

GARDENS AND GARDEN PATTERNS IN HOUSING DEVELOPMENTS ON THE COAST OF ALICANTE¹

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I. INTRODUCTION

The United Nations Development Programme (UNDP, 2000) estimated that 55% of the world's population will live in cities by 2015, and as a result the application of principles of sustainability to the management of urban areas is one of the greatest challenges facing environmental policies in the twenty-first century (Domene and Saurí, 2003). This assumption must be taken into account in extensive areas of Europe that have experienced a significant increase in their urbanized areas since the mid-1980s. According to figures provided by the Spanish Ministry of Public Works, during the period 2001-2011, 5.6 million housing construction permits were granted, of which 55% were in the regions of Andalusia (1,115,659 homes), Catalonia (769,786 homes), Region of Valencia (791,882 homes), Murcia (292,708 homes) and the Balearic Islands (118,069 homes) (Spanish Ministry of Public Works, 2012). The strong growth in residential uses on the Mediterranean coast has been associated with the purchase of homes by people from other Spanish regions; but above all, with strong demand from European immigrants (mainly retired people from central and northern Europe).

External features of housing (kitchen gardens, gardens and swimming pools) have been strongly related with the urbanization process, especially in the low and medium density types imitating the Anglo-Saxon model (Leichenko and Solecki, 2005). Gardens have become one of the outdoor features of housing that consume the most water resources (Domene and Sauri, 2006). This is mainly due to changes in the production of new natures, such as the installation of lawns (Swyngedouw, 1999). The initial hypothesis of our investigation is to verify whether this statement is true in the entire Mediterranean coast, or if other factors (mainly social and economic) exercise any influence in the choice of the type of gar-

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den. Components such as the cost of water may be a factor of considerable importance when assessing the types of garden and the predominant species therein.

II. OBJECTIVES AND METHODOLOGY

According to the hypothesis of this article, the objective of this research is to determine the garden patterns and the characteristics of gardens in housing developments on the coast of Alicante. These are some of the external features of homes that have been the focus of the least study in Spain. This article therefore aims to increase our knowledge of the characteristics of these gardens, and those on the Alicante coast in particular. This understanding is necessary given the extensive spread experienced by these areas, which are associated with new urban typologies that have been widely used in the final construction phase of the expansion. However, they are also due to the increased demands that these typologies can create and the consequent pressure on water resources.

The methodology used to carry out this investigation was based on field work and a survey, given the absence of data concerning this issue in official statistics. It was proceeded in several stages to choose the sample of dwellings to survey. The choice of the municipalities of the study area took into account two elements: that they were representative of the various stages of urban development identified and were attached to an urban low density model. The study area consisted of nine municipalities on the coast and pre-coastal area of Alicante. These locations can be divided into two areas - those on the north coast (Calpe, Altea, Polop, La Nucia and Alfaz del Pi) and those on the south coast (San Fulgencio, Rojales, Torrevieja and San Miguel de Salinas. In a third phase, a random sample of the developments and the interviewees were chosen. This added up to 28 developments. The developments number in each municipality was proportional to the total number existing on it and adjusted to the defining characteristics of the urban development process (the estate size, year of implantation and temporal evolution). A total of 122 surveys of homeowners were carried out in different housing developments in these municipalities during June and July of 2011. The choice was determined by the fact that they were representative of the low and medium density residential model in coastal and pre-coastal Alicante. The survey was made up into six sections: general aspects of homeowners, housing, outside elements of the house, garden features, variable behaviour and consumption of water. The data used for this research were those concerning the main characteristics of the homeowners (socio-demographic traits), attributes (size, elements that compose it) and garden features.

III. GARDEN PATTERNS

When studying types of gardens, it is essential to understand the reasons why homeowners decide to choose one type rather than another. These are varied and are related to various factors (economic, sociological, psychological and cultural) as evidenced by the relevant scientific literature.

