

Occupation models in peri-urban areas: actions for orchard-city integration

S. Garcia-Ayllon

Technical University of Cartagena, UPCT (Spain)

Abstract

The model of urban development in settlements based on sprawl growth systems generates a strong problematic in terms of resource consumption. The management of these environments located between city and the countryside is complex, especially due to the difficult cohabitation between real estate development and agriculture. Water rights, land distribution, urbanistic regulation, etc. are elements to evaluate in order to establish real diagnoses about which must be the future of these territories. This paper presents the orchard of Murcia, an illustrative case study of anarchic urban development (a peri-urban area largely influenced by its traditional irrigation system). With the help of geospatial analysis systems, they will be raised as orchard-city integration models to enable an ordered growth of the urban plot, allow the survival of smallholder agriculture and minimize the impact on the landscape.

Keywords: peri-urban areas, sprawl growth, urban management, rural studies, land transformation.

1 Introduction

The management of peri-urban areas is a field that is gaining increasing interest in the context of scientific research (see [1–3] for example). The sprawl model of growth in cities is a rising phenomenon that encompasses a varied case mix, especially in large megacities of emerging countries with high growth rates [2], where the scale of work reaches the regional level. In such areas, called peri-urban territories, agricultural soil transformation processes and landscape impacts generated by changes in land use and the complex management that commonly suffer these “mixed territories” [3], are particularly interesting.



Within this subject, it is very interesting as a learning element for the development of today's emerging cities the retrospective analysis of ancient European cities of Spain. In these cities, the transformation process of the territory has already internalized dozens of years with changes in economic, political or strategic cycle. A case of particular interest from the point of view of peri-urban areas management is the so called "Huerta de Murcia", a vast agricultural area around the Segura River that lies between Murcia and Alicante in south-eastern Spain (Fig. 1).

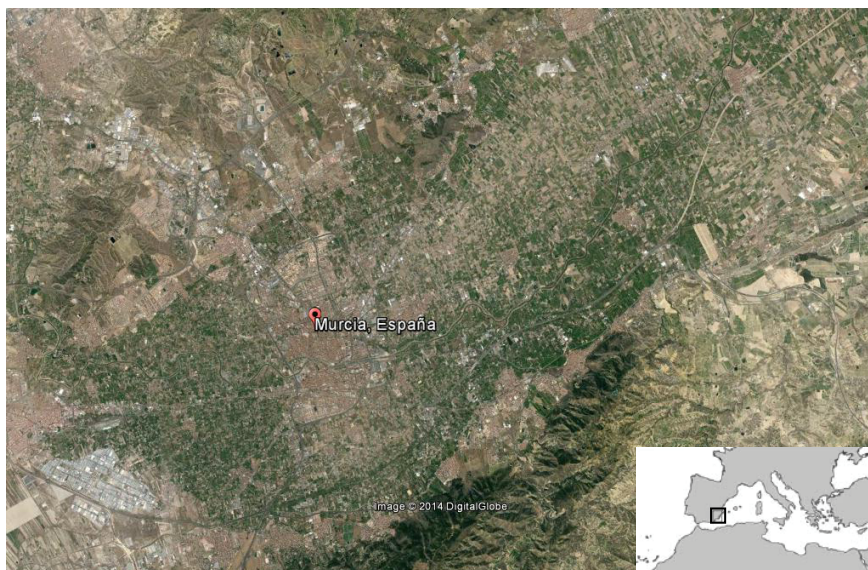


Figure 1: Territorially homogeneous agricultural area associated with the Huerta de Murcia. Source: Google Earth.

If it is focused on the territory belonging to the Region of Murcia, there is a field of study of more than 10,200 hectares (Fig. 2), similar to the whole metropolitan area of cities such as Madrid or Barcelona. This area around the city of Murcia has been traditionally called "the orchard of Europe" due to traditional agricultural capacity of the land, watered by the Segura River. This irrigation system is composed of various interrelated elements: water uptake, its driving by irrigation ditches and the land terracing to irrigate intensively, used since the middle ages (Fig. 3).

