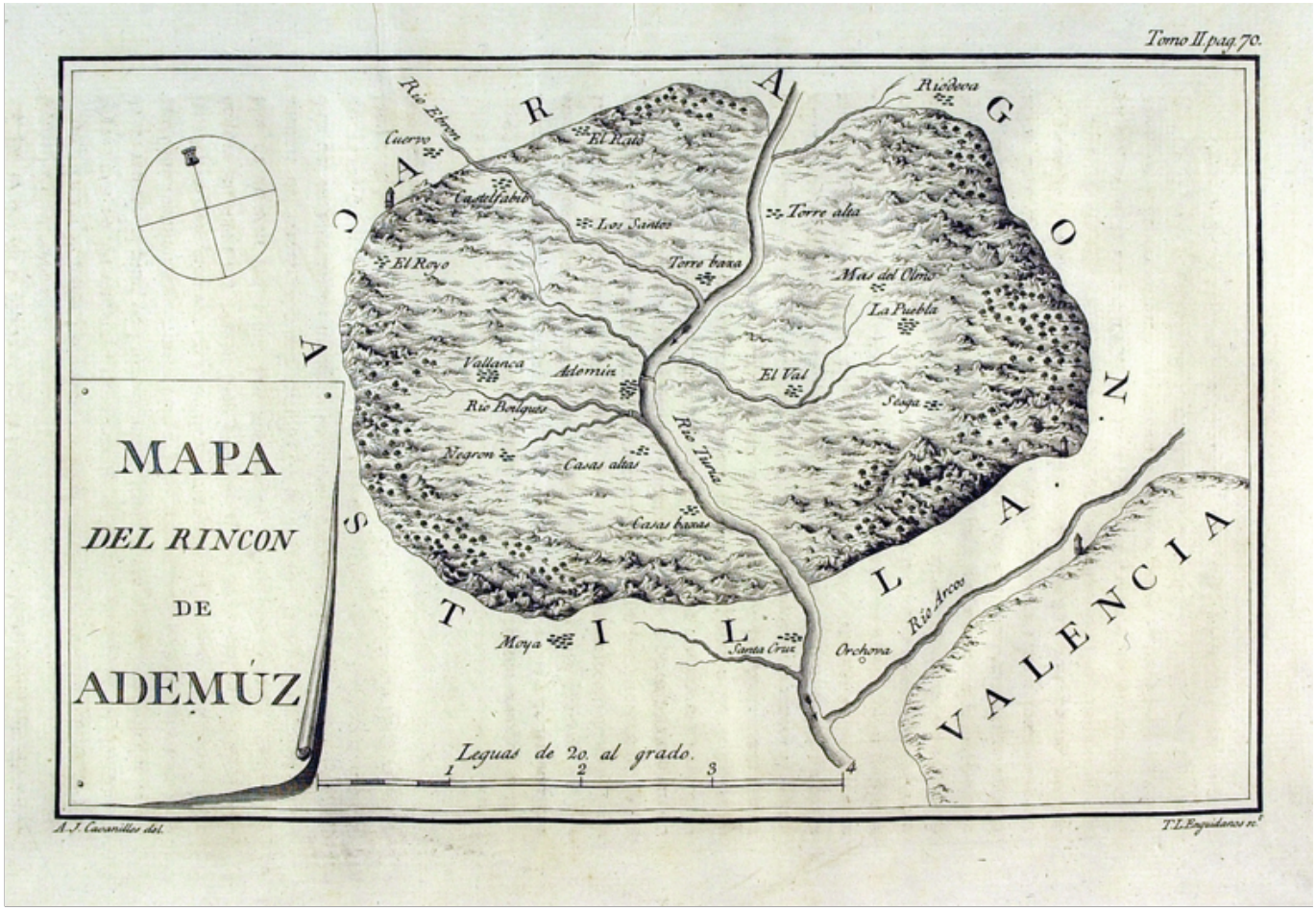


Fig.3.9 The old map (*3.3)

that there are non-dwellings inside the village. This phenomenon is not suitable to the fact that non-dwellings are always built around the village. But when considered from a different angle, it shows the probable location of the former border. This hypothesis allows determining the shape of the old village from the current situation.
The following figures show the location of non-dwellings. The gray color indicates non-dwellings, and the dotted line represents the old border of the village. From this it is possible to understand that there are several layers in the villages. Besides, next figure shows the original places in each village (Fig.3.13).

(1) Torrebaja (Fig.3.10)
The development of Torrebaja began with the tower and some large dwellings around the central square. The Rosario streets, church and Jaime I square are the oldest places in the village (*3.4). In order to focus on the non-dwellings inside the village, some of them are distributed on the Cantón street and Rosario street. Besides, they are also found in the north of the central square. These three pieces were the boundaries of the village. The village was developed based on these two streets.
On the other hand, many of the non-dwellings are distributed on the west side of the mountainside. But, in the past, these non-dwellings belonged to Castielfabib. This land ownership was transferred to Torrebaja in 1995. Needless to say, inhabitants of Torrebaja use many of non-dwellings in this location. However, these non-residential buildings were not built on the border of the village, but outside of it.

Photo3.7 Non-dwellings

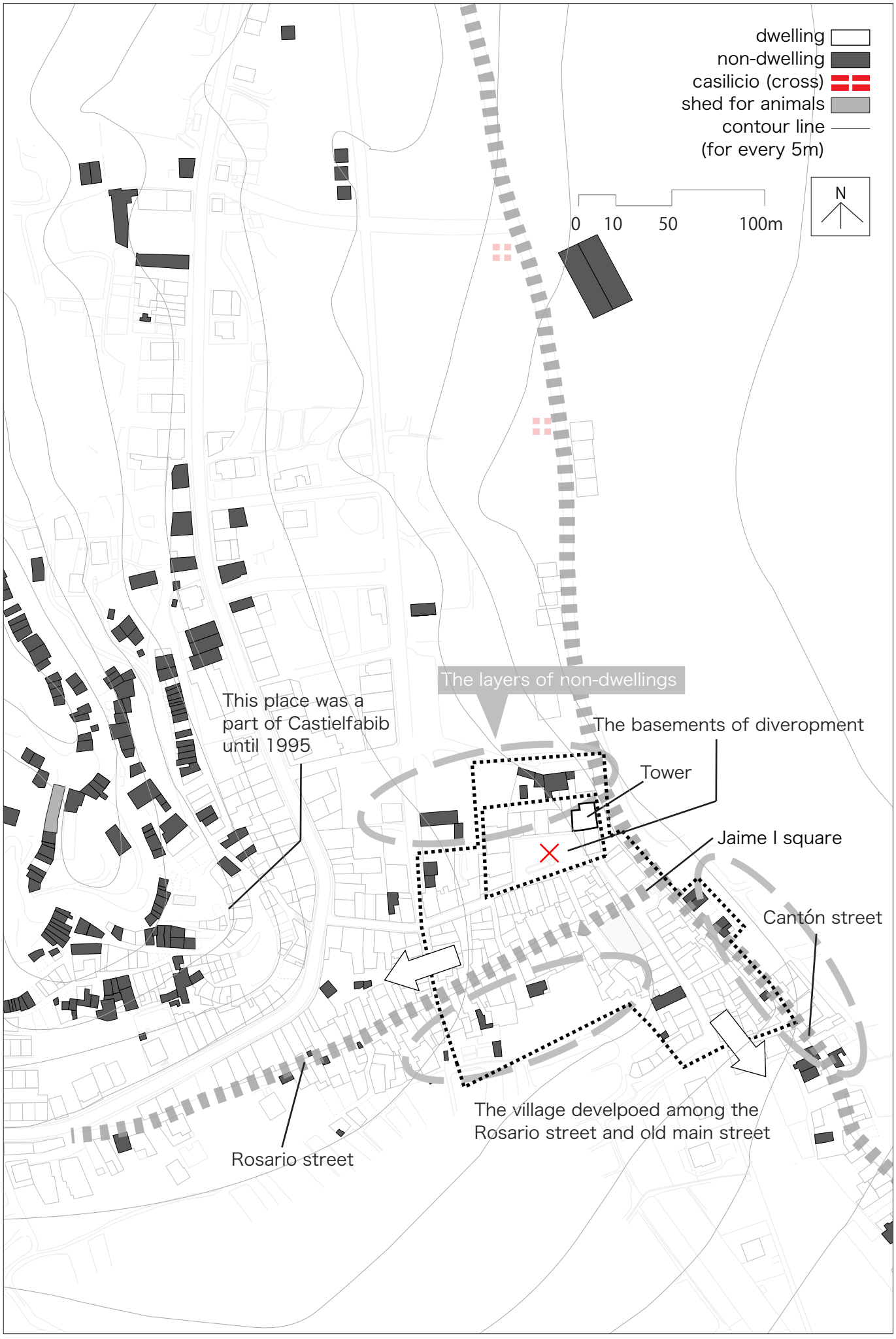


Fig.3.10 The development of Torrebaja

(2) Casas Bajas (Fig.3.11)

There are two original dwellings in Casas Bajas. The common factor among these original dwellings is that it is possible to pass through them across the ground floor (Fig.3.13). The village development started from a sunny spot of the mountain. The cemetery was also built on the mountain. However, in 1834 it was moved to the current location (*3.5). The present central square is located at the former place of the cemetery. Many non-dwellings are built behind the village. They are distributed along the current main road in the south-west and north-east of the village. Besides, some non-dwellings are built on the other side of the river. By focusing on non-dwellings distributed inside the village, it is possible to understand that the village has several layers.

There are three layers of non-dwellings in Casas Bajas. The first is to the north of the original dwellings, the second is to the west of them, and the third is to the south-west. These three layers show the borders of the village in the past. On this basis, it is clear that the village has been developed in the south-west direction. And the only reason that the cemetery was moved to its present place is that the developed dwellings enclosed the cemetery. That is why people moved it to the north of the village. This phenomenon is suitable to the hypothesis that the village was developed in the south-west direction.

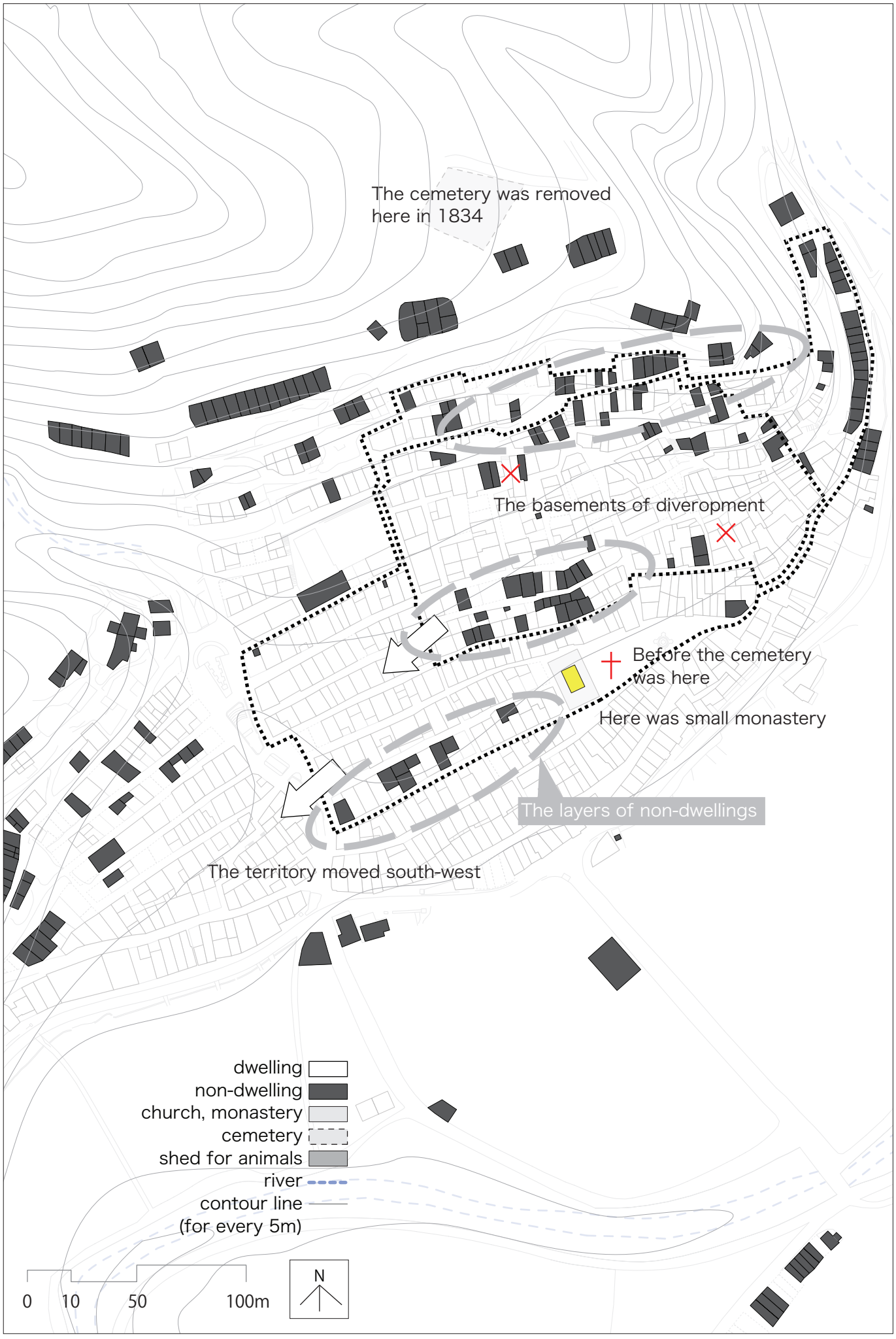


Fig.3.11 The development of Casas Bajas

(3) Castielfabib (Fig.3.12)

In the north of the village on the top of the cliff there are some ruins. This is the origin of Castielfabib. However, it is not clear when inhabitants moved the village to its present location. The buildings around the central square were built from the 16th century, but the castle and some dwellings are older than these buildings. There are two casilicios on the same street that runs to the western part. Besides, one more casilicio is built in the south of the village. Therefore Castielfabib was built as a node of streets that run east-west and north-south.

If compared with the others villages, in Castielfabib there are less non-dwellings, because it is a castle village. The compact village is an effective way to protect from enemy action. Thus, to keep the village compact inhabitants used as storerooms holes made by them in the mountain surface. But because these holes were not enough, they had to make additional barns outside the village.

The castle wall shows the old border of the village. However, it is unclear where actually ran the castle wall. Therefore, to define the former borders of the village, it was necessary to connect the remaining part of the castle wall. The village was developed to the north and south. Especially many dwellings were built on the southern slope of the mountain because of the sunlight. But Castielfabib does not change shape dynamically. It keeps its original shape, because of its location on the mountain. There is no space to spread dwellings.

(*3.3) CAVANILLES A.: “Observaciones del Reyno de Valencia”, Valencia: Faximil Edicions Digital, 1795

(*3.4) RODRIGO C.: “El Rincón de Ademuz. Análisis geográfico comarcal”, Asociación para el Desarrollo Integral del Rincón de Ademuz, 1998, pp.83

(*3.5) RODRIGO C.: “El Rincón de Ademuz. Análisis geográfico comarcal”, Asociación para el Desarrollo Integral del Rincón de Ademuz, 1998, pp.80

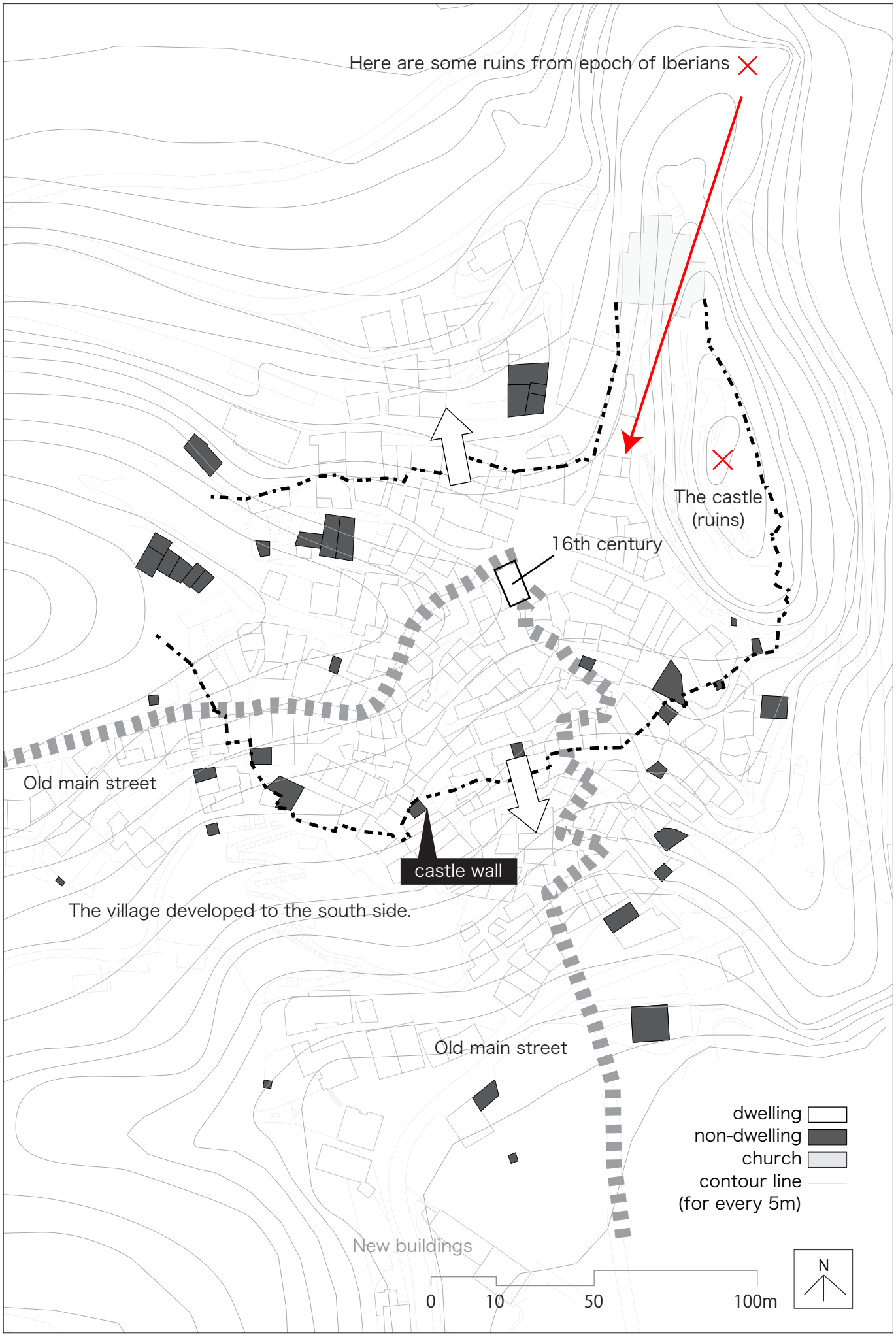


Fig.3.12 The development of Castielfabib

Fig.3.13 The original places in each village

3.4 The wind-path in the village

3.4.1 The location of entrance doors with opening

Many dwellings have more than two entrance doors. This is especially characteristic of dwellings built on slope all of them have two entrances. That is why there are many doors in the village. Generally one door is for inhabitants and another is for domestic animals. But nowadays most inhabitants do not keep domestic animals in their dwellings. Therefore they reformed farm accommodation into a garage or storeroom. As they reformed the space, they also reformed the entrance door. This is why there are several types of doors in the villages.

The doors have three types of use. The first use is for inhabitants only. The second use is for cars or domestic animals. The third use is for all. Besides, there are three types of equipment of the entrance door. The most typical door is made of wood and in this study it is defined as “wooden panel door”. Furthermore, some of the doors have a window in the upper or lateral part. The window is used not only as a peephole to check the visitors, but also as possibility to let pass the wind and sunlight inside the dwelling. This kind of entrance door is defined as “entrance door with opening”. Besides, some doors have a combination of wooden panel and fixed window at upper and lateral parts. They are defined as “entrance door with fixed sash window”. It is a recent trend that the doors are changed in this type. The window of this type of door can not be opened. It is only there to let pass the sunlight into the entrance hall. This is the difference between “Entrance door with opening” and “Entrance door with fixed sash window”. Thus, there are basically six types of doors in the villages. Next figure shows the types of doors (Fig.3.14).

Traditionally, in old dwellings were used wooden panel doors. Some of them are divided into two halves, the upper and lower parts. Thus, it is possible to ventilate the room by opening the upper part of the door and to keep domestic animals inside by closing the lower part. It means that the upper part works as a window. This is a way to keep domestic animals inside the dwelling and at the same time take the wind for ventilation. This is a traditional idea for ventilation. But nowadays, when people have reformed their dwellings, many traditional doors have been replaced with new models. One of the reasons for replacing the doors was that the old doors did not open and close smoothly, without gap. The important thing is how inhabitants reformed the doors. Some doors changed into doors with opening. The opening has a lattice. The lattice does not work as peephole, but as protection to prevent the entry of animals into the dwelling. This idea is similar to a wooden panel door, which can be separated into two halves. In order to analyze the cor-

relation between the wind and the village, this study was focused on the location of the entrance doors with opening.

There are 141 doors with opening in Torrebaja, 136 in Casas Bajas and 110 in Castielfabib. In total there are 387 doors with opening in three villages. This number is 23% of all doors. But the overall percentage does not explain characteristics. When comparing the distribution of the doors, also the characteristics of the distribution can be understood. The following figures show the location of the distribution of the entrance doors with opening (Fig.3.15, Fig.3.16, Fig.3.17).

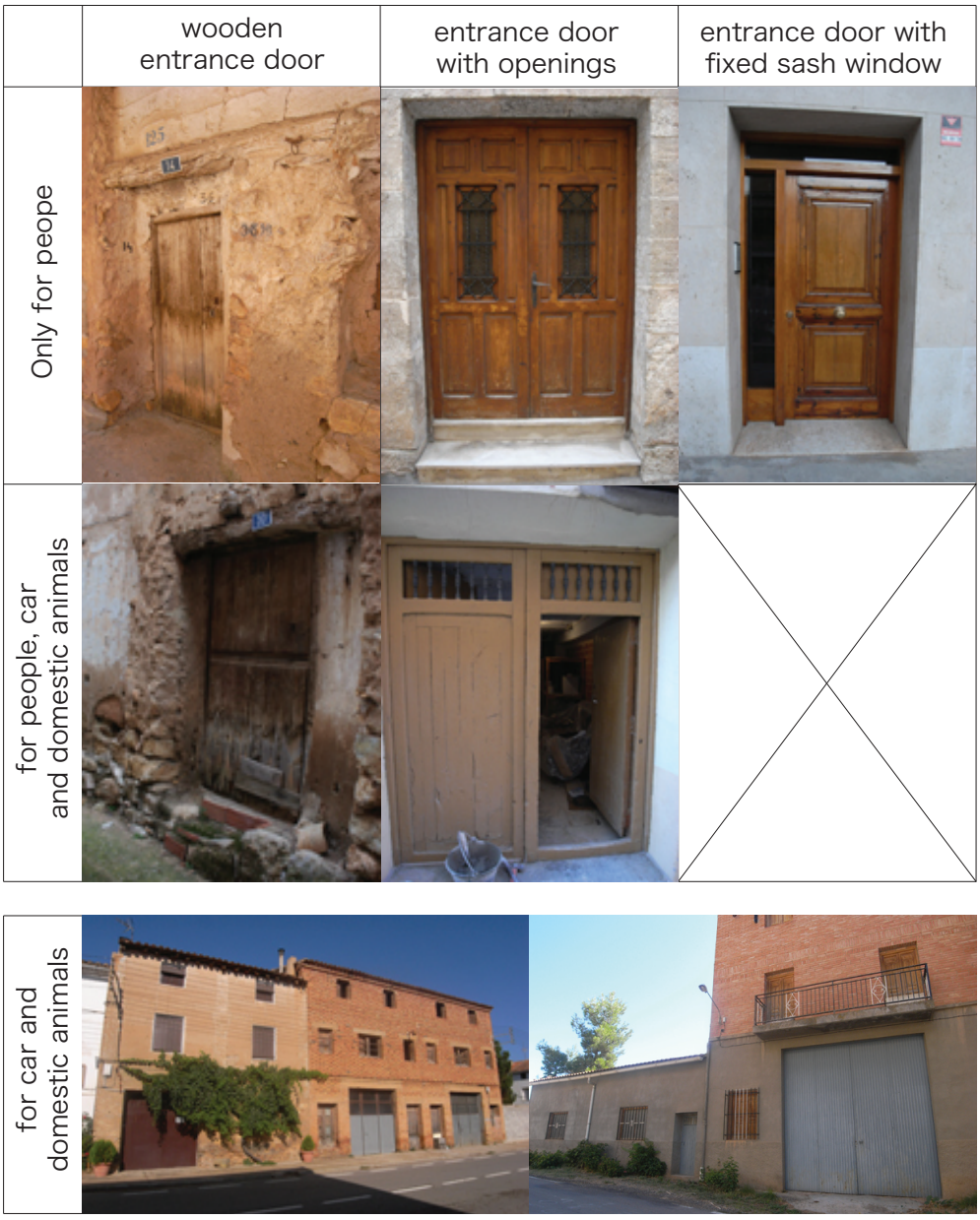


Fig.3.14 The types of entrance doors

only for people (one way)			for people and car (two way)			Garage	Total
wooden entrance door	entrance door with openings	entrance door with fixed sash window	wooden entrance door	entrance door with openings	entrance door with fixed sash window		
118	131	150	6	10	4	97	516
23(%)	25(%)	29(%)	1(%)	2(%)	1(%)	19(%)	100(%)

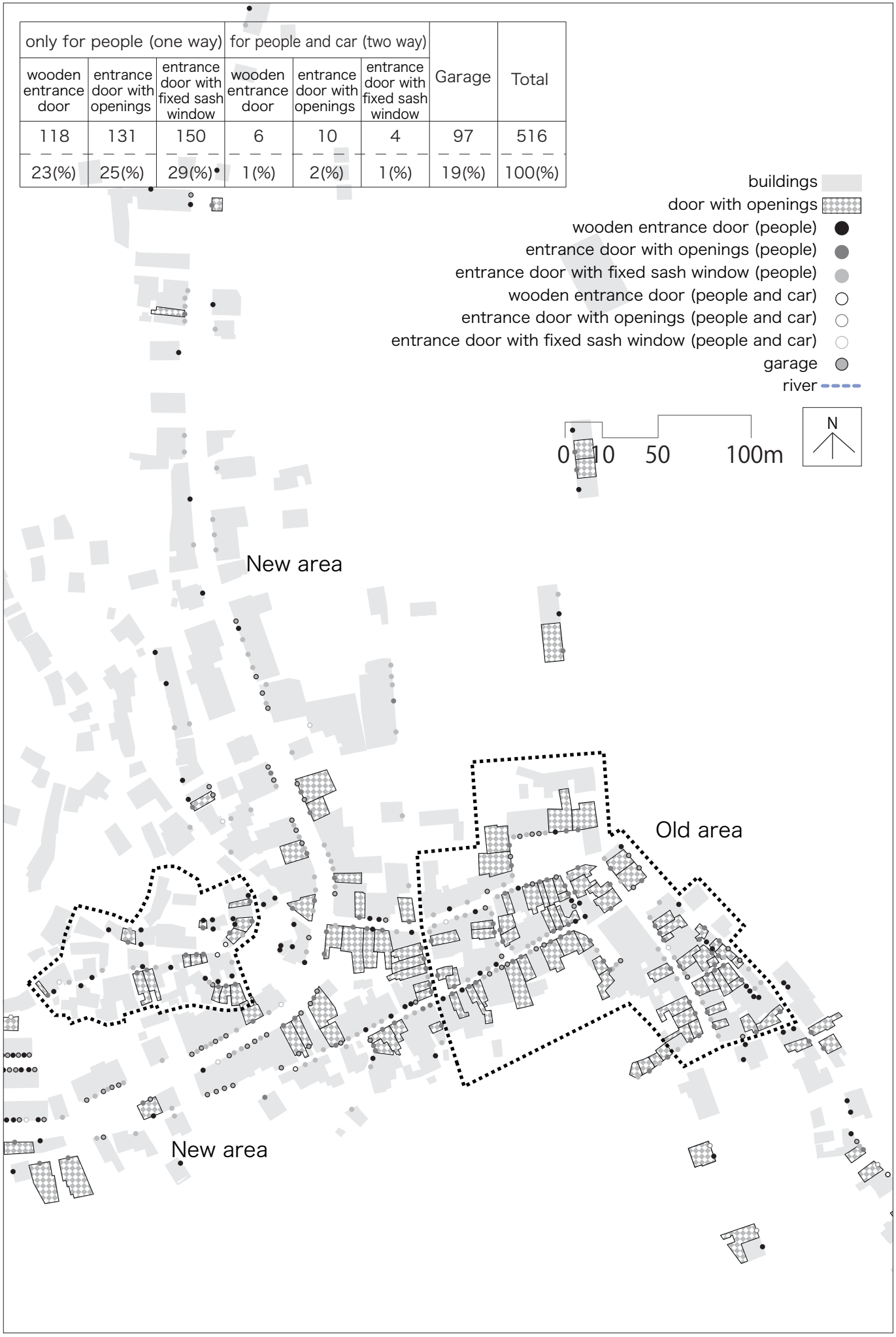


Fig.3.15 The distribution of the entrance doors in Torrebaja

only for people (one way)			for people and car (two way)			Garage	Total
wooden entrance door	entrance door with openings	entrance door with fixed sash window	wooden entrance door	entrance door with openings	entrance door with fixed sash window		
132	129	343	14	7	29	136	790
17(%)	16(%)	43(%)	2%	1(%)	4(%)	17(%)	100(%)

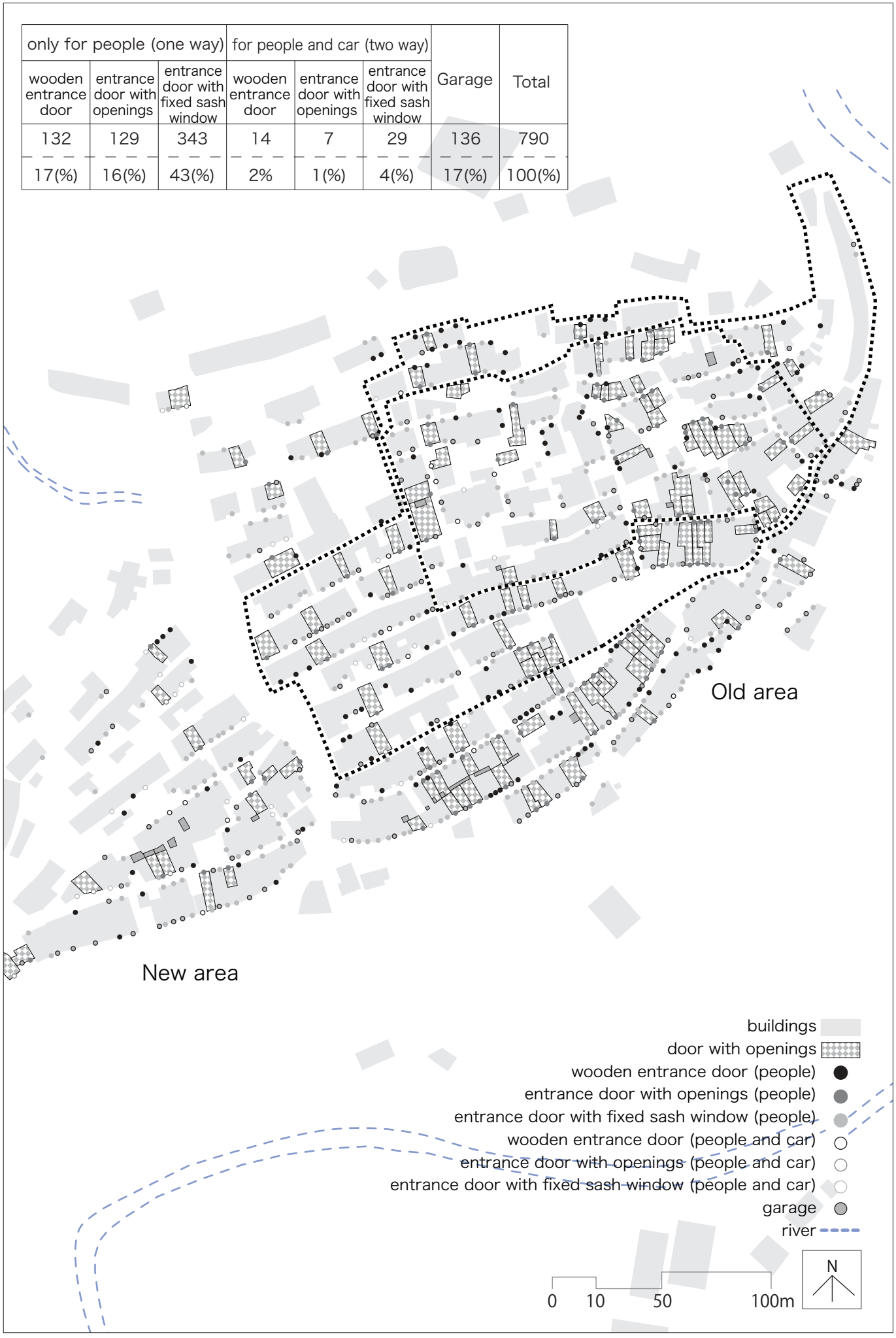


Fig.3.16 The distribution of the entrance doors in Casas Bajas

only for people (one way)			for people and car (two way)			Garage	Total
wooden entrance door	entrance door with openings	entrance door with fixed sash window	wooden entrance door	entrance door with openings	entrance door with fixed sash window		
110	106	92	12	4	1	49	374
30(%)	28%	25(%)	3%	1(%)	0(%)	13(%)	100(%)

Fig.3.17 The distribution of the entrance doors in Castielfabib

Furthermore figure 3.15 shows that almost all the rest of these doors are close to the old area in Torrebaja. In contrast, there is no entrance door with opening in the northern part of the village, because it is a new area. The whole village is located in similar terrain, but there is a difference between its old and new area. The doors with opening are concentrated in the old part of the village. In addition, figure 3.16 shows that almost all the other doors with opening also are distributed close to the old part of the village in Casas Bajas. No doors with opening are in the western area of the village. This is very similar to the phenomenon in Torrebaja. Besides, in Castielfabib almost entrance doors with opening are distributed inside the castle wall (Fig.3.17). The village has not been developed in the last two centuries. Only recently it started to develop again. Therefore, the situation is different compared to the other villages. More than half of the dwellings are built inside the castle wall. This is the old area of the village. Thus there are more doors with opening in the old area. Besides, in last 20 years the village has developed to the south. And in this new area no doors with opening can be found.

These figures show the bias in which area the entrance doors with opening are. The common factor in the three villages is that the entrance doors with opening are distributed in the old area. Even in the new area, this type of doors is distributed close to the old area, because the villages are continuously developing. The result shows that traditionally inhabitants have thought about the wind. Therefore residents have made openings in the doors to take the wind inside the dwelling.

But the new dwellings built along the current main road have almost no doors with opening. In particular, in Torrebaja there are 76 new dwellings built in the last 20 years. But only 7 dwellings have the entrance door with opening. At present the way of ventilation has been changed. This means that the new houses were built according to another logic, by the another system. Changing society is also changing the villages.

3.4.2 The zoning of the villages

The river Turia reaches the city of Teruel located in the north of Rincón de Ademuz. In Rincón de Ademuz villages spread along the river Turia. There are a lot of trees planted in line by inhabitants manually. In winter, the cold wind comes down from the north, as described in the first chapter. The villages are severely affected by the cold weather. Therefore, these trees have a function as a windbreak from the cold northern winds in the winter (Photo3.8). Besides, there are some wind-shaped trees on the riverside (Photo3.9). The strong wind shaped the branches of these trees in curves. The direction of the curved branches is north-south. This direction is suitable for the definition of wind in this study. The valley is the only place in the villages where much water flows. Therefore, the valley is suitable to grow many trees to protect the villages and cultivations from the cold northern wind.

The non-dwellings also work as windbreak like trees. In case of Torrebaja, the non-dwellings are located in the northern part of the village. They are also protecting the village from the cold northern wind. Especially it is cold in the villages located on flat land, because the cold air stays on the flat terrain and reduces the temperature of the ground. Therefore, inhabitants need to protect themselves and their village. The ancient inhabitants built a door on the street on the north side of the old part of the village (Fig.3.18). Nowadays, this door has been removed, but it became known about it from the hearing research. Actually there is no need in the door on the street without the castle walls.

Photo3.8 The windbreak forest

However, in this case, the door was not only protecting from the cold wind, but also was clearly dividing the space between the living and cultivation zone.
For the same reason the non-dwellings create line units in the north part and in the mountainside in Casas Bajas. They are especially distributed in the north-east side, where is the old area of the village. It is the same phenomenon as in Torrebaja.
But the case of Castielfabib is different. Castielfabib was developed as a castle village. In the past, there were a castle and castle wall. The village was specialized for protection from enemy actions. There are only a few non-dwellings in the village. Some of them are built in the northern part. But they are not composed in line units such as in Torrebaja and Casas Bajas.

Photo3.9 The wind-shaped tree

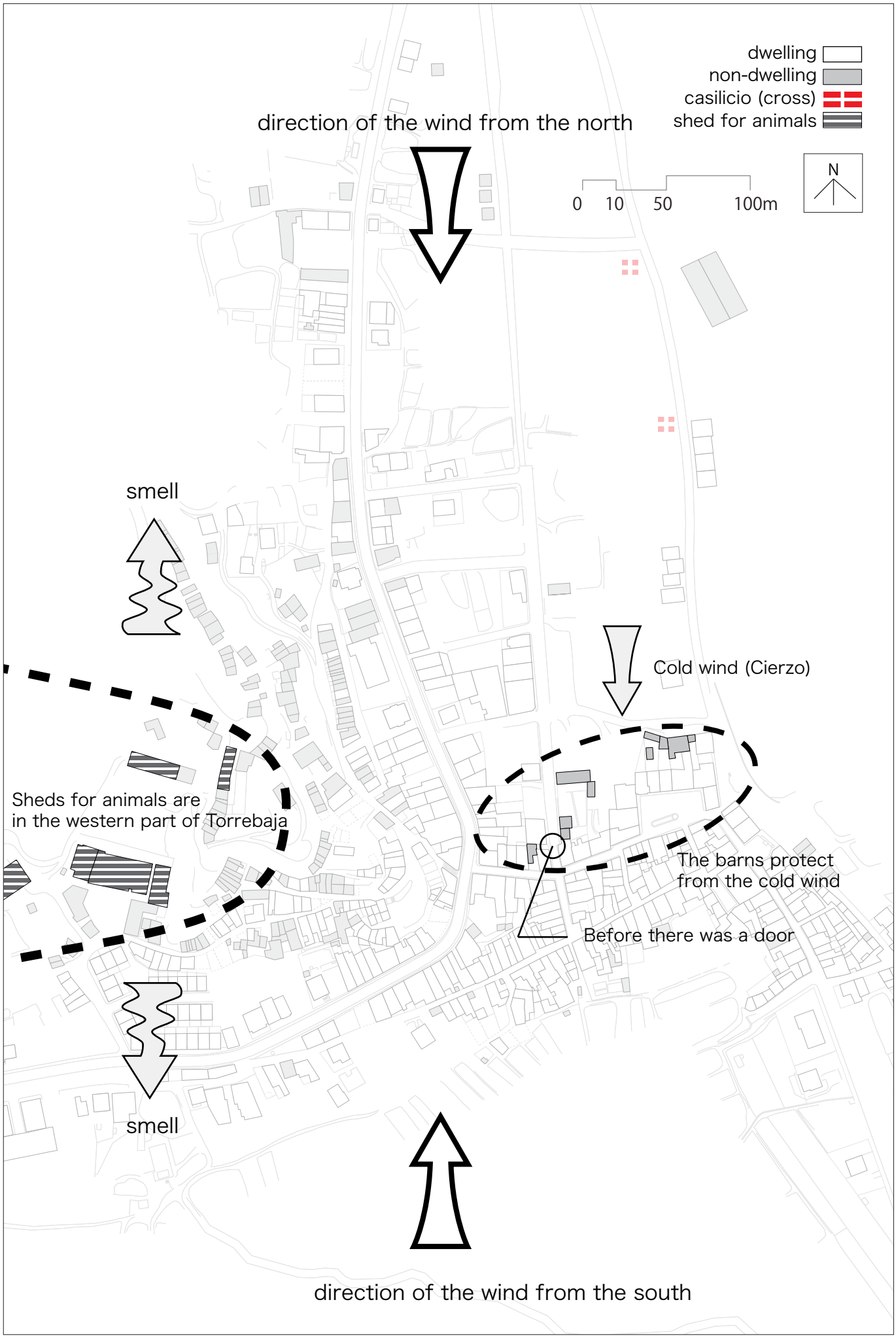


Fig.3.18 The zoning of Torrebaja

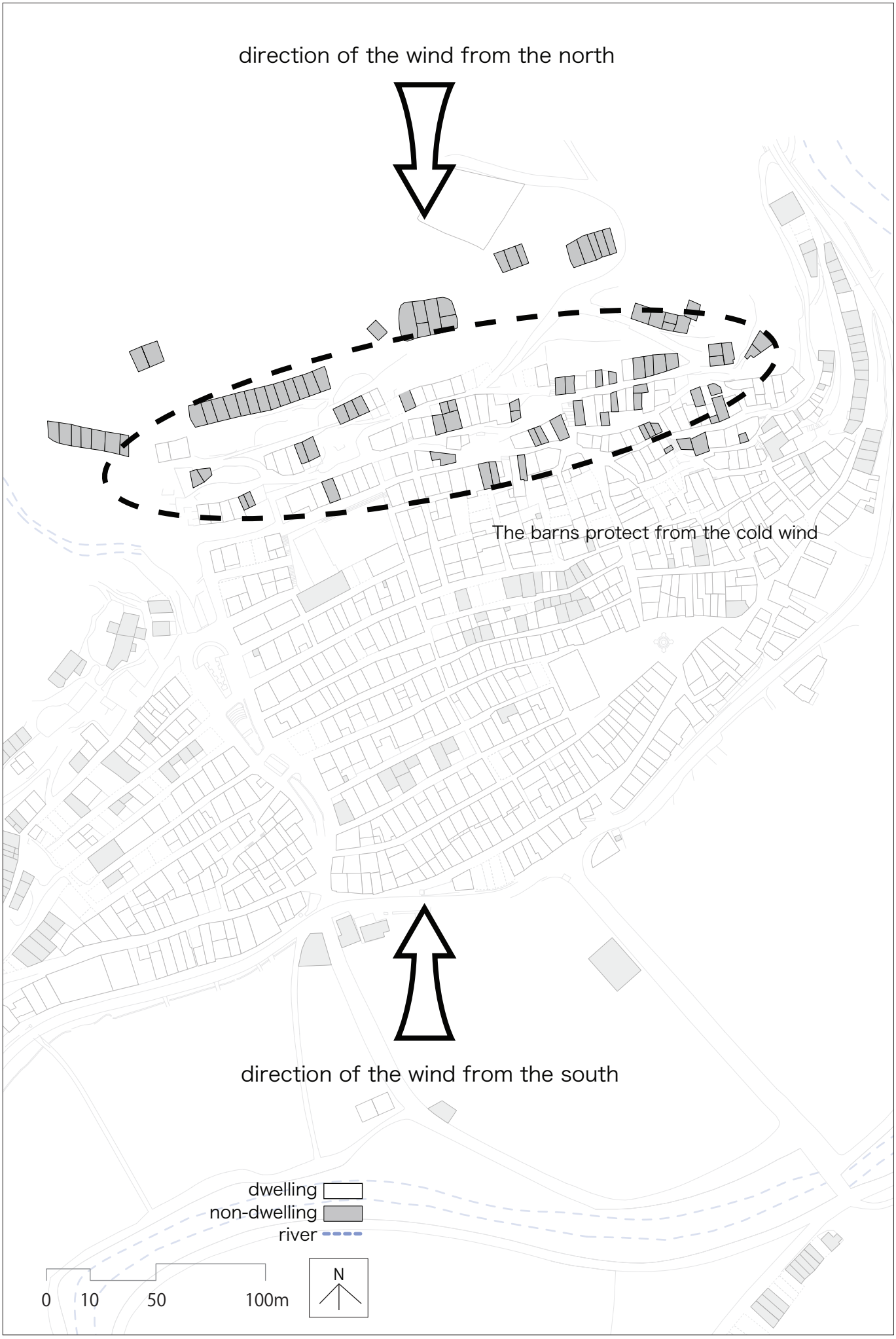


Fig.3.19 The zoning of Casas Bajas

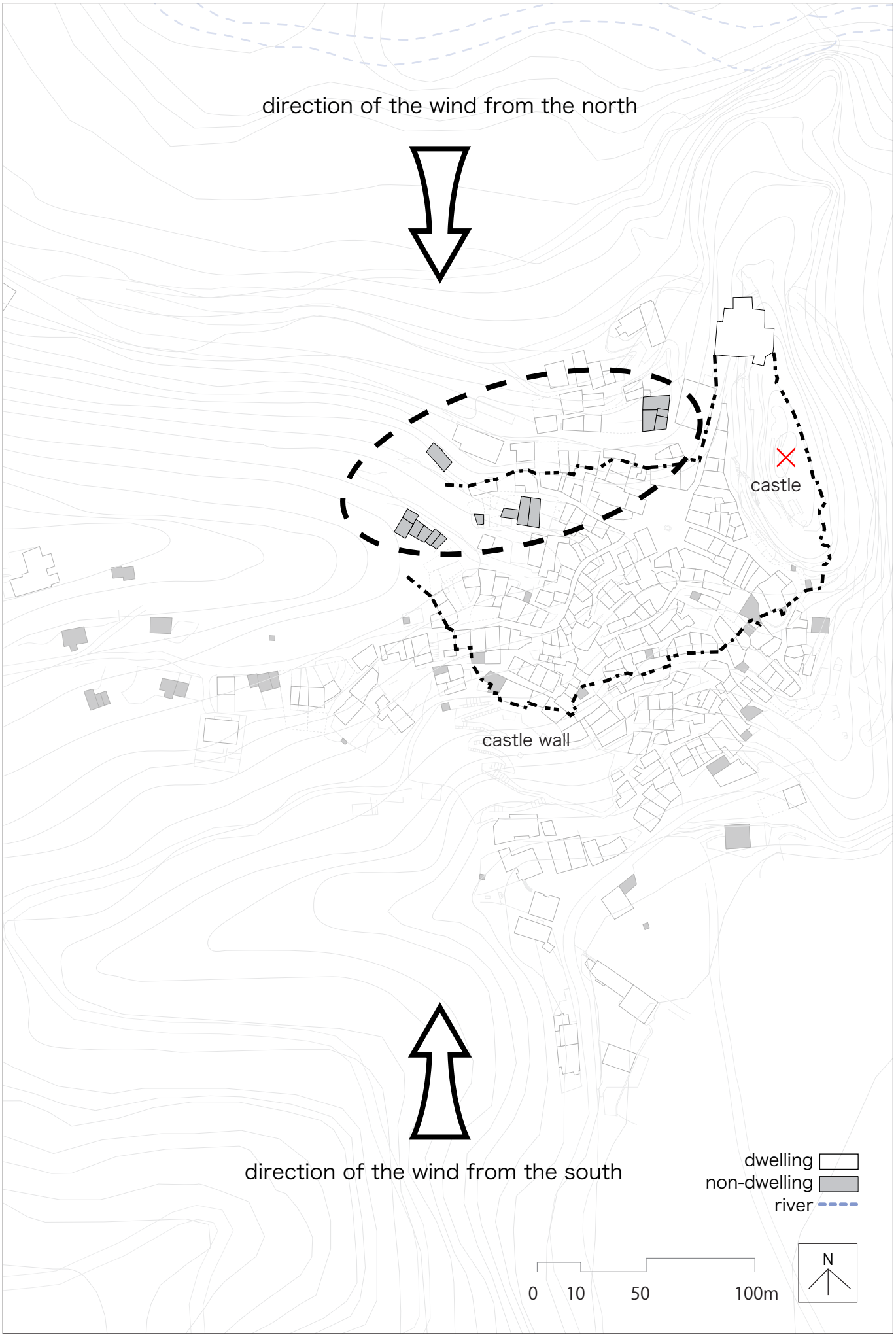


Fig.3.20 The zoning of Castielfabib

On the other side, there are some sheds for domestic animals in Torrebaja. Inhabitants keep cows and sheep in the western side of village. The wind changes direction and blows from the north or south, depending on the time. This is why the west side does not turn out to be the leeward. This is an idea to protect the village from the flow of bad smell. For the same reason, in Ademuz village the sheds for domestic animals are distributed in the eastern side of the village and especially in the places where it is difficult to get water, such as the mountainside. However, there are no sheds for domestic animals in the northern or southern part of the village. The wind has a strong influence on where inhabitants are building sheds for domestic animals.