The socio-economic factors include the family's income and the price of water. The percentage of the garden occupied by the lawn varies depending on the cost of water, the residents' level of education and their degree of awareness as regards water savings (Hurd, 2006).

For this reason, the higher the price of water, the lower the percentage of lawn in the garden and the greater the area occupied by species or items that do not need much water (pots, succulent plants, ground paving, etc.). The financial situation of households (their income level) also influences the type of garden chosen (Larson *et al* 2009). Private gardens can be considered an item that is aimed at displaying its owners' purchasing power and their identity within the community (Larsen and Harlan, 2006). The relationships between economic and sociological factors are equally important. Economic constraints also pose an obstacle to the owners when mentioning their preferred type of garden, and their relationship to the garden they have. Overlapping between the preferred type of garden and the garden they actually possess only occurs among those with higher disposable incomes (Larsen and Harlan, 2006).

A second factor to consider is the spatial distribution of the home and therefore the location of the garden outside the home. This variable is most apparent in the most visible part of the garden, i.e. at the front, where the entrance of the house is located. This is also the area where social standards are complied with, in contrast to the rear, which is more focused on leisure and free time (Larsen and Harlan, 2006). The age of the home is a third factor to consider. According to Larsen and Harlan (2006), the age of the house is an indicator that determines the dominant type of garden at the front of the house, but not at the rear. These authors concluded that the probability of the home having a garden with a high percentage of lawn on the same side as the facade of the house has declined in recent years. Factors such as the price of water and environmental awareness can be some of the causes that explain this decline. As regards family issues, a significant factor is the relationship between the type of garden and the presence of children in the family. Larson *et al.* (2009) argued that parents who have xeric gardens may feel that they are potentially dangerous for their children. The presence of the retired population is also a factor to take into consideration. The fact that they have more free time allows them to spend more time taking care of their garden, which contributes to the existence of more complex and well maintained structures. However, advanced age entails limitations on the possible tasks that can be undertaken, the need to hire people to perform those tasks with the consequent financial outlay, or the simplification of the structures in the garden. A final factor that may influence garden patterns is psychological variables. Residents with more knowledge of garden plants show a greater preference for non-native plants in their garden (St. Hilaire *et al*, 2003), due to their greater ability to care for them.

IV. GENERAL CHARACTERISTICS OF THE GARDENS

Epistemological consideration of the types of gardens allows us to reflect on which factors determine the type of garden chosen (Atlantic or Mediterranean, for example) by a homeowner; as well as their structure (levels of complexity) and the species they contain. The items studied were: the size of the garden, the type, the main plant species therein, the source of the water used and the different watering systems used. To understand the relevance of each of them, it is necessary to make a brief reference to the socio-demographic features of homeowners surveyed. The results show the high presence of foreign population from Central and Northern Europe (75% of the total sample) mostly retired (65% of the population are 60 years or over) and with a medium, medium-high level of education.

IV.1. The size of the garden

The analysis of items such as “size of the garden” and the objects in it aims to determine the size of the plots, and of the various items within them to demonstrate the growing importance of outdoor spaces in homes, in areas with a predominance of residential tourism. The values obtained show that they are small properties (35.30% are less than 250 m²) and medium-sized properties (22.7% are between 251 and 500 m²). The average size of the plot in the sample is 678 m². The area occupied by the garden in relation to the plot amounts to 41.48% of the area, i.e. just over a third of the entire plot is allocated to garden areas. However, this percentage has declined in recent years to the detriment of the area occupied by paved areas (31.86%). The increase in the paved area is linked to the lower maintenance costs involved. The average area of the garden is 274 m². Most gardens have an average size of between 51-250 m² (42.21%). A small percentage (8.34%) is over 800 m² in area. These are the largest plots in the study area, which are located on the north coast. Those with less than 50 m², which are generally associated with developments of semi-detached homes, account for 23.32%. A majority of these (58.82%) are located on the south coast. Household income capacity is one of the factors determining the choice of the size of the plot and garden. While the average income in the province of Alicante according to the Socio-Commercial Atlas of the Region of Valencia (Rovira, 2011) is €13,168, in the northern municipalities in the province that threshold is largely exceeded. However, the average income in the municipalities in the south is below the provincial average. The highest values (around €16,000) are found in the municipalities of Alfaz, Altea and La Nucia, i.e. those with the largest plots, with a high proportion of individual swimming pools and the largest gardens.