This environment is undergoing an intense transformation process for last decades. The strong housing growth and spread of the city has gradually generated a mixed suburban territory where coexist agricultural and urban uses. In this sense, one of the main indicators of the current situation is the impact on the landscape and the resources and infrastructure consumption. The consequences of this process will be discussed in this study, proposing the basis for the establishment of solutions.

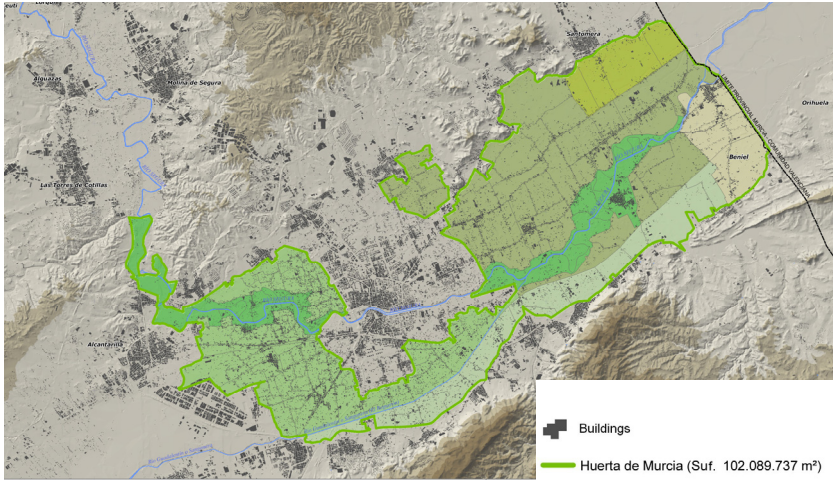


Figure 2: Geographical scope of the Huerta de Murcia.

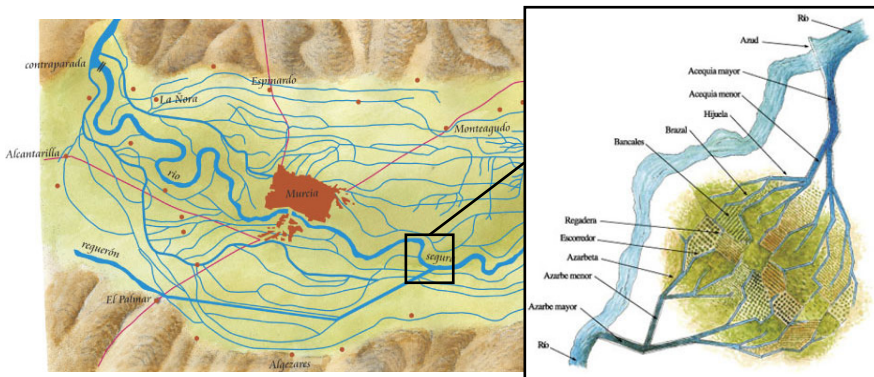


Figure 3: Operation of traditional irrigation in the orchard since the Middle Ages.

2 Urban retrospective analysis of the La Huerta de Murcia

The city of Murcia is suffering since 30 years an acute phenomenon of sprawl growth. 60% of its population is located outside the town centre, which generates a chaotic urban plot that has been invading the traditional orchard space anarchically. This phenomenon has been extensively analyzed from the perspective of geography (see for example [4, 5]), but there are scarce scientific publications related to an analysis of the transformation of territory from the point of view of urban planning and landscape.

The result of this transformation process can be observed analyzing retrospectively the evolution of the agricultural land in the Huerta of Murcia in the last 50 years. If a comparative GIS analysis of agricultural land

transformation is done (Fig. 4), it can be observed the gradual replacement of traditional irrigation network formed by water ditches and small agricultural holdings, for a complex urban plot lacking many of the most basic sewerage services.