Trees and non-dwellings protect the living areas in three villages. Besides, inhabitants do not set sheds for domestic animals in the wind-path, because of the smell problem. This is why by studying the wind it is possible to explain the composition of the villages and also the living area. The next section explains how inhabitants control the wind in the living area.

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

Rincón de Ademuz is located on the mountainous terrain and many dwellings are built on the slope. As a rule, inhabitants build their dwellings parallel to the contour lines of the slope because of to the construction problems. If they would build perpendicularly to the contour lines, then they would need to dig more earth than in the parallel construction. And this requires not only special technology, but also increases the cost of construction. This is why the dwellings are always built along the contour line and make the line-unit on the slope. In case when the dwellings are built on the flat land, inhabitants build them along the street. Thus, the buildings make long line-units in the village. And some dwellings are built as block-units. This is the most noticeable difference between the dwellings on flat land and on slope. However, all buildings are connected to each other and make units, regardless of where they are located. This section is focused on how these units are functioning and adapting to the environment, to control the wind.

(1) The building-units make front to catch the wind (Fig.3.21)
Normally dwellings compose line-units along the contour line in any location. But the sizes of the units are different in each location. In general, the units on the flat land are composed of more than 10 dwellings. In contrast, the units on the slope are composed of less than 10 dwellings. All the villages of Rincón de Ademuz were developed on the southern slope of the mountain. Therefore, the line-units are always facing the south, the direction where the wind is blowing. This is why the line-units create front to “catch the wind” and direct it pass through the streets.
In the case of the flat land, dwellings are composed in long line-units. Inhabitants use the space between the line-units as the street. The line-units catch the wind from the south and lead it down the streets. Particularly on a gentle slope to the south-west of Casas Bajas the line-units consist of several layers. This area is new and is the result of population increase. There was a priority to effectively build a lot of dwellings in a limited area. The method of construction was changed in this epoch.
In contrast, on the slope the composition of line-units is focused on the form. There are found forms which are not rectangular. Each unit is inclined upwards to the left or right. Theoretically the line-units must be connected straight because of construction technique and of course, the rectangular shape makes it simpler than organic. However every building on the slope is constructed in a trapezoidal shape to create the curved line-units. All curves are dependent on the contour line of the mountain because of the ridge line and thalweg. Even if the villages are located on flat land, such as Torrebaja and Casas Bajas,

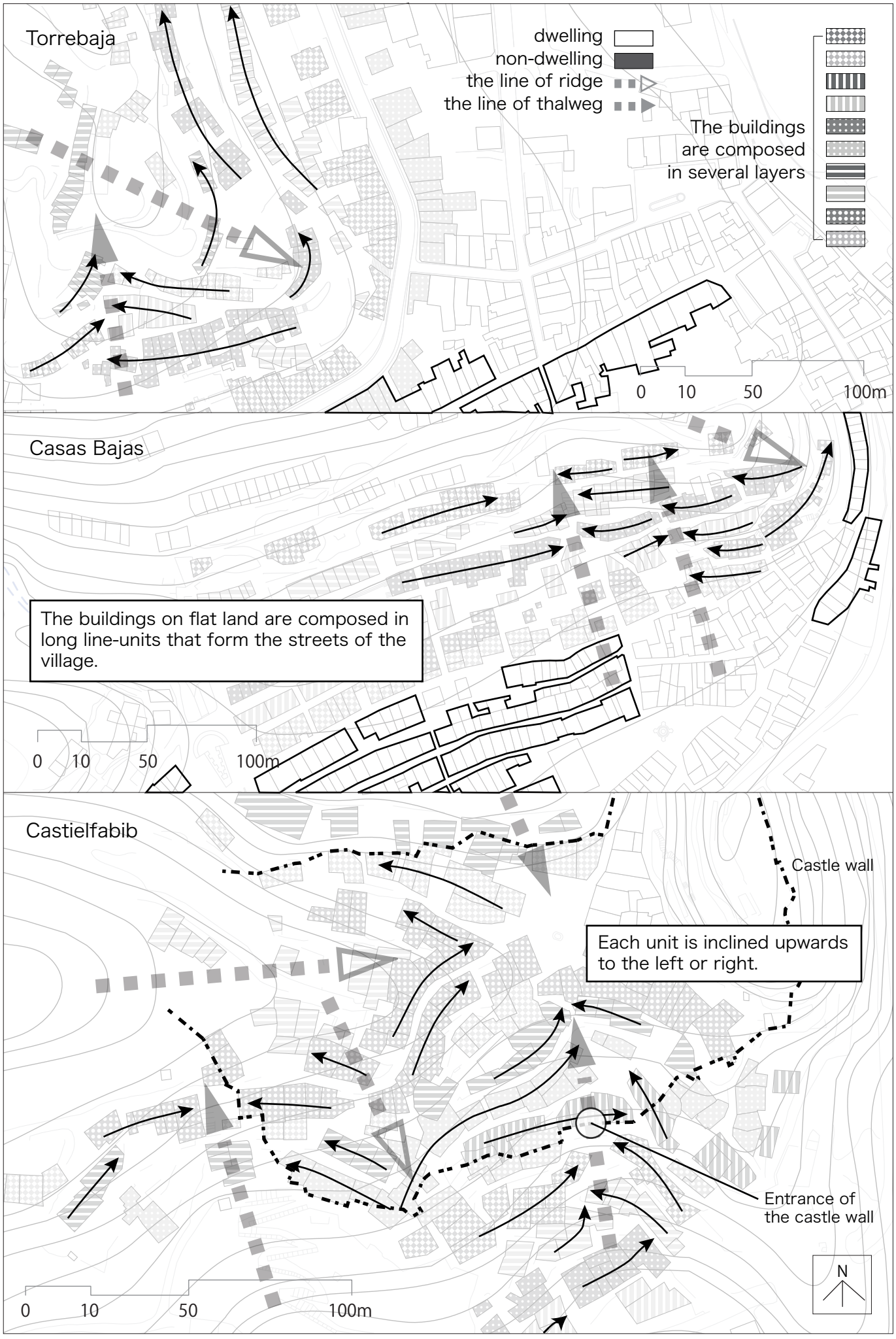


Fig.3.21 The building-units are composed in several layers to catch the wind

the mountain side has the ridge line and thalweg. In addition, the line of thalweg is the place where inhabitants pass through the village. Usually they walk along the winding line of thalweg in the village to go up the mountain. Thus, it is possible to say that the villages are not only developed on the southern slope of the mountain, but also they are developed along the ridge line and thalweg.

The figure shows that the line-units change their direction according with the line of the thalweg. The wind blows through the thalweg as explained in the first chapter. Therefore, it is possible to say that inhabitants built the line-units to direct the wind to the thalweg. Thus, inhabitants not only use the thalweg to walk up the mountain, but they also directed the wind to blow through it. Windbreaks in front of the line-units and the broken wind are concentrated toward the line of the thalweg. It is most obvious in the case of Castielfabib. Inside the castle walls, there are no buildings that cross the line of the thalweg, except the entrance gates (Photo3.10).

In this way, the line-units on the flat land are long in order to direct the wind to the street. Besides, the line-units on the slope have two directions. Each unit is inclined upwards to the left or right, creating a front to catch the wind and direct it to the thalweg to pass through whole village. It is an idea the wind in village.

Photo3.10 The entrance of castle wall

(2) Building-units built across the contour line to dodge the wind (Fig.3.22)

One of the most important characteristics of the wind, is the necessity of an outlet. In terms of hydrodynamics, for the wind to pass through well, the outlet should be larger than the inlet (*3.6). However, the villages are in outside. But inhabitants make the wind to pass efficiently through the entire village. They everywhere made some outlets. Each location has its own characteristic way of making the outlets. In order to explain the way of making the outlets in the village, the analysis is focused on the building-units that are built across the direction of the contour line. Since in the village at the locations, where the building-units are built across the contour line, are created or small squares or courtyards, it is possible to say that dwellings "dodge the wind" to create 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 the flat land. Even in Castielfabib, there is one block-unit on the flat land on the mountain. In general, there are two types of block-unit. One is the block-units that have an almost square shape, as in Torrebaja. Another is the block-units that are composed of several line-units, as in Casas Bajas and Castielfabib. The common factor of these two types is that they both have an inside courtyard. The courtyard works as an outlet for the wind because of the chimney effect. This is the same system that uses the difference in atmospheric pressure to remove the smoke from the chimney. This is an idea to make the wind to pass through the whole block-unit.

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-units make front to catch the wind". Therefore, to create a small square between two line-units inhabitants built some dwellings to connect them. This is the reason why some dwellings are built across the contour line. Three dwellings in Torrebaja and five dwellings in Casas Bajas fall within this case. In Castielfabib, there are eight cases when dwellings are connected across the contour line and thus create several small squares inside the village. These small squares, just as the courtyards, work as outlets for the wind. In addition, these small squares also take sunlight into the dwelling complexes to create a comfortable living environment. Besides, the sunlight promotes the air raise in the village and the small squares have the chimney effect. The thermal circulation is explained in detail in the next section.

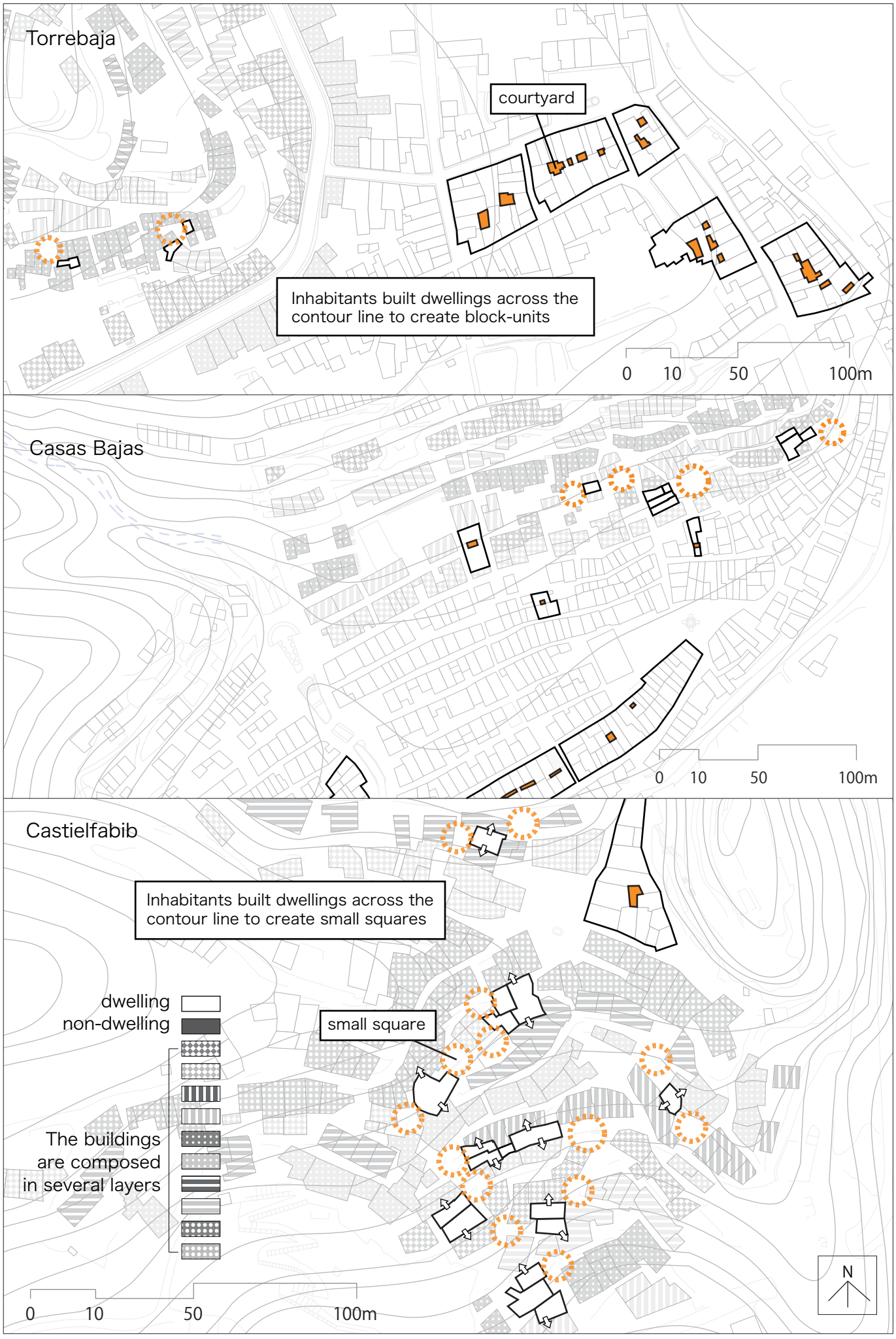


Fig.3.22 The dwellings are built across the contour line to create courtyards or small squares

In conclusion, the building-units have two directions (Fig.3.23). One of them is when the building-units make front to catch the wind. The units 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 work as outlets to dodge the wind and lead the wind through all the dwellings.

In Rincón de Ademuz the wind is blowing in a south-north direction. The villages are developed on the southern slope of the mountain, because dwellings require sunlight, which is why all the dwellings are facing south. The south is a suitable direction to catch the wind and the fact that the dwellings are facing it, is not a coincidence. This is one of the reasons why the villages were able to continue up to the present.

(*3.6) NAITO H.: “環境デザイン講義 (The lecture of environmental design)”, Okokusya, 2011

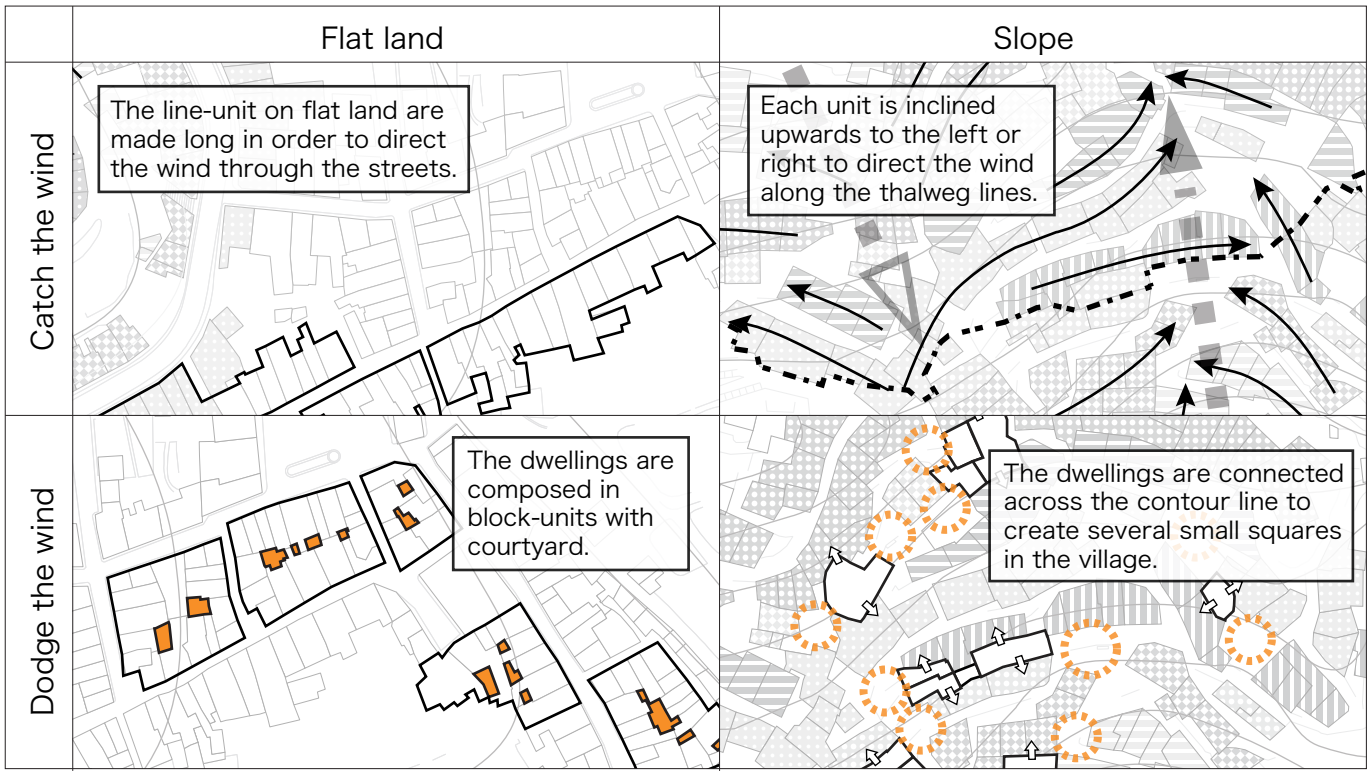


Fig.3.23 The directions of the building-units and wind-path in the village

3.5 The passive design in the village

There are many sunny and shady spots in the village. The sunlight heats the space and thereby creates air movement upward. Therefore sunny spot has a lower pressure than shady spot. It means that a shady spot has a relatively high pressure and the air is pushed downwards. In theory, the air moves from high to low atmospheric pressure, from shadow to sun spots. This is a passive system that controls the wind through composition of the buildings in the village. It should be noted that this system does not generate a strong wind. This air movement is less than 1 meter per second and inhabitants can only feel it on their skin. Of course, this air movement can not be compared with the strong wind that blows from the sea to the mountains, but it is important for inhabitants to pass the time in the village comfortably. Needless to say that the multi-storey dwellings provide plenty of shade in the village. However, there are many other ideas for making the sunny and shady spots in the village. The next figures show where are the sunny and shady spots in three villages (Fig.3.24, Fig.3.25, Fig.3.26).

Fig.3.24 The sunny and shady spots in Torrebaja

Fig.3.25 The sunny and shady spots in Casas Bajas

Fig.3.26 The sunny and shady spots in Castielfabib

(1) Courtyard, garden and trees

The courtyard is always set inside a block-unit, as already mentioned in section 3.4.3. It takes sunlight into the unit. Besides, in the three villages there are many gardens in front of the dwellings. Especially many of them are in Castielfabib. Since the dwellings on the mountains must be composed with high density, the dwelling complexes in the village give too much shade. Therefore, inhabitants set gardens in front of their dwellings, so that sunlight can enter inside the village.

In contrast, the trees create shady spots in the village. In the case of Torrebaja, the ground of the village is full of water because of its proximity to the river. Thus, it is a good place to grow trees. Especially many trees are distributed between the river and the village (Photo3.11). For the same reason, there are many trees in the southern part of Casas Bajas (Photo3.12). Inhabitants cultivate vegetables and fruits in this area. By closer look on Casas Bajas, it is possible to notice that some trees grow in places where dwellings were once (Photo3.13). Inhabitants have decided not to build in these places, but to plant trees there. This is also an idea to create shady spots in the village. Thus, the trees do not only protect the village from the cold wind in the winter, but also give shade in the summer. Besides, next to the fountain points there are always trees. The water can effectively lower the surrounding temperature. Furthermore shady spots with a fountain always work as community space in the summer. The details of community spaces are explained in the section 3.6.2. Thus, this is an idea how to create a temperature difference in the village.

Photo3.11 Trees on the riverside in Torrebaja

Photo3.12 Trees on the riverside in Casas Bajas

Photo3.13 Trees grow in places where dwellings were once

(2) Composition of building-units

The composition of the building-units also creates sunny and shady spots in village. Squares work as sunny spots and narrow streets as shady spots. But this section is focused especially on a cul-de-sac and a set-back in the village (Photo3.14, Photo3.15). A cul-de-sac is a dead end and a set-back is a way to create an open space in front of the line-units building complexes. Therefore, the cul-de-sacs create closed spaces and the set-backs

Photo3.14 Cul-de-sac

Photo3.15 Set-back

create open spaces in the village. This is the difference between cul-de-sac and set-back. Thus, they not only produce varied spaces, but also sunny and shady spots.

Since the land on the mountain for the buildings is limited, it is very inefficient to make cul-de-sacs in the village. However, in the villages of Rincón de Ademuz there are many cul-de-sacs. By focusing on the way of the use of the cul-de-sacs, it was noticed that many inhabitants set an entrance in this spaces. Furthermore, some inhabitants put there flowers and small chairs and effectively use this closed space as private area. In the case of the flat land, the cul-de-sac has a meandering shape. Inside the block-units is inserted a small, narrow street that works as a courtyard to take the sunlight. In contrast, since on the mountain there are no block-units, a cul-de-sac on the slopes has a straight shape. The cul-de-sacs on the slope are characterized by the fact that almost all of them are distributed around dwellings that are connected to other dwellings across the contour line. This is logical, as the building units on the mountain are composed only in line-units. However, it is impossible to compose the cul-de-sacs only by the line-units. Therefore, there are no cul-de-sacs in the north-west area of Casas Bajas, which was developed in the last century. This area is composed only by regularly aligned line-units. But in order to create a cul-de-sac, several line-units must be connected to each other. Thus, this is why the cul-de-sacs are always distributed around the dwellings which are interconnected by dwellings built across the contour line. On the other hand, the set-back is the way to create a square in front of the line-unit. There are six set-backs in three villages. The set-back spaces are used as entrance hall and, additionally, some of them are used as common work space. For example, in the past, the set-back square in Casas Bajas was used as a place for sifting wheat. Thus, the cul-de-sac and set-back are some of the ways to create spaces in the village.

In such a way, the next step is to analyze how these places work as sunny and shady spots. This largely depends on the location of the buildings. Therefore, it is needed to focus on how the buildings compose spaces. An important factor is the direction of the cul-de-sacs and set-backs. For example, if a building is set back from the north, then the set-back creates a sunny spot in its southern side. Thereby, it is necessary to analyze the direction of these spaces in order to understand how they create sunny and shady spots in the village. The following figure shows the details of how the cul-de-sacs and set-backs create sunny and shady spots in the village (Fig.3.27). From this figure, it is possible to understand that each of the cul-de-sac and set-back have different directions.

In total 8 of 21 cul-de-sacs and set-backs work as sunny spots in the village and 13 of 21 cul-de-sacs and set-backs work as shady spots. In the case of flat land, as Torrebaja, the

meandering cul-de-sacs, found in blocks-units, take sunlight inside the units. And another one that is next to the wide street drops shadow on the street. In case of Casas Bajas, there are four cul-de-sacs and set-backs that work as sunny spots. Since the village of Casas Bajas is composed of line-units, this is the way to take sunlight inside the village. Besides, there are two cul-de-sacs in the village, similar to the cul-de-sac of Torrebaja, that drop shadow. They are located inside a building complex. Their direction creates shady spot inside the unit, because it is located around the square full of sunlight. Thus, the cul-de-sacs make a contrast with the square. Besides, by analyzing the ends of the line-units, it was noted that usually buildings at both ends are smaller than the buildings in the center. Especially, this scheme is common in Casas Bajas, because this village situated on the gentle slope is composed of line-units. This system allows taking sunlight in front of the small buildings located on both ends of the line-units. Thus, this is not only a way to adapt the winding contour line for building, but also is a system for taking sunlight into the village, that works similar to set-back. In case of Castielfabib, there are many small

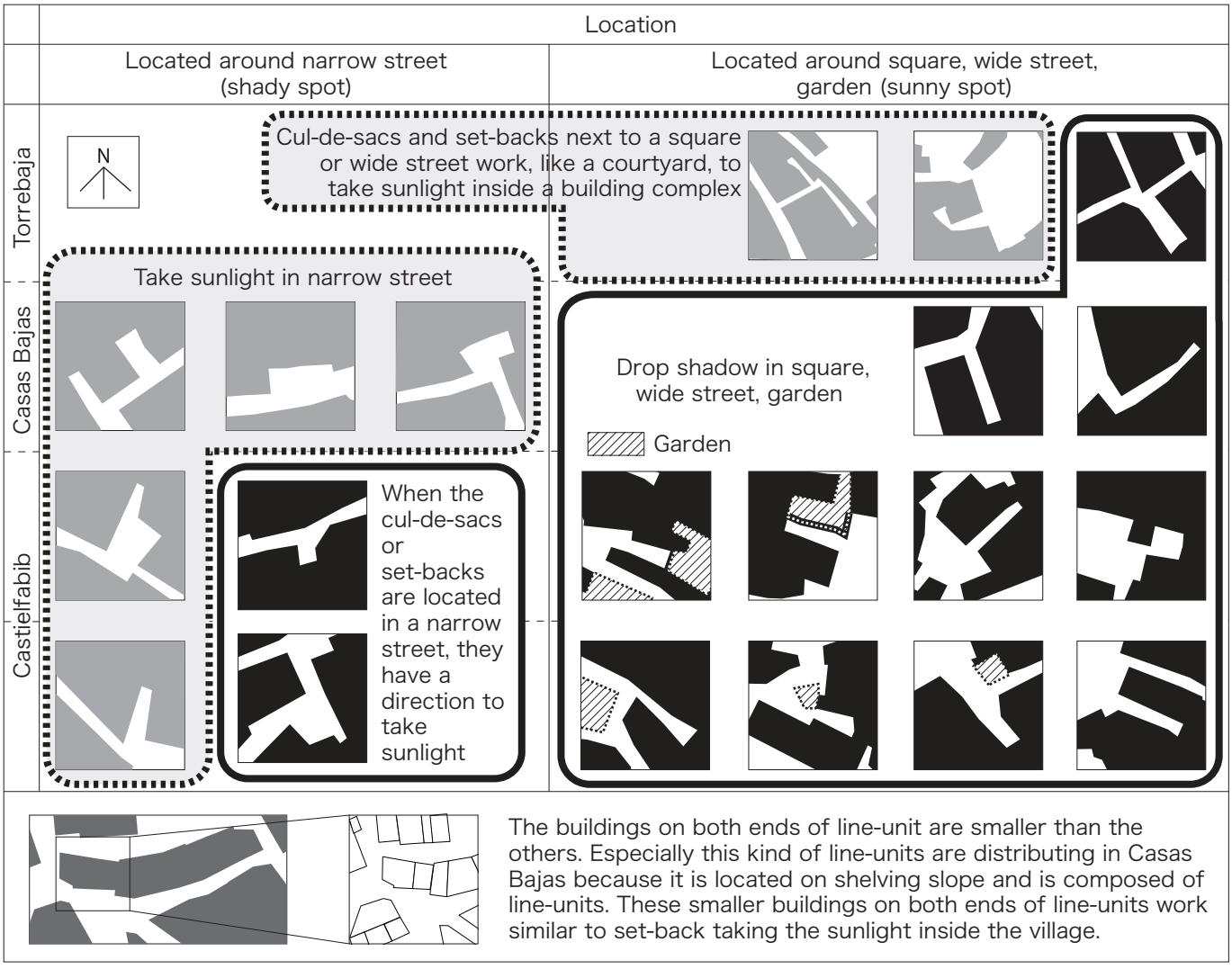


Fig.3.27 The location of the cul-de-sacs and set-backs

squares in the village. As explained in section 3.4.3, dwellings connected to neighboring dwellings across the contour line create small squares that work as sunny spots in the village. By closer look on the figure, it is possible to understand that many cul-de-sacs in Castielfabib are distributed around small squares and gardens. The garden is also a place to take the sunlight into the highly dense construction complex. 8 of 12 cul-de-sacs and set-backs are located next to a sunny spot to drop shadow. However, 2 of the 12 cul-de-sacs and set-backs take sunlight into a narrow street, which works as a shady spot. And, in contrast, the other 2 of 12 set-backs also located on a narrow street are set back from the south side to create shady spots. They drop shadow on sunny narrow street, which is different from other 10 set-backs.
The common factor of the cul-de-sacs and the set-backs is that they always create a contrast in the village. When they are located in a narrow street, they have a direction to take sunlight. And, in contrast, when they are located next to a square, they have a direction to drop shadow.

Many villages in Spain are located on the mountainous terrain. The land is dry and there are many sunny spots everywhere. Therefore, trees are planted to create shady spots around a village. Additionally, cul-de-sacs and set-backs create a contrast. This means that the village is equipped with a contrast of sunny and shady spots in the macro and micro levels (Fig.3.28). Moreover, in Castielfabib, compared with the other two villages, there are many cul-de-sacs. Two-thirds of the cul-de-sacs in the village drop shadow. In Torrebaja and Casas Bajas it is possible to plant trees around them, but Castielfabib is on a mountain, and there are no trees. The idea of cul-de-sac is equal to the trees that create a contrast of sunny and shady spots in the village. Every village has a different location. Therefore, each village has a different solution to make contrast of sunny and shady spots. This kind of contrast is important to create the temperature difference and thereby the air movement in the village. This is the passive design in a village.

	Sunny Spot	Shady Spot
Macro Level	Earth, Mountain	Trees, Buildings
Micro Level	Garden, Courtyard Set-back, Cul-de-sac (the composition of buildings makes sunny spot) Square, wide street	CONTRAST Building complex, Block-unit Narrow street Set-back, Cul-de-sac (the composition of buildings makes sunny spot)

Fig.3.28 The conclusion of sunny and shady spots

3.6 The wind and the local community

3.6.1 A summary of the public space and the small community space in the village

The central square has always worked as a community space in any epoch. In the past, it was especially important because it was the place where the water from the well was taken. In order to focus on the way of getting water in three villages in the following research has been done. As it explained in section 3.3.1, Torrebaja is located between the rivers Turia and Ebron. And since this village is close to these two big rivers, therefore there are a lot of wells. Besides, there is also a small river in Torrebaja. In the past, inhabitants used this river to wash their clothes. Nowadays, the river runs underground the village. Casas Bajas is located in the mountainside and there is no groundwater. That is why it is very difficult to get water. In recent years appeared a fountain in the central square of the village, but there is no well water. There were places to collect water for drinking and washing clothes on the other side of the river Turia (Photo3.16). Castielfabib is located on the mountaintop. Therefore, there is also difficult to get water. There are four fountain points in the village. Each fountain point tends to be located on the thalweg line because it is closer to the groundwater (*3.7). Inhabitant set these fountain points in the last 40 years. The southern one is the oldest.

In each village there is a central square and inhabitants always set a fountain in the center of the square. Passed only 40 years since the water system came into the dwellings. That is why the well water was important for daily living of inhabitants. It was an everyday

Photo3.16 A laundry shed in Casas Bajas

work for inhabitants to go to the fountain to get water. Therefore, the central square was always full of people. Thus, this place was used as a common community space. In the past, inhabitants set the facilities for life around the central square, such as town halls, schools, pubs, and bakeries. Every village has at least one water mill (Photo3.17). Traditionally, inhabitants used the water mill for milling. There was a common bakery in the village. Baking bread was an important corporate work. Therefore, inhabitants normally set the common bakery near the central square. Years ago in the central square was also set the mailbox because this place was a common area for all people. Nowadays, the system of network communication has made the connection with other towns and villages easier than it was used to be and thereby changed the lifestyle of inhabitants. Since everyone has a cell phone it has become possible to contact people at any time, however, before this technology came, for each village there was only one landline telephone. When something happened people had to use a public telephone.

At present each family has a telephone and running water. Bread is no longer done in the common bakery. Recent developments allow inhabitants to constantly change the usage of the common area. And along with the use and purpose, their needs in the town halls, supermarkets, churches, bars, etc also constantly change. Also, sometimes in the common area are held open-air markets and festivals. The central square for inhabitants is always a common space and always at every moment there is something essential to them.
Apart from the fountain points in the central square, there are other fountain points in the village. In Torrebaja there are five fountain points. Characteristically, near each fountain,

Photo3.17 The water mill in Casas Bajas

there is a bench and some trees that create shade. In the summer, many inhabitants sit on the bench and talk to each other (Photo3.18). Proceeding from the hearing research it becomes clear that the inhabitants who live near use that space. Thus, this place not only works as a simple space, but also is a small community space for the neighborhood.

Before Casas Bajas had no wells. Thus, inhabitants built laundry space located across the river, it also worked as a community space. However, in the past 40 years, inhabitants have made fountain points in the village. Currently, there are four of those places. There are some benches around the fountain points, as in other villages. Besides, there are many benches in front of dwellings. Many inhabitants spend time here to chat with the neighbors.

Castielfabib has four fountain points except the one in the central square. The southern one is the oldest. Inhabitants said that in the past they used this fountain. Around the fountain point there are some benches. Inhabitants reformed the area around the southern well into park and now there are many trees. On the other hand, there are a lot of small chairs in front of the entrance doors (Photo3.19). Inhabitants decorate the entrances with many flowers. It means that they use this space to relax or chat with the neighbors, what is similar to the fountain points in Torrebaja.

Thus, there are two kinds of community spaces. One is the central square. Inhabitants set the facilities around the central square. The facilities, like town hall and supermarket support the life of inhabitants in the village. The central square is the most important public

Photo3.18 The fountain point in Torrebaja

space. And the other kinds of community spaces are some of the fountain points and the spaces in front of the entrance of the dwellings. Sometimes these places are working as a small community spaces, but they are not for all people, as the central area, they are only for the neighbors. Inhabitants decorate these spaces and put chairs there to enjoy their daily lives.

(*3.7) AIDA R.: “A study of the common space at the street of village and the structure of the village, in Castielfabib” Graduation thesis, Niigata University Press, 2008, pp.66

Photo3.19 The small chairs in front of entrance door in Castielfabib

Fig.3.29 The community spaces in Torrebaja

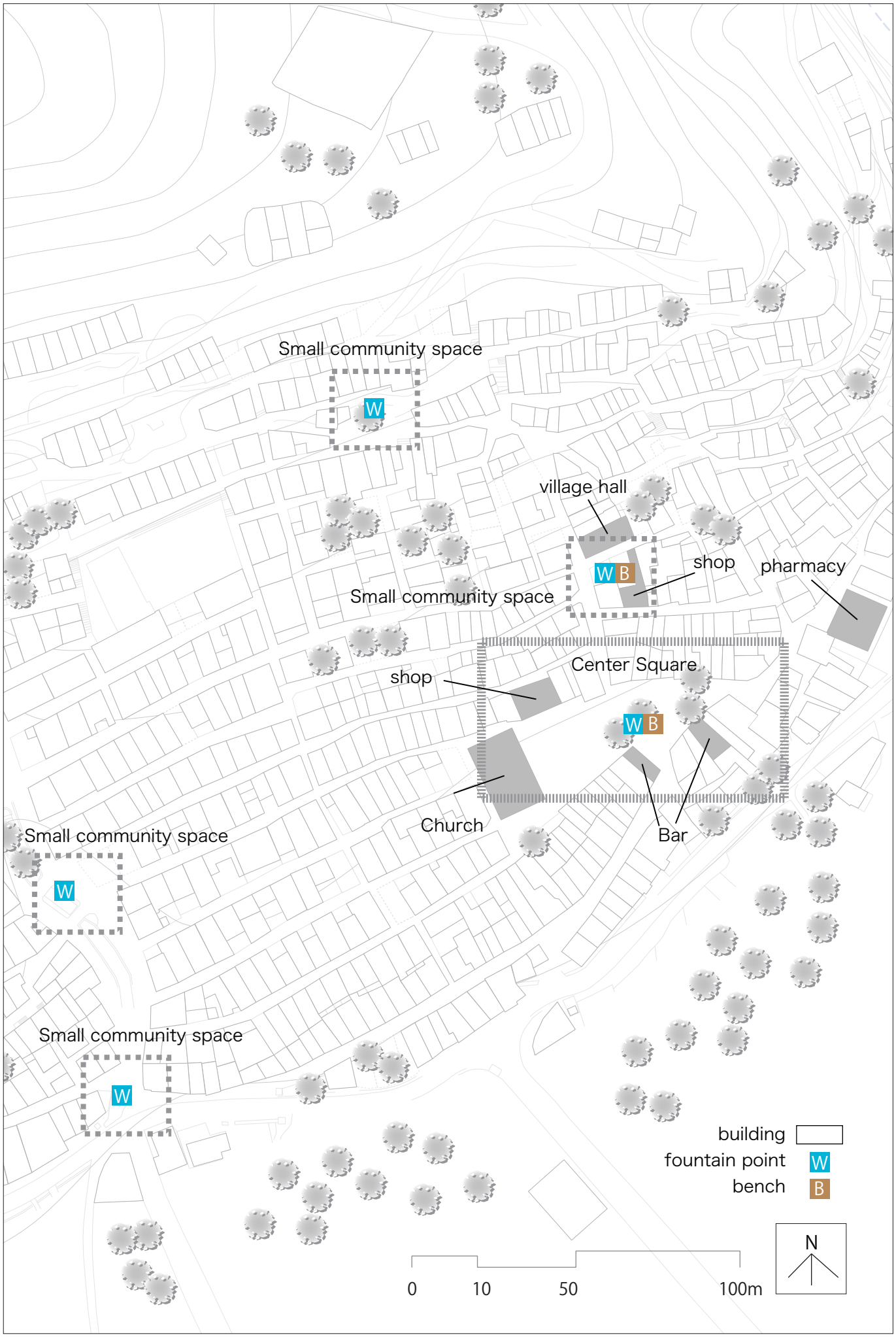


Fig.3.30 The community spaces in Casas Bajas

Fig.3.31 The community spaces in Castielfabib

3.6.2 The pattern of the outgoing behavior of inhabitants

On summer mornings in the central square there are many inhabitants. However, at about two o'clock everyone returns to their dwellings to eat lunch. And until the evening the streets are empty. The outgoing behavior of inhabitants has clear characteristics according to each season and each time of day. In addition, the sunny and shady spots also have a powerful influence on the outgoing behavior.
The detailed characteristics of outgoing behavior are as follows:

(1) The daytime in summer
In the morning many inhabitants are on the street. They choose a shady spot to stay during the daytime in summer. In the afternoon, no inhabitants are outside the dwellings because of the hot weather. All inhabitants close doors and windows to prevent the entry of hot air into their dwellings. As explained in the second chapter, the masonry construction controls the environment of the dwelling. It makes a time lag in the conduction of heat. For stone is characteristic that it needs time to heat up and cool down. In the daytime, the building is cooler than outside because of the radiant heat at night. Therefore, inhabitants do their work in the morning, and around one o'clock they start to close doors and windows and keep them closed until about six o'clock. They wait the sunset in their dwellings.

(2) The night time in summer
Stones of the masonry construction radiate heat at night time. Therefore, after the sunset outside is cooler than inside of the buildings. This is the contrary of the daytime. Inhabitants come out to enjoy the coolness of evening. In Spanish they say, "salir a la fresca". Especially in August on vacation many inhabitants return home from cities. They take out from their dwellings tables and chairs to enjoy a beer on the street. At night time in summer, the streets are full of inhabitants enjoying the village (Photo3.20). In addition, some inhabitants like to walk along the river with friends or family. The evaporation of water takes heat from the air, and the temperature falls by approximately two degrees Celsius. Besides, a fresh wind is blowing down from the mountains along the river. Inhabitants know that river is pleasantly cool on summer nights.

(3) The daytime in winter
Most of the younger generation in the winter is not in the village. They come back to the village only for a short stay at Christmas. Thus, in winter on the central square there are only elderly inhabitants dressed in heavy coats. In contrast to summer, they are looking

for sunny spots to stay. The state of the sun influences the outgoing behavior. Besides, inhabitants do not put chairs in the streets. Compared to the summertime, on the streets there is little action. Inhabitants prefer to stay in the bars around the central square, or in the homes of friends.

(4) The night time in winter

Inhabitants do not go out in the winter evenings. The summer heat is over and the early sunsets make inhabitants return earlier to their dwellings. They stay with the family in front of the fireplace.

Outgoing behavior depends on the season and time. In summer, inhabitants start to go out in the morning and in the evening around six o'clock. They take out tables and chairs to drink outside at the night time. Even at one o'clock in the night, some inhabitants still remain on the street. In winter, on the contrary, they stay outside only during daytime. The bar tables are also arranged in a sunny spot in the winter. Inhabitants want to be in a place where they can take the sunlight and enjoy some time with their neighbors.

The community spaces on the flat land and the slope are different. In the villages located on flat land, such as Torrebaja, there are only a few chairs in front of the dwellings. Since the streets are wide and straight, many people pass in front of the dwellings. And because of this, the inhabitants of flat land use the street in front of dwellings less than those who live on slope land. Many inhabitants prefer to stay near the fountain, as it is explained in the previous section. Besides, some dwellings have a yard and inhabitants like to invite

Photo3.20 Salir a la fresca

there their neighbors.
In contrast many inhabitants in Casas Bajas and Castielfabib put small chairs in front of their dwellings to enjoy the time. Thus, this place works like a small community space (Photo3.21). There are especially many flowers and small chairs in front of dwellings built on the slope. Since the streets are narrow and winding, there are many routes to reach any dwelling, as well as the minimum number of inhabitants walk through the streets. Tangled streets create familiar spaces. Therefore the streets are like private space. The place in front of the dwelling is suitable to take a rest in the summer evenings, because there is shadow. Thus, many inhabitants put chairs in front of their dwellings. The common factor about the community spaces in the villages is that the central square is always a common public space, as well as every inhabitant has a small community space near their dwelling.

Therefore, the sunny and shady spots in the villages are not only passive design, but also work as community spaces. These places are related with the daily life of inhabitants in each season. Because every inhabitant behaves in the same pattern, it means that everyone has plenty of opportunities to see each other in their daily lives. And it is important to keep the local communities in the villages.

Photo3.21 Inhabitants put small chairs in front of their dwellings to enjoy the time

3.7 Conclusion

In the third chapter, it was analyzed how the composition of the village controls the wind to create a comfortable environment in the village. Besides, the lives of the inhabitants and the local community are also affected by the wind and controlled environment. The following figure shows the conclusion of the relationship between the wind and the village (Fig.3.32).

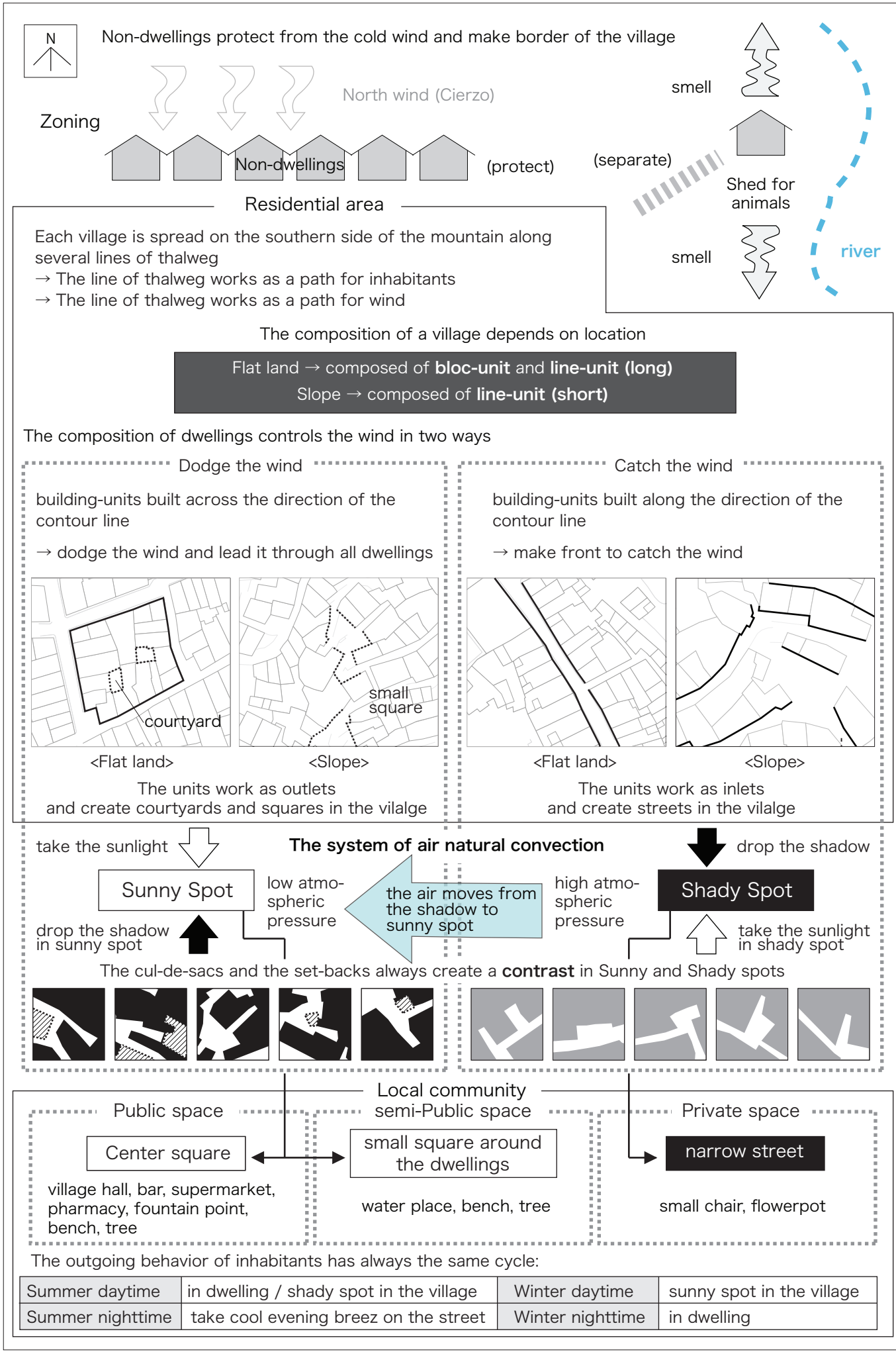
There are three types of typical locations in Rincón de Ademuz. Torrebaja is located on the flat land and Castielfabib is located on the mountaintop. Besides, Casas Bajas is located on the gentle slope, between the flat land and the mountaintop. Each village is located on the south side of the mountain with several lines of the thalweg. The composition of buildings depends on their location. When the buildings are built on flat land, they are composed in block-units and long line-units. And when the buildings are built on slope, they are composed in short line-units.