IV.2. Types of garden

For the type of garden, we analyze the complexity of the structure and the density of the vegetation. By doing so, we attempt to assess the factors that explain the type of garden chosen and how these influence its structure. The type of garden has been analysed based on complexity levels. The distinction is made between those of one level (consisting of lawn, bushes or trees), those of two levels (consisting of a lawn and trees, a lawn and bushes, or bushes and trees) and those of three levels (those with a lawn, bushes and trees). The most common choice is a two-level garden (43.48%), consisting mainly of trees and bushes. With close values (40.21%) are those who have a single level, mainly composed by bushes and trees. Those with a higher level of complexity are rare (16.3%) due to the scarcity of grass, which makes it difficult to achieve these three levels of density.

The choice of the type of garden is related to the climatic conditions and water requirements of species, and indirectly to water consumption and maintenance costs. Predominant among the trees are those of Mediterranean descent (adapted to high levels of evapotranspiration) such as pine and palm trees. There are also olive trees, which despite being a Mediterranean crop, are also extensively used as an ornamental plant. Bushes are also of clear Mediterranean descent. Succulent plants (cacti) and Mediterranean scrubs predominate. These species have limited water requirements and are fragrant. Income level is not a key factor when choosing the type of garden. Owners in both the south and the north prefer

xeric and Mediterranean gardens to Atlantic gardens. The reasons for the limited presence of lawns are the maintenance costs (the water consumption associated with watering), as well as the tasks involved in their conservation and the difficulty of keeping them in good condition during the summer months due to the high temperatures. Lawns are also the area that has presented a negative trend in the last five years. The sociological and cultural factors have a considerable importance when choosing the type of garden. This feature is obvious when analysing origin area of the owners and, associated with this, their patterns of life. Population cultural level and the socialization process may also help to explain the adoption of Mediterranean gardens facing the Atlantic ones which should be majority because predominate dwellers from Central and Northern Europe.

IV.3. Type of vegetation

The analysis of plant species is closely related to the type of garden. The aim of studying the plant species is to highlight the main varieties, and as in previous sections, to identify the factors that determine their choice. For these garden species, a distinction is made between succulent plants, ornamental bushes, flowerbeds and lawns. In general terms, the structure of a standard garden in the homes where the surveys were carried out is characterised by the predominance of succulent plants covering an area amounting to approximately 33.7% of the garden. Ornamental bushes (rosemary, thyme, heather, arbutus, etc.) are the second most common formation in terms of the area occupied. They are usually planted both in isolation, as well as in groups, as hedges, in order to enhance the garden's appearance. The term "bed" is in reality an exaggeration when describing the flowerbeds (geraniums, daisies, lilies, etc.), as they are in fact mostly plants in pots with an annual cycle, which have presented a positive dynamic in recent years. This increase, and above all the fact that they are potted are linked to improved efficiency of watering, especially during their period of growth and flowering; however, the fact that they provide a great deal of colour in small garden spaces must also be taken into account. Lawns account for the lowest percentage (15.12%). The reasons given for this limited presence are associated with economic and sociological issues. In specific terms, the reasons were poor adaptation to the Mediterranean climate, with the resulting high levels of water consumption and high maintenance costs, and the much longer periods of time that must be spent on maintenance (watering, cutting, fertilizing, airing, scarification, reseeding, etc.) compared to other plant species.