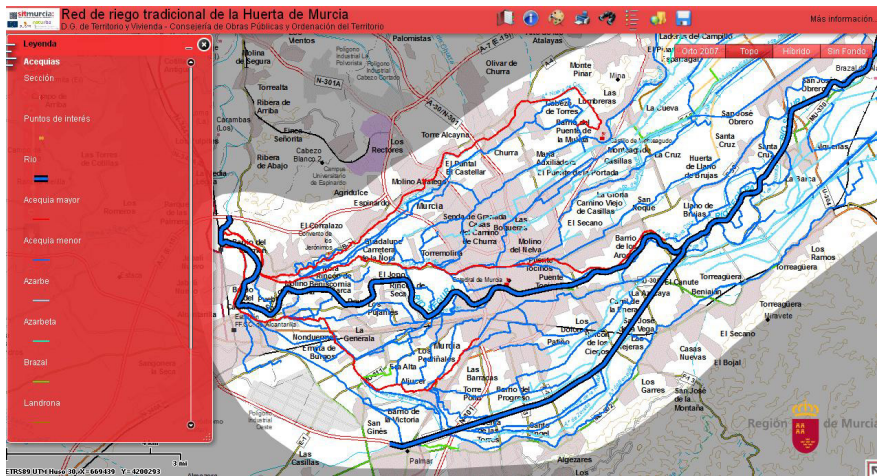


Figure 4: GIS analysis study of traditional irrigation network in the orchard.

If we perform a GIS analysis on a large scale over the entire territory of orchard it can be seen that the population growth of 8% compared to the rest of the region does not correspond with an increase of over 22% of urban land (Table 1).

Table 1: Evolution of population and land transformation of the Huerta of Murcia vs. the whole Region of Murcia. Source: [5].

	1950	1960	1970	1981	1991	2001	2011
Land transformed							
Huerta de Murcia	526	1,079	1,886	2,782	3,931	6,156	7,832
Region of Murcia	4,861	6,415	8,579	10,515	14,806	28,252	54,673
% HdM/Region	10.82	16.81	21.98	26.45	26.55	21.78	14.32
Population							
Huerta de Murcia	260,023	297,806	304,522	371,237	432,851	491,290	551,119
Region of Murcia	755,850	803,086	832,047	955,487	1,045,601	1,190,379	1,335,792
% HdM/Region	34.40	37.08	36.59	38.85	41.39	41.27	41.25

This situation can be checked at the municipal level, where it is observed that there has been essentially a process of land transformation by sprawl growth between 1980 and 2007. Looking at Fig. 5, it can be seen how the growth of the affected municipalities by the metropolitan area of the city of Murcia and its orchard have a consumption rate much higher than other municipalities of the Region of Murcia and Alicante.

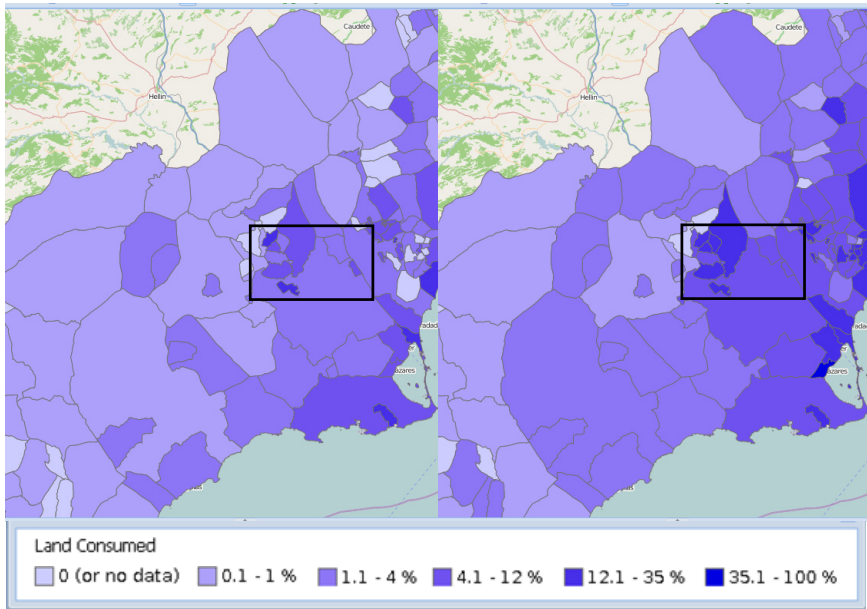


Figure 5: Land consumed by municipalities in 1990 (left) and 2007 (right) in the Region of Murcia (black box corresponding to influence area of Huerta de Murcia). Source: [6].