Logically, non-dwellings, such as barns, are built outside of the village. Therefore, they show the borders of the village. However, some of the non-dwellings can be found inside of the village. These buildings also worked as the border of the village, and now they are showing the ancient form of the village. During the analysis of the relationship between the old borders and entrance doors, it was found that most of the entrance doors with window are concentrated in the old village area. Thus, based on this phenomenon, it can be understood that the ancient inhabitants had an idea to take the controlled wind inside their dwellings. The ideas of this kind appear on the surface of the dwellings. The wind also determines the zoning of the village. Many non-dwellings are built in the north part of the village to protect from the cold wind in winter. Moreover, sheds for animals are placed in the western part of Torrebaja, what protects the village against the bad smell. Thus the ancient inhabitants thought out a way to make a good environment in the residential area.

The building-units have two different ways to control the wind. The first is when the building-units make front to catch the wind. In this case, the dwellings are composed in block-units on flat land and line-units on slope to lead the wind to the street and line of thalweg. Thus, the thalweg line is not only used as a street, but also as a wind-path.

Also the contrast of sunny and shady spots creates a natural air convection in the village. The central square and wide streets work as sunny spots. And in contrast, the small streets work as shady spots. Also cul-de-sac and set-backs perform this function of creating the contrast in the village. Depending on their direction, they can make sunny or shady spots. For example the cul-de-sac next to a square has the direction to drop shadow in the sunny spot. Even so it is inefficient to make cul-de-sacs in the mountainous terrain because of its

limited land use, this system is used to create contrast and natural air convection.
In addition, sunny and shady spots make influence on the lives of inhabitants and the local community. The sunny spots such as central square work as public space. Inhabitants set a supermarket, a bar and a pharmacy around this space. In addition, small squares, narrow streets and cul-de-sacs work as small community spaces for neighborhoods. Inhabitants set fountain points, benches and small chairs around these spaces. This kind of furniture shows how inhabitants use these spaces. In addition, the outgoing behavior of inhabitants has a relation with the wind, season and time. In summer, during the day the hot wind blows from the south. However, the masonry construction keeps dwellings cool. Thus, inhabitants close the windows and doors and stay inside their dwellings. In contrast, at night the fresh wind comes from the north. Then inhabitants take tables and chairs to the streets and enjoy the cool evening breeze. In winter, this behavior is reversed. Inhabitants go out during the day and at night everyone stays inside their dwellings. This circulating activity creates many opportunities for inhabitants to meet each other in their everyday lives. These opportunities are important to keep the relationships of the local community.
In such a way the ancient inhabitants knew well the characteristics of the wind. They used the composition of building-units to make front to catch or dodge the wind to lead it through all dwellings, In addition the composition of building-units took the advantage of the chimney effect and natural air convection to control the wind and to create a comfortable environment in the village. Therefore, these are the systems to control the wind and adapt the environment in villages. Besides, it is possible to understand from the outgoing behavior of inhabitants, that they also adapt to the controlled environment of the village.



Summer daytime	in dwelling / shady spot in the village	Winter daytime	sunny spot in the village
Summer nighttime	take cool evening breez on the street	Winter nighttime	in dwelling

Fig.3.32 The conclusion of the relation between the wind and village

Chapter 4
The nested structure in the village

Chapter 4. The nested structure in the village

4.1 The purpose of this chapter

The second chapter analyzes how inhabitants control the temperature in the living room to create a comfortable environment. The third chapter focuses on the composition of the building-units and the benefits of the chimney effect and the natural air convection, systems that allow to control the wind and create a comfortable environment in the village. Therefore, the purpose of the fourth chapter is based on the results of the second and third chapters and analyzes the structure of the villages, that is to say, how this structure adapts to the natural environment to maintain life of inhabitants in the village for more than two thousand years.

The composition of this chapter is as follows. The second section refers to the control system of wind in the dwelling and the village, because the system is similar in both. This section explains the common factors of this system and how it creates a micro-climate in the village. The third section is about the life of inhabitants in the village. Relying on the micro-climate, it is possible to explain how inhabitants keep their family and community lives in the village. And at last, the fourth section is a general conclusion. It analyzes the structure of the village in terms of the dwellings, the composition of the village, the life-style of inhabitants and the local community.

4.2 The system to control the wind

In previous chapters it was noted that the cover of the chimney, the fireplace and the building-unit have a specific direction to control the wind. The purpose of this section is to focus on the common factors of this topic and it is based on the first, second and third chapters. In addition, it clarifies the systems to control environment and to create micro-climate in the village.

(1) The direction of the cover on the chimney

Traditionally, inhabitants have joined two tiles together to create a cover for chimney, therefore openings of the covers on chimneys usually have a specific direction. When the opening is set in the right direction, the wind can be caught to suck the smoke out of the living room by the chimney effect. Needless to say, it is better that the cover has a big opening. Thus, the ceramic tiles should be set on the short-edge of the chimney. However some covers are set on the long-edge of the chimney. This is an illogical way to set the cover, because the opening is smaller than on the short-edge. But what is characteristic of the illogical small openings of the covers is that they are facing the north-south direction. This is the direction of the wind flow in Rincón de Ademuz. Thus, as a result, it shows that inhabitants unconsciously understand that the wind flows in the north-south direction. Inhabitants turn around the cap on the chimney to catch the wind in the correct direction.

(2) The direction of the fireplace

As was explained previously, the direction of the covers on the chimneys indicates that the wind in the Rincón de Ademuz mostly flows in the north-south direction. When comparing the direction of the fireplace and the wind, it is possible to understand that the fireplace has two types of direction. One type of direction is when the fireplace makes front to catch the wind. And the other is when the fireplace works as an outlet to dodge the wind and lead it through the living room. Furthermore, the direction of the fireplace is related to the wind-path in the living room. If the living room has a good wind-path, the fireplace can be set in various directions, because it is possible to eliminate the smoke through the window. But if the living room has a bad wind-path, the fireplace should necessarily be set in the north-south direction. This is the direction when the chimney cover catches the wind and lets out the smoke efficiently. Besides, the dwellings of Rincón de Ademuz have jack arch floors, which is the traditional method of house construction. Several joists are bridged on the ceiling of the living room. From the research it is clear that the beams and joists have the same direction. Logically the fireplace should be set parallel to the joists,

because the chimney has to pass through the living room ceiling. But in some dwellings the chimney intersects with the joists. All these dwellings have a poor wind-path in the living room. Therefore, inhabitants set the fireplaces in the north-south direction, which corresponds to the wind flow direction, to support smoke elimination, even if the chimney and beams have to cross. Therefore, a fireplace is turned around in the living room, depending on the situation of the wind-path, to create a comfortable environment.

(3) The direction of the connection of buildings

The common factor of three analyzed villages is that they are spread on the southern slope of the mountain, where the sunlight can reach every building. The most rational way to build on the mountainous terrain is when the building-units are constructed along the contour line. Therefore the building-units built along the contour line make front to catch the wind, because the wind flows from North-South direction in Rincón de Ademuz. But by focusing on the connection of the building-units, it was noted that some of them are connected across the direction of the contour line. These building-units create some small squares and courtyards in the village which function as outlets to dodge the wind and lead it through all of the dwellings of the unit. Thus, construction units, as well as fireplaces, have two types of direction. One of these types is when the building-units make front to catch the wind and the other is when the units work as outlets to dodge the wind.

Moreover, squares, courtyards and streets create sunny and shady spots in the village. This passive design creates a natural air convection in the village. When focusing on cul-de-sacs and set-backs, it becomes clear that almost all of them have the directions to create contrast in sunny and shady spots of the village. For example, the cul-de-sacs located around the squares always drop shadow. Thus, the building-units turn to make front to catch the wind or to work as an outlet to dodge the wind. In addition, the composition of the units makes cul-de-sacs and a set-backs to create a natural air convection in the village. Thus, this is the system to control the wind and create a comfortable environment in the village.

In this way the direction of the chimney cover, the fireplace and the building-units are decided by the wind. The next figure on the basis of these results shows the relationships between the opening of the chimney cover, the slant of the roof, the beam, the fireplace, the composition of the building-units and the contour line (Fig.4.1). Needless to say that each building has a different location. Therefore, the situation of neighboring buildings, the direction of the contour line and the slant of the slope are different for each building. But the common factor of all buildings, is the concern to avoid rainwater fall on the

neighboring buildings. Generally, the slant of the roof inclines toward a street or a courtyard. Therefore the slant of the roof is decided by the direction of the drainage. The rafter must have the same direction as the slant of the roof. The beams in the living room also have the same direction as the rafter due to the construction of the chimney. Therefore the beams are parallel to the rafter, and the rafter is parallel to the slant of the roof. For this reason, it is possible to say that the direction of the beams is decided by the drainage and the location of the dwelling in the street. However, the building complex does not allow to each dwelling to drain rain water to two street. In some cases, the building-units built across the direction of the contour line create courtyards or small squares which function as an outlet for the wind. In terms of the wind control, the building-units need to be rotated on the contour line. Therefore the beams have different directions, depending on the location of the dwelling. Thus, the direction of the beams is based on the exterior theory. On the other hand, an important factor is that inhabitants control the environment in the living room to create a comfortable life there. In the case of poor or bad wind-path in the living room, inhabitants turn the fireplace so it is set in the north-south direction to catch the wind and maintain the smoke elimination. The fireplace is turned around in the living room to control the wind. Therefore its location is based on the interior theory.

In this way the direction of the beams is based on the exterior theory of controlling the wind in the village. In contrast, the direction of the fireplace is based on the interior theory of controlling the wind in the living room. Each factor is turned depending on its situation to control the wind. Therefore, in some cases, it happens that the fireplace crosses the joists because the two theories are facing different directions (Photo4.1). In other

Photo4.1 The fireplace crosses the joints

words, the phenomenon when the fireplace intersects with the joists is the visualization of the border of the exterior and interior theories. The different theories of the wind control cross in the floor of the living room. Each direction has its own meaning. It is the system to create micro-climate in the village where the fireplace works as the axle and the chimney cover, fireplace and building-units turn to adapt to each location to control the wind.

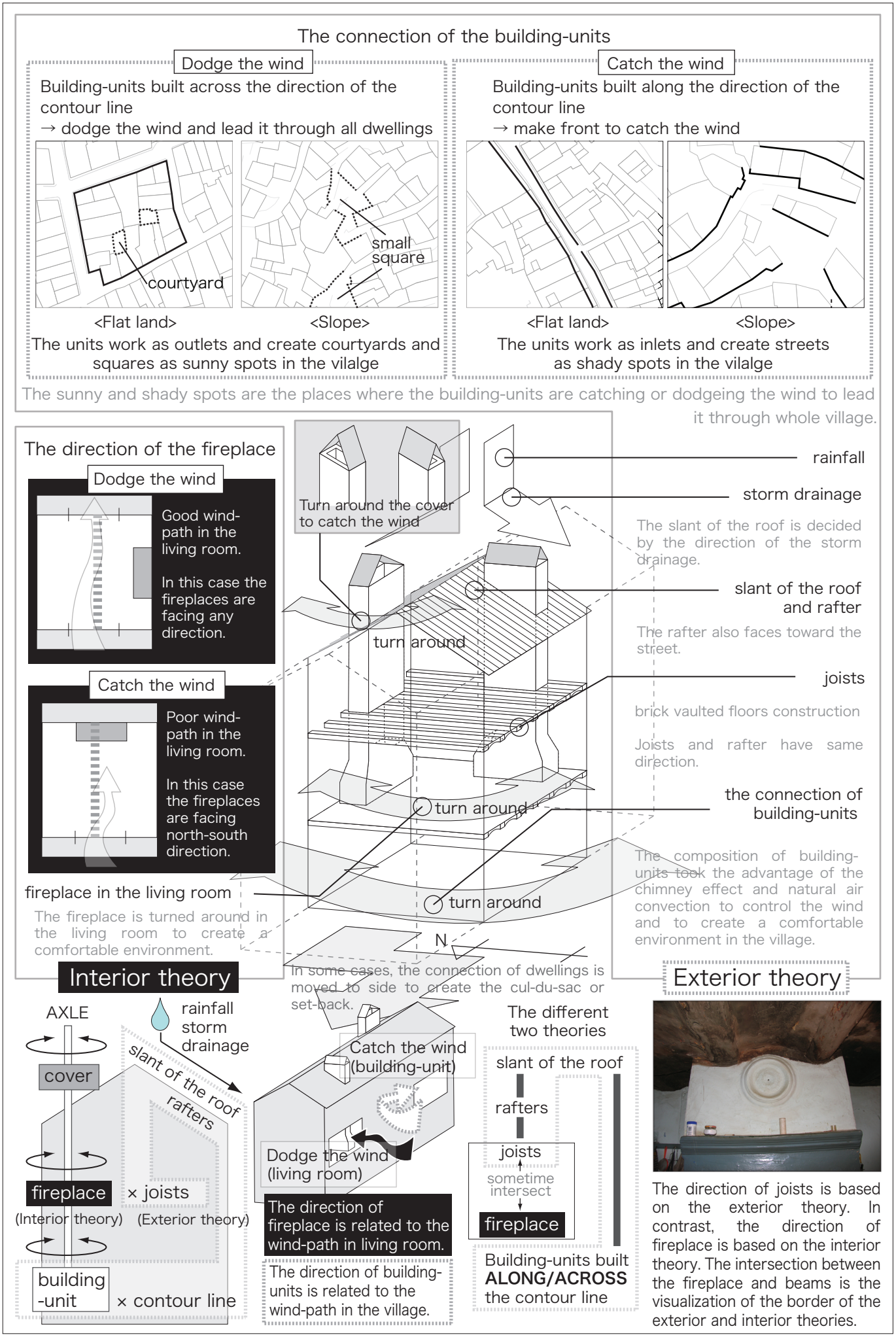


Fig.4.1 The system to create the micro-climate in the village

4.3 The wind and the life of inhabitants

The micro-climate created by the directions of the fireplace and building-units, makes a potent influence on the lifestyle of inhabitants.
In terms of dwelling, a fireplace not only warms the dwelling, but also turns to dodge the wind and thereby creates a good wind-path. In addition, the stair hall also supports the wind-path from different floors in the case of a poor or bad wind-path in the living room. Because of the dry weather, the wind-path creates a comfortable environment in the living room in the summer. The masonry construction during the day keeps the cold air, and at night the wind-path ventilates the dwelling and lets out the warmed air. Besides, in winter, the fireplace is the only source of heat in the dwelling and the wind-path supports the elimination of smoke from it. This is the micro-climate in the dwelling. Inhabitants designed the living room as the most comfortable space in the whole dwelling. Therefore it works as the center of the dwelling and is a buffer space between the public and private spaces. Everyone stays at living room. It is possible to know from some characteristic household items such as chairs and ceramic tiles.
On the other hand, the micro-climate also makes a potent influence on the support of local communities. The outgoing behavior of inhabitants is due to the sunny and shady spots which are created by the composition of building-units in each season. Especially the outgoings of Inhabitants are concentrated in the evening during the summer and during the day in the winter. Inhabitants stay in the shady spots in summer and in the sunny spots in winter. The sunny and shady spots are places where the building-units catch and dodge the wind and make it pass through the whole village. Thus, the composition of the building not only controls the wind, but also performs the function of community spaces for inhabitants.

In such a way inhabitants are adapting the micro-climate to stay in the living room and always have the same cycle of outgoing behavior in the village. In other words, the village has a system that gives an opportunity to its inhabitants to communicate with family and neighbors. The satisfaction with life is when everyone has less health problems and has the opportunity to spend some peaceful time to enjoy life with his or her family and neighbors. Everyone supports the community and shows his or her trust in others. The same cycle of outgoing behavior gives the opportunity to talk with each other. Furthermore, it should be noted that the family ties in rural area are especially important because of farm work. In the past, all family members had to work together in the farm work. Only through the farm work inhabitants were able to continue their lives in the same village for

more than two thousand years. This system helps to understand each other, because the dwelling situation inevitably slides toward the living room. In this way the micro-climate makes a powerful influence on their lifestyle. This is a sustainable system that helps to keep their life in the same village over centuries.

4.4 The nested structure in the village

In section 4.2 it is explained that the fireplace and building-units change their directions to control the wind and create a micro-climate in the village. Besides, in the section 4.3 it is explained that the lifestyle of inhabitants is adapting to the micro-climate and protects the local communities from disintegration. Fireplace and building-units are completely different things. However, in terms of controlling the wind, they have the same functions, such as dodge and catch the wind to create a micro-climate and protection of local communities in the village. Furthermore, it should be noted that the characteristics of the decoration of fireplace and building-unit are also similar.

The explanation of the decoration of the fireplace is found in the second chapter. Traditionally, the fireplace is decorated with ceramic tiles. The fireplace is the most important object in the dwelling, because in the past it was the only source of heating. Therefore, the living room is not only room for the family, but it is also an invitation space. Generally, dwellings located on flat land are decorated with ceramic tiles from the entrance hall to the living room. In contrast, dwellings located on slope are decorated only in the living room. The common factor of the decorations is that the living room is always decorated with ceramic tiles, which is a symbol of the family.

On the other hand, in order to make clear the characteristics of the decoration of the building-units, the analysis of this study was focused on the backsides of the balconies. Many balcony backsides are decorated with colorful ceramic tiles. When a passerby looks up at the facade of the entrance, he or she can see the decoration on the backside of balconies

Photo4.2 The reverse side of the balcony is decorated with ceramic tiles.

on each floor (Photo4.2).

In terms of function, ceramic tiles drain well. Therefore, when inhabitants grow some plants on the balcony this material is suitable. But if it was just a matter of draining it would be enough to put the tiles on the floor of the balcony. The question is why inhabitants put them on the backside. In order to clarify the matter, it focuses on the meaning of decoration. Decoration is starting to become socially significant when inhabitants look at them. Therefore, the purpose of ceramic tiles on the backside of the balcony is due to the fact that the passersby look up to see the balcony decorations. Therefore, due to the decorated backsides of balconies it is assumed that inhabitants often pass by the front of the building-unit. The phenomenon is similar to the relation between the fireplace and living room. As explained in the second chapter, the living room is also based on the stay of inhabitants. This is why, the living room is decorated with a fireplace, and the streets or plaza are decorated by building-units. In terms of the social meaning, the decoration of fireplace and building-unit is based on same theory.

In this way, the fireplaces and building-units are turned depending on each location to create the micro-climate in the dwelling and village. Moreover, in terms of decoration, there are many colorful ceramic tiles that decorate the fireplaces in the living rooms and the facades of the building-units in the streets or squares. Consequently, a fireplace and a building-unit not only have the same function in controlling the wind, but also have the same social meaning in the village. The result shows that a fireplace in the dwelling works the same way as a building-unit in the village. This means that a fireplace for a dwelling is equivalent to a building-unit for a village. Therefore it is possible to say that a building-unit is like a fireplace for the village.
Needless to say, a dwelling is one of the units of the village and the village itself is a complete unit of dwellings. The analysis indicates that a single unit system and the entire unit are based on the same theory. In other words, a dwelling works in the same way as

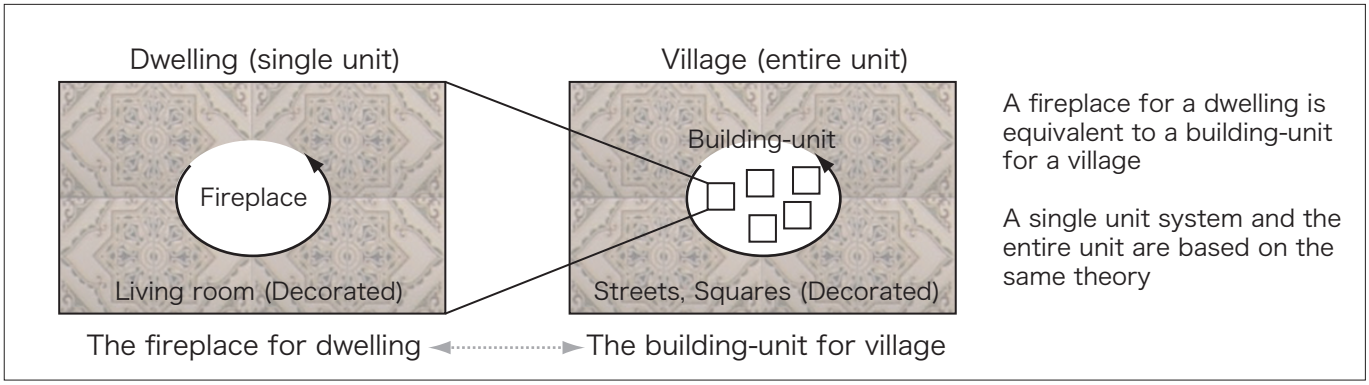


Fig.4.2 The nested structure in a village

a village, while a village works like a dwelling. This is the nested structure in a village. The nested structure creates a micro-climate and supports the life of inhabitants as the sustainability of the village.

Chapter 5
Conclusion

Chapter5. Conclusion

5.1 Final conclusion

Because of the dry climate and the wind-path it is possible to create a comfortable living environment in the villages of Rincón de Ademuz. Moreover, traditionally the fireplace worked as kitchen and was the only domestic heat source in dwellings located in the mountainous terrain. In terms of the elimination of smoke emitted by the fireplace, dwelling needs the wind-path during all the seasons. Therefore, in this sense, the wind-path also creates a comfortable atmosphere in the village. But at the same time, the wind is a disaster that destroys buildings and damages crops. In some cases, wind threatens the lives of inhabitants. Therefore, inhabitants need not only the efficient use of the wind in their daily lives, but also the protection from it. Thus, this study is focused on the relation between the wind and the village in order to make clear the system, which was constructed by inhabitants over many years. This section is the conclusion of each chapter, and also refers to the results of analysis of the sustainability of the village.

The introductory chapter explains the purpose and analysis of the research method, as well as the composition of the study. Moreover, this chapter also refers to previous studies, to clarify the meaning of the study.

The first chapter explains the reasons of why certain villages were selected. The selection was considered in terms of population, industry, history and location. Moreover, this chapter refers to the point of analysis of why this study focuses on the wind. In order to analyze the invisible wind, it is necessary to clarify its characteristics. In the terms of geography and meteorology, three of analyzed villages are located on the banks of the river Turia. The river passes through the Rincón de Ademuz from north to south. This is the characteristic direction of the wind blowing along the valley. Wind blows from the sea to the mountain, as the valley breeze during the daytime, and at night it blows from the mountain to the sea, as the mountain breeze. This is why it is clear that the wind changes its direction depending on the time of day and blows or from the north or from the south.

In addition, the original research method of this study is to focus on the cover of the chimneys to determine the wind direction. Traditionally inhabitants join two ceramic tiles together to create a cover for the chimney. Logically, to eliminate smoke, the cover opening should be facing the direction of the wind. This is why the openings show the direction of the wind. As a result of the field research, it was found that the openings are facing

several directions. But the covers that inhabitants put on the long-edge of the chimney leave almost all the openings facing the north to south direction. The cover opening on long-edge of the chimney is smaller than on the short-edge. Therefore it should be facing the correct direction of the wind. In addition, the north-south direction is the direction to the city of Teruel, which is located upstream of the river Turia. The result proves that the method is correct. Thus, this is the method to visualize the wind. It defines that the wind in Rincón de Ademuz blows in the north-south direction.

The second chapter focuses on the relation between the wind and dwelling. It shows that the wind makes a powerful influence on the composition of a dwelling. The basic composition of the dwellings is different at each location. Usually, in a mountainous area, dwellings are constructed as a multi-storey dwelling. Another difference between the dwellings located on different locations appears in the planning of corridor. The dwellings located on flat land have always a corridor inside. In contrast, the dwellings located on the slope do not have it, because the site area is smaller than on the flat land and there is no space for a corridor. Each room is compact and connects directly to the stairs. Besides, the advantage of multi-storey dwelling is that living quarters on the upper floors are separated from the smelly farm accommodation on the ground floor. Also, many dwellings have an attic with a large opening. As it always has good wind-path, inhabitants used it as a place to dry fruits and ham, however nowadays it is used as a place to dry clothes.
Furthermore, it is clear that the direction of the fireplace have two meanings. One is to dodge the wind, and the other is to catch the wind. It is proved that both directions are the result of adaptation to particular conditions. In case of good wind-path in living room, the fireplace faces various directions to dodge the wind. In this case, the priority for inhabitants is to make openings in both ends of the living room so that the wind can pass through well. In contrast, in the case of poor or bad wind-path in the living room, fireplace faces the north-south direction to catch the wind, in order to support the smoke elimination. Moreover, in the situation of poor or bad wind-path in the living room, there are cases when a fireplace intersects joints. All fireplaces of these cases are facing the north-south direction. This shows that inhabitants aimed to catch the wind for better smoke elimination, even constructing in an unreasonable or more difficult manner. In addition, the staircase also supports the wind-path in the living room. The temperature difference between the attic and ground floor makes the natural air convection as passive design. In cases when a living room has a bad wind-path, the stairs are always set in the same place on each floor so that the passive design works well. This is how inhabitants plan the living room to create a comfortable environment.

On the other hand, the distribution of chairs and ceramic tile makes it clear that the living room works as a space for family and guests. It functions as a buffer space between private and public. In contrast, the bedrooms are decorated in a simple style. Inhabitants put there a minimum of furniture. The result shows that people stay longer time in the living room. The lifestyle is also shown in the need to control the environment of the living room.

The third chapter focuses on the relationship between the wind and village. It refers to the fact that the wind makes influence on the composition of the village. The basic composition of villages is different in each location. On a flat land building are composed in block-units and long line-units. In contrast, on a slope, they are composed in several line-units. Besides, the zoning is also decided by the wind. The non-dwellings (stores, barns, granaries, etc.) are built outside the village. They show the borders of the village. Many non-dwellings are built in northern part of village in order to protect from cold wind, like windbreak forests. Besides, the sheds for domestic animals are built eastern or western part of the villages to avoid the bad smell flow into the village.

The direction of the village is similar to the dwellings. It also has two different ways to control the wind, catching and dodging. By the logic buildings should be built along the contour line. But, in fact, many dwellings are built across it. Basically, buildings located along the contour line compose the streets in the village. In contrast, the buildings built across the contour line compose small squares and courtyards. All the villages are developed on the southern slope of the mountain. Therefore the buildings located along the contour line make front to catch the north-south wind and lead it to the streets, which work as inlets. In contrast, the buildings built on the contour line dodge the wind, and the small squares and courtyards composed by these buildings work as outlets.

Furthermore, passive design is also related with the composition of the village. The street, formed by building-units that are built along the contour line, create shady spots in the village. And the small squares and courtyards, composed by building-units, that are built across the contour line, create sunny spots. The air moves from high to low atmospheric pressure, from shady to sunny spots. Moreover, this study also focuses on the cul-de-sacs and set-backs. They also create a contrast in the village to support the passive design. In the case when cul-de-sacs or set-backs are located on a narrow street, they are directed to take the sunlight. In contrast, when they are located next to a square, they are directed to drop shadow. This is why building-units not only catch and dodge the wind, but also create a contrast of the sunny and shady spots in the village.

Besides, this chapter explains that sunny and shady places also support the local com-

munities. The sunny spots, such as the central square, work as a public space. Inhabitants set supermarket, bar, pharmacy and village hall around this space. In addition, the small squares, narrow streets and cul-de-sacs work as small community spaces for neighborhoods. In these spaces, there are many flowers small chairs and benches. All these things show that inhabitants use these spaces to relax or chat with neighbors. Moreover, this study clarifies that the outgoing behavior of inhabitants is circular. The seasons, time and wind have a potent influence on it. Because of masonry construction in summer during the daytime the inside of the dwelling is cooler than the outside and at night is quite the opposite. In the summer evening, everyone takes tables and chairs outside and enjoy the cool breeze. In winter, this behavior is reversed. Inhabitants go out during the day and at night everyone stays inside their dwellings. These circulating activities create many opportunities for inhabitants to meet each other in their everyday lives. These opportunities are important to keep the relationships of the local community in the village.

Fourth chapter is based on the results of the second and third chapters, and refers to the structure of villages. The fireplace works as the axis. And each element, such as the cover of chimney, fireplace and building-unit, changes the direction in order to adapt to locations and to create the wind-path in the dwellings and village. This is a system to control the wind and create a micro-climate in the village. In order to create a comfortable living environment, inhabitants over many years built up the system of micro-climate to overcome the nature of mountainous terrain. Besides, the micro-climate also makes great influence on the lifestyle of inhabitants. They change flexibly spaces to stay in the dwellings and villages depending on the season and time. Therefore, the system of wind control not only creates a micro-climate in the village, but also works as a system to make inhabitants to gather in certain places. Depending on the micro-climate, comfortable places and times in the village are limited. The repetitive cycles of outgoing behavior give opportunities to communicate with family and neighbors and protect from disintegration of the local community.

In terms of the system of the wind control, dwelling and village are based on a same theory. Fireplace for dwelling is equivalent to building-unit for village, both factors are changing directions to control the wind. Furthermore, after analyzing the decorations it becomes clear that the decoration of fireplace and building-unit also has a social meaning. A dwelling is one of the units of the village and the village itself is a unit complete of dwellings. The analysis indicates that a single element of the unit and the entire unit are based on the same theory. Dwelling works in the same way as a village, while a village works just like a dwelling. This is the nested structure in a village. Thus, externally, the

nested structure in a village supports the system to protect the village from natural disasters and to create a micro-climate. Moreover, internally, it protects from the destruction of the local community. Because the system works well the village could survive until the current time (Fig.5.1).

This study proves that in the village there is an order, even if the village consists of a complex constitution. The order is the system to adapt the environment. It was constructed by hands of inhabitants over many years through trial and error. Therefore, it is important that inhabitants understand well the system and advance in accordance with this system, because the system is one of the best adaptive responses to the environment, to continue their lives in Rincón Ademuz also in the future. All dwellings, streets and squares have their own function. For these systems, there are no useless elements. This means that even if one square will not work as an outlet for the wind the micro-climate system will not work properly. There is one report about the city of Toledo that reflects a similar problem (*5.1). Currently, some of the hotels in Toledo covered some courtyards to make an open space in the restaurants. To cover the courtyard has the same meaning as if to close the window in the dwelling. This is the cause of rising temperatures in the city of Toledo in recent years. Thus, Toledo has the same village system as Rincón de Ademuz and inhabitants need to understand it well. And we need to maintain and develop this system for sustainability of rural communities.
Needless to say, sustainability cannot be explained only by one topic such as the wind chosen in this study. It consists of many factors such as religion, education, medicine, agriculture and so on. Everything that exists in the village today is sustainable. This study focuses on dwellings that were made to adapt to the wind, as well as the lifestyle of the inhabitants, which is one part of the sustainable elements in Rincón de Ademuz, Valencia.

(*5.1) EQUIP ARQUITECTURA PICH-AGUILERA: “Criterios Bioclimáticos y de Sostenibilidad, Casco Histórico de Toledo”, Consorcio de Toledo, 2009

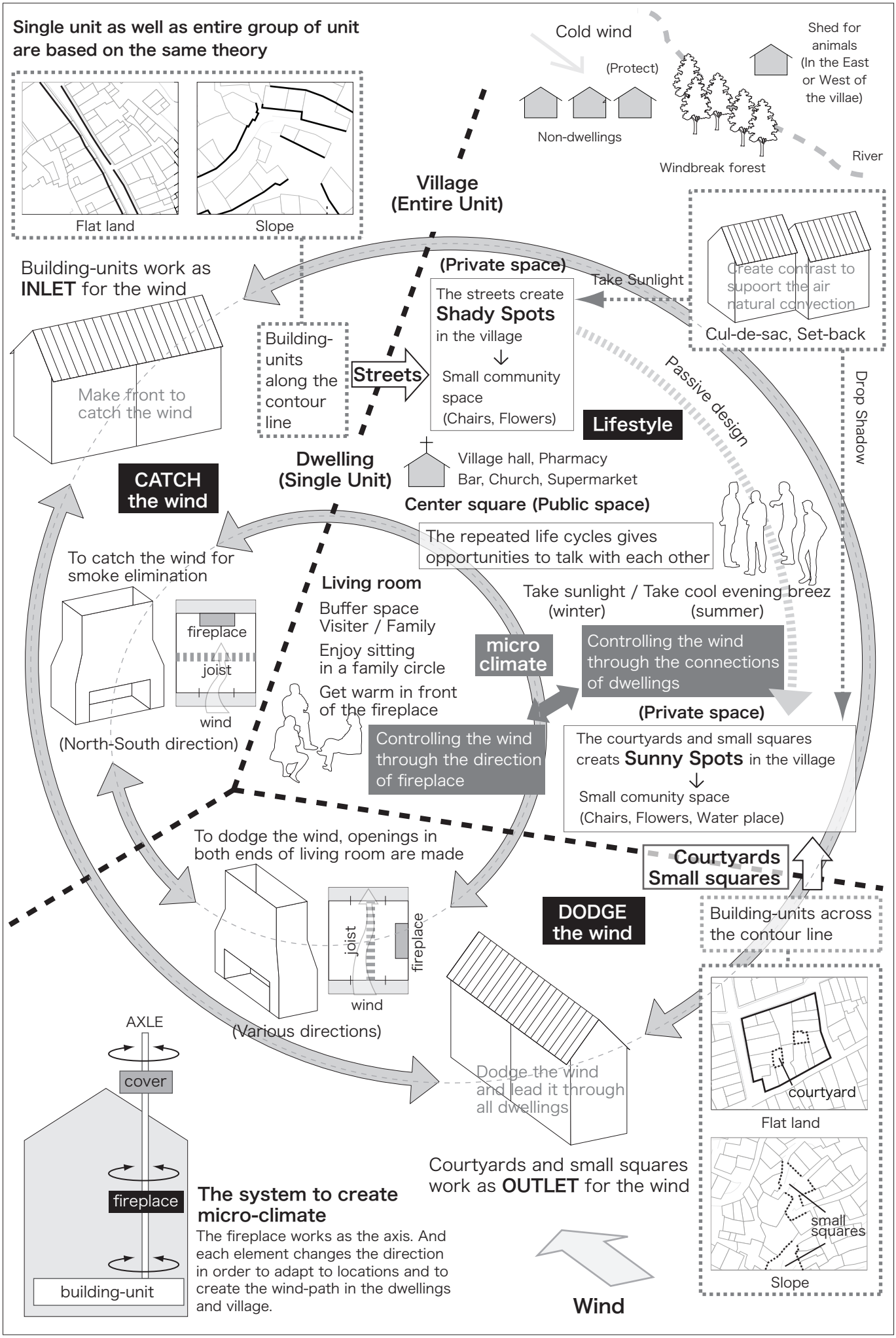


Fig.5.1 The wind and the village

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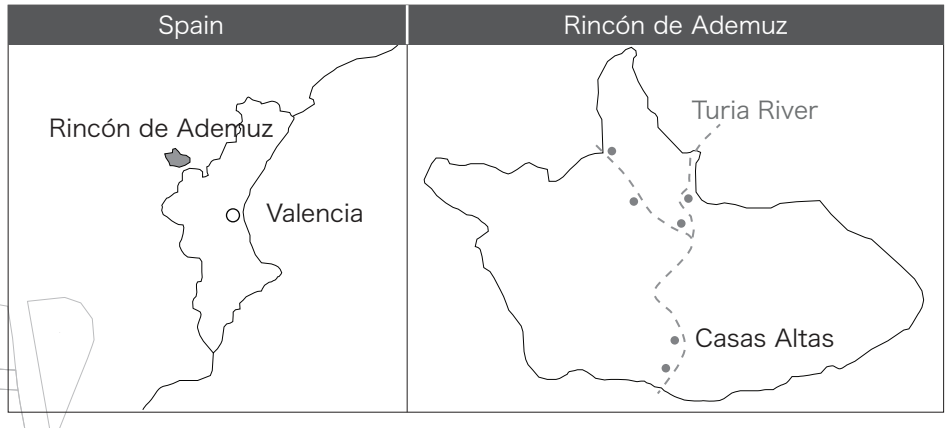
Appendix

Casas Altas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CA1
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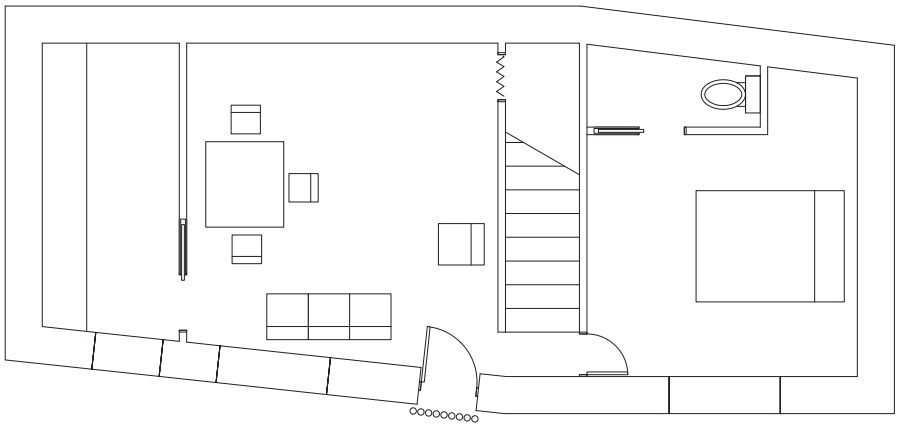

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Rincón de Ademuz

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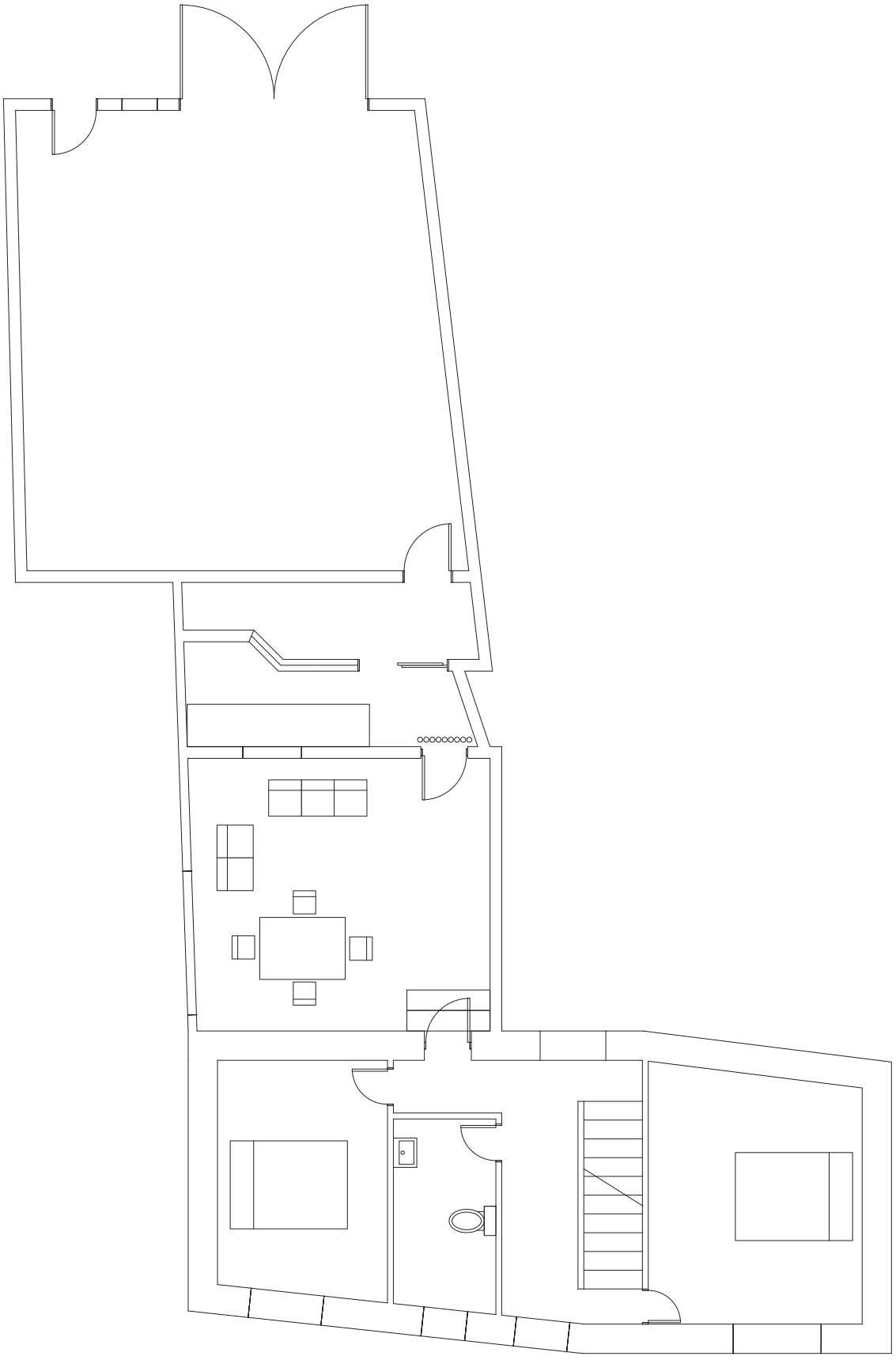
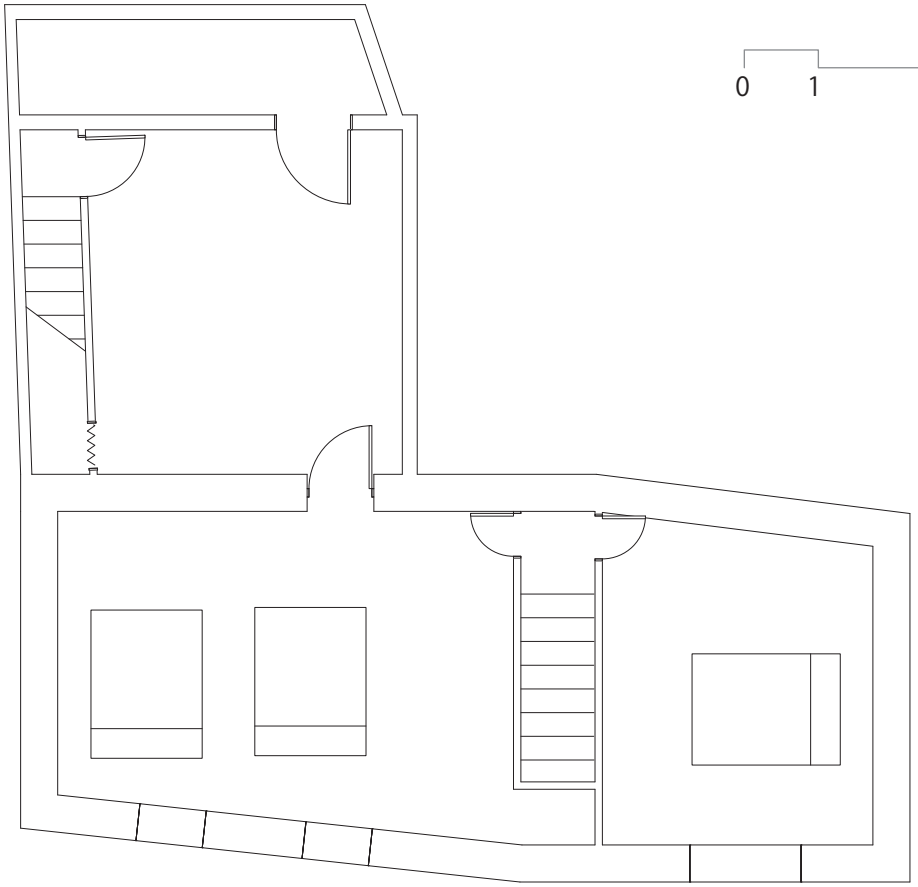


Rincón de Ademuz

Village Casas Altas House CA1 Floor 0 1 2 3



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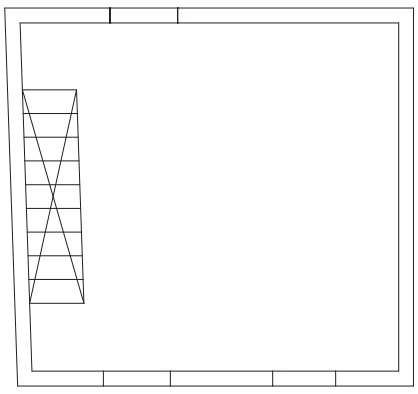

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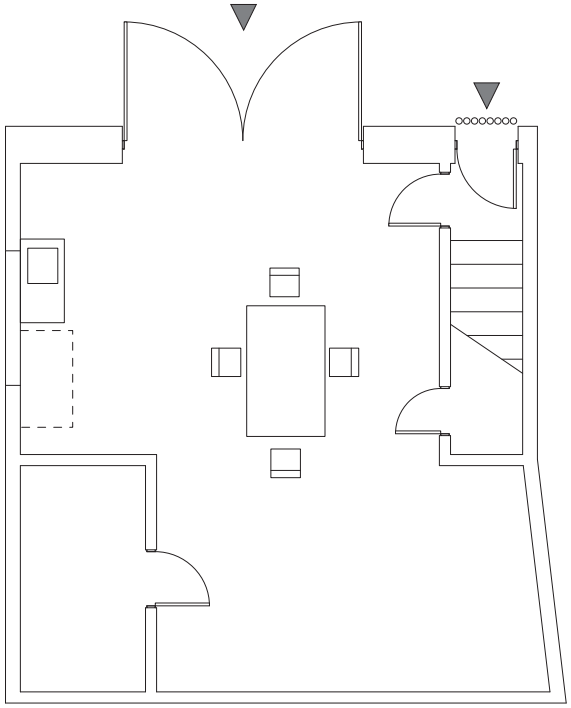