IV.4. Sources of water supply

The various features of the exterior of homes - mainly gardens and swimming pools - are items that have been associated with a significant increase in residential water consumption in the suburbs (Domene and Sauri, 2006). This is mainly due to changes in the production of new natures, such as the installation of lawns associated with Atlantic-type gardens (Swyngedouw, 1999). In this context, we consider the questions relating to the sources used in the various areas of the plot (inside the house, the garden, swimming pool, kitchen garden and other uses) and watering systems. With these questions, we aim to determine not only the sources of supply, but also whether the owners adopt alternative systems to the public network for the supply or adopt measures to minimize their consumption.

The items about sources of supply in the gardens included in the survey questions were: the public distribution network, a well with meter, a well without a meter and a rainwater tank. Most of the respondents (90.74%) said that the water they use for the garden comes from the public distribution network, although they sometimes mentioned its poor quality and supply problems. There was a token presence of wells and rainwater tanks. Only 6.7% stated that they use them, and 4% obtain their water from wells. The extensive overexploitation of aquifers means that the use of wells is very rare due to their depth. However, it is striking that in a semi-arid region, where the traditions of rainwater use are ancestral (wells, cloudy water irrigation, etc.), it is not used as an alternative for watering the gardens. The preponderance of the foreign population with little knowledge of these traditions may be the reason behind this low percentage of use.

IV.5. Watering systems

Watering systems (sprinklers, hoses, sprays and manual, watering cans or automatic drips) are one of the factors that can have the most influence when establishing a type of garden, given the relationships between these and the dominant species type, and its size as a result of their different water needs and the potential savings associated with each system. An analysis of the data from the surveys shows that the most commonly used watering system in the garden is the hose (38.12%), followed by the automatic drip (27.12%). The predominance of gardens that are dominated by bushes and trees and with a growing presence of paved areas makes this system the most suited to this typology. In addition, it requires little investment in its implementation and promote water saving. Despite progress in the technological development of the watering systems used (drip, spray, etc.) and the belief that water is saved by using them, most homeowners still use the hose. The reasons given for its use are linked to the size of the garden and ease of use, the predominance of a small number of plants, which are generally trees and bushes that can easily be watered with the hose, the cost arising from the installation of the new watering system which makes it not financially worthwhile, and the realisation that because of poor practice or poor programming, the level of efficiency of these systems is not particularly high and they may even consume more water. Watering cans are in third place in the watering systems used. They are very widely used due to their convenience when watering ornamental bushes and flowerbeds, as these are usually planted in isolation or in small groups in pots in the garden.

The hose is the easiest and most convenient way of watering. However, if each item is analysed separately, we can see that the automatic drip system becomes important: it accounts for 30% for trees, 28% for succulent plants and flowers, 26.4% for ornamental bushes. Although it is not extensively used, its presence is increasing. A significant number of homeowners (about 50%) who have made changes to their garden in the last five years decided to introduce watering management systems (drip and sprinkler). They justify their introduction in terms of the savings on consumption, though they acknowledge that they have sometimes consumed more water, especially in the early stages of installation. Their dissemination is related to their widespread use in the nearby rural areas, where their introduction dates back to the 1980s, and is linked to the modernisation of irrigation systems and the transformation of dryland into irrigated land by means of water and management saving systems.

V. CONCLUSIONS

In-depth knowledge of the features that characterise urban models is a priority for determining potential environmental impacts, such as future water consumption. However, an examination of the factors accounting for the choice of a particular type of garden or predominant species is also a priority. Gardens are one of the items related to the dramatic increase in urban development in recent years, and they must be taken into account, as a great deal of household water consumption in these housing developments takes place in the exterior of the homes. A better understanding of these factors will help to contribute to understanding the dynamics of water demand and the planning and management of these spaces. This is particularly true on the coast of Alicante where the housing developments (mainly of detached houses) that have taken place since the 1960s have experienced spectacular growth since the mid-1990s. The limited scientific literature on this subject relating to the Alicante coast emphasizes the value of the results derived from the implementation and statistical processing of the survey conducted. However, the size of its universe is obviously limited. A better understanding of these factors can help with the management and planning of the resources available in this area, and raise public awareness with a view to their more efficient management.