If it is analyzed in detail over the last 50 years the behaviour of the transformation evolution of agricultural land into urban land, repetitive patterns of conduct are observed (Fig. 6):

- Systematic piping of the traditional irrigation ditches and natural waterways
- Generation of unconnected frames associated urban to rural roads (different performance in the east and west side of the orchard)
- Progressive fragmentation of agricultural plots (weathering of property) accompanied by breaking new ground plots (different behaviour in the east and west side of the orchard)

Considering the progression in the evolution of land use, orchard trend models can be set about the future occupation of the territory obtaining the following trend analysis (Fig. 7):

- Strangulation of urban development to the east by the existence of the barrier that generates the A-7 highway

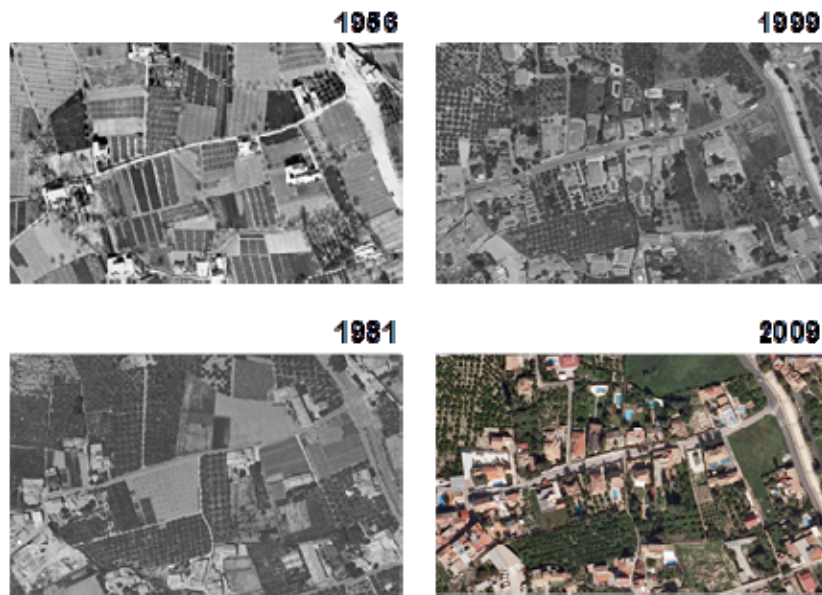


Figure 6: GIS evolution of a set of plots in the Huerta de Murcia. Source: [6].

- Strong urbanizing growth northward caused by the resort phenomenon and the infrastructural expansion of the city
- Formation of scattered settlements in the environment of the western orchard and filling of the interstitial spaces in the eastern orchard
- “Sandwich effect” on the south by the natural growth of the city urban plot combined with the urban development of the industrial outside districts.

3 SWOT analysis and diagnosis

It can be imagined therefore sufficient evidence on a different behaviour between the east and west orchard, which must be demonstrated. Analyzing two statistically significant portions of both spaces they can be diagnosed pathologies and trends of both environments. For this, it has been selected in the study the most interesting features of land transformation, the structure of property and infrastructure provision thereof (Table 2).

Looking at the analysis of the western sample it can be deduced that the territory has almost completely abandoned its productive agricultural facet to provide support for a kind of anarchic city-garden. Comparing the two samples, one can see that while the western orchard land has a rate of built soil higher than 10%, in eastern orchard this value is just over 3%. Besides, the impact of roads and paths is three times higher as a result of the increased urbanization. Furthermore, although the agricultural surfaces of both samples are not very different, the area of cultivated land at the time of analysis is much higher in eastern orchard.