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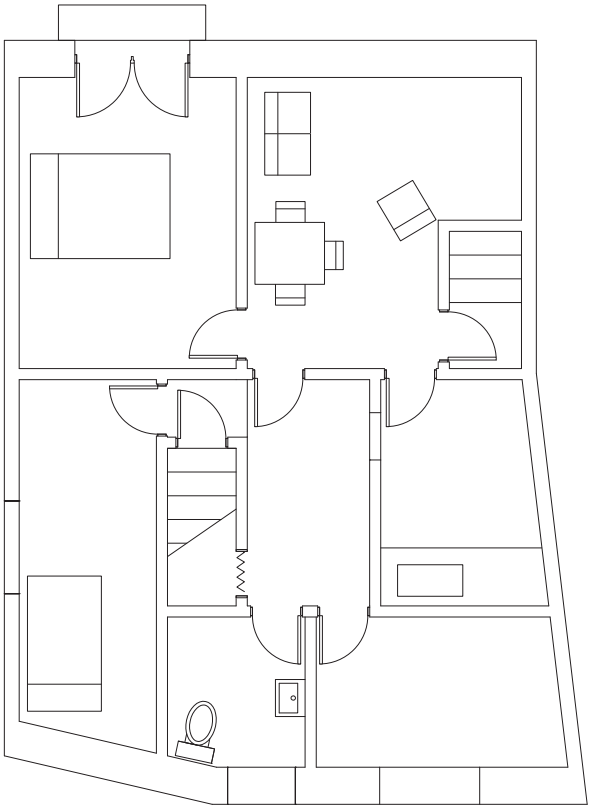
Rincón de Ademuz

Village Casas Altas House CA2 Floor 0 1 2 3



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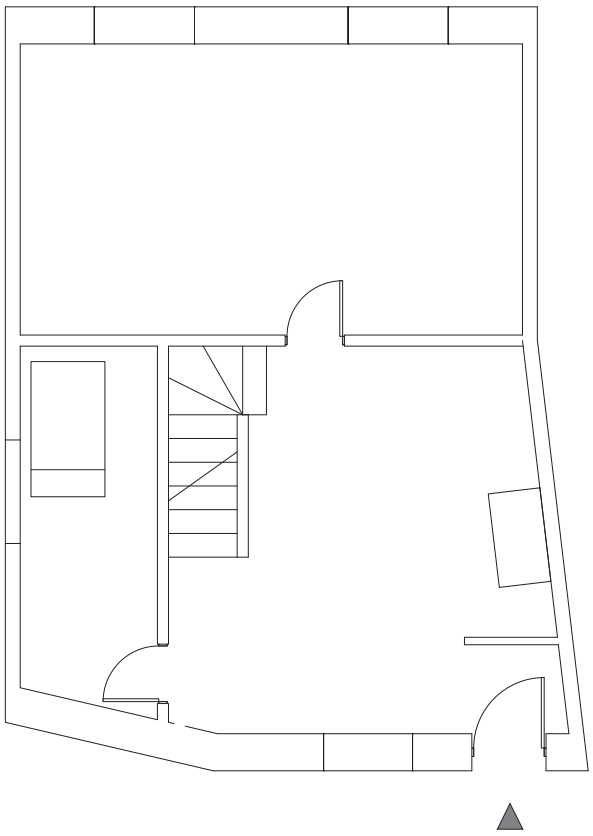
Rincón de Ademuz

Village Casas Altas House CA2 Floor 0 1 2 3



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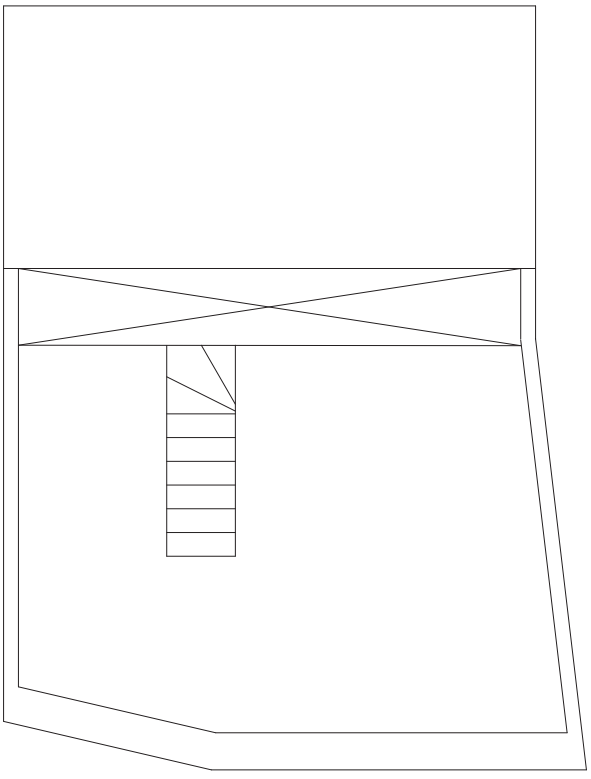
Rincón de Ademuz Village Casas Altas House CA2 Floor 0 1 2 3



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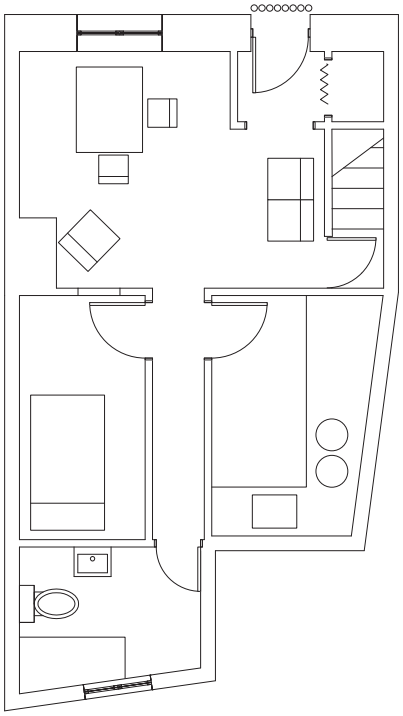
Rincón de Ademuz Village Casas Altas House CA2 Floor 0 1 2 3



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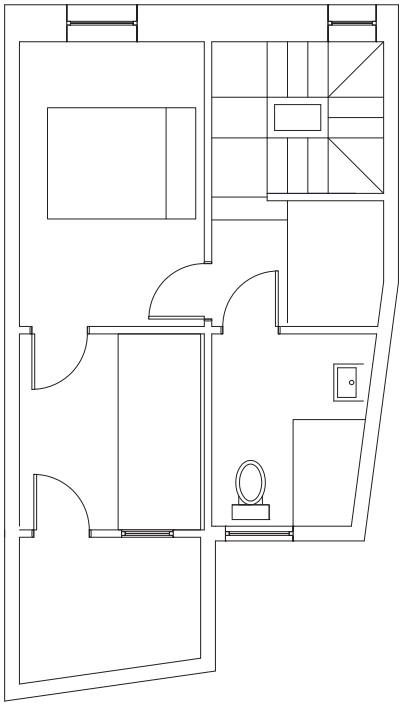
Rincón de Ademuz

Village Casas Altas

House CA3

Floor 0 1 2 3



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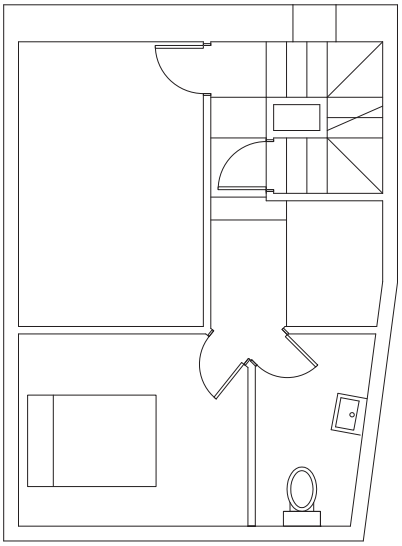
Rincón de Ademuz

Village Casas Altas

House CA3

Floor 0 1 2 3



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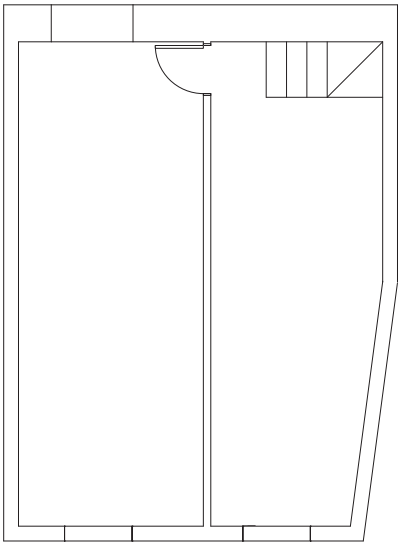

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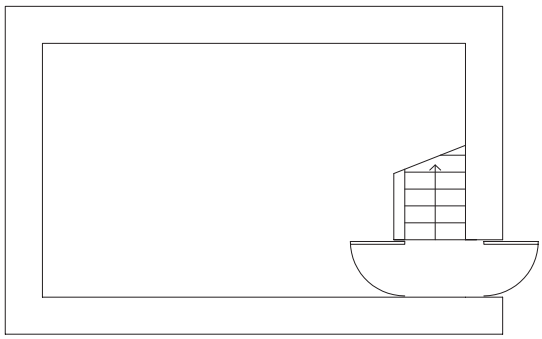
Rincón de Ademuz Village Casas Altas House CA3 Floor 0 1 2 3

Casas Bajas


Spain
Rincón de Ademuz
Rincón de Ademuz
Valencia
Turia River
Casas Bajas
CB3
CB2
CB1
0
10
50
100m
N



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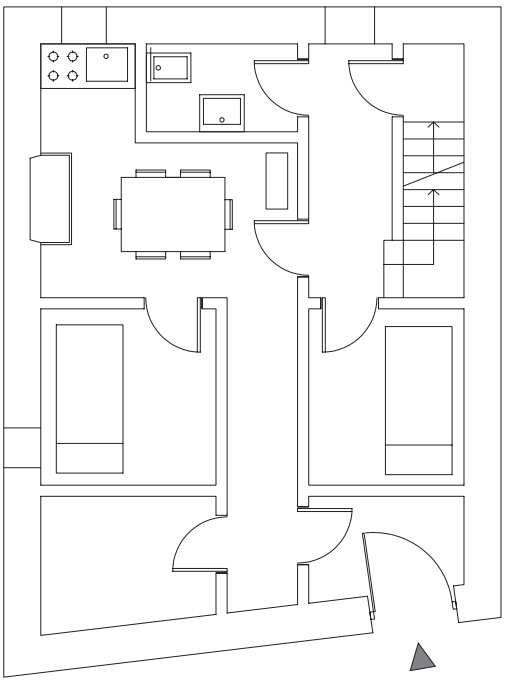

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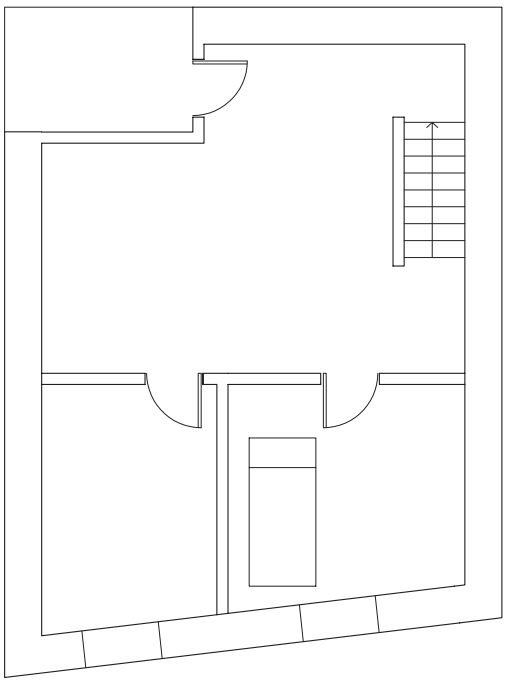
Rincón de Ademuz Village Casas Bajas House CB1 Floor -1 0 1



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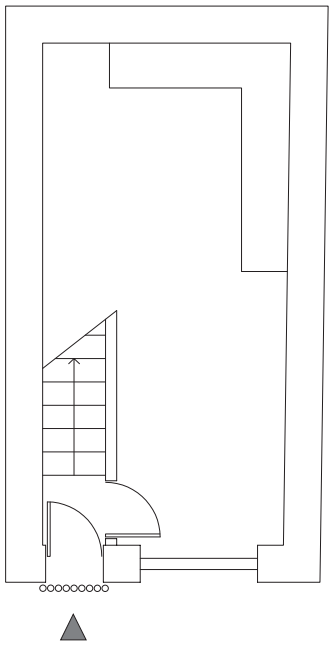
Rincón de Ademuz Village Casas Bajas House CB1 Floor -1 0 1



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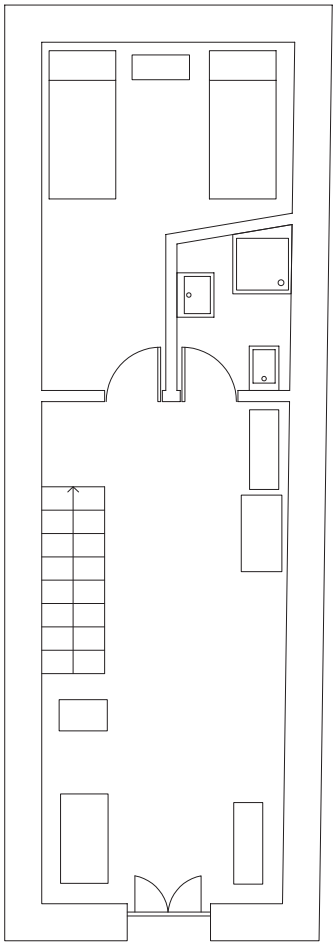

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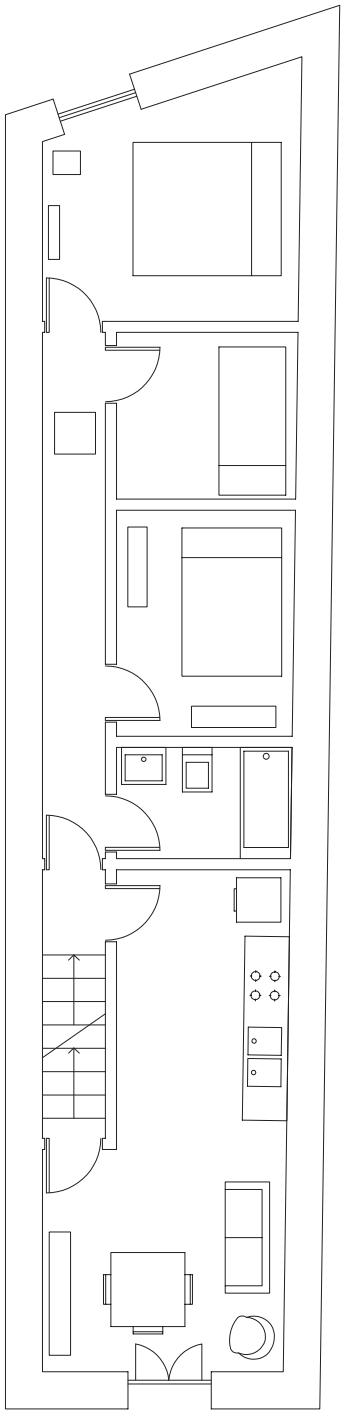

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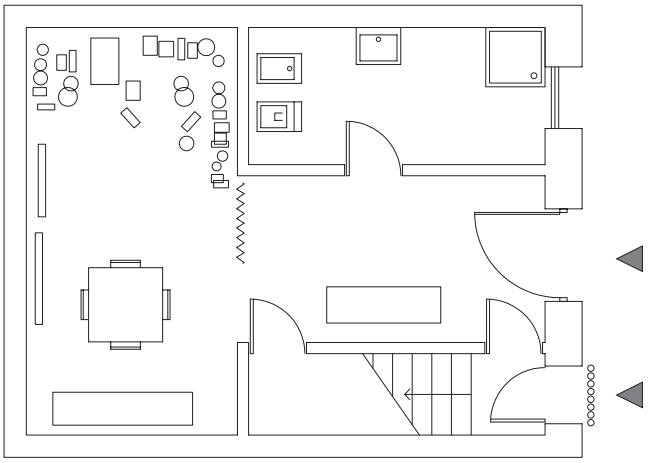
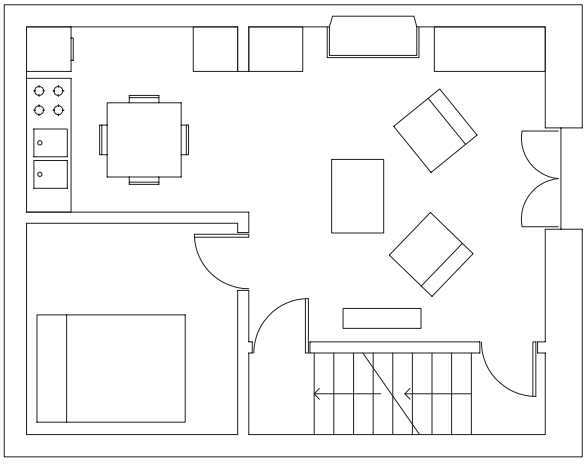
Rincón de Ademuz

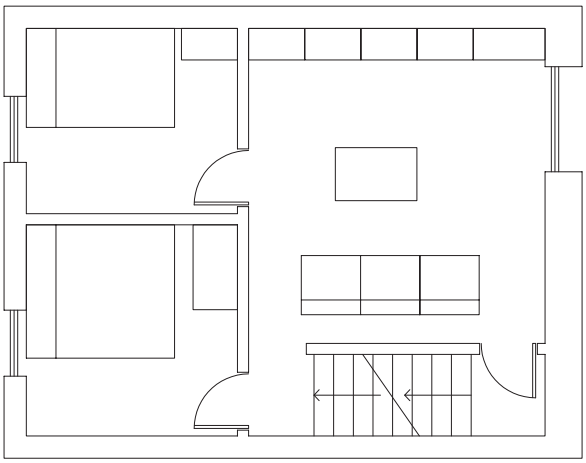
Village Casas Bajas House CB2 Floor 0 1 2



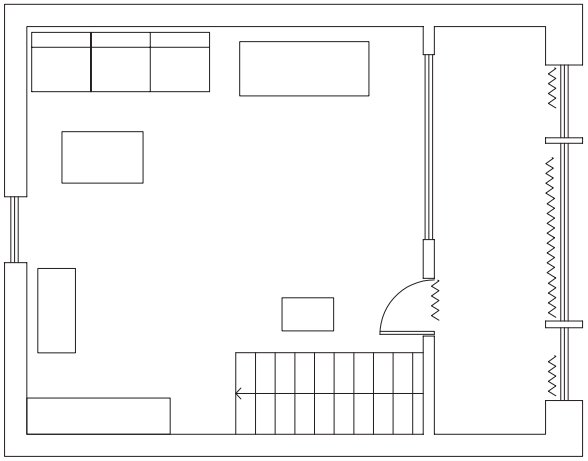
Rincón de Ademuz Village Casas Bajas House CB3 Floor 0 1 2 3



Rincón de Ademuz Village Casas Bajas House CB3 Floor 0 1 2 3

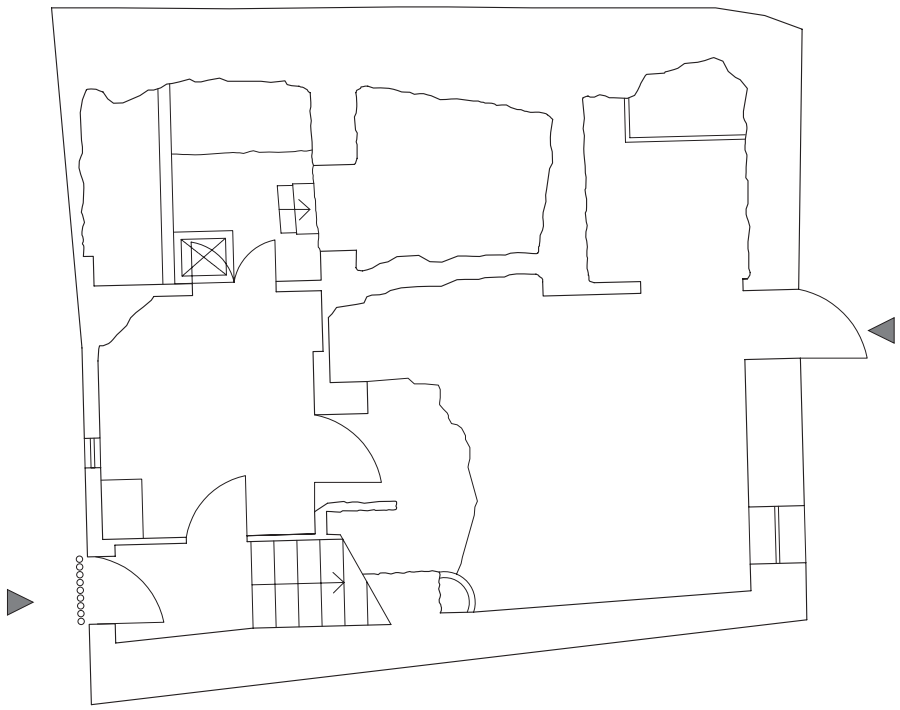


Rincón de Ademuz Village Casas Bajas House CB3 Floor 0 1 **2** 3



Rincón de Ademuz Village Casas Bajas House CB3 Floor 0 1 2 **3**

Castielfabib



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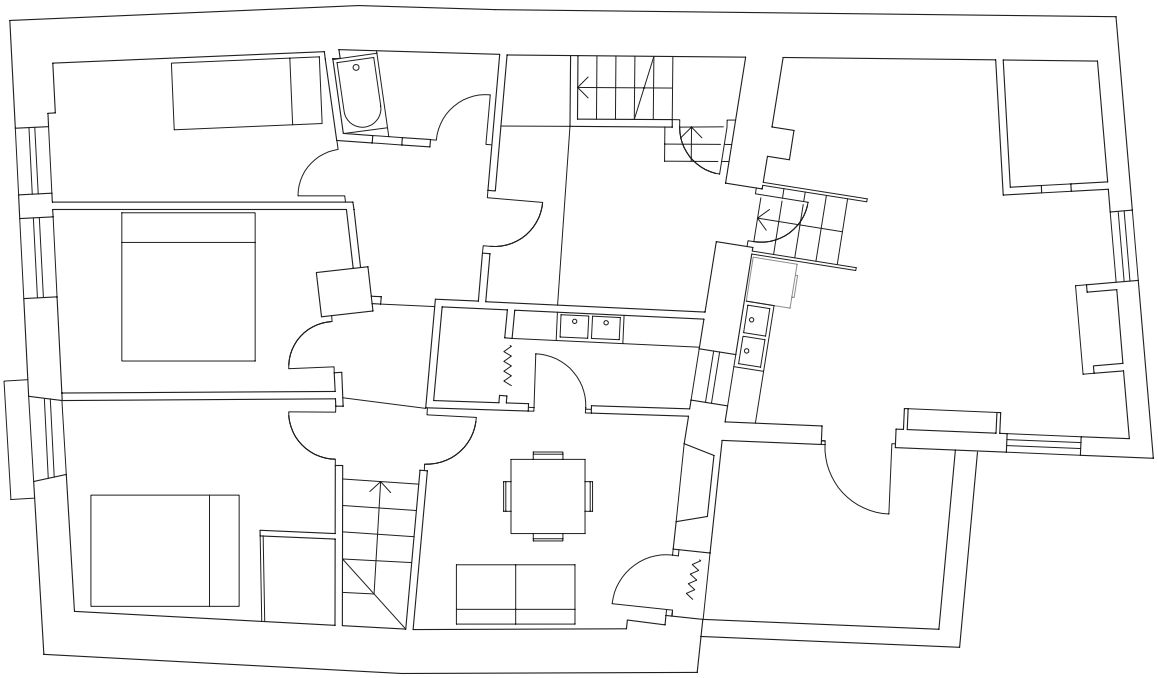
Rincón de Ademuz

Village Castielfabib House CF1 Floor 0 1 2



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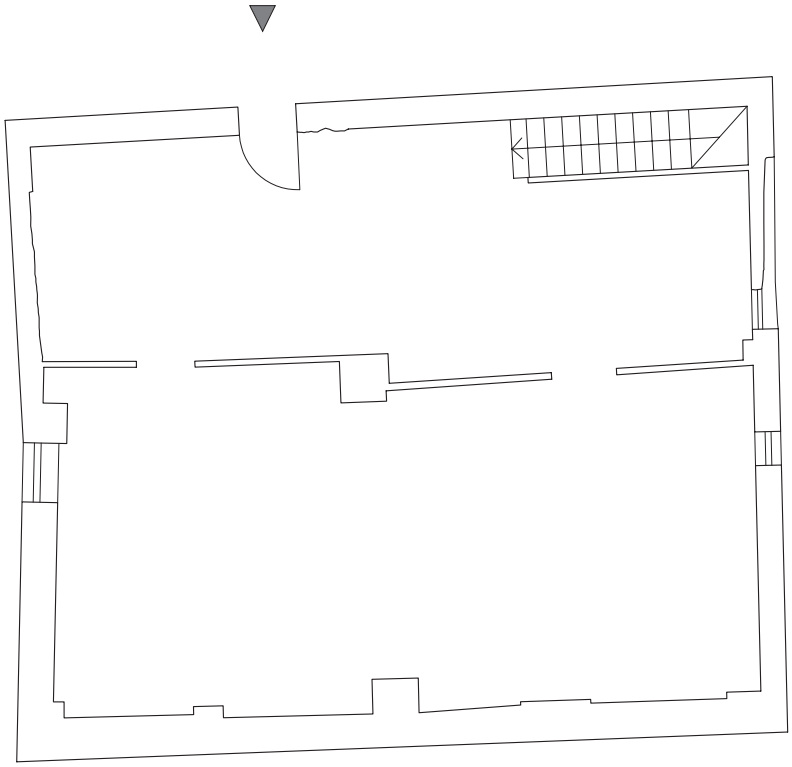
Rincón de Ademuz

Village Castielfabib House CF1 Floor 0 1 2



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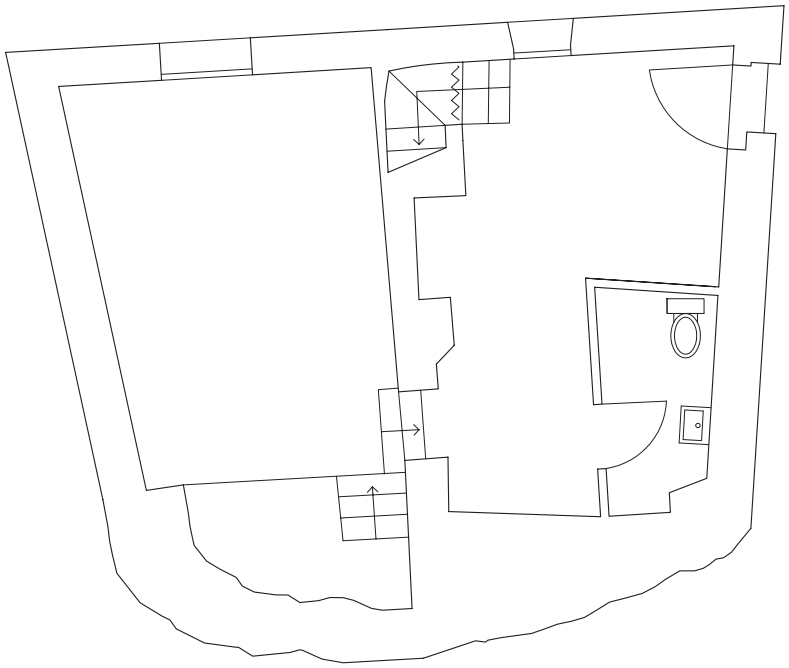
Rincón de Ademuz

Village Castielfabib House CF1 Floor 0 1 2



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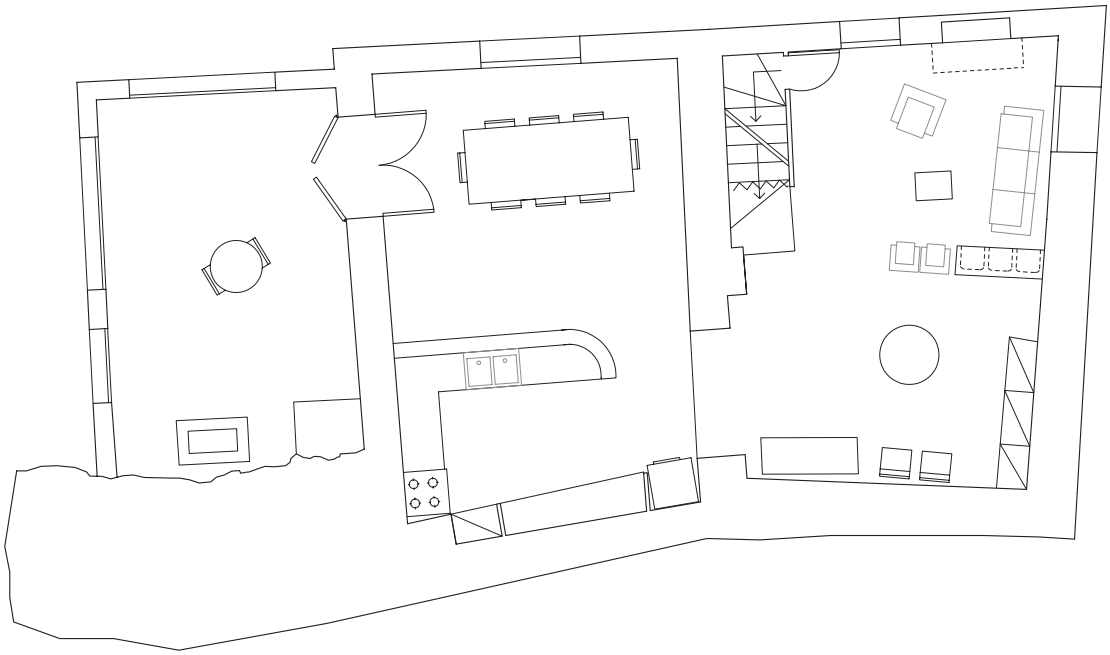
Rincón de Ademuz

Village Castielfabib House CF2 Floor 0 1 2 3 4



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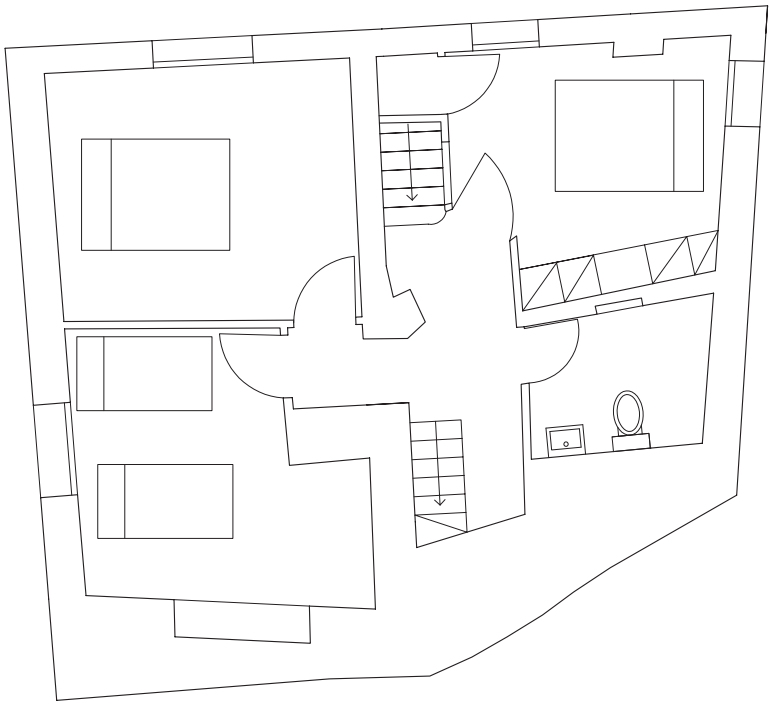
Rincón de Ademuz

Village Castielfabib House CF2 Floor 0 1 2 3 4



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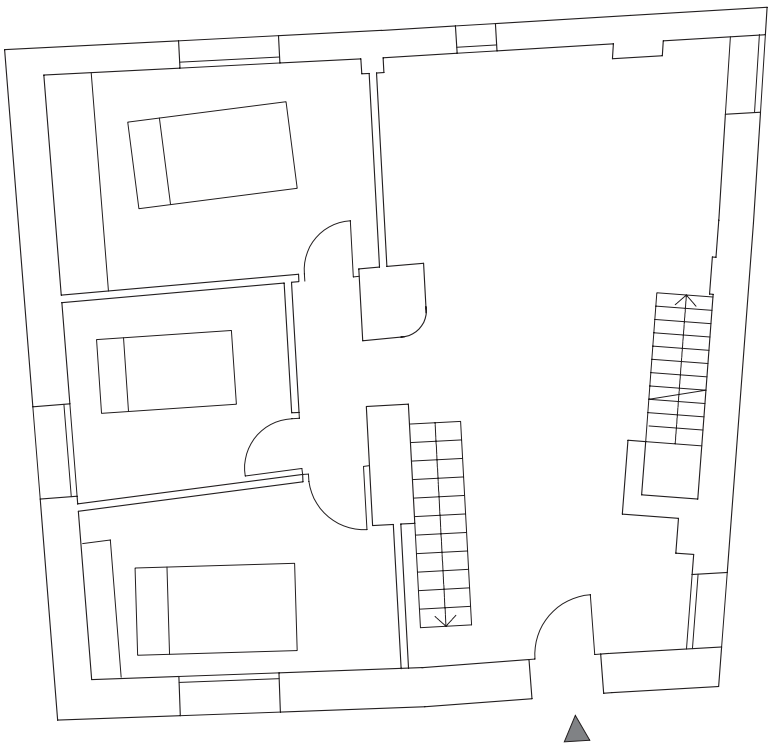
Rincón de Ademuz

Village Castielfabib House CF2 Floor 0 1 **2** 3 4



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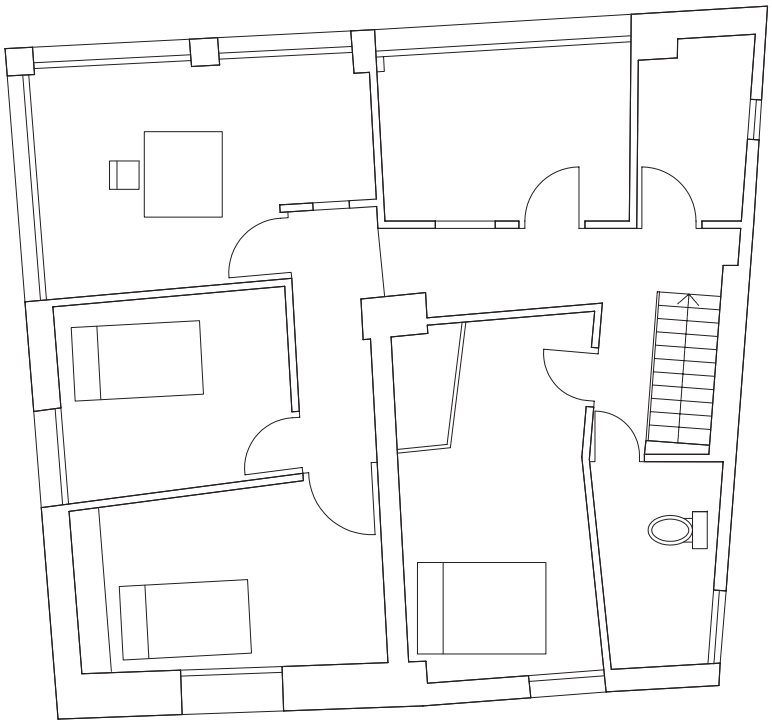
Rincón de Ademuz

Village Castielfabib House CF2 Floor 0 1 2 **3** 4



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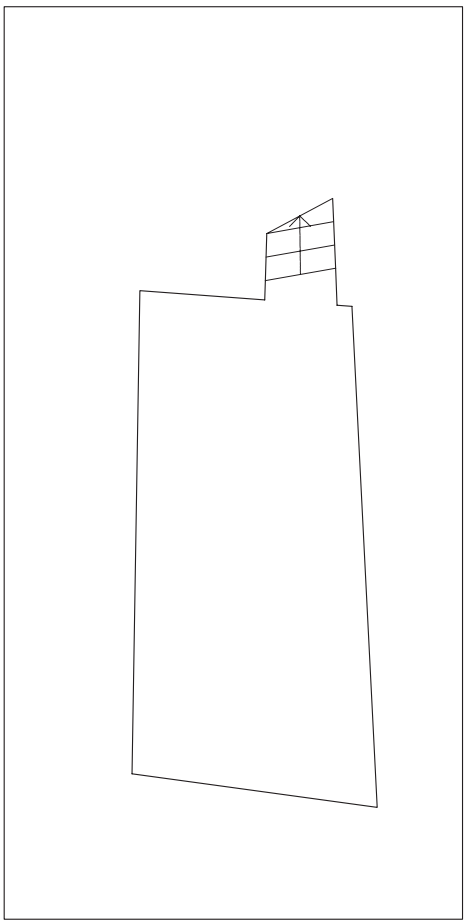
Rincón de Ademuz Village Castielfabib House CF2 Floor 0 1 2 3 4



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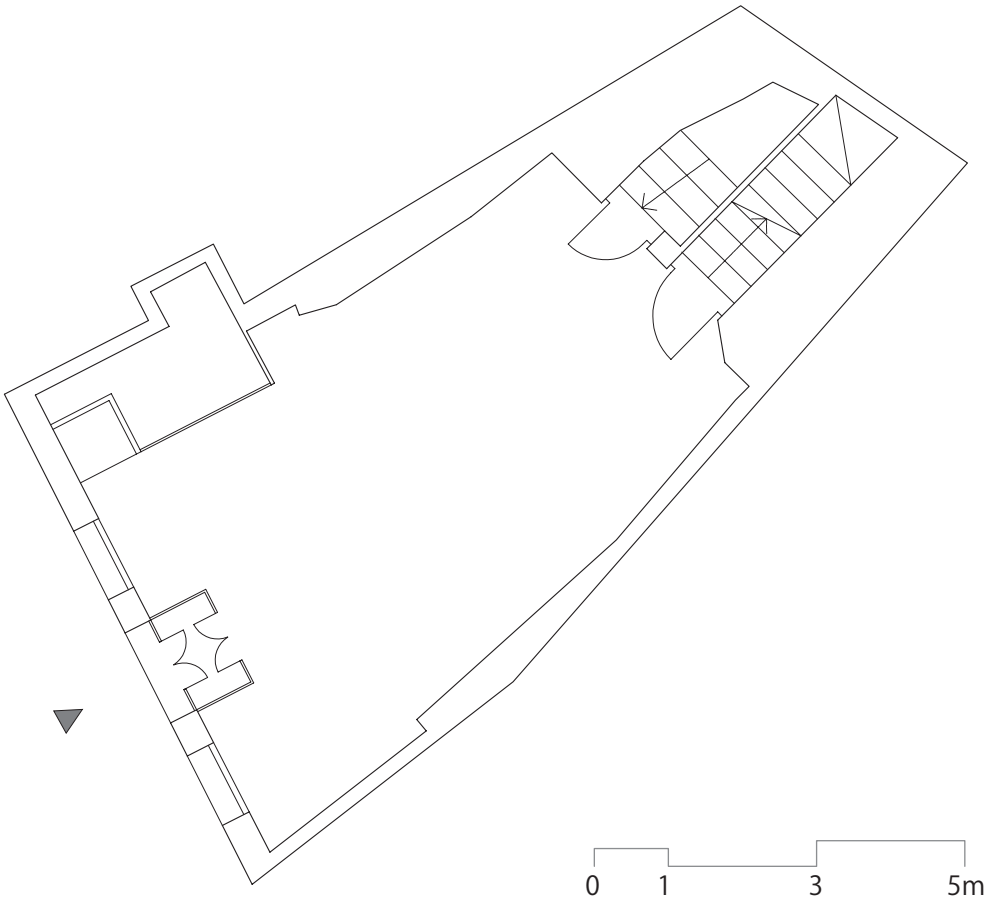
Rincón de Ademuz Village Castielfabib House CF3 Floor -1 0 1 2 3



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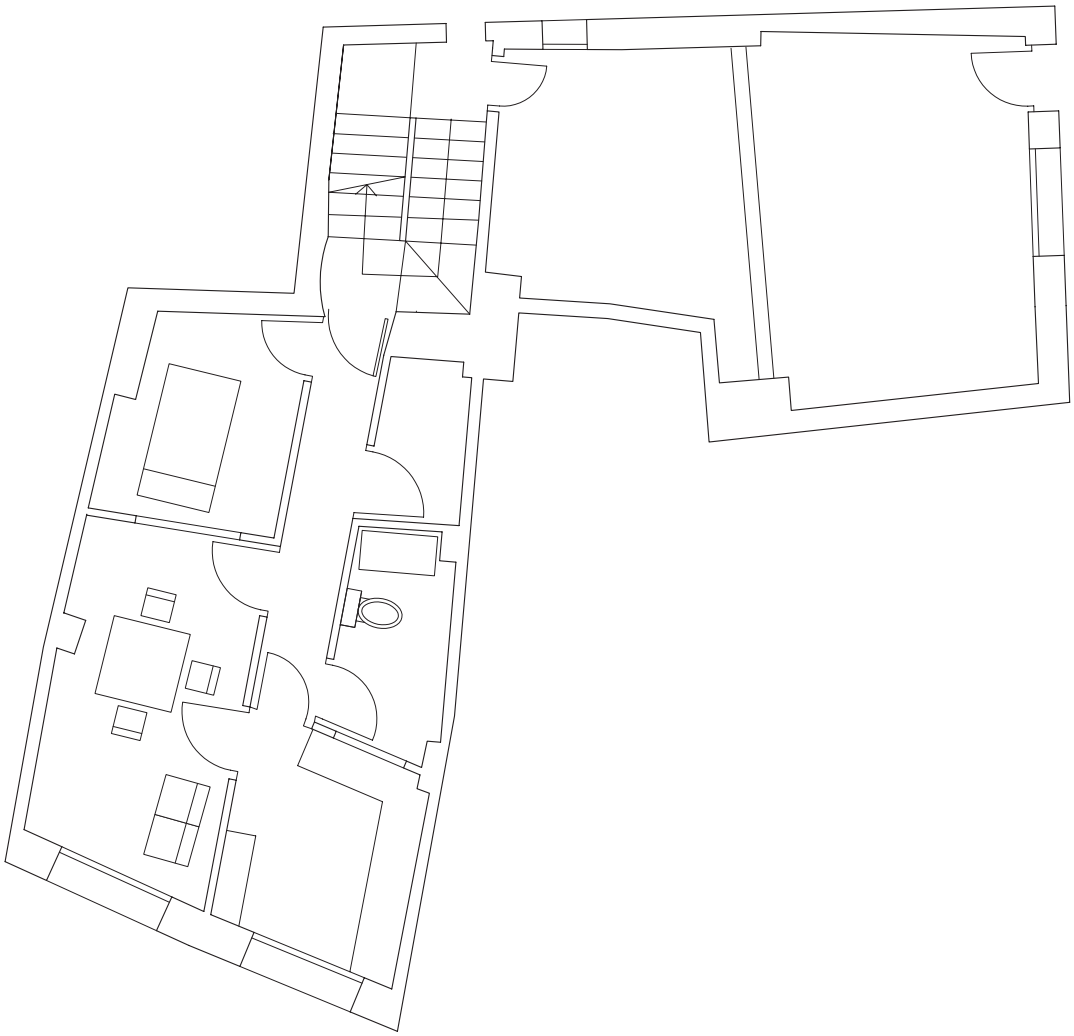
Rincón de Ademuz Village Castielfabib House CF3 Floor -1 0 1 2 3



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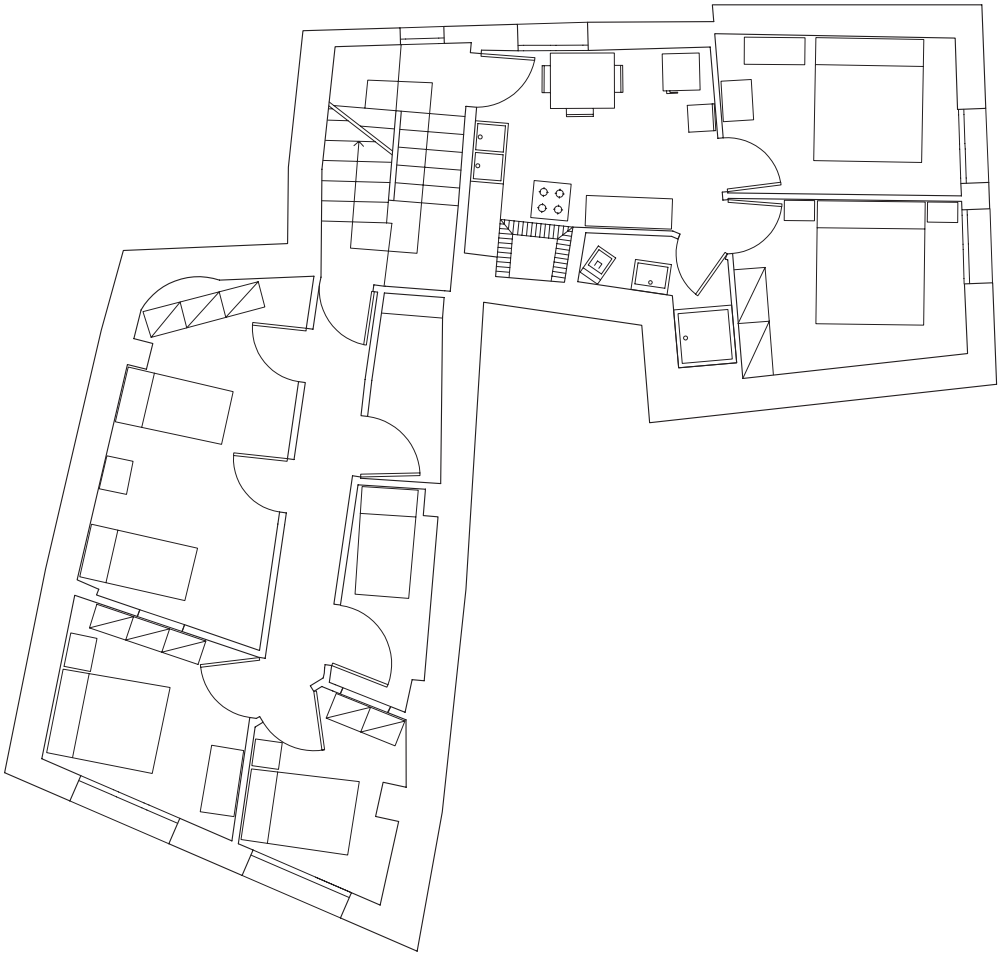
Village Castielfabib House CF3 Floor -1 0 1 2 3



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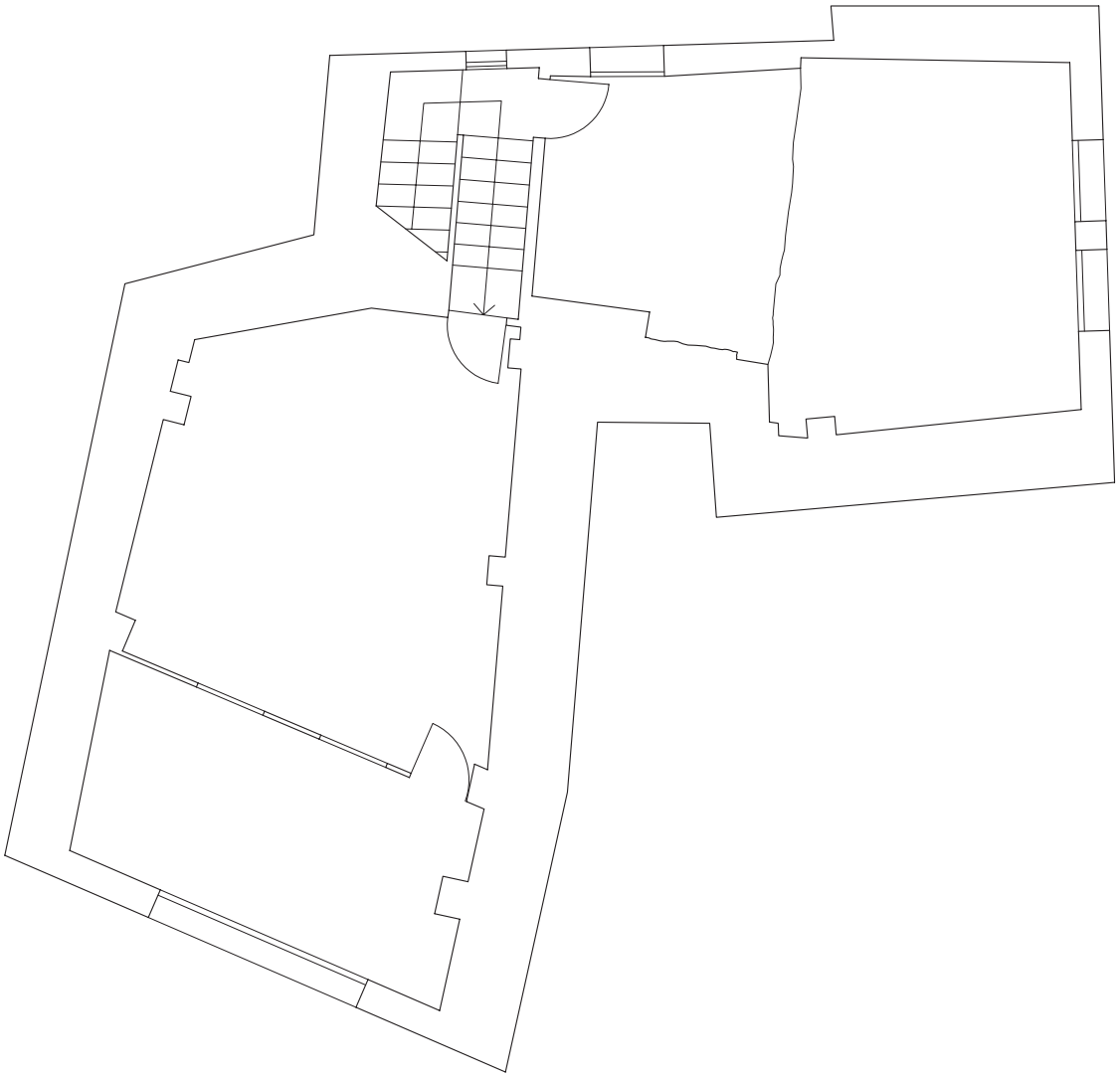
Rincón de Ademuz

Village Castielfabib House CF3 Floor -1 0 1 2 3



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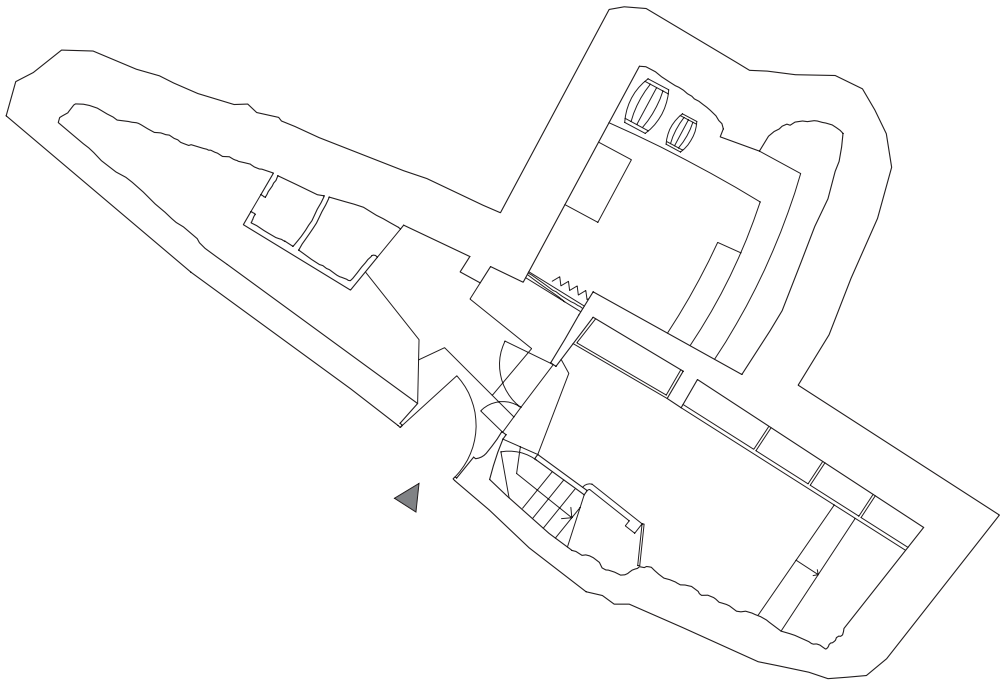
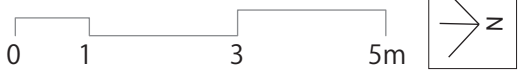
Rincón de Ademuz

Village Castielfabib House CF3 Floor -1 0 1 2 3





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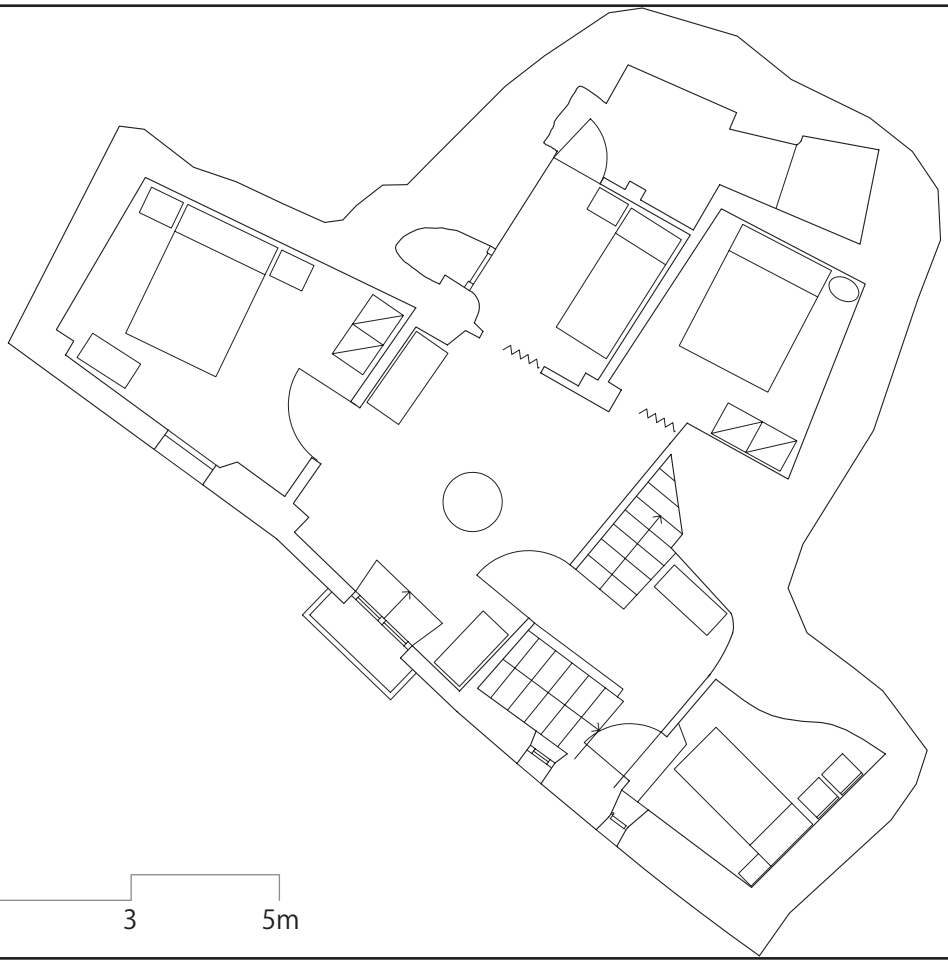
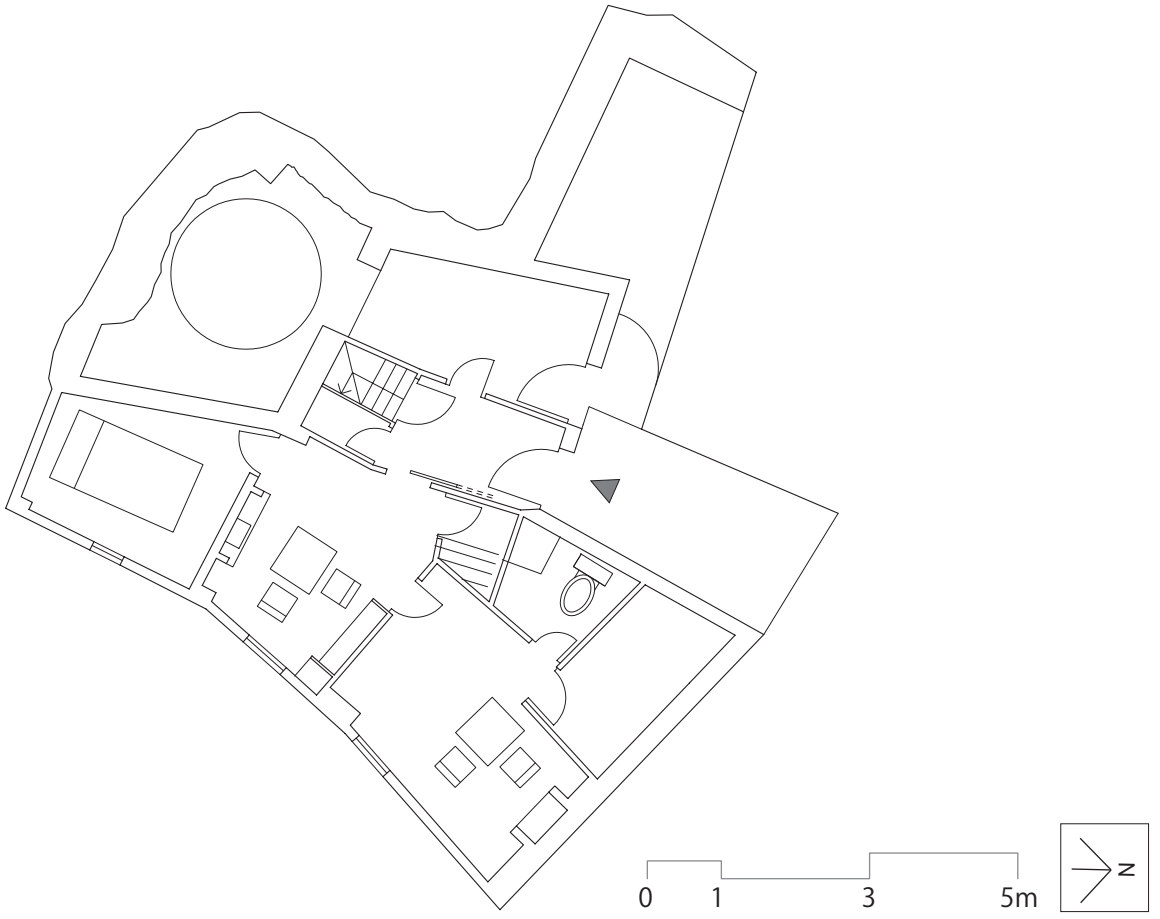
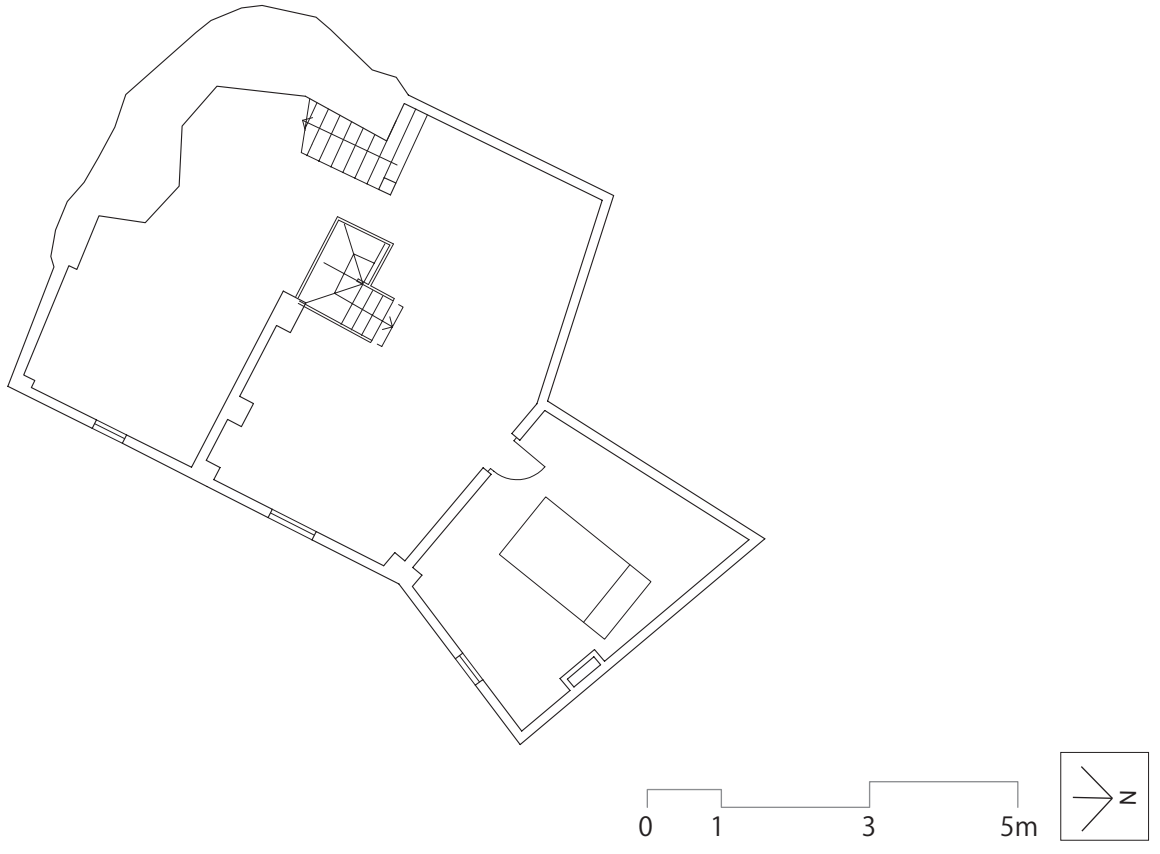


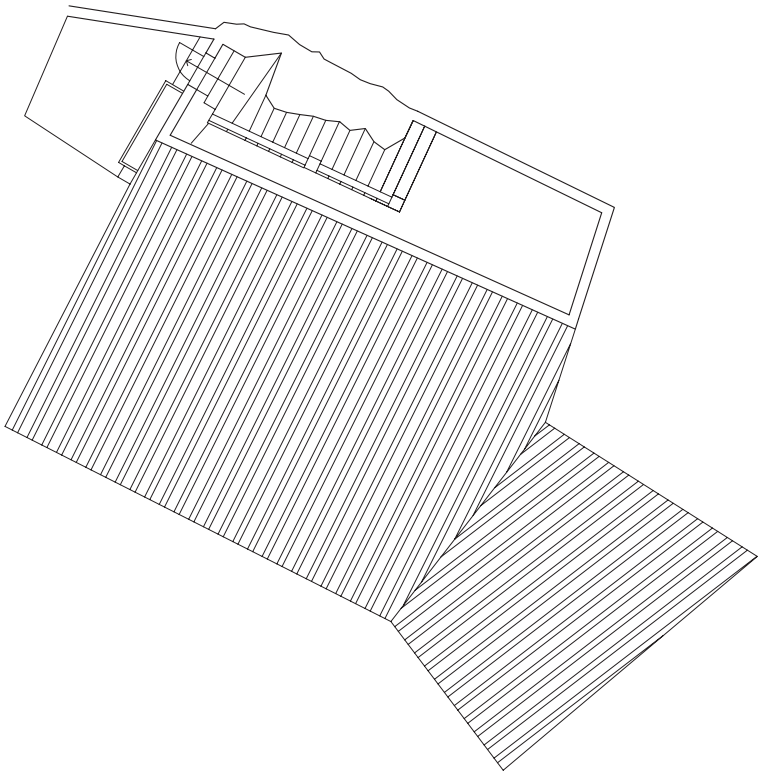
Rincón de Ademuz Village Castielfabib House CF4 Floor -2 -1 0 1 2



Rincón de Ademuz Village Castielfabib House CF4 Floor -2 -1 0 1 2



Rincón de Ademuz Village Castielfabib House CF4 Floor -2 -1 0 1 2



0 1 3 5m

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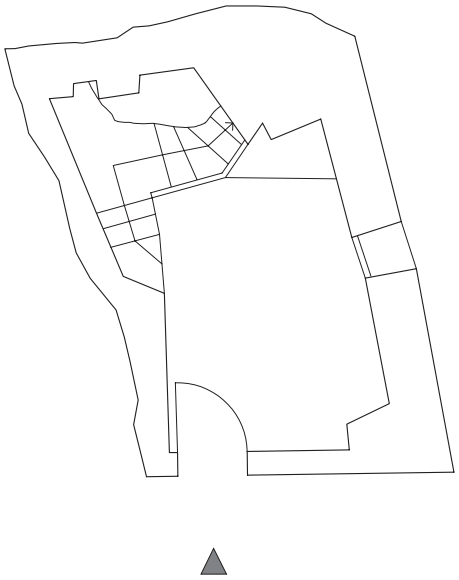
Rincón de Ademuz

Village Castielfabib House CF4 Floor -2 -1 0 1 2



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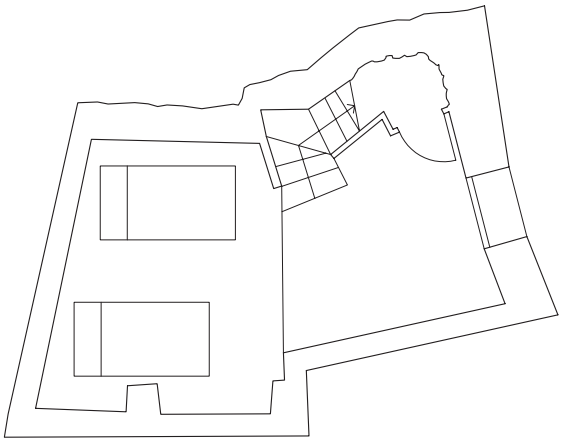
Rincón de Ademuz Village Castielfabib House CF5 Floor -2 -1 0 1



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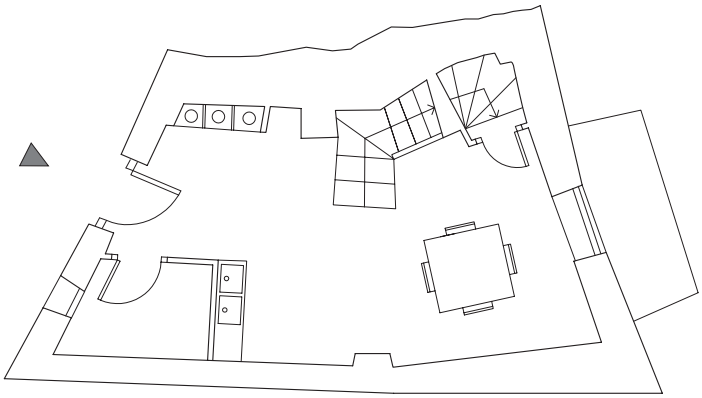
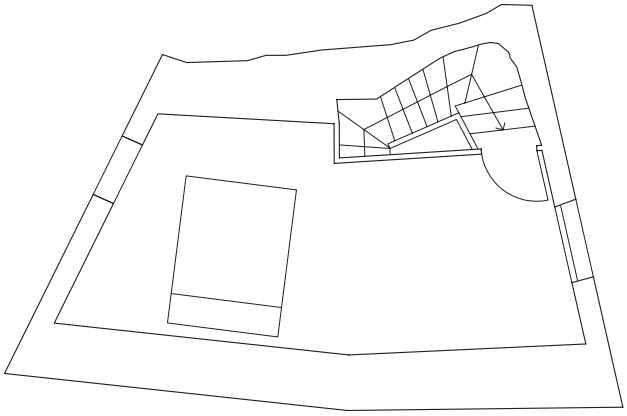
Rincón de Ademuz Village Castielfabib House CF5 Floor -2 -1 0 1



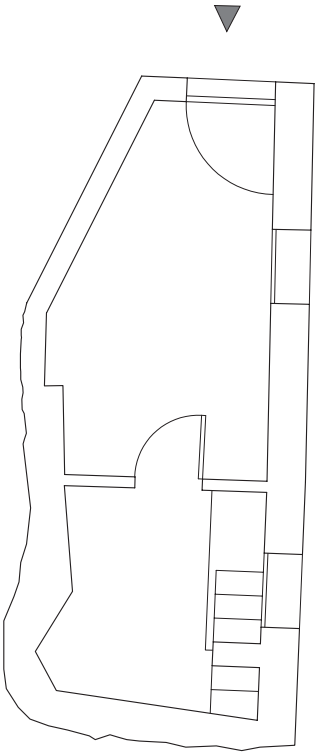
Rincón de Ademuz

Village Castielfabib House CF5 Floor -2 -1 0 1



Rincón de Ademuz

Village Castielfabib House CF5 Floor -2 -1 0 1



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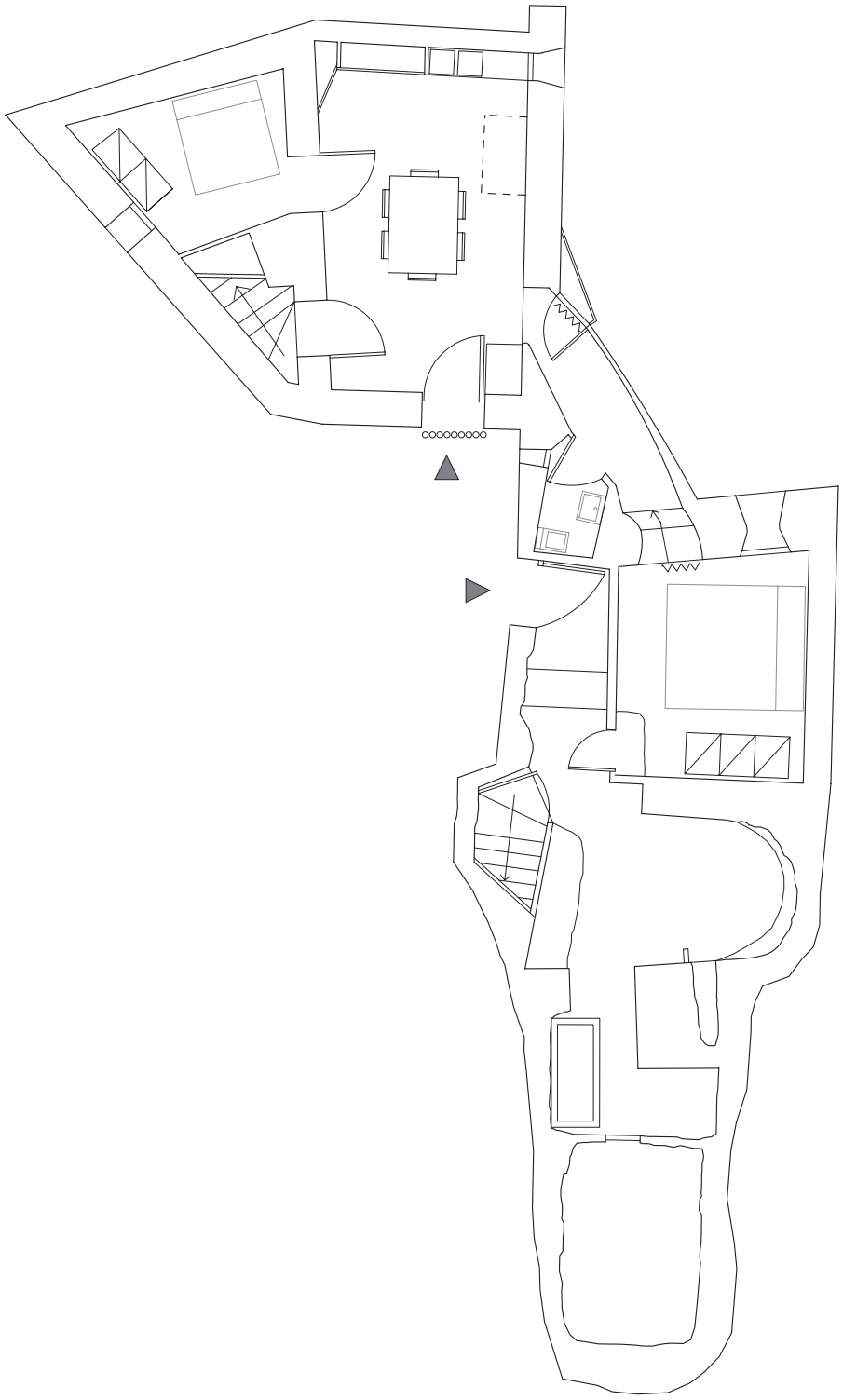
Rincón de Ademuz

Village Castielfabib House CF6 Floor -1 0 1



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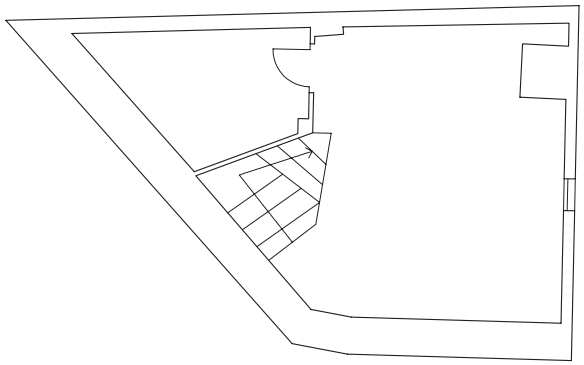
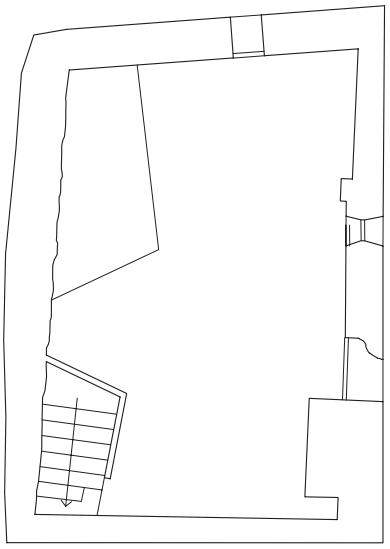
Rincón de Ademuz

Village Castielfabib House CF6 Floor -1 0 1





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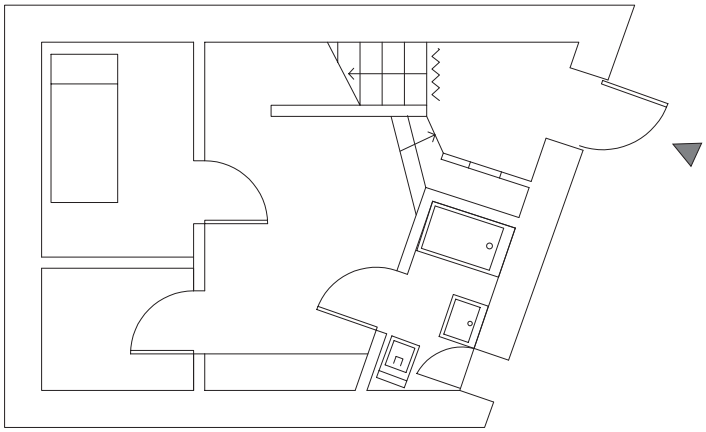
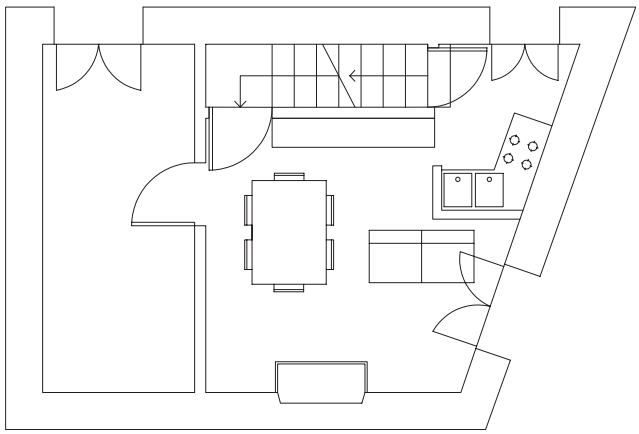
Rincón de Ademuz

Village Castielfabib House CF6 Floor -1 0 1



Rincón de Ademuz Village Castielfabib House CF7 Floor 0 1 2



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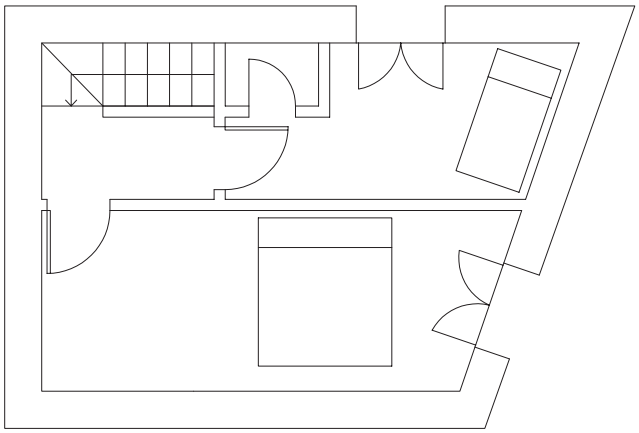

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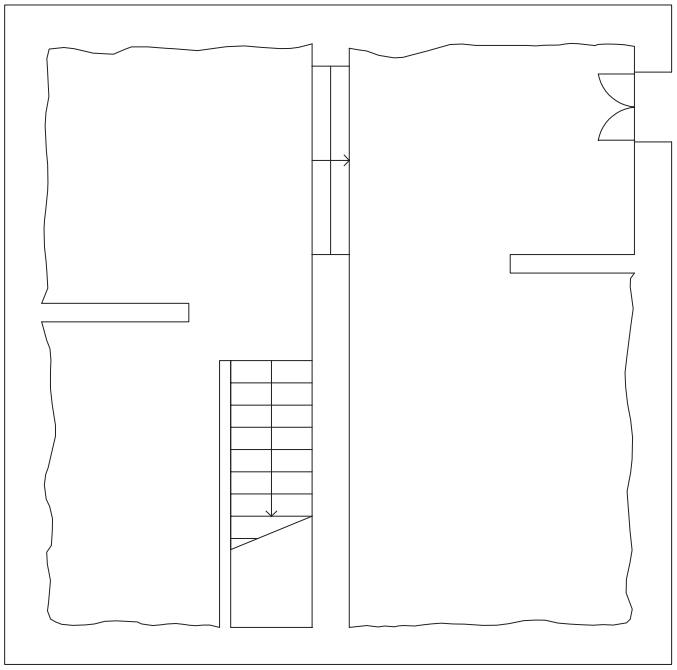
Rincón de Ademuz Village Castielfabib House CF7 Floor 0 1 2



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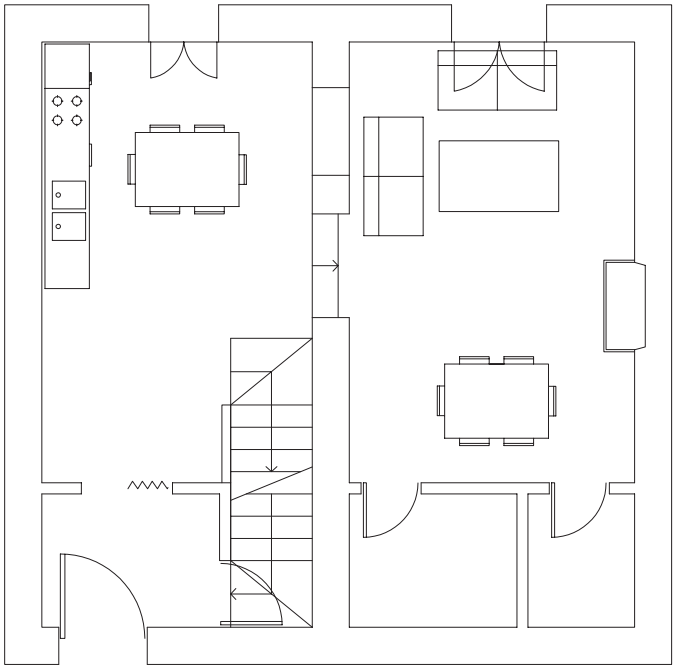
Rincón de Ademuz Village Castielfabib House CF8 Floor -1 0 1



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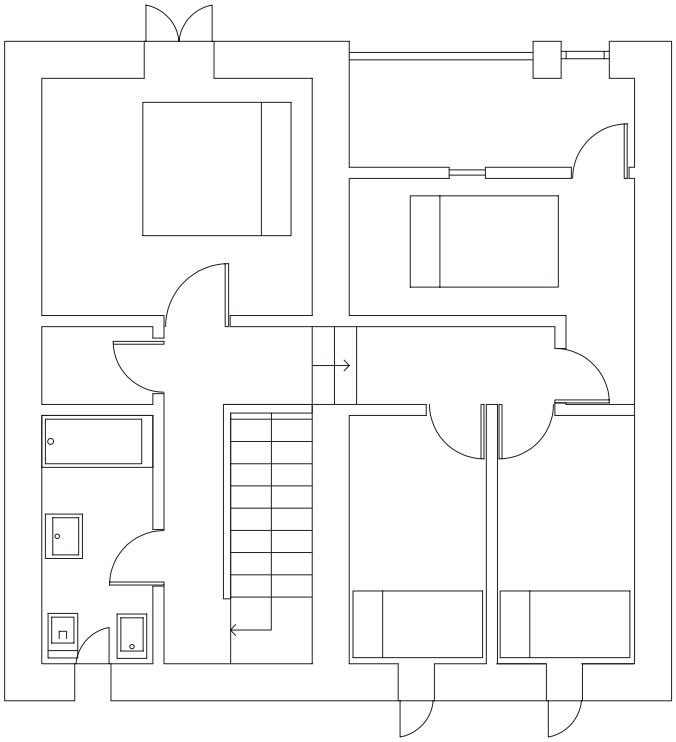

0 1 3 5m

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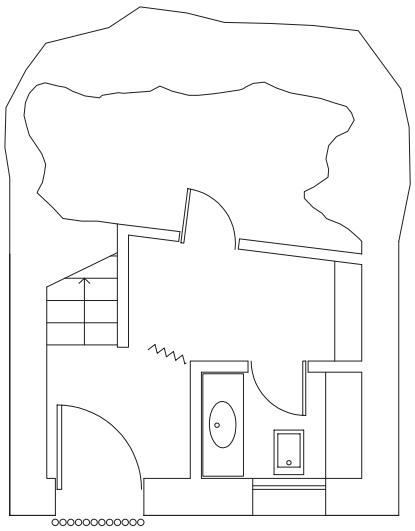
Rincón de Ademuz Village Castielfabib House CF8 Floor -1 0 1



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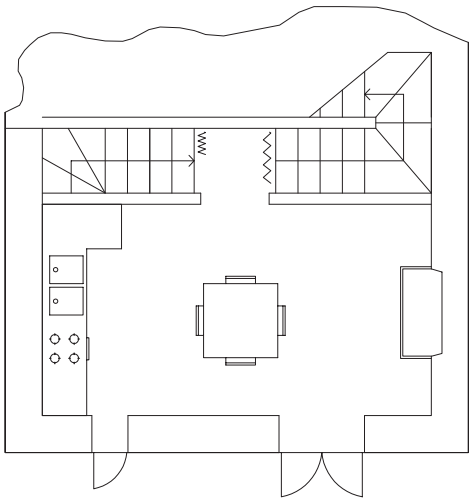
Rincón de Ademuz Village Castielfabib House CF9 Floor 0 1 2 3 4



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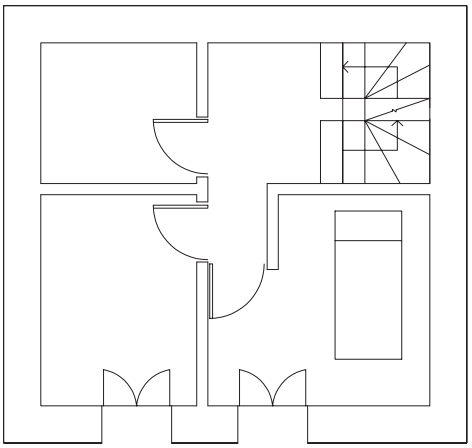
Rincón de Ademuz Village Castielfabib House CF9 Floor 0 1 2 3 4



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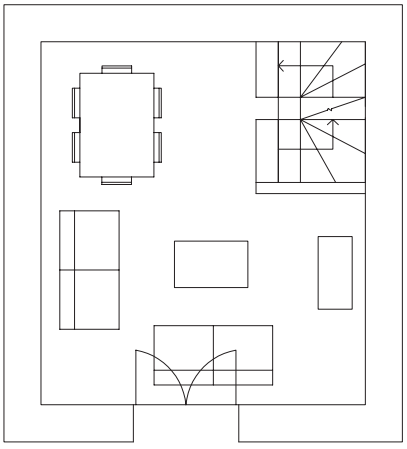
Rincón de Ademuz Village Castielfabib House CF9 Floor 0 1 **2** 3 4



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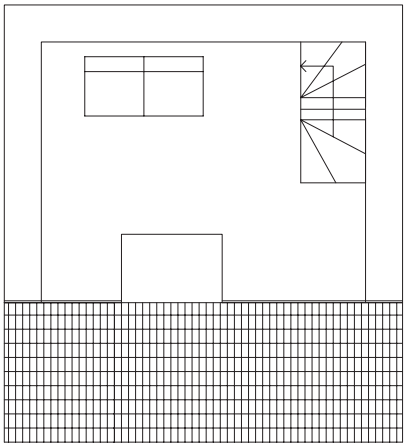
Rincón de Ademuz Village Castielfabib House CF9 Floor 0 1 2 **3** 4



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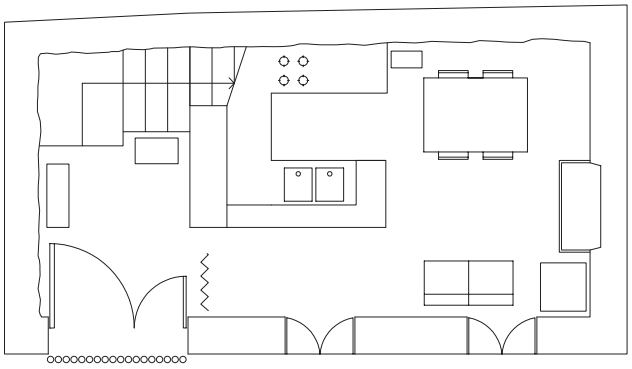
Rincón de Ademuz Village Castielfabib House CF9 Floor 0 1 2 3 4



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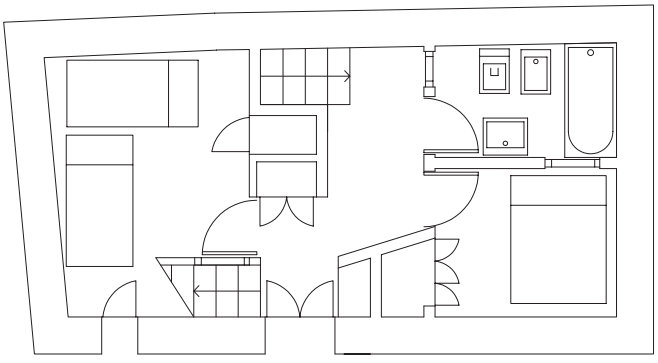

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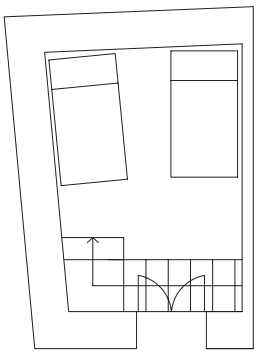

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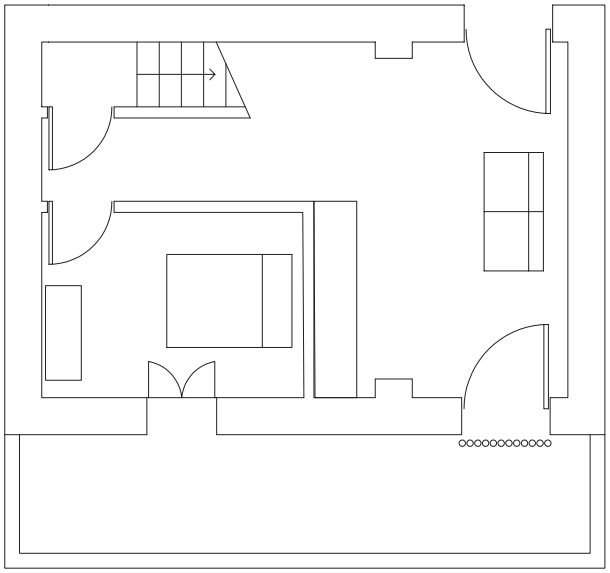
Rincón de Ademuz

Village Castielfabib

House CF10

Floor 0 1 2



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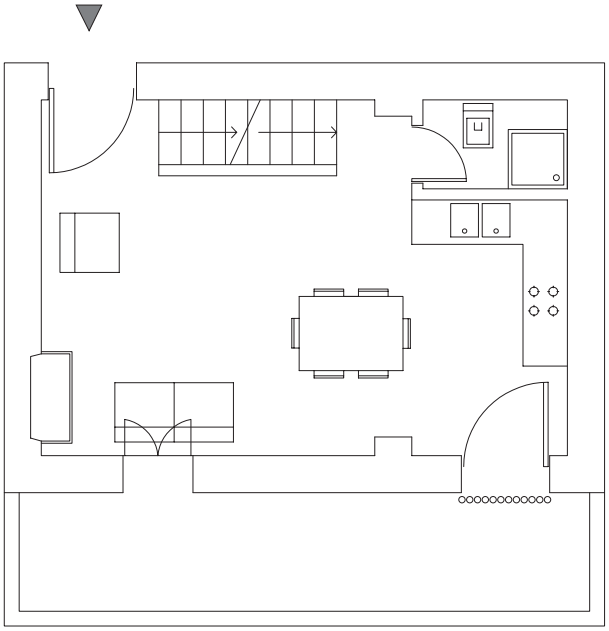

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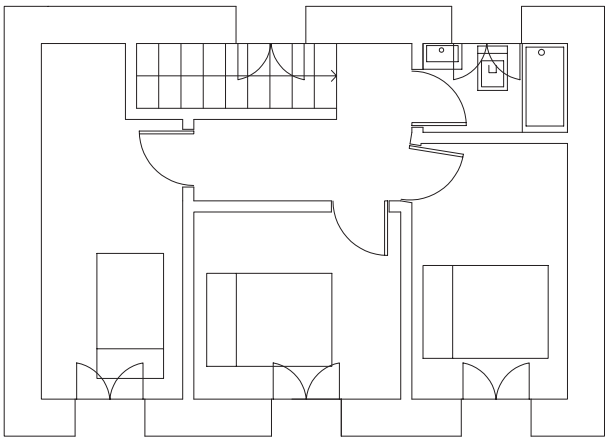