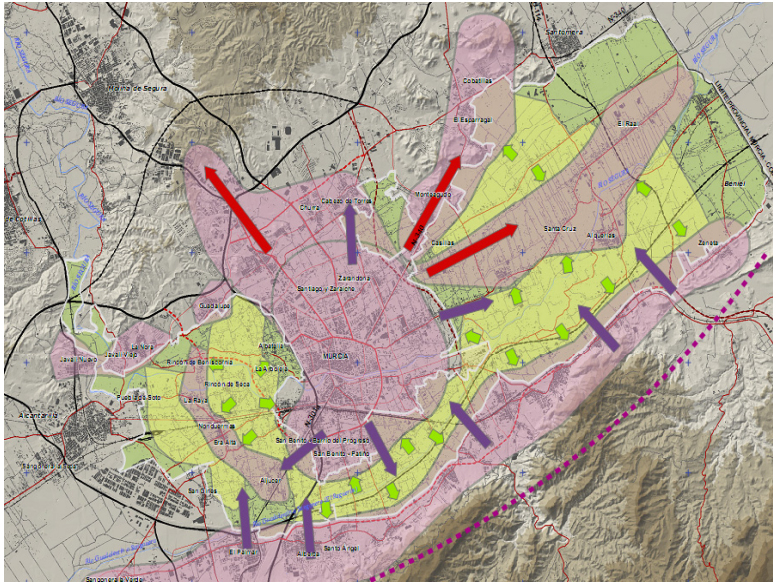


Figure 7: Trend analysis of the Huerta de Murcia.

Table 2: Data from the two samples analysed.

Sample 1 (West orchard)		Sample 2 (East orchard)	
Analyzed surface	654,387 m ²	Analyzed surface	654,387 m ²
Artificial surface	67,165 m ²	Artificial surface	18,263 m ²
Agricultural area	523,632 m ²	Agricultural area	597,372 m ²
Number of houses	743	Number of houses	108
Average size of plots	1,600 m ²	Average size of plots	12,200 m ²
Transformation rate 1956–1981	12.5%	Transformation rate 1956–1981	11.7%
Transformation rate 1981–2007	67.3%	Transformation rate 1981–2007	37.6%
Road length	9,673 m	Road length	4,836 m
Cultivated land	217,812 m ²	Cultivated land	486,785 m ²

This may be explained as a result of the existing property structure, which makes that the estimated average holding in eastern orchard is almost ten times the western one. This has allowed during the period of major transformation of the soil (1981–2007), the East orchard to maintain some of its original essence. In the case of West Orchard, farms have become too small, been unattractive for cultivation, and gradually reconfiguring the territory in a more residential area (Fig. 8).

Based on this analysis it can be performed the following SWOT diagnosis highlighting the strengths, weaknesses, opportunities and threats that currently owns the Huerta of Murcia (Table 3).



Figure 8: Urban configuration in western orchard (left) and eastern orchard (right). Source: [7].

Table 3: SWOT diagnosis.

WEAKNESSES	<ul style="list-style-type: none"> - High complexity - Low legibility and <i>imageability</i>: suburban fringes - Low landscape quality in the nuclei and access to populations - High fragility of the areas of highest landscape quality - Low contribution of landscape to the competitiveness - Lower contribution from the daily landscape to quality of life
THREATS	<ul style="list-style-type: none"> - Loss of the magnificent landscapes of orchard - Growing of suburban fringes - Reduction of readability and low <i>imageability</i> and identity - Tendency to <i>aterritoriality</i>
STRENGTHS	<ul style="list-style-type: none"> - The existence of the mountain ranges in good condition - The wealth of contrasts (Huerta, forest, semi-desert in wadis) - The existing vegetation: the geomorphological variety run great interest as potential asset - The orchard as a landscape identity and the existence of the already executed river buttes
OPPORTUNITIES	<ul style="list-style-type: none"> - Rethinking the orchard as an identity preserving landscape speck structural axis of the river as an overall approach to the metropolitan landscape - The restatements that forces the economic crisis may allow the consideration of landscape as a key element of competitiveness - Improving the quality of life of citizens by improving urban landscape - The landscape strategy in the region, instrument implementation of the European Landscape Convention



4 Proposals for improvement

From the SWOT analysis conducted they can be considered various defensive, offensive, proactive and reactive strategies (growth-share matrix) and some actions to promote agricultural activity for orchard-city correct integration [8]:

Table 4: Strategic SWOT analysis.