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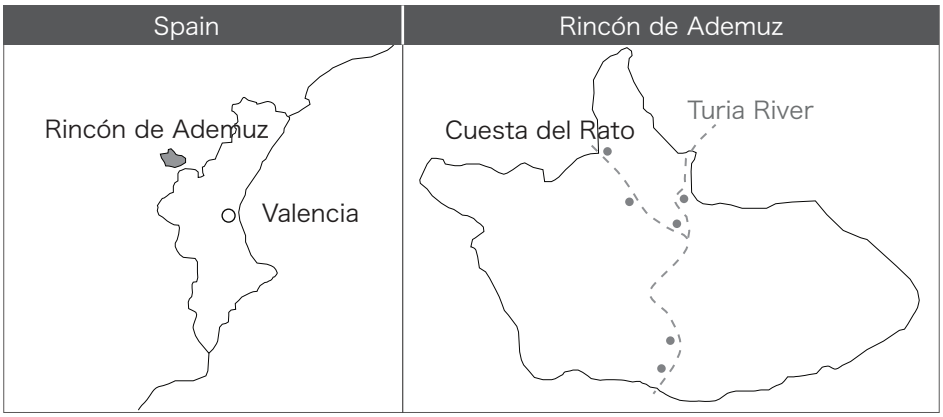
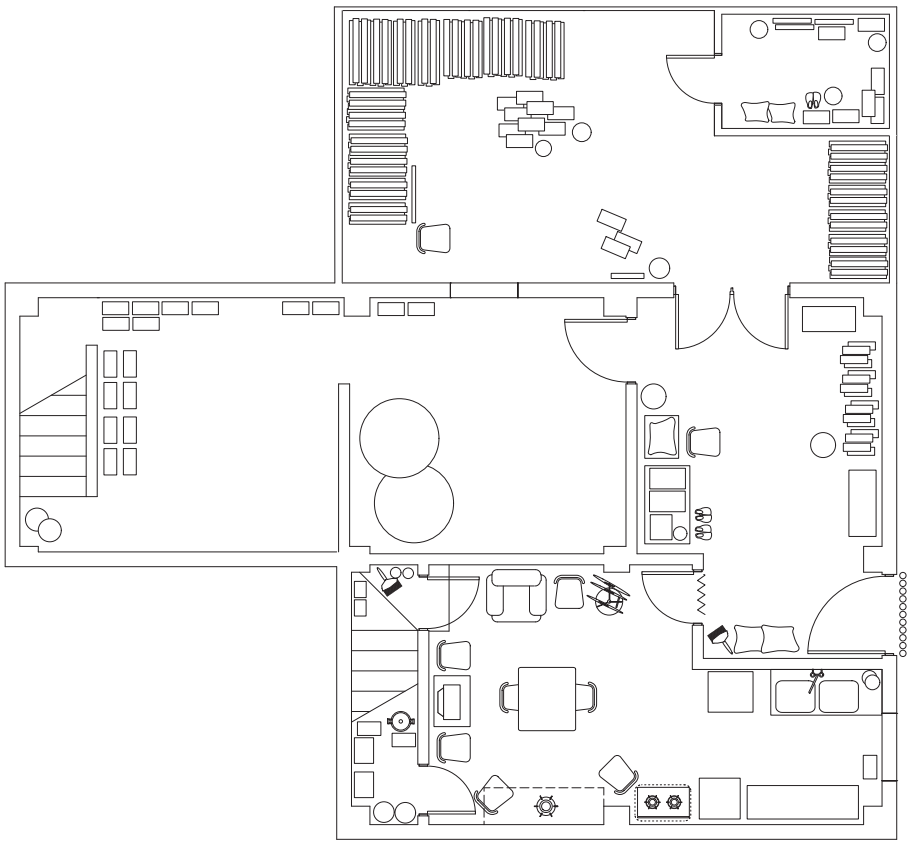
Rincón de Ademuz Village Castielfabib House CF11 Floor -1 0 1

Cuesta del Rato





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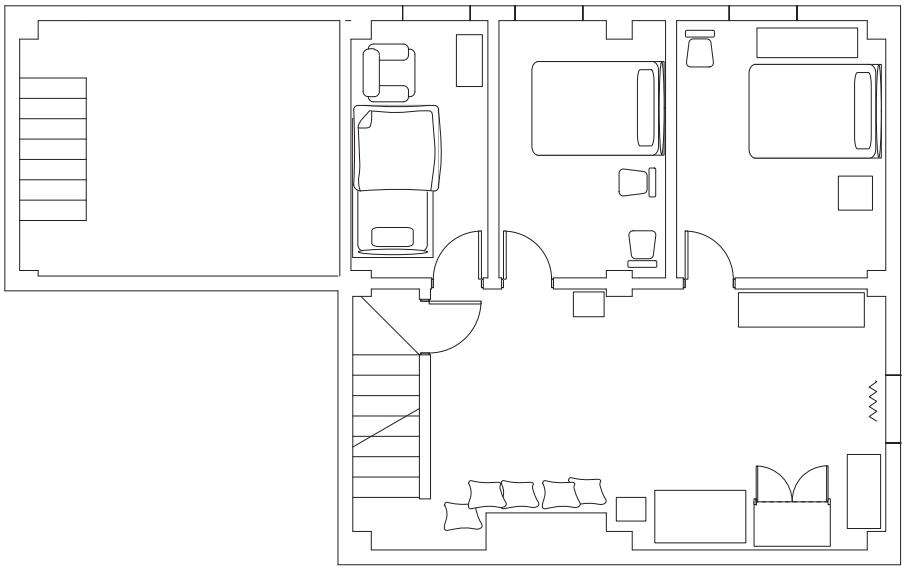
Rincón de Ademuz

Village Cuesta del Rato House CR1 Floor 0 1 2



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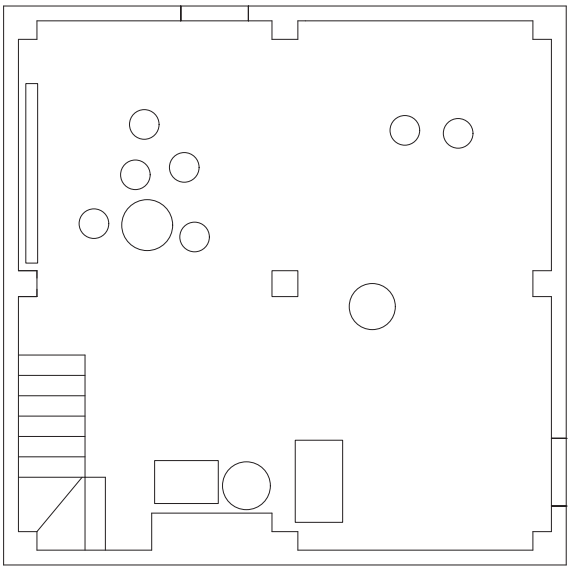
Rincón de Ademuz Village Cuesta del Rato House CR1 Floor 0 1 2



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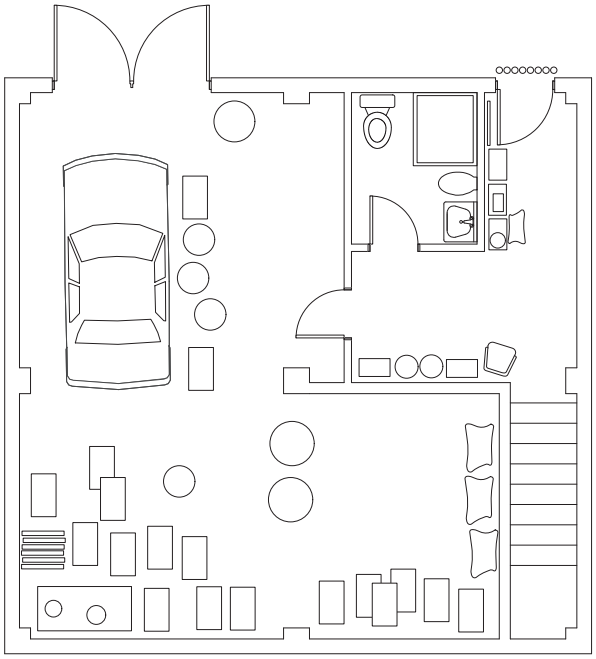
Rincón de Ademuz Village Cuesta del Rato House CR1 Floor 0 1 2



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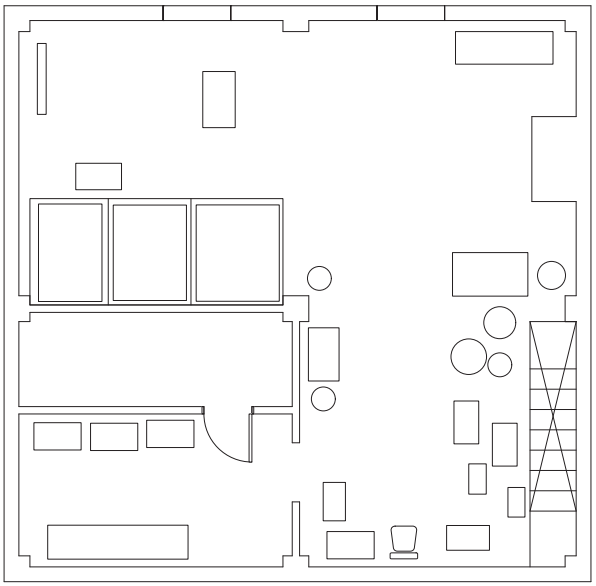
Rincón de Ademuz Village Cuesta del Rato House CR2 Floor 0 1 2



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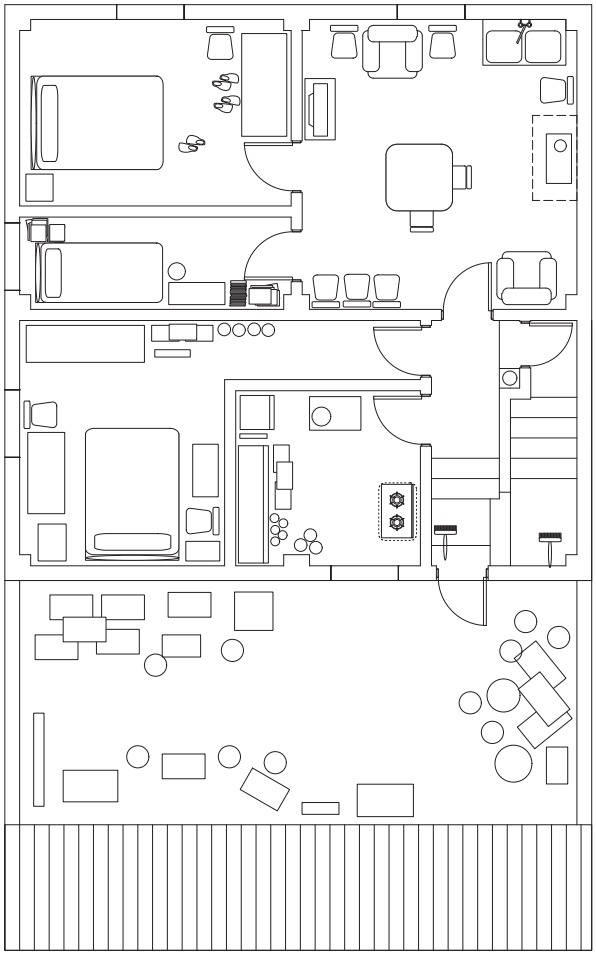
Rincón de Ademuz Village Cuesta del Rato House CR2 Floor 0 1 2



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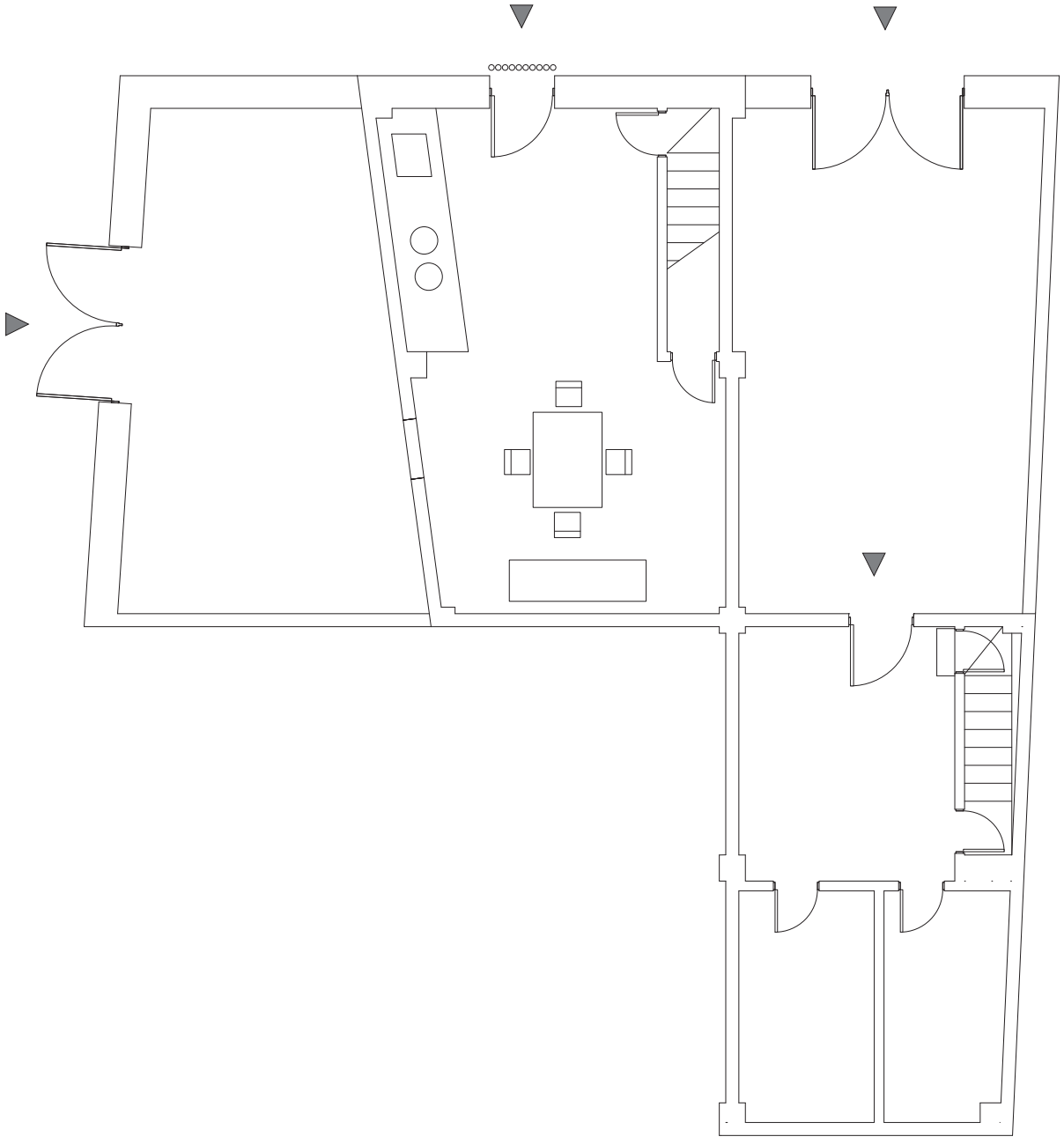
Rincón de Ademuz

Village Cuesta del Rato House CR2 Floor 0 1 2



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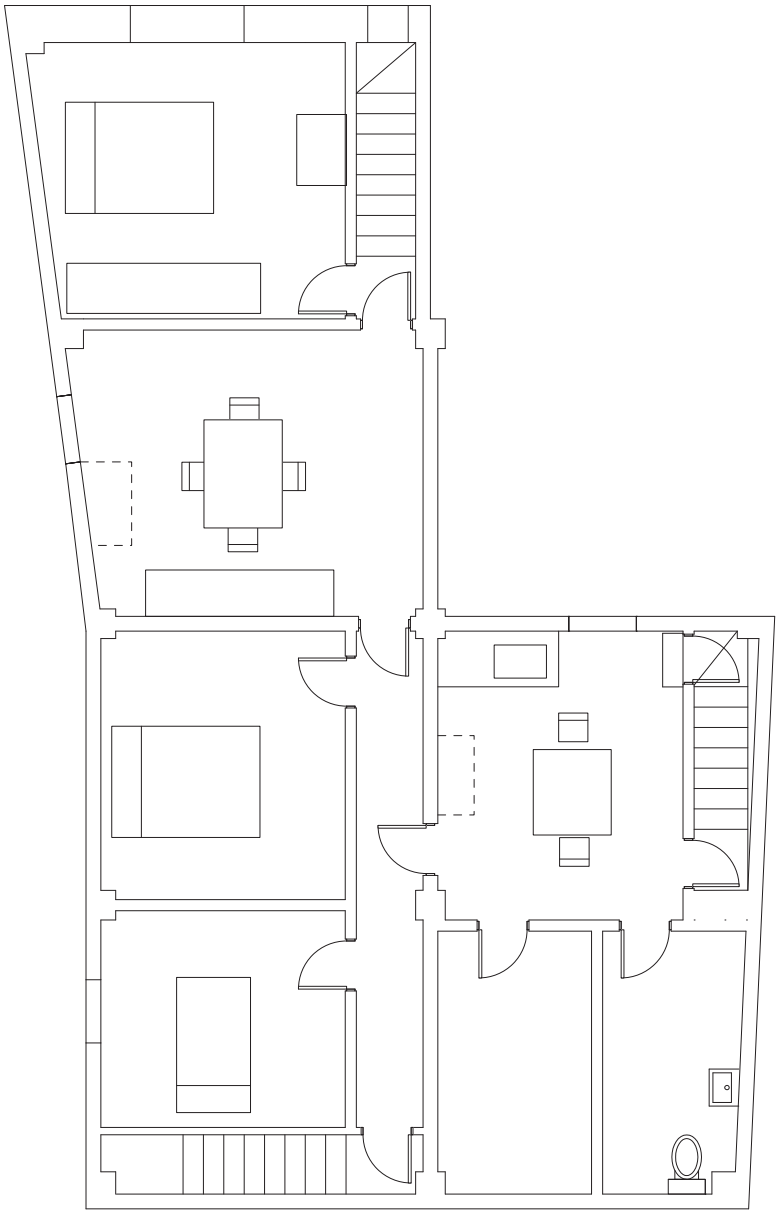
Rincón de Ademuz

Village Cuesta del Rato House CR3 Floor 0 1 2



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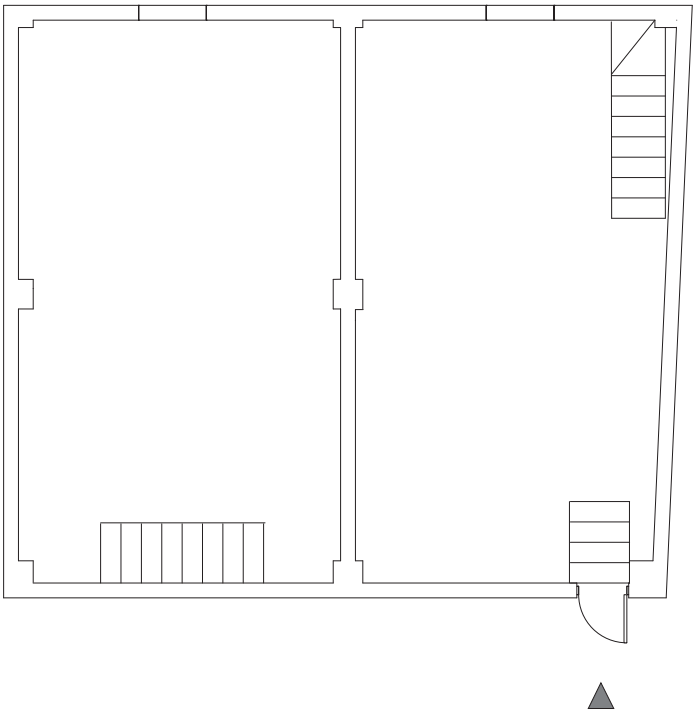
Rincón de Ademuz

Village Cuesta del Rato House CR3 Floor 0 1 2



0 1 3 5m

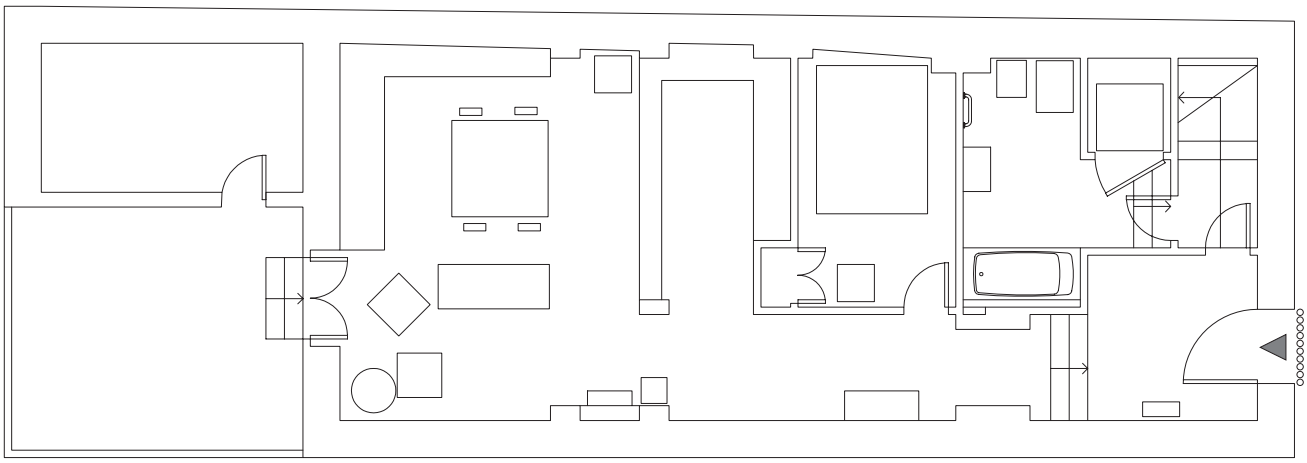
Rincón de Ademuz

Village Cuesta del Rato

House CR3

Floor 0 1 2


Torrealta
Spain
Rincón de Ademuz
Rincón de Ademuz
Valencia
Turia River
Torrealta
TA1
TA2
N
0
10
50
100m



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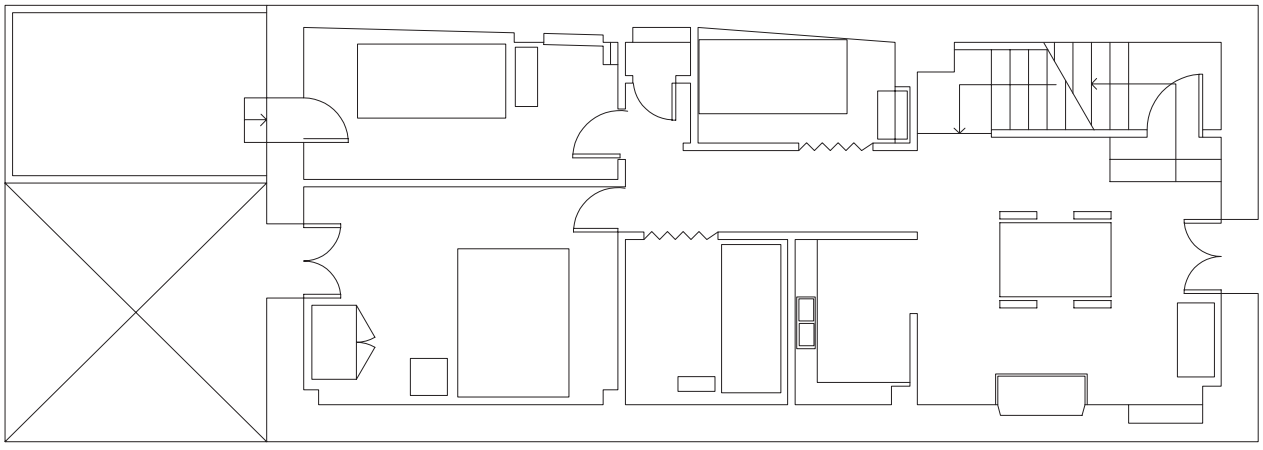
Rincón de Ademuz Village Torrealta House TA1 Floor 0 1 2 3



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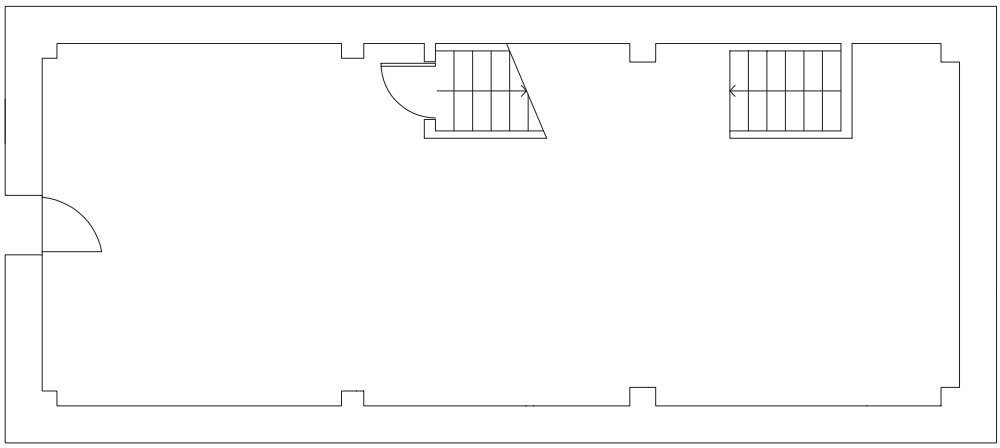
Rincón de Ademuz Village Torrealta House TA1 Floor 0 1 2 3



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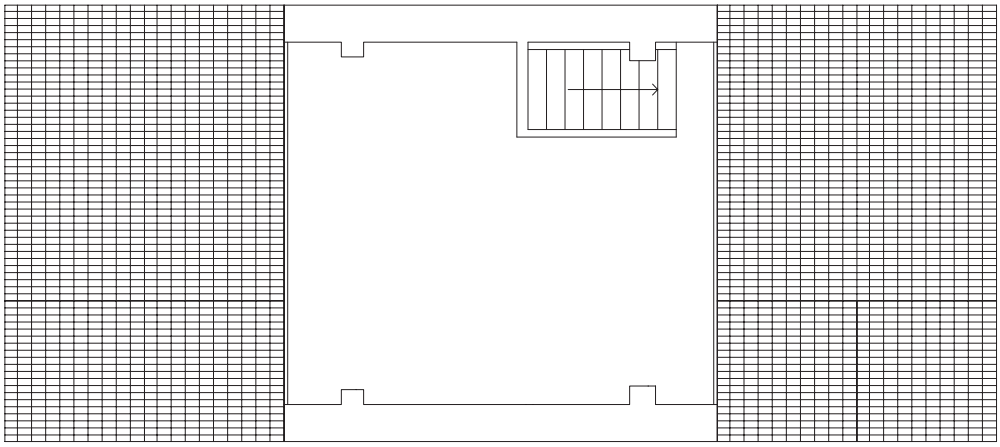
Rincón de Ademuz Village Torrealta House TA1 Floor 0 1 2 3



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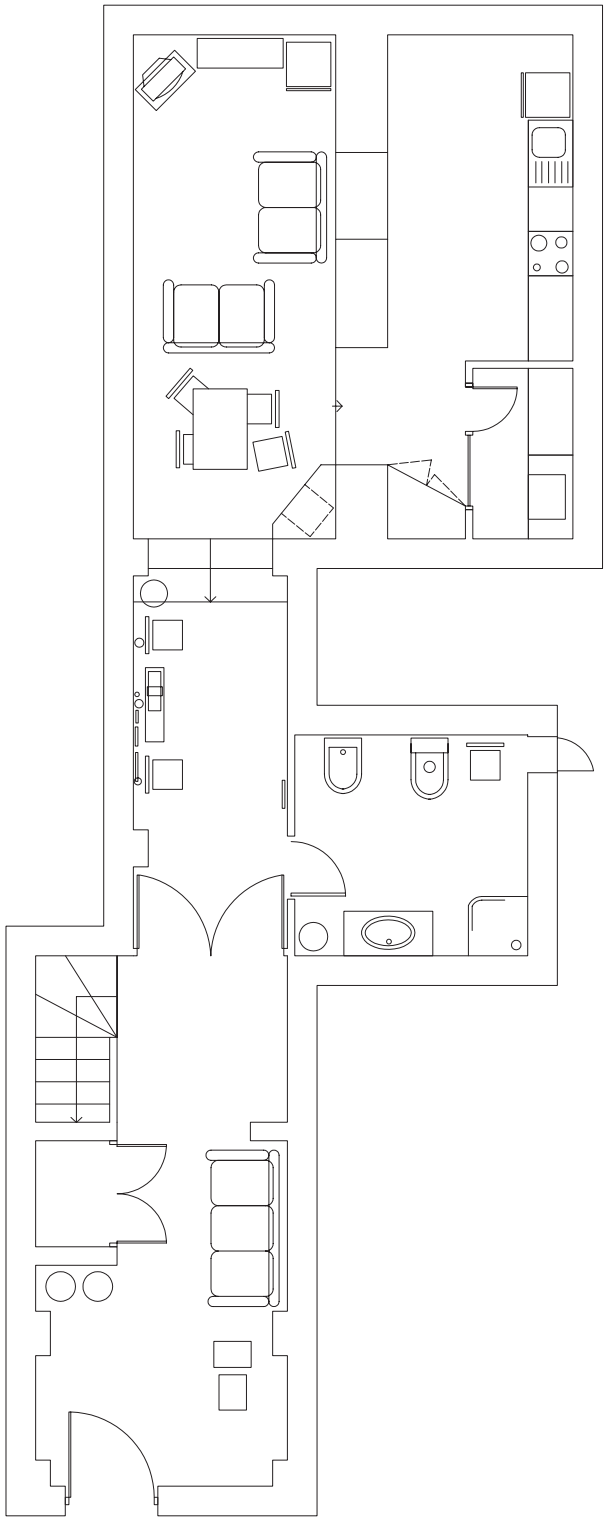
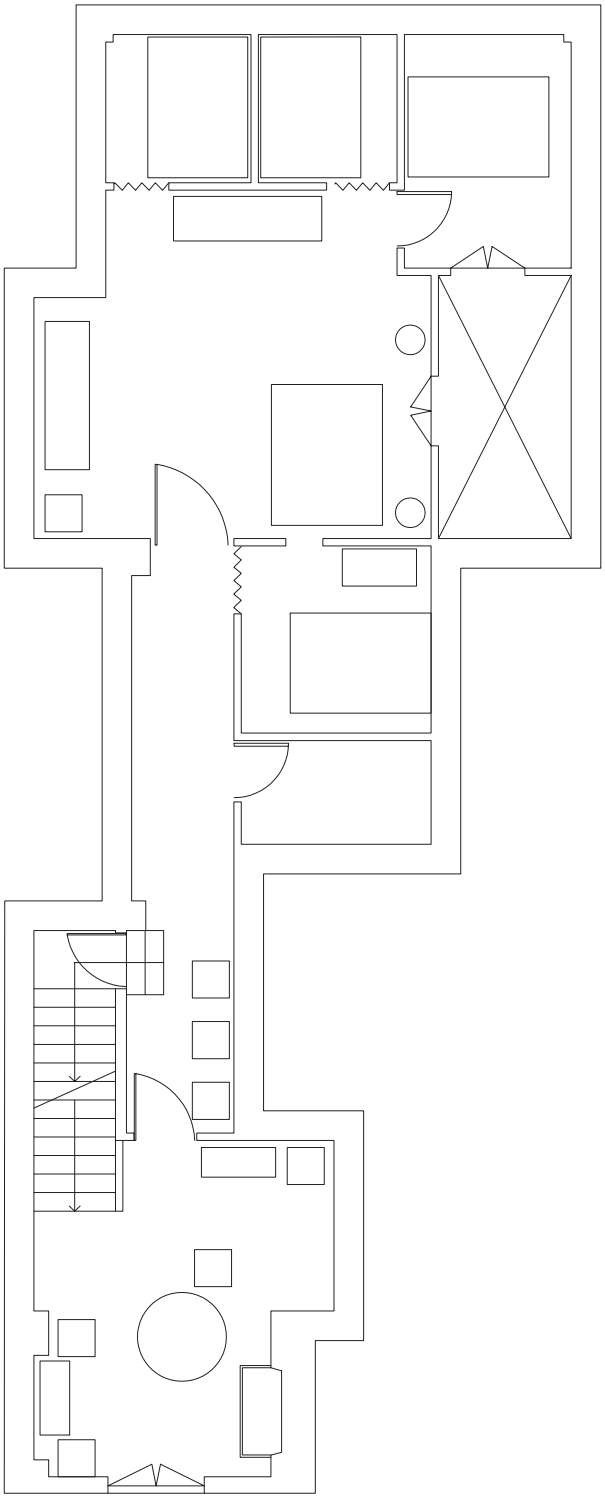
Rincón de Ademuz Village Torrealta House TA1 Floor 0 1 2 3



Rincón de Ademuz

Village Torrealta House TA2 Floor 0 1 2



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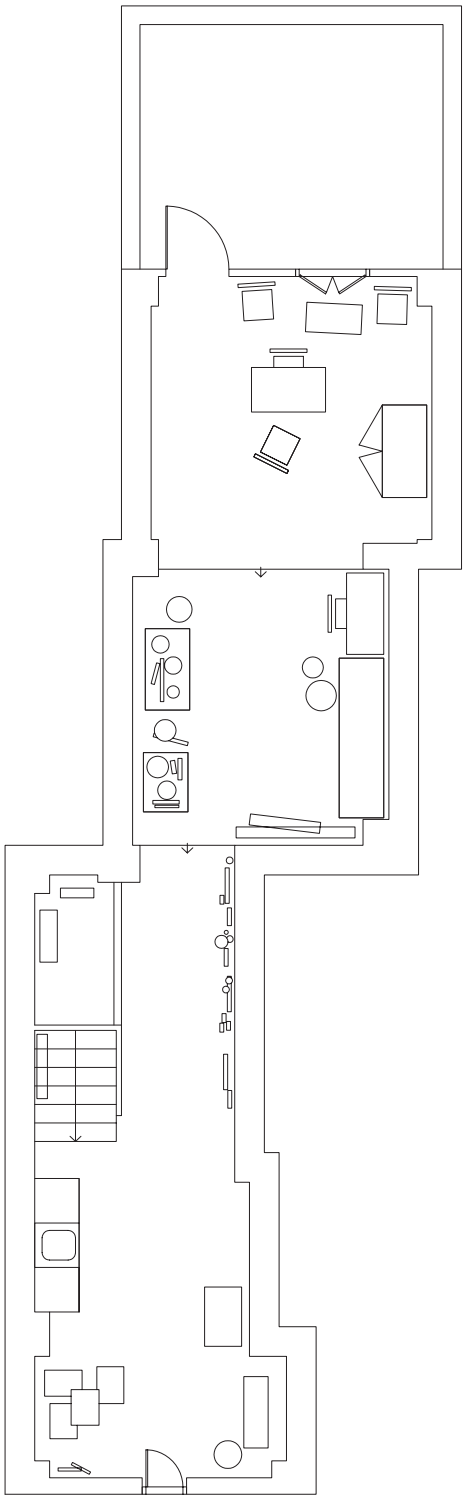
Rincón de Ademuz

Village Torrealta House TA2 Floor 0 1 2



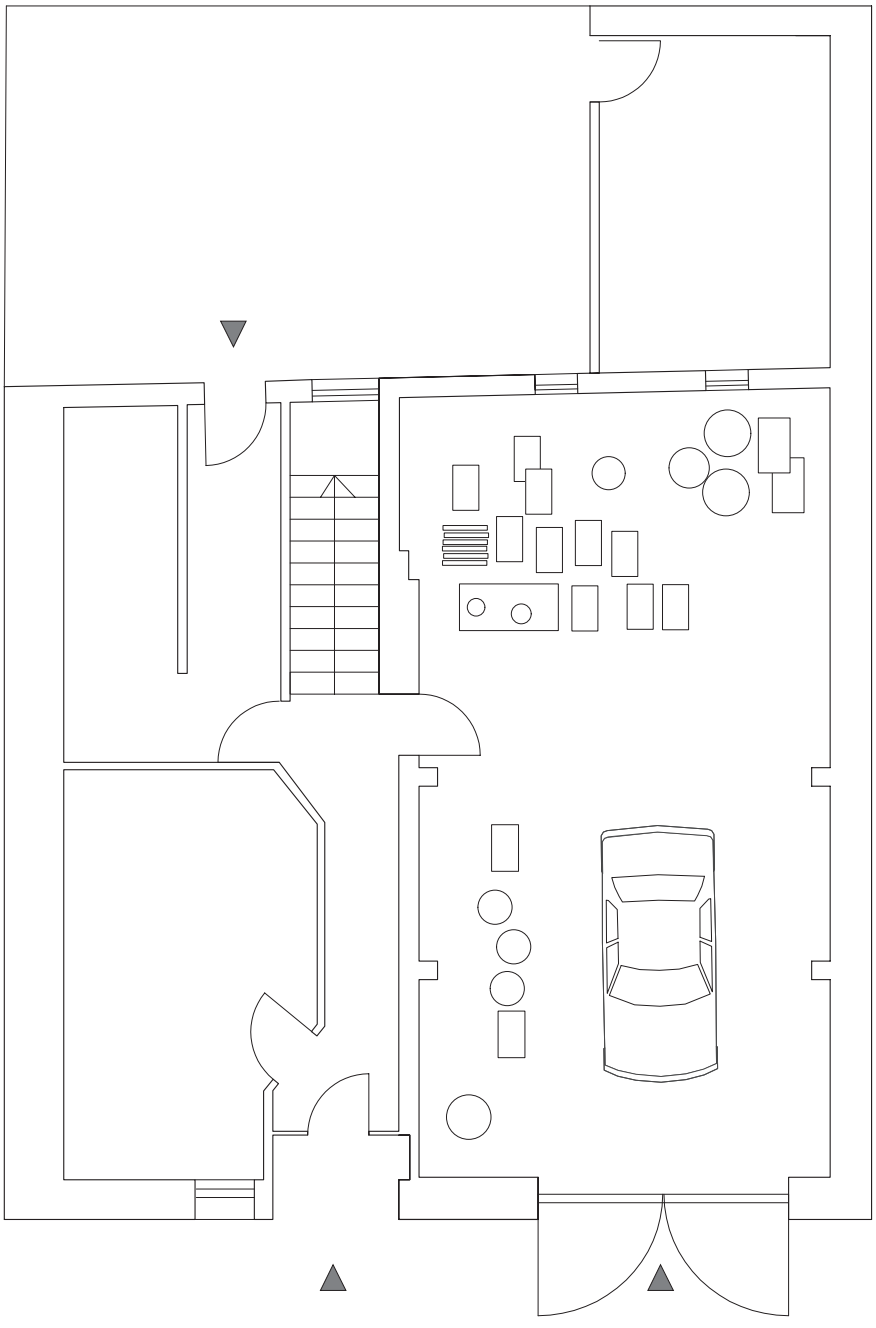
0 1 3 5m

N

Rincón de Ademuz

Village Torrealta House TA2 Floor 0 1 2


Torrebaja
Spain
Rincón de Ademuz
Rincón de Ademuz
Valencia
Turia River
Torrebaja
TB4
TB1
TB2
TB3
TB5
TB9
TB8
TB7
TB6
0 10 50 100m
N



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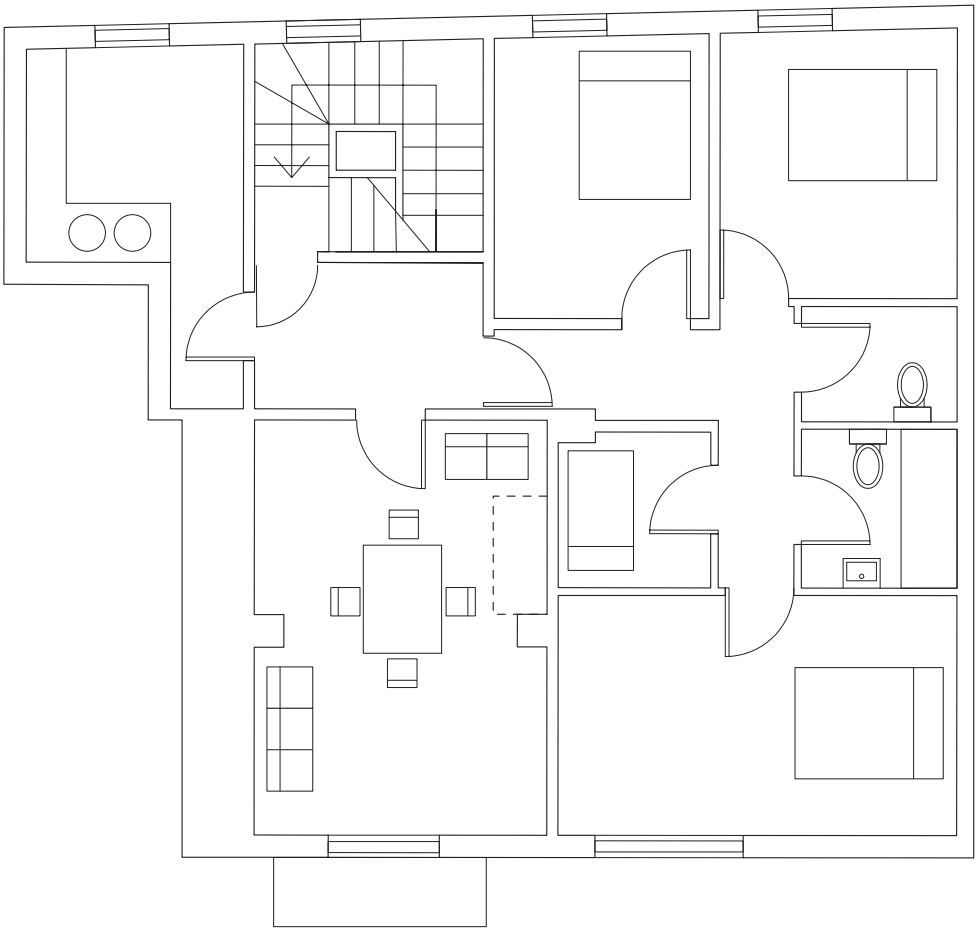
Rincón de Ademuz

Village Torrebaja House TB1 Floor 0 1 2



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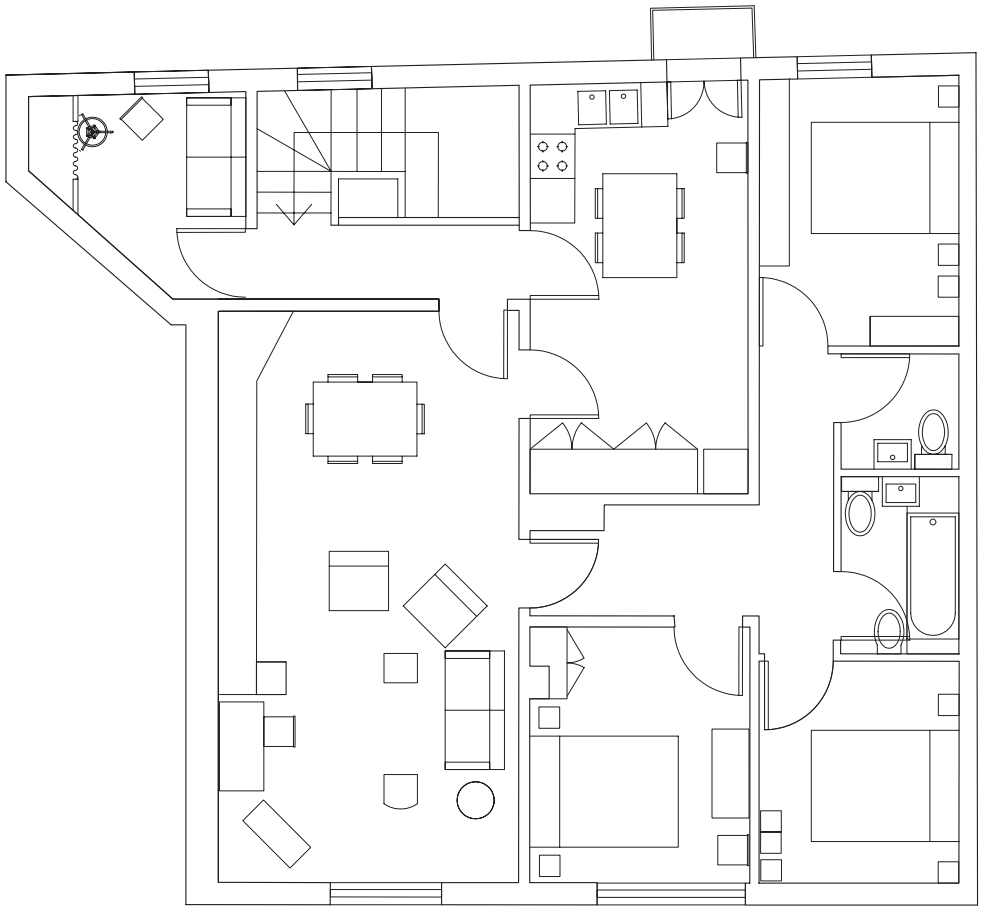
Rincón de Ademuz

Village Torrebaja House TB1 Floor 0 1 2



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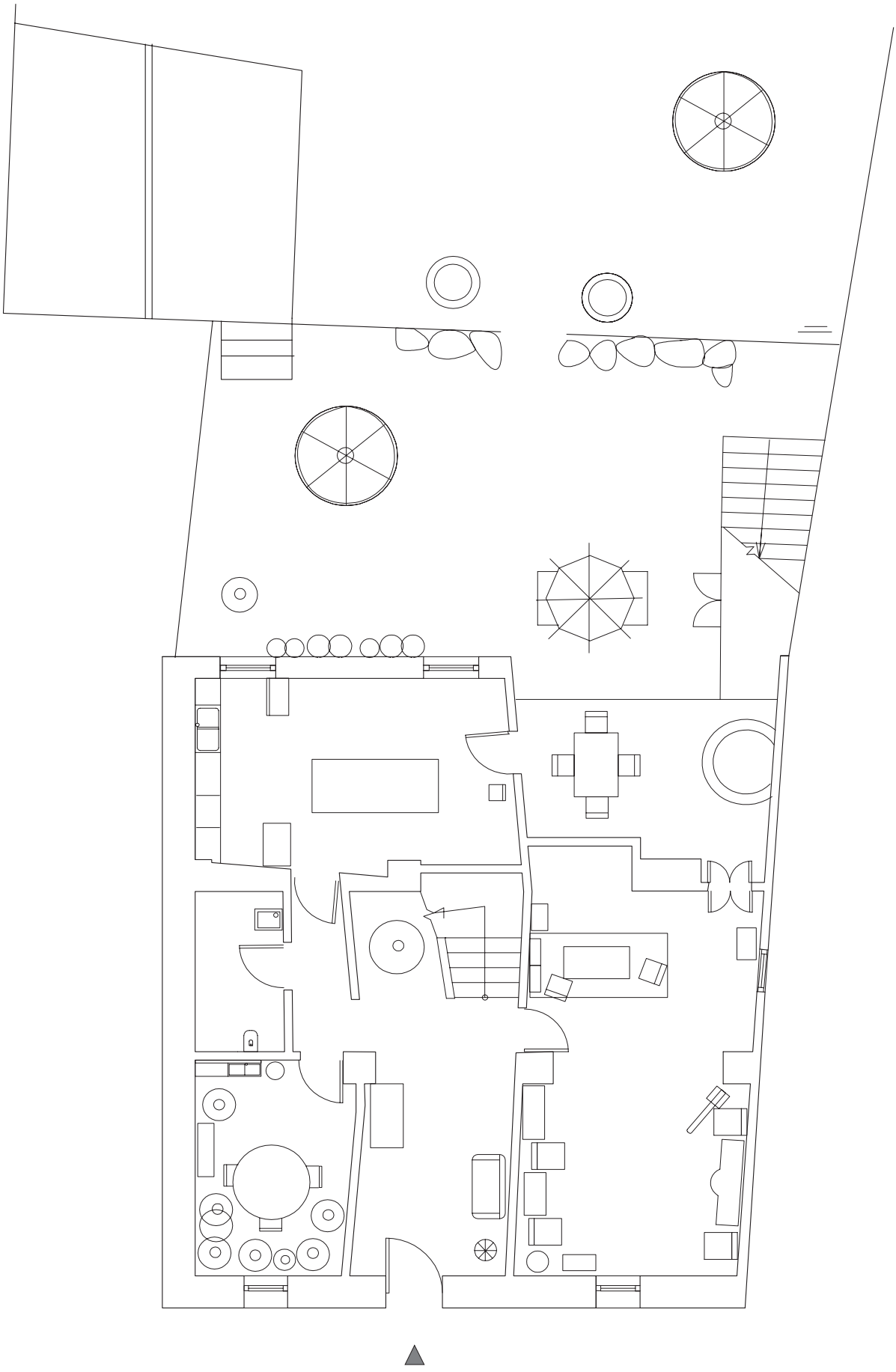
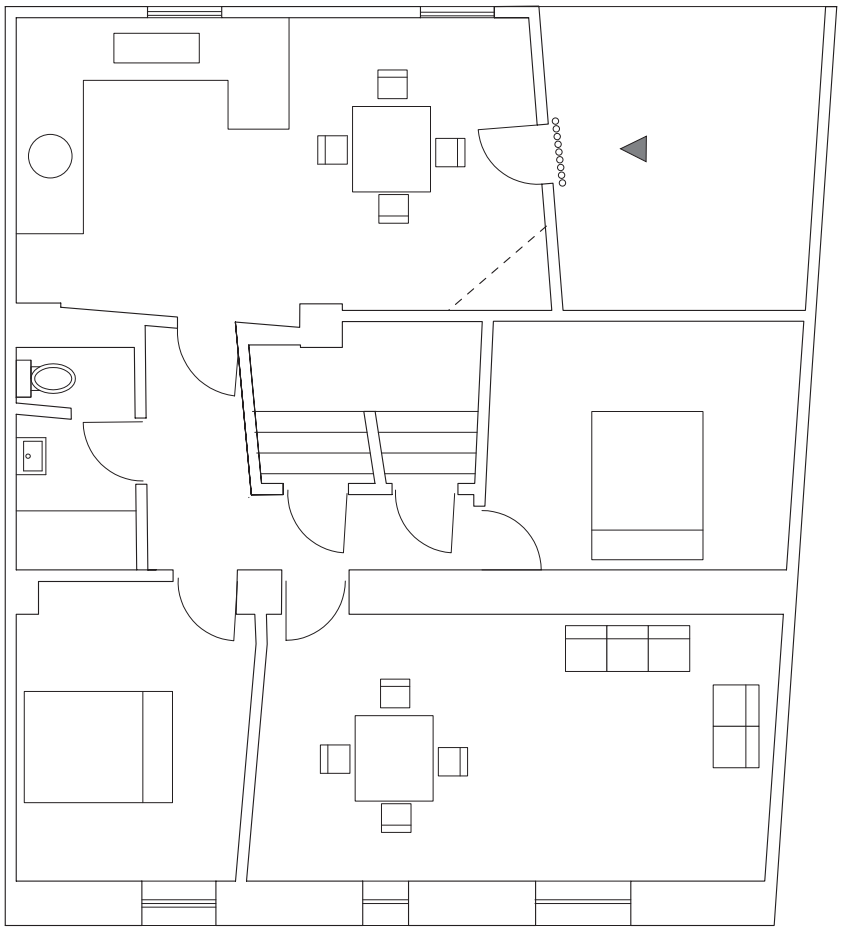
Rincón de Ademuz

Village Torrebaja House TB1 Floor 0 1 2



Rincón de Ademuz

Village Torrebaja House TB2 Floor 0 1 2 3



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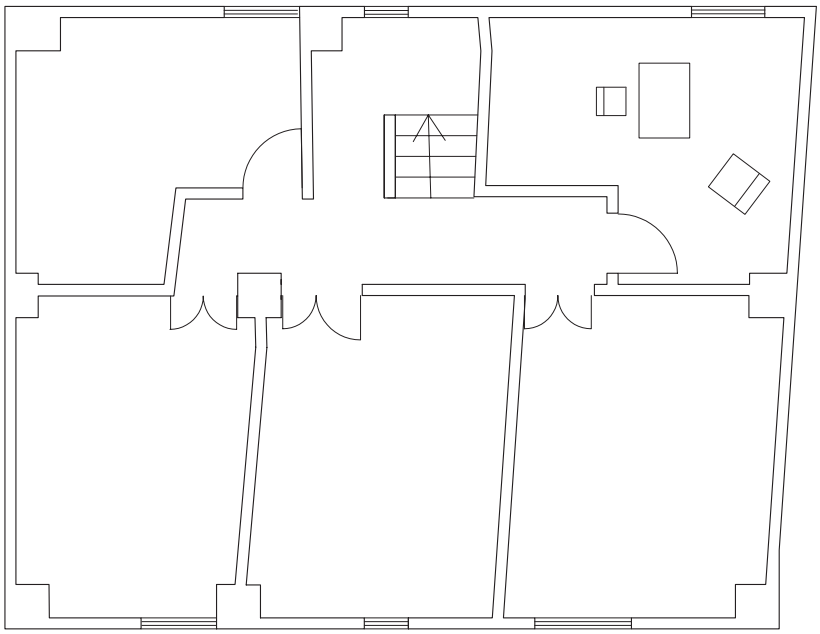
Rincón de Ademuz

Village Torrebaja House TB2 Floor 0 1 2 3



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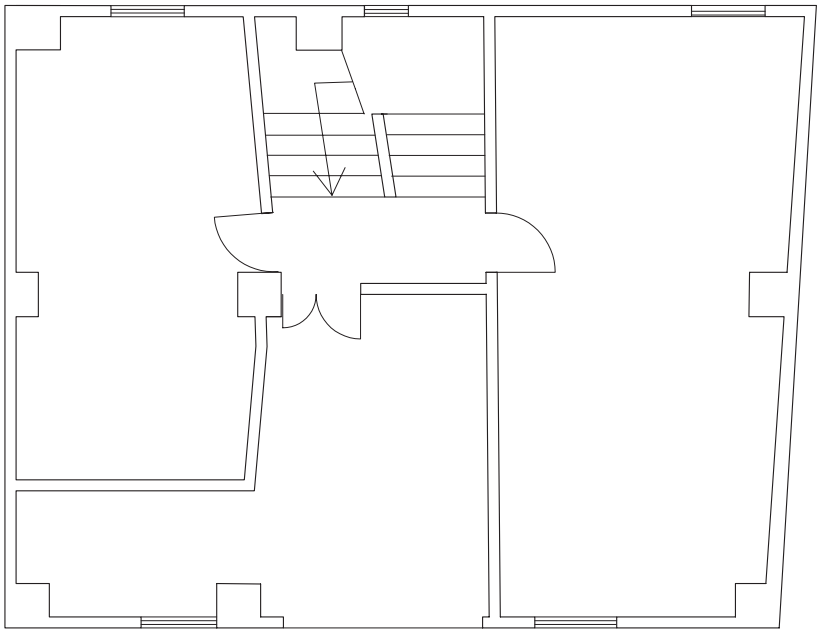
Rincón de Ademuz Village Torrebaja House TB2 Floor 0 1 **2** 3



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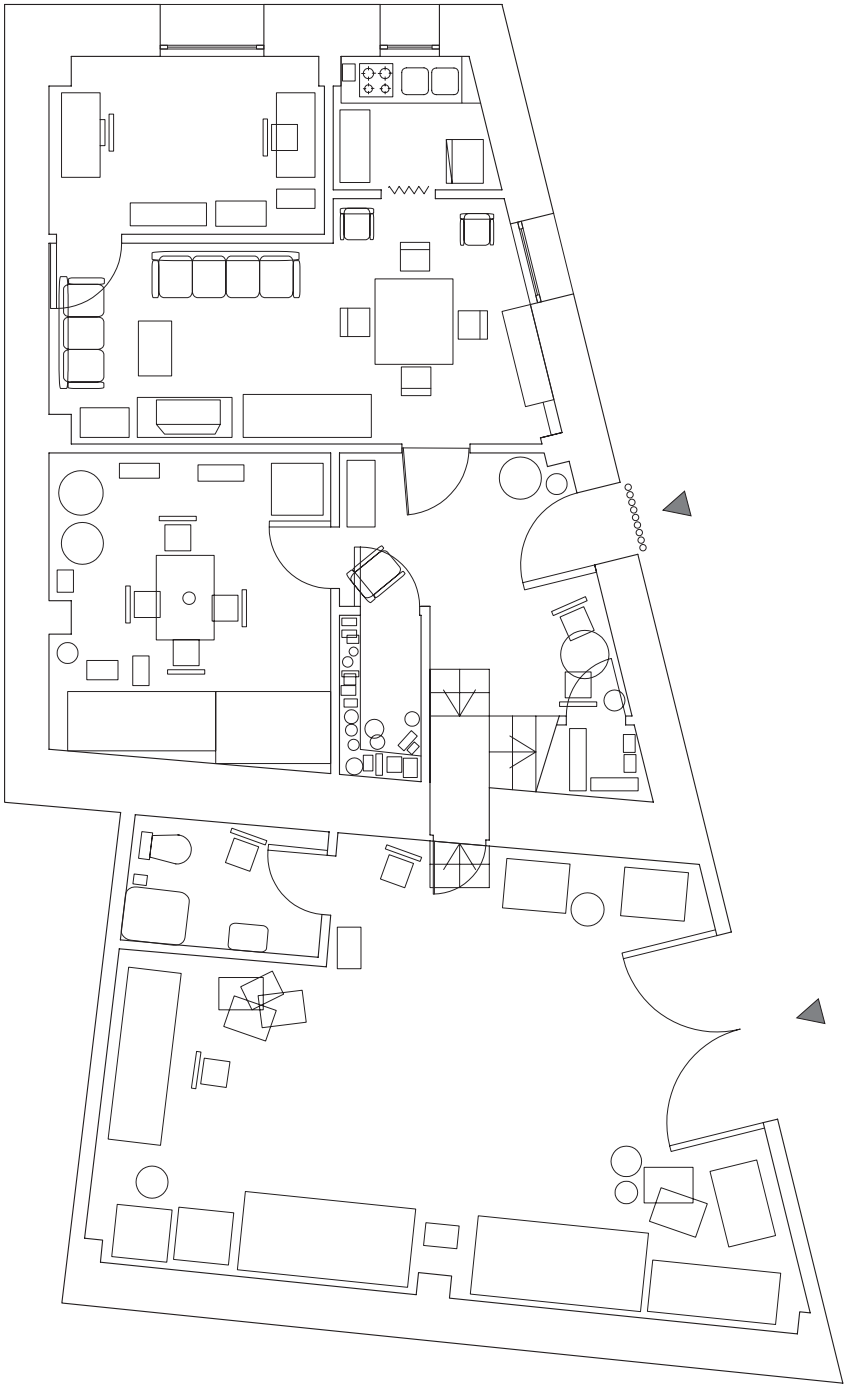
Rincón de Ademuz Village Torrebaja House TB2 Floor 0 1 2 **3**



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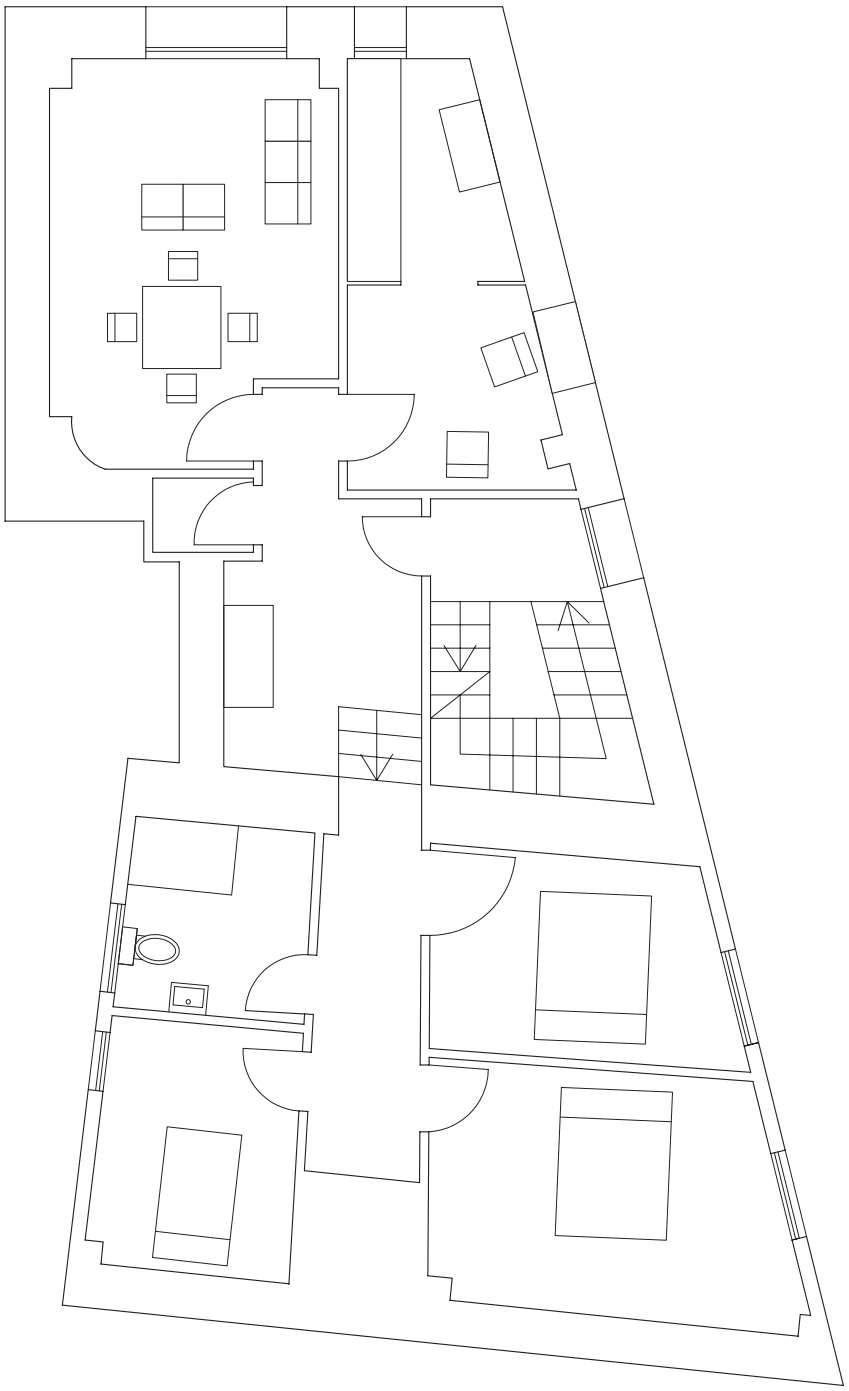
Rincón de Ademuz

Village Torrebaja House TB3 Floor 0 1 2 3



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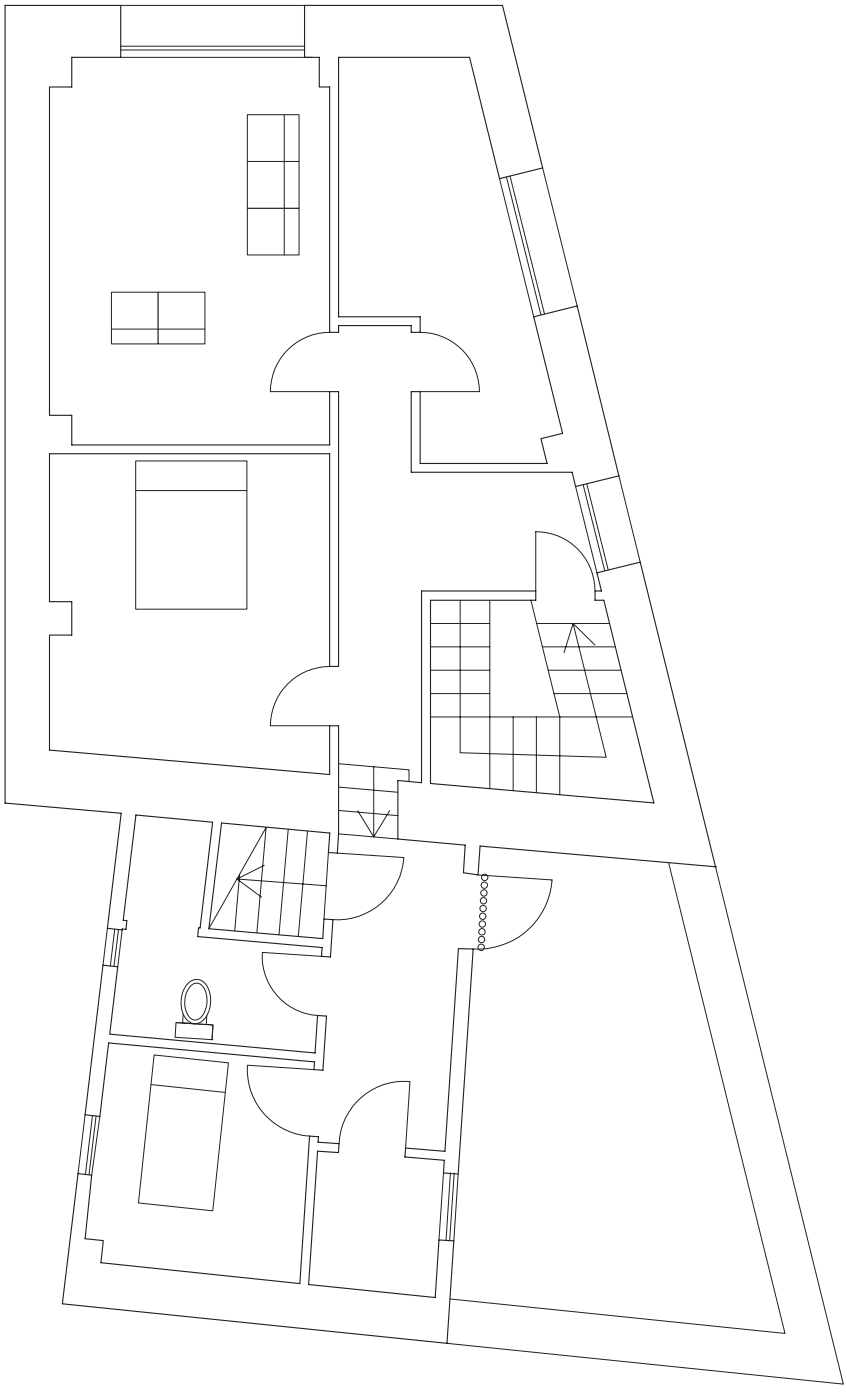
Rincón de Ademuz

Village Torrebaja House TB3 Floor 0 1 2 3



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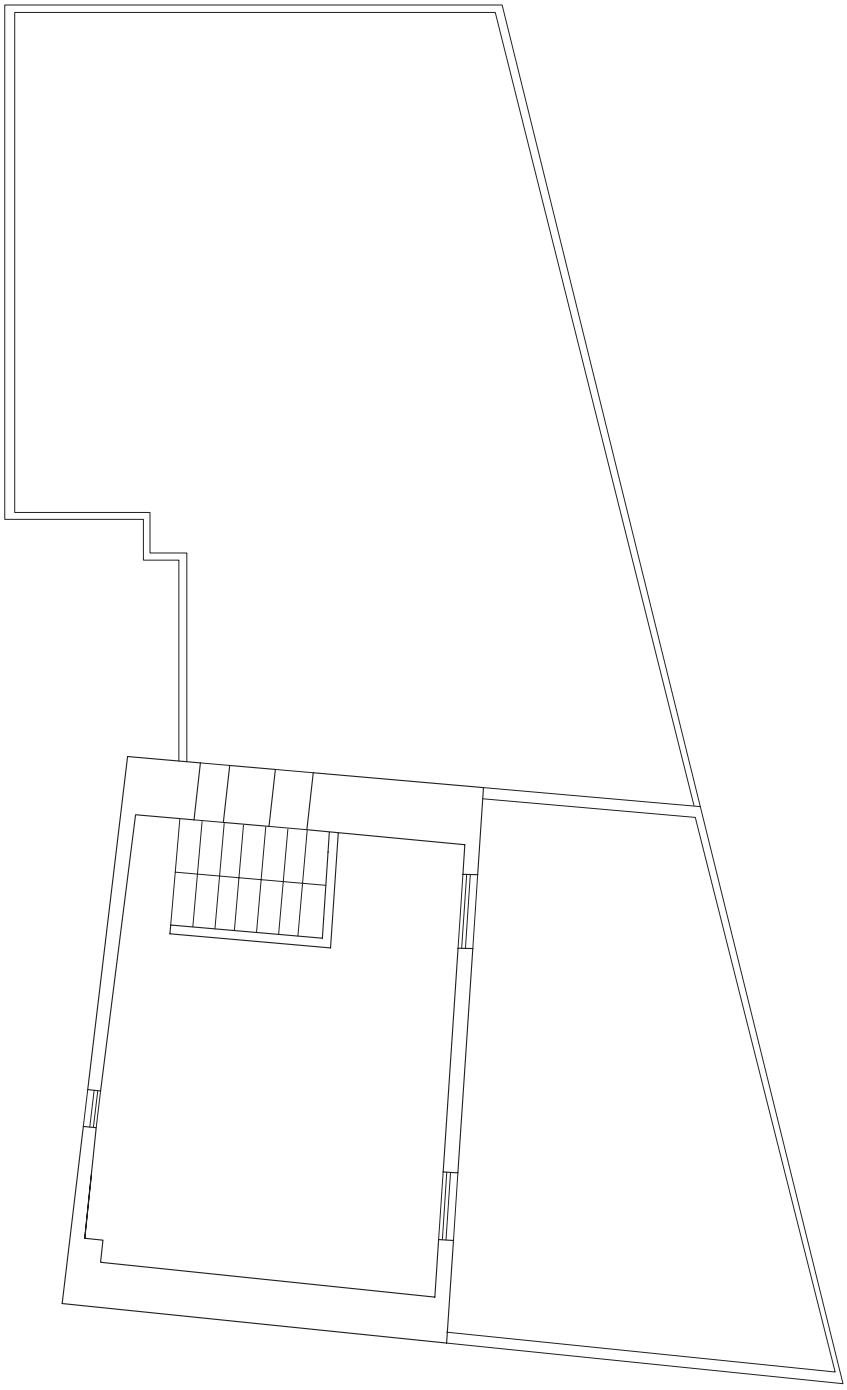
Rincón de Ademuz

Village Torrebaja House TB3 Floor 0 1 2 3



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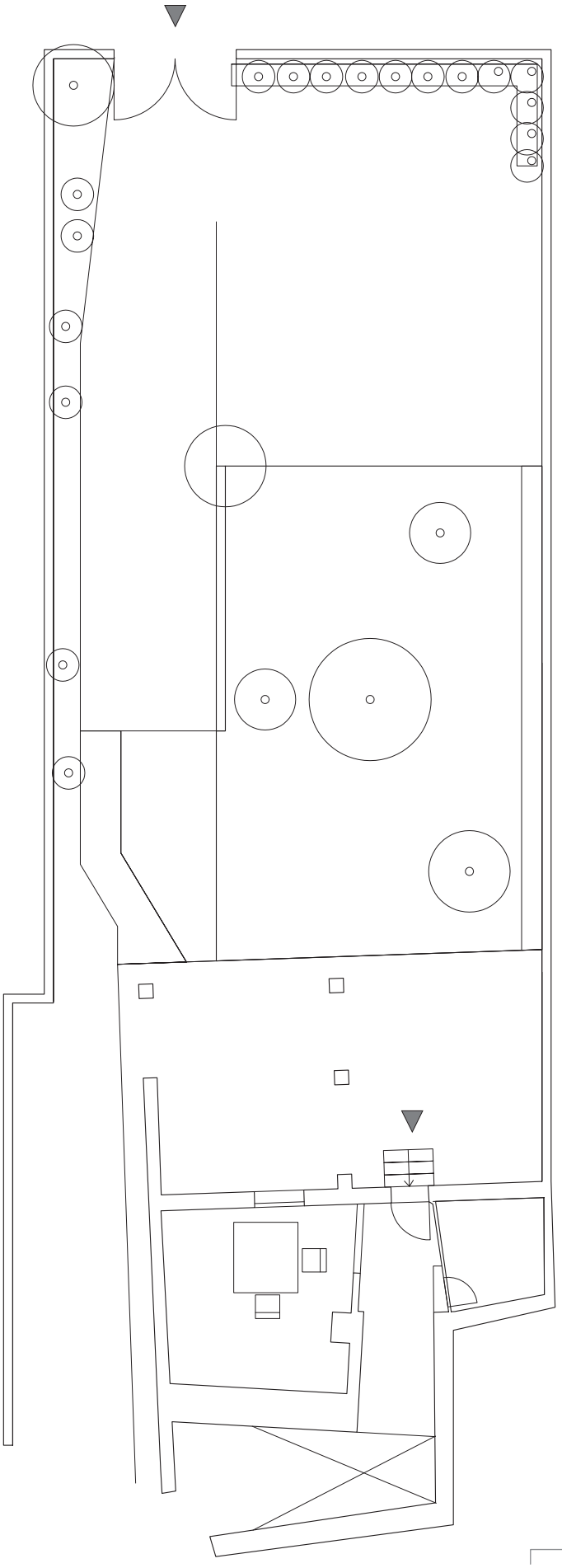
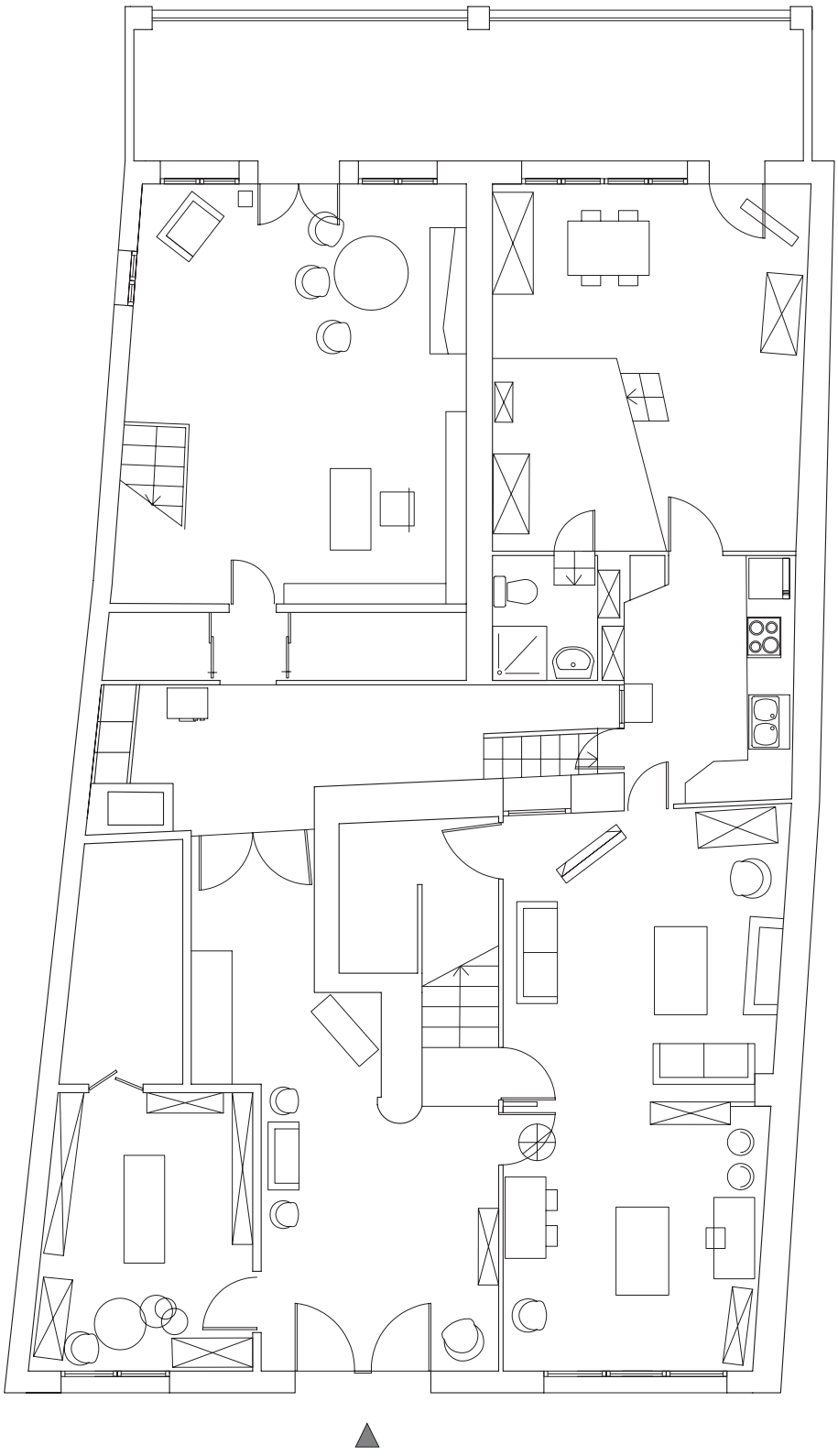
Rincón de Ademuz

Village Torrebaja House TB3 Floor 0 1 2 3



Rincón de Ademuz

Village Torrebaja House TB4 Floor -1 0 1 2



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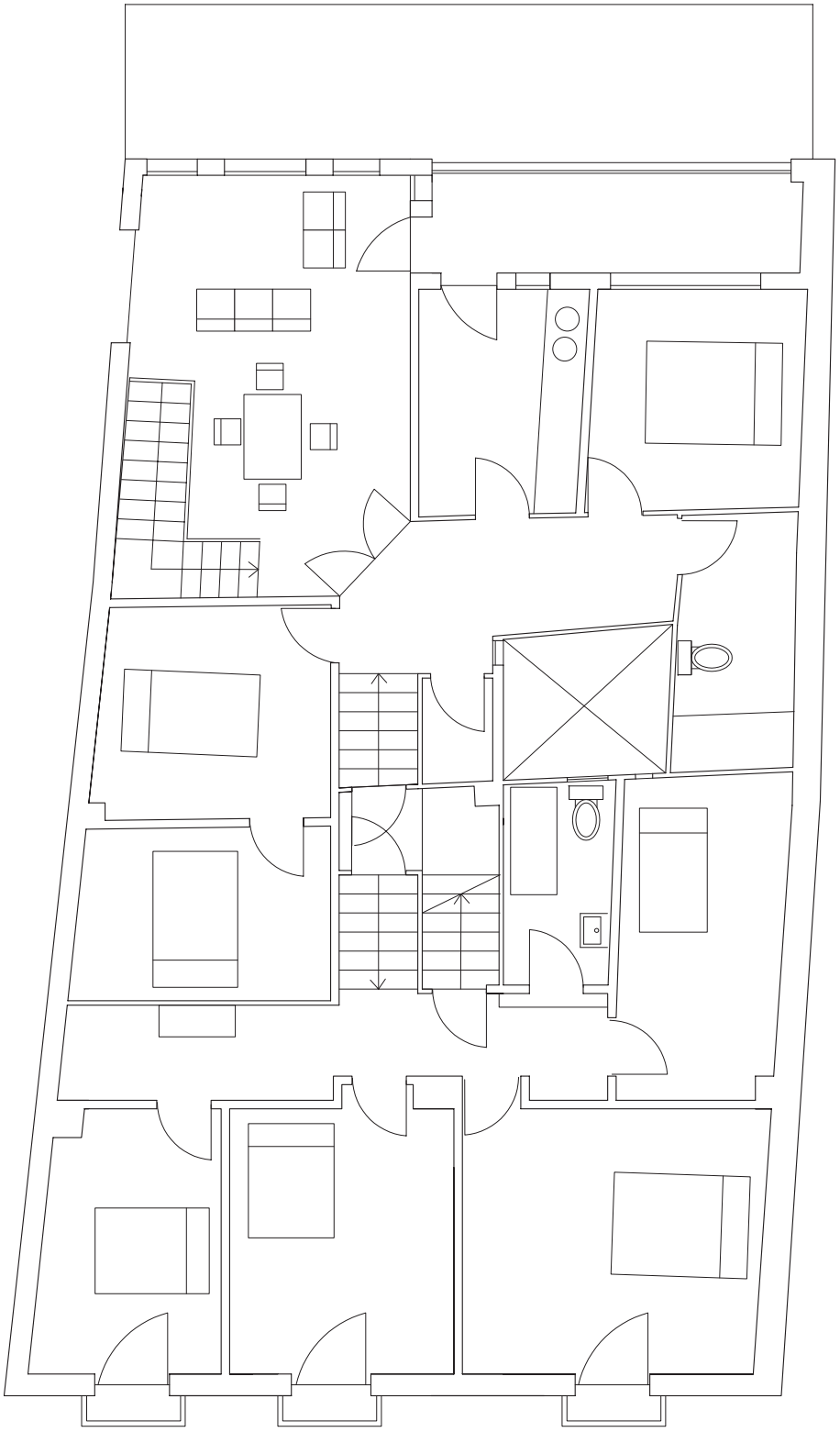
Rincón de Ademuz

Village Torrebaja House TB4 Floor -1 0 1 2



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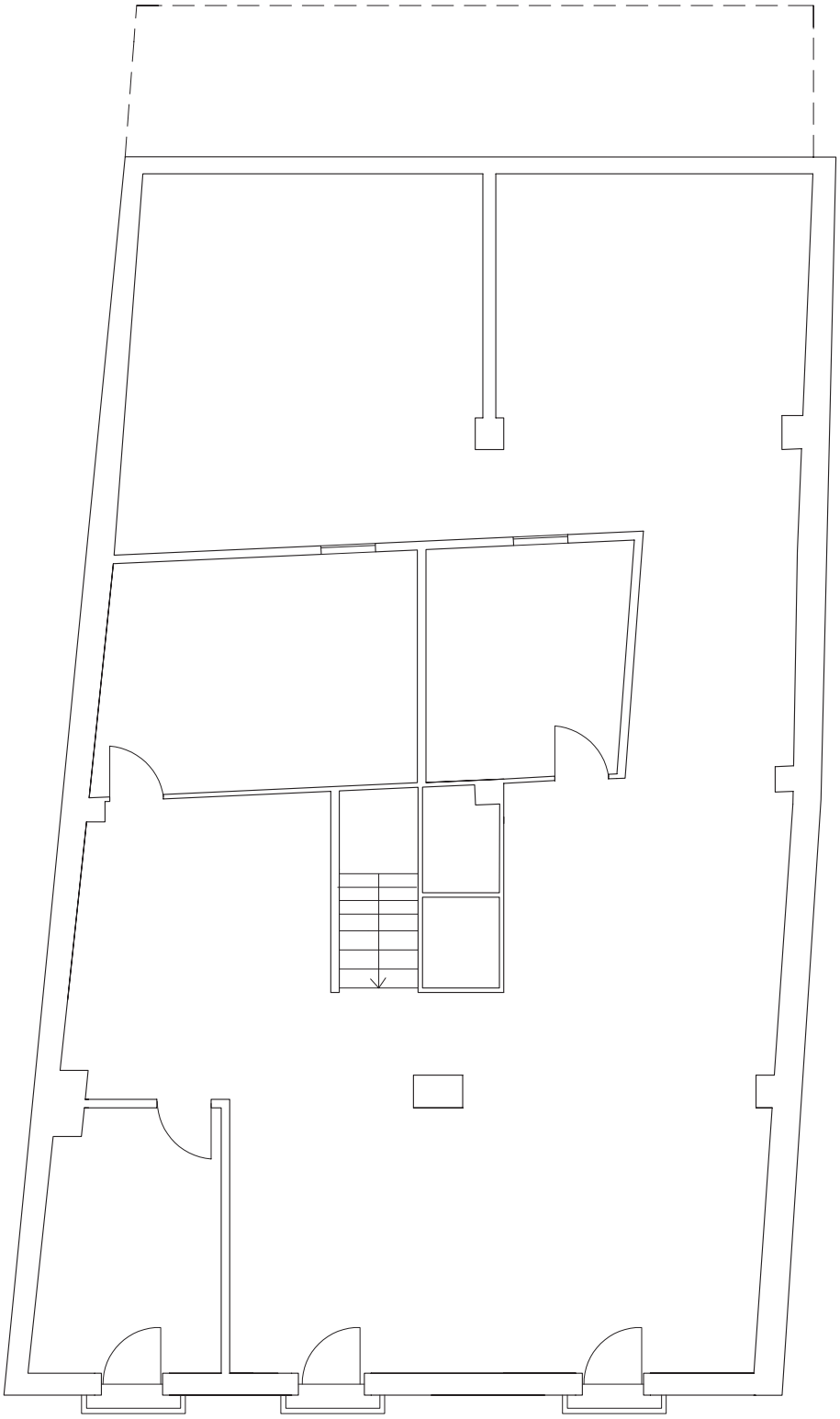
Rincón de Ademuz

Village Torrebaja House TB4 Floor -1 0 1 2



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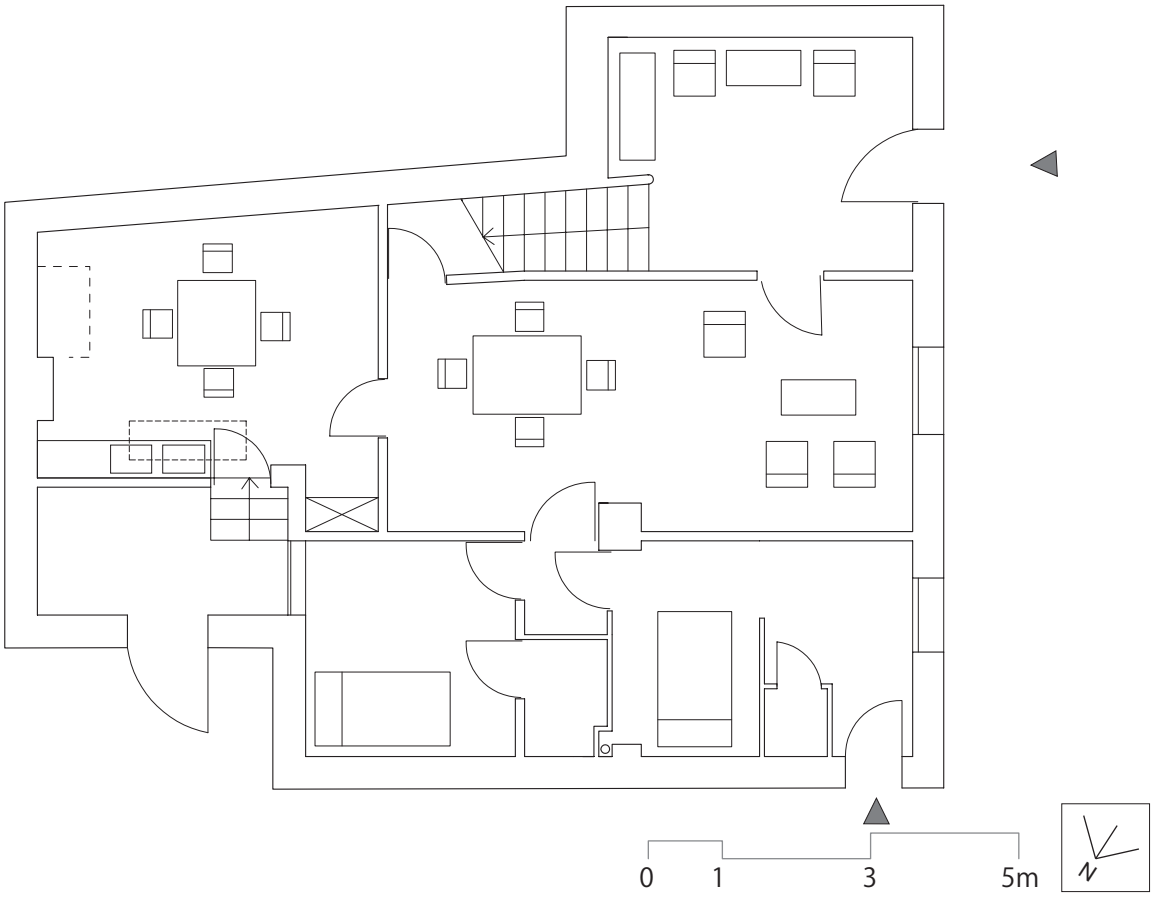
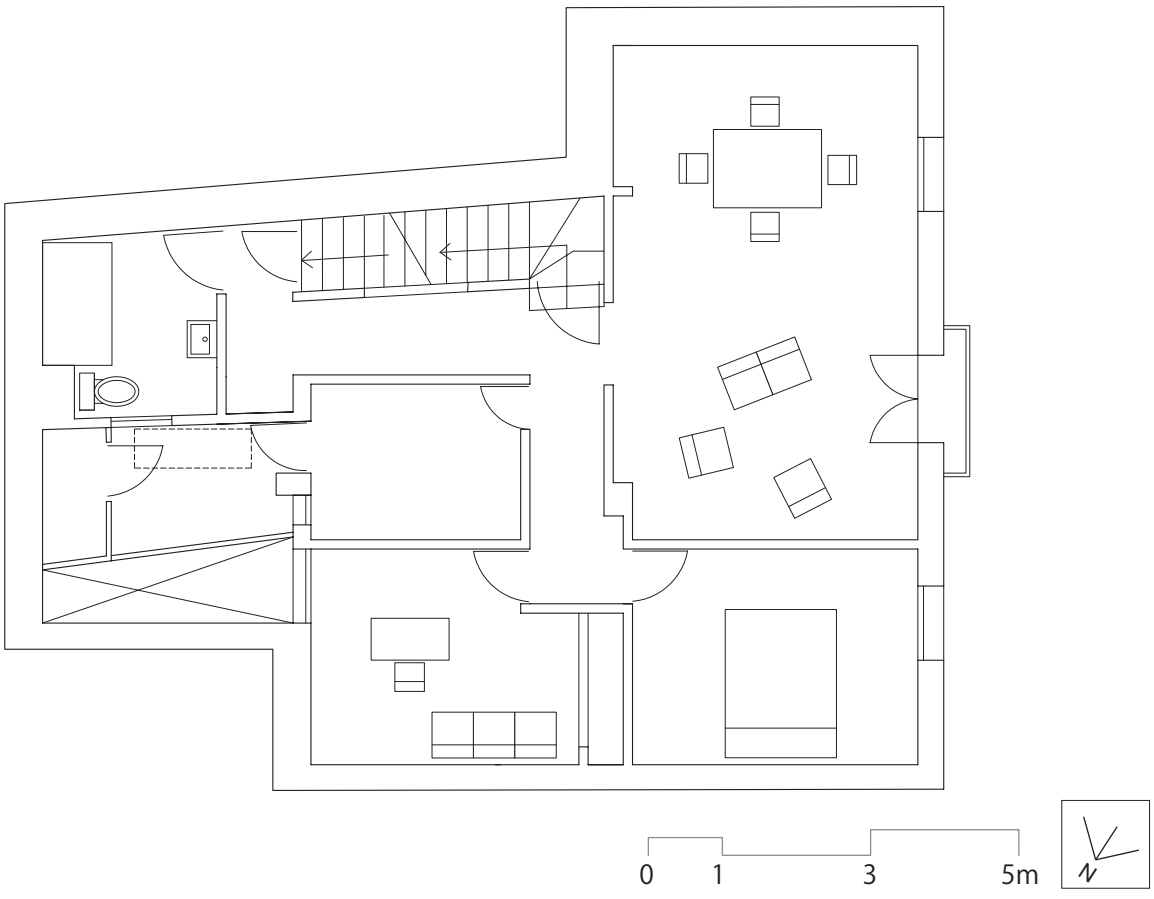
Rincón de Ademuz

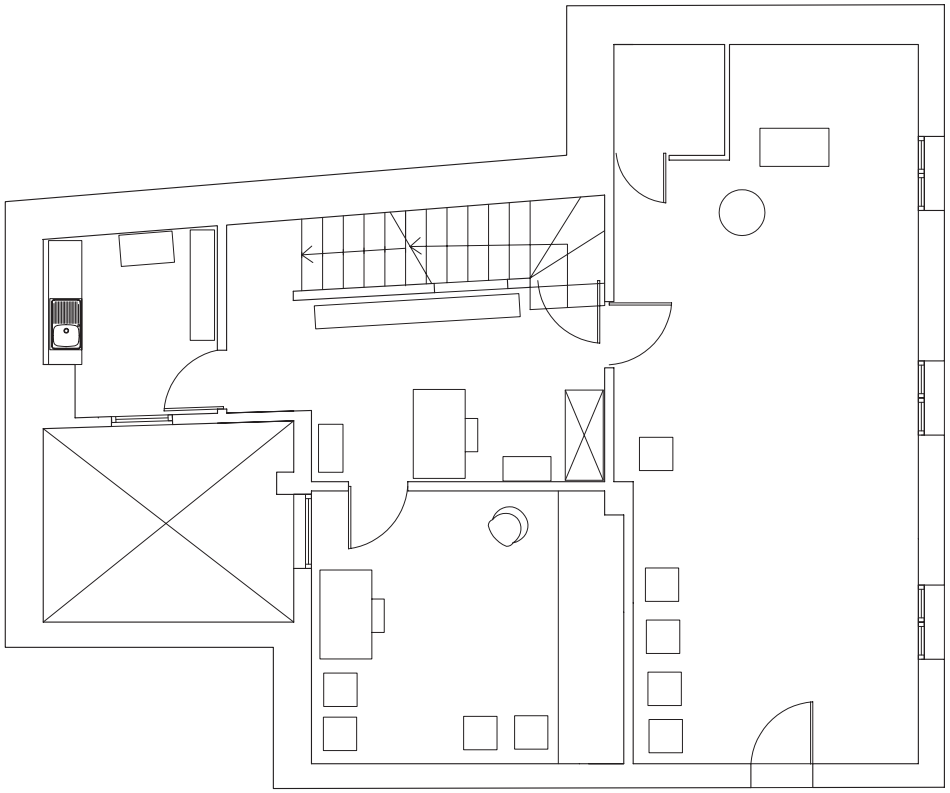
Village Torrebaja House TB4 Floor -1 0 1 2