	STRENGTHS	WEAKNESSES
OPPORTUNITIES	Offensive Strategies: <ul style="list-style-type: none"> - River buttes as a strategic elements, linked through lanes and channels form a network of pathways between the soft hills and Huerta - Setting priorities for recreational/productive use/ urban growth in low and middle river stretch 	Proactive Strategies: <ul style="list-style-type: none"> - Enhancement of the structural elements of the landscape (paths, viewpoints) as a tool for solving landscape deficits - A green belt of mixed uses as an opportunity for a hierarchy and consistency of services to different mesh use
THREATS	Reactive Strategies: <ul style="list-style-type: none"> - Preservation of existing trees and vegetation in the fight against desertification - Integration of orchard in regional tourism as a living reality and transformation in a moment of fashion urban agriculture and local food production 	Defensive Strategies: <ul style="list-style-type: none"> - Urban planning discipline - Reorientation of urban land use regime and orchard urban corridors - Identification of opportunities for rural plot rearrangement respects traditional landscape frame

From the socioeconomic point of view, these strategies can be translated into actions in order to promote the competitiveness of the orchard and its differentiation in economic activity:

- Creating a quality brand of orchard products of Murcia.
- Consolidation of local circuit's sale of direct selling.
- Development of organic agriculture with high added value for foreign markets.
- Incorporate all associated with these products experience: recipes, tourism (B&B).
- General help on the marketing and production: Agricultural Orchard Park.
- Lost or abandoned orchards mismanaged, leasing companies.
- Create a land bank to be sold to third parties.



Having seen the importance of ownership structure and the average size of plots in the development of the orchard, the proposal for an orchard bank is very necessary to avoid the fragmentation of ownership and consequent urbanization unstructured of landscape [9]. Promoting the sale of abandoned orchard plots for rental by individuals or associations could be articulated through this tool, because despite the fall in the rate of urbanization after the bursting of the housing bubble in Spain, who require some land to develop agriculture have actually real trouble acquiring land:

- The owners have no interest or need to sell their land.
- The soil is generally under strong speculation.
- The creation of a market for rural-agricultural land is essential to ensure a future in the industry.

The only way to generate a reliable market floor is through an entity endorsed by the government itself (Fig. 9).

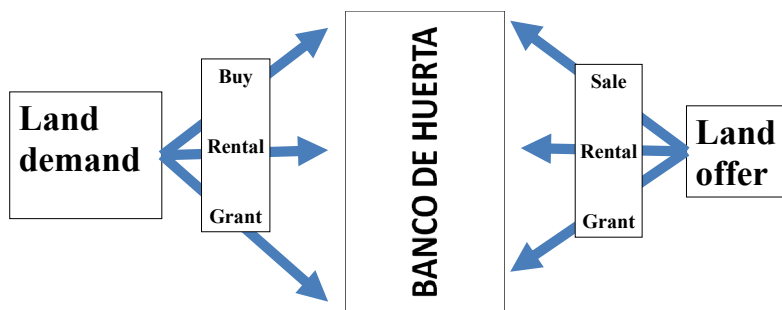


Figure 9: Operating of the Orchard land bank.

Thus, this instrument would permit to retake much of the farming loss in last decade and preserve from urbanization the undeveloped plots that are currently in danger of falling into the hands of speculative processes (Fig. 10).