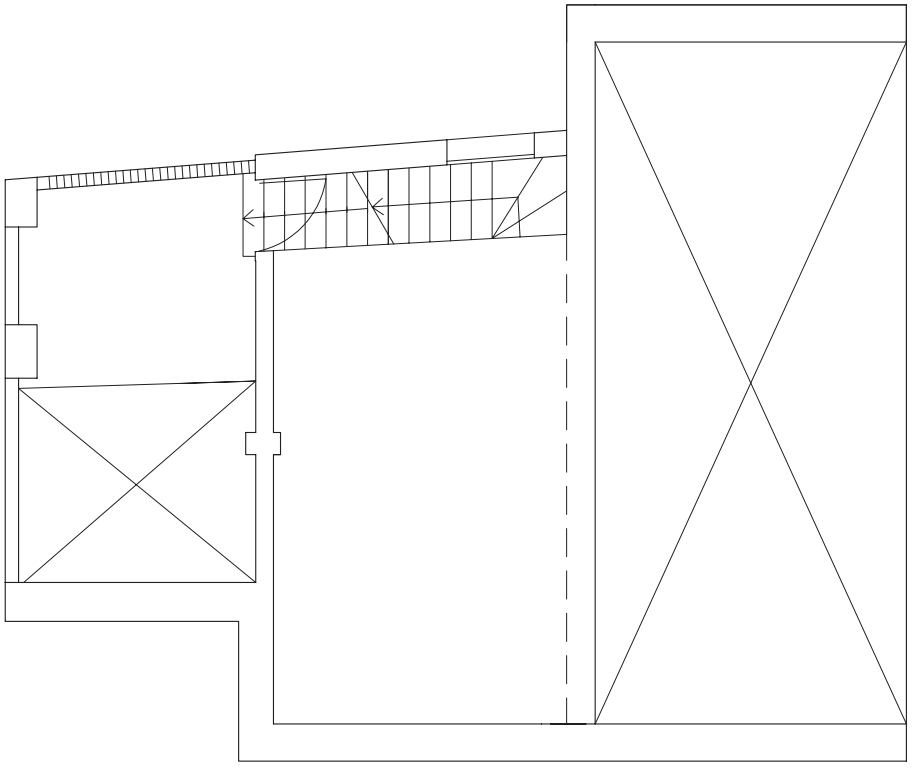
Rincón de Ademuz Village Torrebaja House TB5 Floor 0 1 2 3



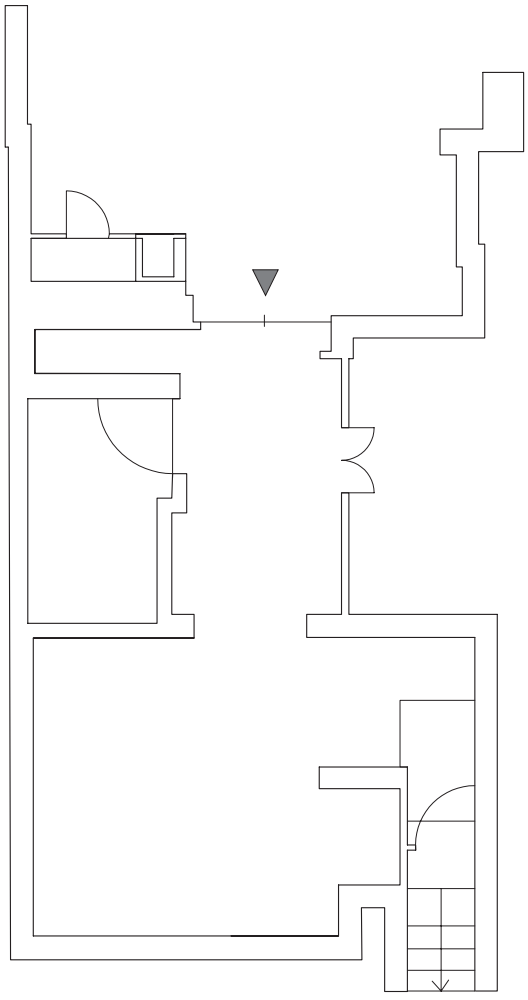
Rincón de Ademuz Village Torrebaja House TB5 Floor 0 1 2 3



Rincón de Ademuz Village Torrebaja House TB5 Floor 0 1 **2** 3



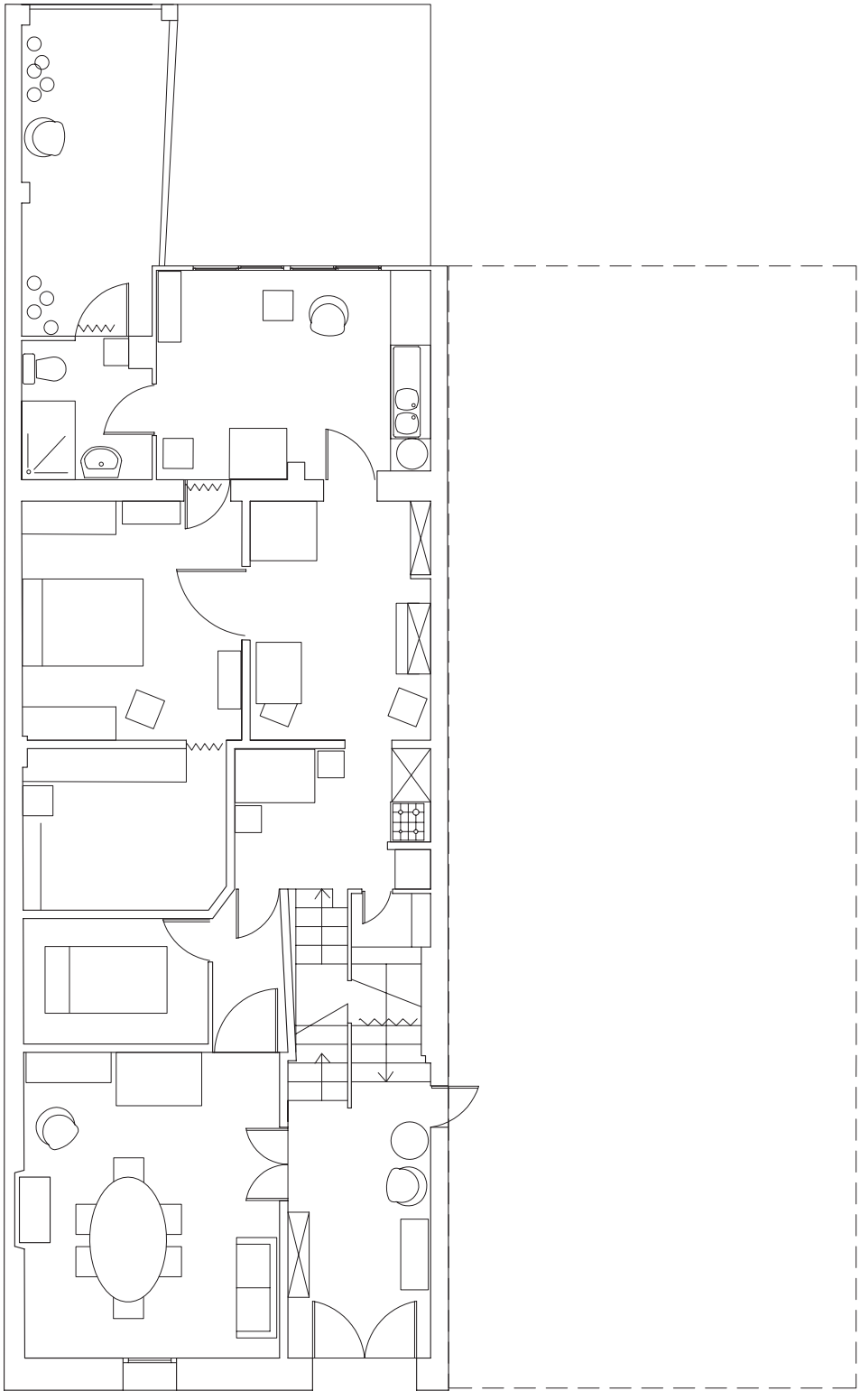
Rincón de Ademuz Village Torrebaja House TB5 Floor 0 1 2 **3**



0 1 3 5m

Rincón de Ademuz

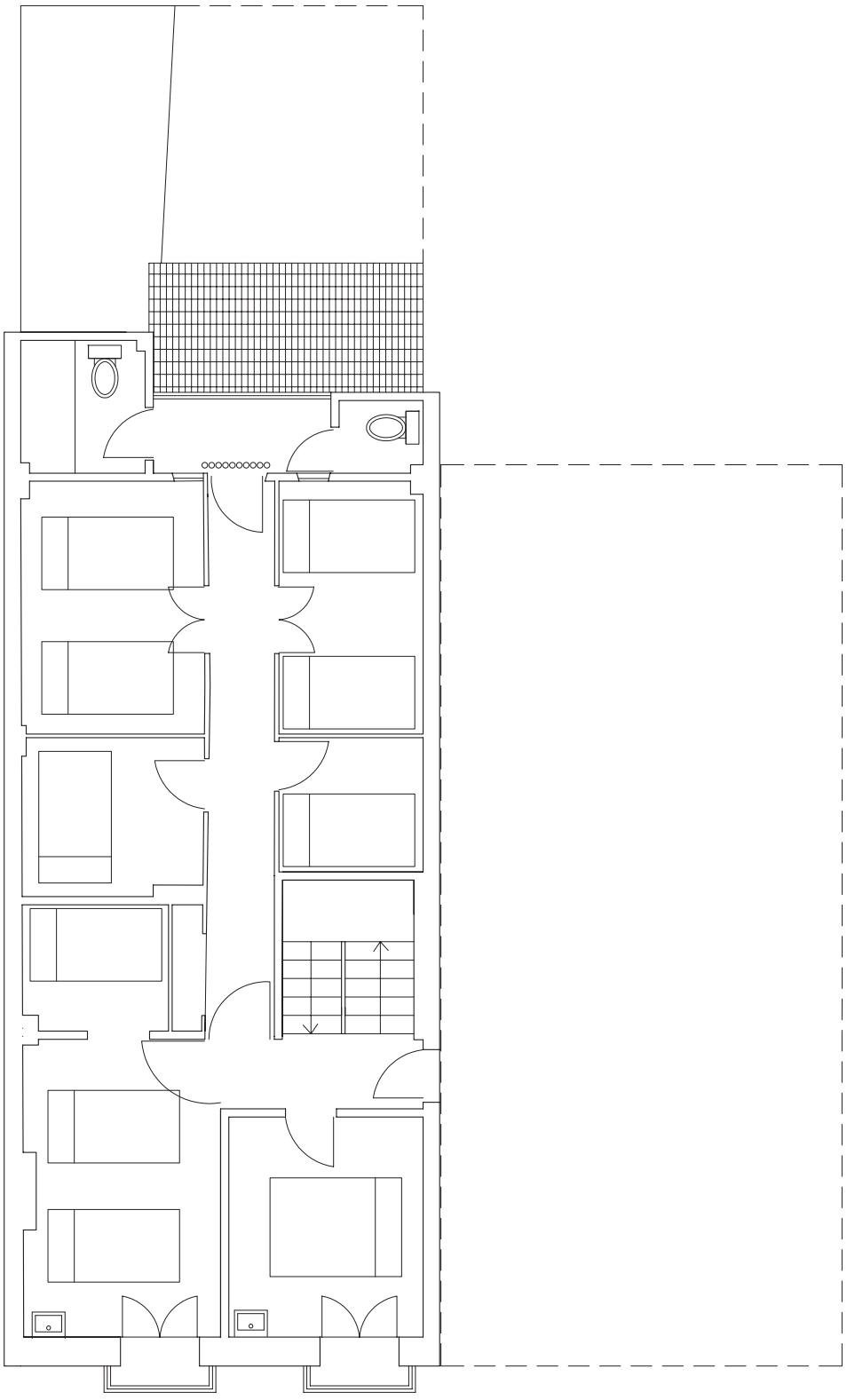
Village Torrebaja House TB6 Floor -1 0 1 2 3



0 1 3 5m

Rincón de Ademuz

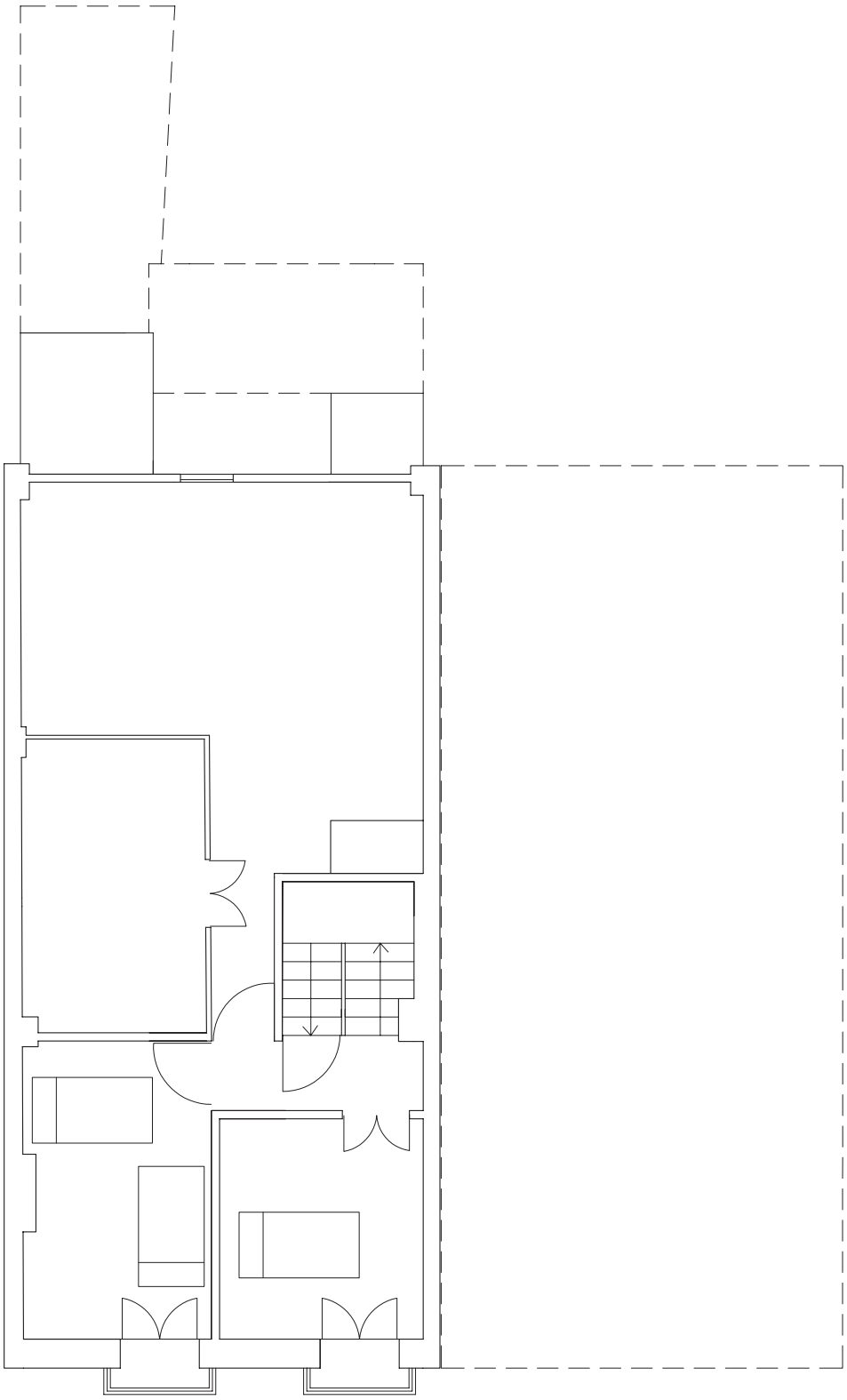
Village Torrebaja House TB6 Floor -1 0 1 2 3



0 1 3 5m

Rincón de Ademuz

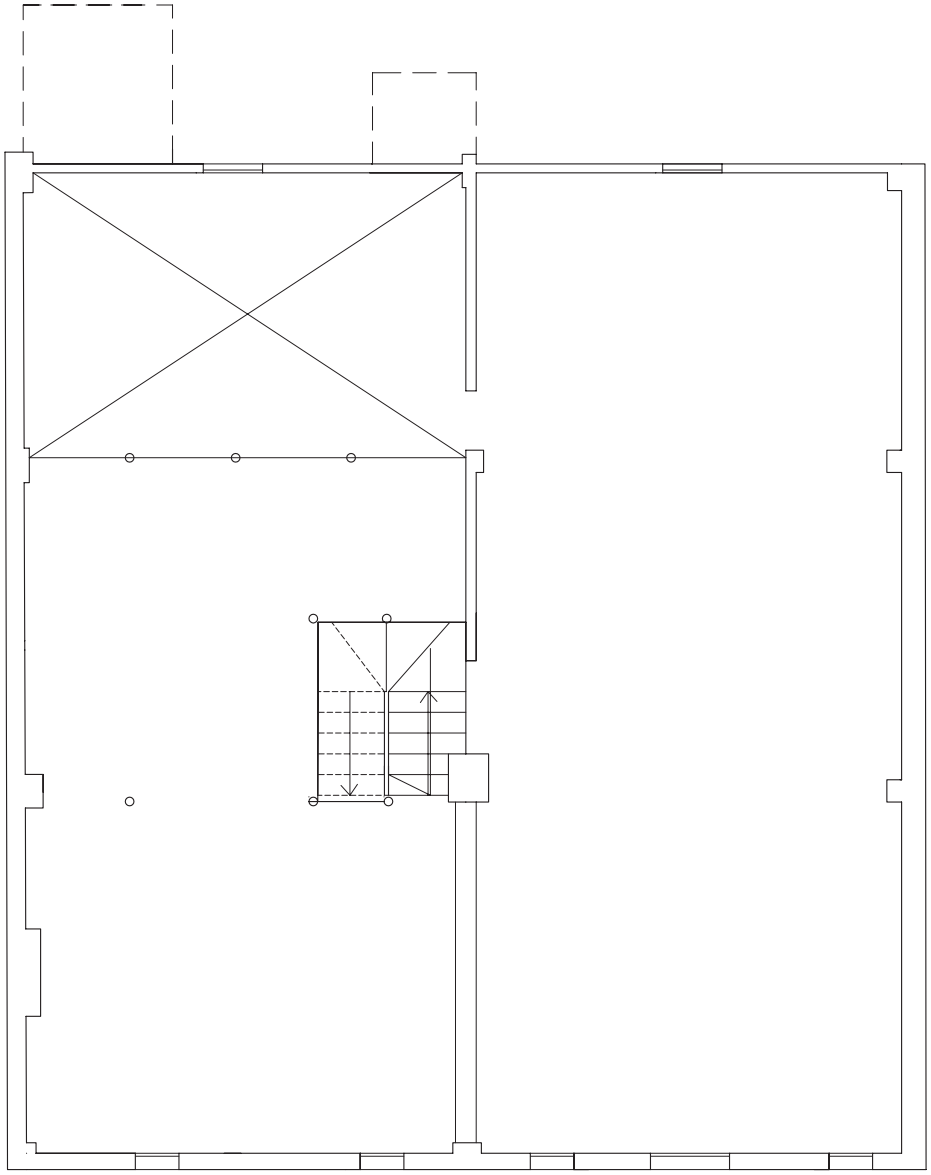
Village Torrebaja House TB6 Floor -1 0 **1** 2 3



0 1 3 5m

Rincón de Ademuz

Village Torrebaja House TB6 Floor -1 0 1 2 3



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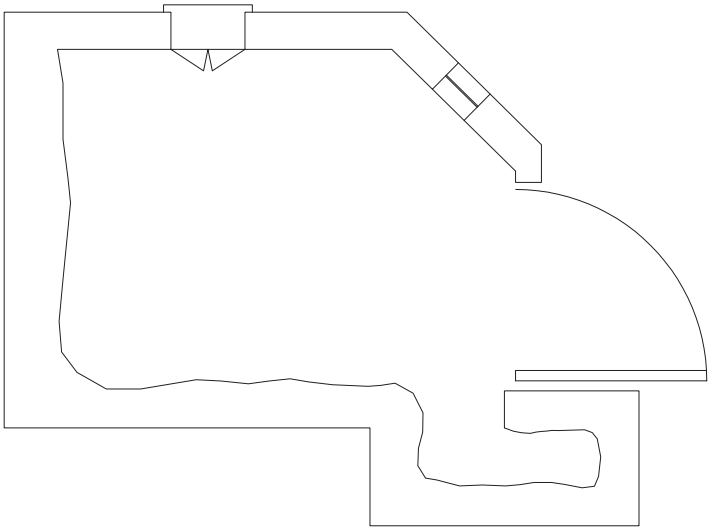
Rincón de Ademuz

Village Torrebaja House TB6 Floor -1 0 1 2 3



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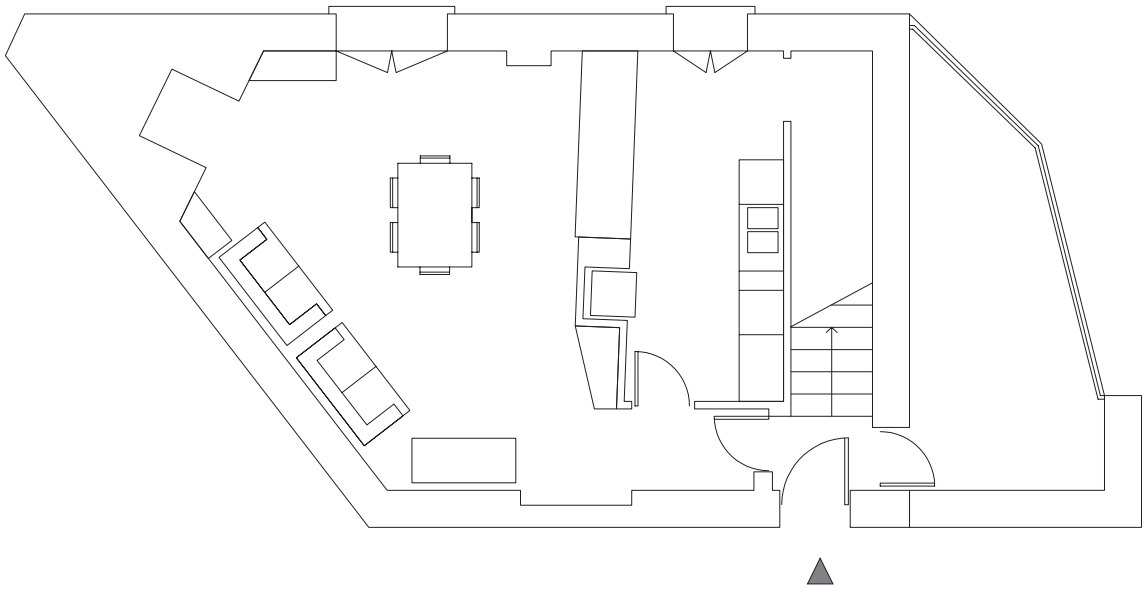
Rincón de Ademuz Village Torrebaja House TB7 Floor -1 0 1



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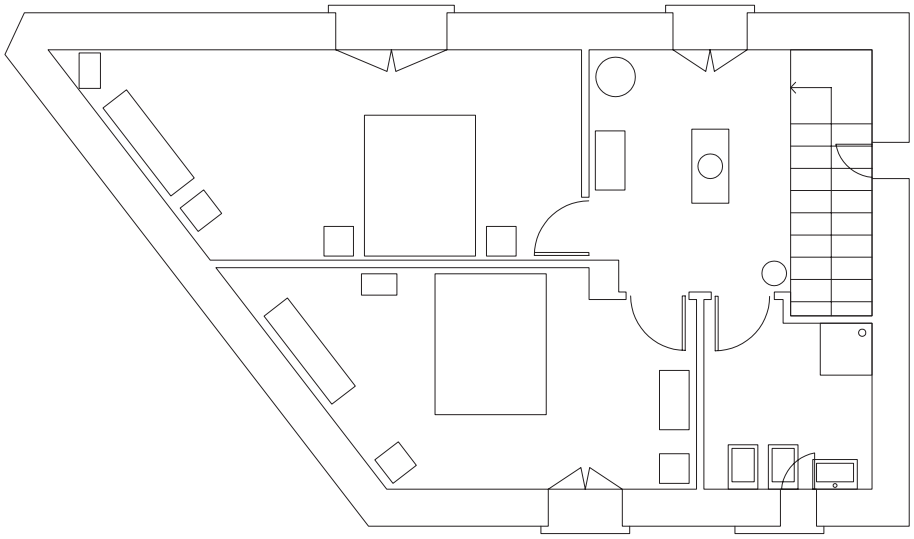

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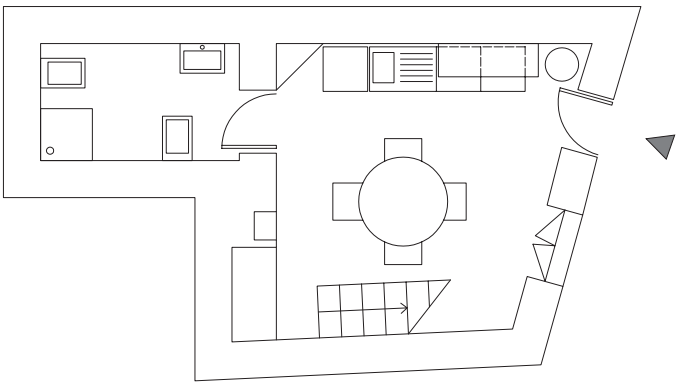
Rincón de Ademuz

Village Torrebaja House TB7 Floor -1 0 1



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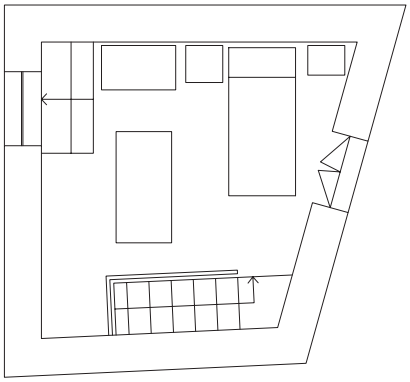

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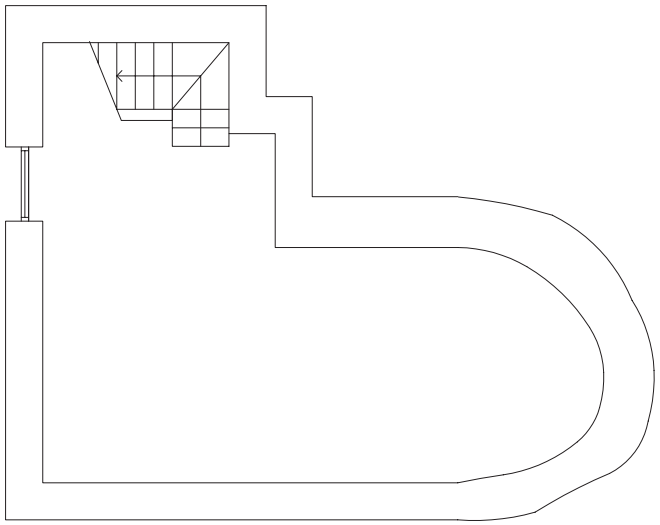
Rincón de Ademuz Village Torrebaja House TB8 Floor 0 1



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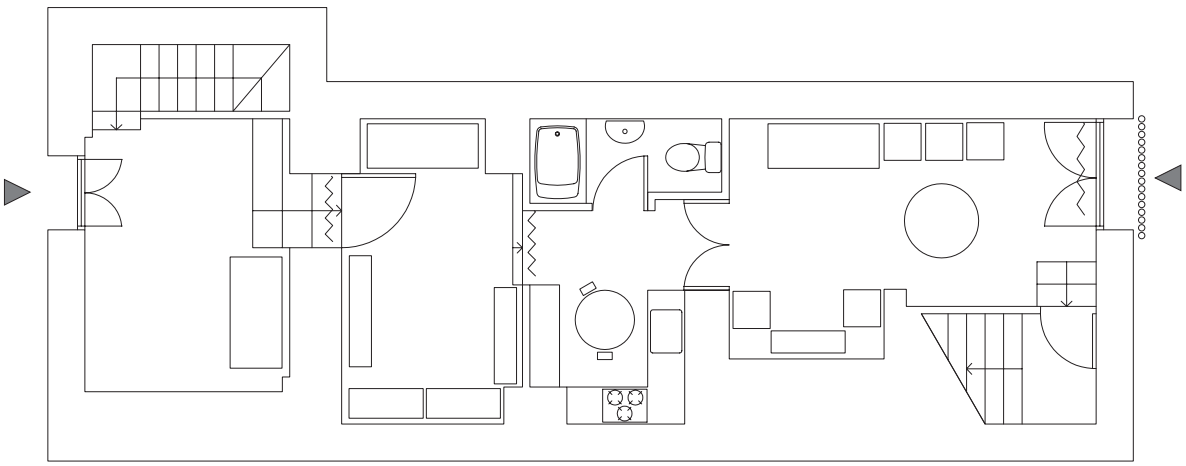
Rincón de Ademuz Village Torrebaja House TB9 Floor -1 0 1 2



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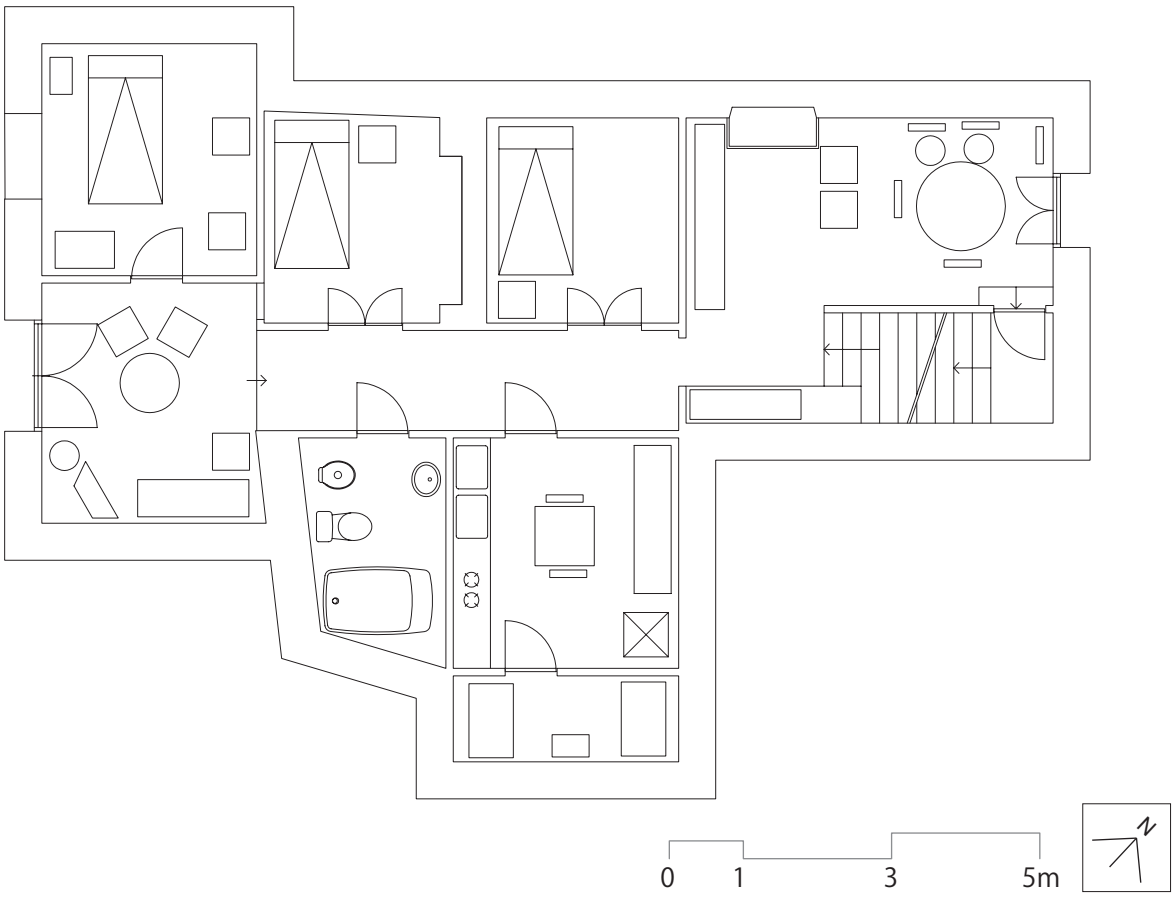

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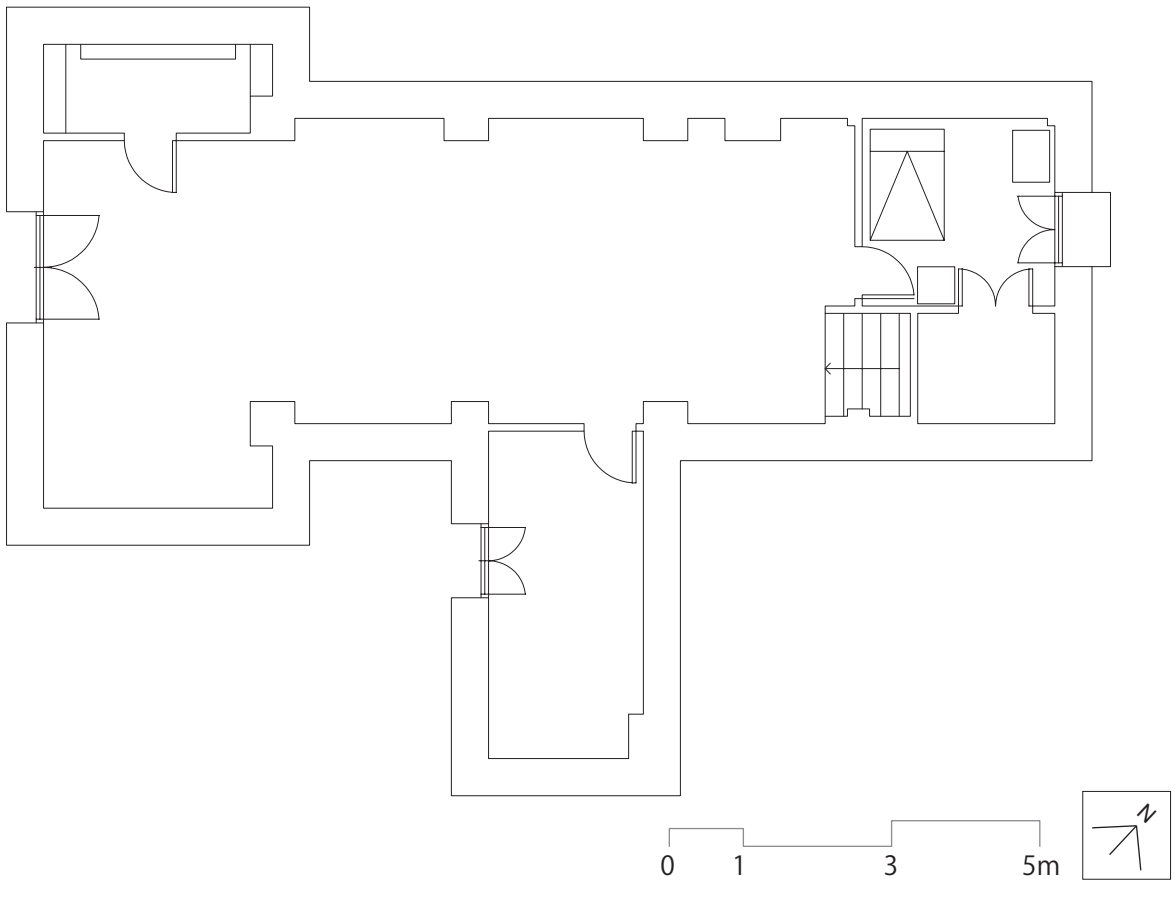

Rincón de Ademuz Village Torrebaja House TB9 Floor -1 0 1 2

学位論文の要旨

学位論文題名

A study into the sustainable system between the wind and the villages in Rincón de Ademuz, Spain

本論文の目的は、バレンシア州内陸部の山間部に位置するリンコン・デ・アデムースの農村集落郡を対象に、その数世紀にも渡って存続し続ける集落が持つ仕組みを明らし、環境に適応した集落の構造を解明することである。調査対象集落であるリンコン・デ・アデムースは少なくとも数百年、カスティエルファビブに至っては二千年以上に渡って存続している。しかし、集落は自然発生的に生じたものでは決してなく､設計者がいて組織的に計画されたものではない。住民たちの試行錯誤による試みで無意識下によって長い年月とともに作り上げられたものである。こうした集落には極めて優れた仕組みが存在している。なぜなら、その仕組みが対外的な自然の脅威から人々の暮らしを守り、また対内的な社会の崩壊に対しても、それを未然に防ぐことが出来たからこそ、現在に至るまで存続することができたからである。こうした集落に介在する環境に対して適応的・共生的な仕組みは、エネルギーに頼らない、これからの循環型の農村社会の在り方において、重要な方向性を示唆してくれるものであると考える。

本論文は、全部で五章からなる。序章においては、研究の目的、方法、構成を述べている。既往の集落研究の成果に言及しながら、本研究の位置付けを明らかにした。

一章では調査対象集落を選定すると共に、分析の視点として「風」に着目することを言及した。集落は人口、産業、歴史、立地条件から３つの集落を調査対象として選定した。また、分析を行うにあたって、風という不可視な要素を捉える必要があった。そのために、まずは気象学的見地として、南北に流れるトゥリア川の谷筋に沿って、海から山へ向かう海風と山から海へ向かう山風が、日中と夜間に向きを変え、交互に吹くことを明らかにした。それに加えて本研究では、風という不可視な要素に対して、煙突の蓋に着目することで、集落に吹く風を捉えた。伝統的にセラミックを二枚突き合わせることで、煙突に蓋を被せるこの手法は、風向きを捉えることで始めて正しく機能する。フィールドワーク調査した結果、煙突の蓋は様々な方向を向いていることがわかった。しかし、特に煙突の長手に対して載せている蓋に着目したところ、そのほとんどは南北の方向を向いていることがわかった。煙突の長手に蓋を載せることは、短手に載せたものよりも開口が小さいために、正確に風向きを捉える必要がある。また、この南北の風向きは同じトゥリア川上流に位置するテルエルと一致していた。煙突の蓋の向きに着目することは、見えない風を可視化する手法であり、おおよそ南北の方向で風が吹くことを定義

することができた。

二章においては、風と住居の関係に着目し、住居空間の構成が風の影響を大きく受けていることを示した。住居空間の構成は、住居の立地によって異なることが明らかになった。山岳集落においては多層式の住居が建つ。平地に建つ住居は、廊下と階段室が設置され、居住面積が大きいのに対して、傾斜地に建つ住居では、居室に直接階段が設置され、廊下が存在していない。
臭いのする家畜スペースは多層式住居の特性を用いて、上階を生活空間、下階を家畜スペースとして上下階分離することが多い。また、屋根裏部屋にはアルコバと呼ばれる大きな開口部があり、常に風通しがよく、伝統的に生ハムや果物を干す場所として利用され、現在では洗濯物が干されている。
加えて、暖炉には風を受ける向きと風をかわす向きがあり、それぞれの立地に適応した建て方をしていることを明らかにした。風通しの悪い居間では、暖炉は風を受ける南北の向きに設置し、煙突が風を受けることで排煙を促す。それに反して、風通しの良い居間においては、暖炉が居間の両端の開口を塞がないように、風をかわす向きに設置されている。この場合、暖炉は東西南北あらゆる方向を向くが、これらは居間の風通しを優先した結果である。暖炉と梁が交錯する事例の全ては、風通しの悪い居間の状況下において、非合理的であるが排煙を促すために暖炉を南北の風向きへと設置している。加えて、階段を利用した上下階の風通しについて着目すると、居間の風通しの悪い住居においては、階段が平面上一ヶ所にまとめられており、上下階からの風通しが期待できる。また、内扉に穴が開けられた住居も共通して居間の風通しの悪い住居でのみ確認された。
また、椅子とセラミックタイルの分布に着目することで、居間は家族との憩いの場であると共に、来客をもてなす接客の場であることがわかった。つまり、公私の中間領域である居間が中心となって生活が営まれている。そのため、その反面寝室は質素であり、ベッドと必要最低限の家具しか置かれていない。それ故に居住者が最も長い時間滞在する居間の環境をコントロールすることが、快適な生活を送る上で最も重要になる。風通しに対する工夫が居間を中心にみられるのはそのためである。また、居間が複数ある住居においては、居住者が季節・時間によって住み分けている。夏場の昼間は窓を閉め切り、夜間には窓を開けっ放しにする、また冬場においてはその行為は反転し、住居内の環境を意識的にコントロールしている。

三章においては、風と集落の関係に着目し、集落空間構成が風の影響を受けていることを示した。集落の構成に関しては、立地によって違いがみられた。平地では街区を形成するのに対して、傾斜地では住棟を形成する。ゾーニングに関しても風の影響は大きい。非住居は、集落の北側に集中し、冷たい風から集落を守っている。また、牛舎は住居の風下にならない集落の東

西に建てられている。
集落においても同様に、家並には風を受ける向きと風をかわす向きがある。本来、等高線に沿って列状に住居を建てることが合理的で手法である。等高線上に沿って建てられた住居は集落の街路を形成し、等高線に反して建てられた住居は小さな広場・中庭を形成していることが明らかになった。山の南の斜面に広がった集落の家並は、風を受けることで街路に風を送ると共に、風をかわすことで風の出口となる広場・中庭を形成している。これは集落の日照とも関係している。等高線に沿った家並の日影となる街路と、等高線に反して家並の日なたとなる広場が、集落内に気圧差を生み、空気の対流を促している。加えて、クルドサックやセットバックに着目すると、日なたをつくるものと、日影をつくるものがあることがわかった。特に日なたをつくるセットバックは影が落ちる路地に多く、反対に日影をつくるクルドサックは広場の周りに分布しており、集落内に常にコントラスを作るように配置されている。このように南北に吹く風をコントロールするために家並は、風に対して面をつくり、抜けをつくる。また、それによって生れる日なたと日影の空間が空気の対流を生み出す仕組みとして機能し、その対比を際立たせるように、クルドサックやセットバックは配置されていることがわかった。
こうした集落の配列から生まれる日なたと日影の空間は、地域コミュニティーを支える役目も担っている。日なたとなるところでは、水場がありスーパーやバルなど公共の施設が配置されるのに対して、日影となる小さな路地や水場と共にベンチや樹木があり木陰となっている場所では、近隣の人らが椅子を出してきて休息したり、話し込んだりするなど、御近所の繋がる場所となっている。こうした人らの外出行動には、季節や時間、風の動きと大きな関係がある。夏の昼は南から熱い風がくるので石造りの家の中が涼しい、夏の夜は山から冷たい風が降りてくるので、みんなで出来て外で楽しむ。冬場はその逆で昼は外、夜は家の中ですごす。こうした同じリズムで営まれる暮らしが、地域コミュニティーを支えているものがと考えられる。

四章においては、風と住居の分析と風と集落の分析を合わせて考察することで、風とコントロールする仕組み、集落が持つ構造に言及した。暖炉を軸として「煙突の蓋・暖炉・家並」が、風向きに対して、「受ける側」と「躱す側」に設置されることで、異なる立地条件に対応し、住居の風通し、集落の風通しをコントロールする仕組みを集落は持ち、集落内に微気候をつくり出す仕組みが存在している。山岳地帯に位置するリンコン・デ・アデムースの集落は、夏は暑く、冬の寒さは厳しい。また、雨が少なく乾燥していることから、夏場日影であれば快適に過ごすことができる。また、唯一の暖房器具である暖炉は、同時に台所として年中使わる。特に冬場においては、扉や窓は保温のために閉めながら、適度な通風が排煙のために必要である。こうした理由が、集落が風をコントロールするのに至った大きな要因であると考えられる。また、居住者の生活の仕方においても、その微気候が大きく関係している。居住者は住居内にお

いても、集落内においても、集落がつくり出す快適な空間に流動的に滞在する。そのために風をコントロールする仕組みは、同じ時間、同じ場所に人が集まる仕組みとしても機能している。滞在時刻と滞在場所が限定されることは、家族と必然的に顔を合わすと共に、必然的に地域住民とコミュニケーションを促すきっかけとなり、集落の内部コミュニティーが自壊することを防ぐものである。住居という1つのユニット内の風とコントロールする仕組みは、集落という全体のユニット内の風をコントロールする仕組みと同じ原理によって成立している。住居においては暖炉が、集落においては家並が回転することで風をコントロールする。つまり「住居にとっての暖炉」は「集落にとっての家並」と同様である。1つの集落が1つの住居と同じ仕組みを有している。1つのユニットの中で起きていることと、その集合である全体のユニットの中で起きていることが同じ仕組みを持つ。これがリンコン・デ・アデムースの集落が持つ入れ子の構造である。

以上を踏まえて五章では、本研究論文の総括を述べた。結論として、リンコン・デ・アデムースの集落においては、住居・集落の空間構成の成り立ちが風に大きく関与しており、風に適応した入れ子の構造を持つことが、対外的な自然から守る仕組みと共に、対内的な社会の崩壊要因に対しても、それを未然に防ぐ仕組みとして機能し、長い年月の間、集落が持続することを可能にした。また、本研究においては、複雑に構成された集落内においても、ある秩序が存在することを証明した。その秩序とは、居住者が長い年月をかけ、試行錯誤によって作り上げた、その集落の土地に住むことに適応した仕組みである。そのため、その秩序を把握し、仕組みに沿った計画をすることが、これから更に長い年月集落が持続していく上で求められる。全ての住居、全ての広場、全ての路地には、それぞれの場所に適合した機能があり、無駄なものは存在していない。つまり、その広場を1つ潰すことで集落全体の風をコントロールして、微気候を作りだす仕組みが機能しなくなることを意味する。近年、旧首都トレドにおいては、ホテルの乱立により中庭に屋根を被せる事例があるとの報告がある。中庭に蓋を被せるということは、1つの家において窓を閉め切ることと同義であり、集落全体の風通しを悪くすることである。結果として、トレドの平均気温が上昇した。リンコン・デ・アデムースの集落においても同様であり、集落自体に備わっている仕組みを居住者が理解し、これからのその仕組みを活かしたこれからの集落あり方を模索することが、循環型の農村社会の形成する上で重要である。
言うまでもなく集落が持続するためには、宗教や教育、医療、農業など様々な要因があり、1つの要素で説明しきれるものではない。今日においてその集落が存続している限り、有りと有らゆるもの全てが持続的である。本研究は、その持続性の一端である風とそれに適応した住居と集落、そして居住者の暮らしについてバレンシア州の内陸部に位置するリンコン・デ・アデムースの集落を対象に言及したものである。