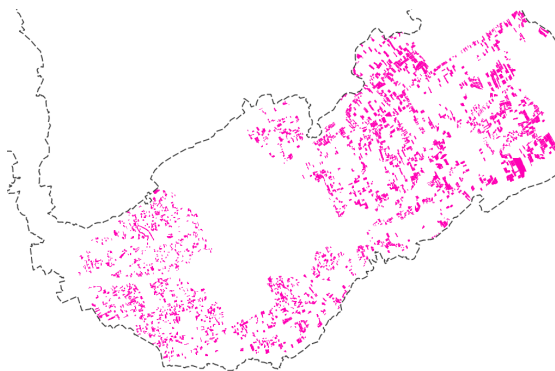


Figure 10: Plots with higher than minimum area to build without building in 2014: area to preserve.

5 Conclusions

La Huerta de Murcia is an environment of high cultural and landscape value closely associated with the identity of Murcia. Based on a GIS analysis was conducted a SWOT diagnosis that has allowed to highlight the current pathologies and trends in the area of orchard. This diagnosis has established various strategies for western orchard (converted into a highly urbanized city-garden, with widespread loss of agricultural activity and atomized ownership structure) and eastern orchard (less dysfunctional due the larger size of their plots but with significant endowment problems and streamline in its infrastructures and significant danger of speculative processes).

To catalyze these strategies have been proposed various socioeconomic measures, including the implementation of a land bank in the orchard. All these measures will require being channelled through important urban planning regulations and modifications that should be addressed in two stages:

1. Development of integrated studies characterizing the orchard:
 - Special urban development plans for Huerta recovery, contemplating improvement and enhancement of irrigation network, generating tourism and scenic routes, establishing visual windows and vectors connecting garden spaces.
 - Development of special infrastructure plans to streamline service networks.
 - Mobility studies to reduce vehicle access to certain routes/paths.
2. Adaptations in the General Urban Plan of Murcia municipality, applying the results of the studies:
 - Temporary limitation of the transitory building regime.
 - Moratorium on the development of particular sectors of building land Huerta to develop comprehensive plans.
 - Complete and set clear limits to the growth of developable land in Murcia environment and districts.
 - Reorder buildable urban land especially in western orchard, to allow visual landscape windows.
 - Implement setbacks especially in urban land of eastern orchard, to allow visual landscape windows.
 - In general, adopt specific regulations for construction in orchard area.

References

- [1] La Rosa D. & Privitera R. (2013). Characterization of non-urbanized areas for land-use planning of agricultural and green infrastructure in urban contexts. *Landscape and Urban Planning* 109, pp. 94-106.
- [2] Salvati L., Zitti M., Sateriano A. (2013). Changes in city vertical profile as an indicator of sprawl: Evidence from a Mediterranean urban region. *Habitat International* 38, pp. 119-125.



- [3] Taylor J.R., Lovell S.T. (2012). Mapping public and private spaces of urban agriculture in Chicago through the analysis of high-resolution aerial images in Google Earth. *Landscape and Urban Planning* 108, pp. 57-70.
- [4] Andres, J. L. Changes in the agricultural landscape on the outskirts of cities: the example of the Huerta de Murcia. *Proceedings, Eighth Symposium of Spanish Geographers*. Barcelona, 1983, pp. 399-406.
- [5] Serrano, J. M. Organization and Operation of Metropolitan Murcia: Traits and basic problems. University of Murcia, Murcia City Council. Murcia, 2005, p. 439.
- [6] European research projects in the Mediterranean space: Otramed & OSDDT. FEDER & Interreg IV Programs. www.sdimed.eu / www.osdd.eu.
- [7] Ros M., Sanz J.P. & García F. Periurban land management in the garden of Murcia. First National Congress of Applied Research Building Management. Alicante, 2010.
- [8] Miralles J.L. (2006). The suburban rural heritage: l'Horta de Valencia case study. *Journal of Engineering and Territory* 75, pp. 78-85.
- [9] J.L. Miralles & F. Gaja. Proposal for to Natural Capital Bank as a managing tool for urban management sustainability. "Sustainable City". Editors C.A. Brebbia, J.F. Martin-Duque, L.C. Wadhwa. Published by WIT Press. Southampton, 2002.

