

URBAN GROWTH (1956-1998) IN THE METROPOLITAN AREA OF ALACANT-ELX (COMUNITAT VALENCIANA)

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I. INTRODUCTION

Urban growth causes fast and deep impacts on the environment. Environmental issues related to urban growth are the following: impacts on the hydrological cycle; air, soils and water contamination; micro-climatic changes; fragmentation of natural habitats or lost of agricultural soils. During the last half of the XX century, urbanization in Europe has been closely related to industrialization and economic growth initiated in the Second Industrial Revolution. In the Mediterranean countries, urbanization has been especially rapid in the coastal zones and these pressures are likely to remain or increase in the coming years.

Land use/cover maps are the most reliable information in urban growth studies. In Europe there is not enough information about this process at a detailed scale. For example, Corine Land Cover data contains some issues derived from this low spatial resolution. Although the MURBANDY/MOLAND project has applied a common methodological strategy in the data extraction at detailed scale, none of the 30 urban areas analyzed is in the Spanish Mediterranean coastal region.

In the Comunitat Valenciana, land use changes caused by urban growth have affected especially the metropolitan cities of the coastal plains. In these areas the soils often are highly productive and can support an intensive and profitable agricultural system. Most the population, infrastructures, economic activities of the region are concentrated in these urban centres. This paper presents the results on the urban dynamics since 1956 to 1998 in the Metropolitan Area of Alacant-Elx, the second largest (112,565 ha) metropolitan area in the region, by using photo interpretation of aerial photographs dated on 1956, 1985 and 1998 and map analysis based on Geographical Information Systems (GIS).

II. METHODOLOGY

Urban growth was analyzed in a GIS framework. The methodology was structured in four modules: data input; database management; data analysis and modelling, results presentation. Data input is more difficult than the other phases and has high influence on the data quality and the reliability of results. A digital topographic map, scale 1:10,000, from *Instituto Cartográfico Valenciano* (ICV) was the cartographic reference for aerial photographs from 1956 and 1985 and the high resolution digital ortophotos from 1998. Methodology is designed for a progressive updating. The aerial photos were scanned in high resolution format and urban use was digitized at a detailed scale (1:10,000) for the three dates. A previously designed legend was used. The map legend classes were high-density urban use —UAD— (when built-up area was higher than 80% of the digitized unit) and low-density urban use —UBD— (built-up area lower than 80%). The difference between the two urban classes depends of more or less presence of vegetation or bare soil on the built-up matrix.

Data input was performed at two levels. First, geometrical data (polygons) were digitized in vector format from the aerial photos. Next, class attributes were assigned to the polygons in the GIS database by using numerical identifiers. Data in GIS environment was classified by original scale and theme for an optimal database management. New thematic covers were corrected in a common reference system to avoid displacement issues. In the analysis module, absolute and relative data from the spatial variables were obtained for the study area. A diachronical comparison was applied for the selected classes. In addition, data values and trends were compared to obtain derived indicators. Main indicator obtained in this study is land consumption by urban growth.

III. SPATIAL AND TEMPORAL DYNAMICS OF URBAN GROWTH. 1956-1998

Results show a very large transformation to urban use during the selected period. These changes are linked with the regional economical and demographical dynamics, although, there are some differences between municipalities of the study area. The differences are related with biophysics, demographics and economical factors. Spatial distribution and temporal dynamics in urban use change are analysed for the selected dates (1956, 1985 and 1998) in the 12 municipalities of the study area (Figure 1).

1956

In 1956, only 2,226 ha (1.98%) of the total surface was occupied by urban uses. But variability between municipalities was high (Table 1). UAD represents the 53.45% of the total urban surface; these compact areas were located next to urban centres. UBD class represents 1,036 ha and it is distributed in dispersed form: in Elx municipality, in the north part of Alacant and in the central sector of Sant Vicent del Raspeig. Only in the urban fringe of Alacant city and in the south coastal area of El Campello there were compact units of UBD (Figure 2).

1985

Since 1960, the processes of urbanization and economical growth in Spain become more intense. These dynamics are closely related with the demographic changes of the study area. In 2005, population was 3 times higher than in 1950 (Table 2). The increase of inhabitants could explain the urban use dynamics in the selected period. In 1985, 10,513 ha (9.34%) of the Metropolitan Area of Alacant-Elx, were urban (Table 3). Although the urbanization process is not constant, the increase of 8,287 ha from 1956 to 1985 represented an annual average growth of 285.76 ha/year.

The growth of UAD class was located next to the historical centres and along main roads. It was related to the creation of new industrial areas. Furthermore, new urban uses appeared, for example university campus or l'Altet airport. In the East part of the municipality of Alacant and in Santa Pola was important the development of tourist buildings. In summary, the urban growth was mainly located in the following sites (Figure 3): the periphery of the metropolitan centres; along main roads and in the littoral plains.

1998

In 1998, the total urban area of the study area is 13,598 ha (12.08%); the surface of UAD class is 5,653 ha, and 7.945 ha are in the UBD class (Table 4). Although high, these values show a lower growth rate than in 1956-1985. From 1985 to 1998, total urban growth was 3,085 ha, an average rate of 237.31 ha/year. The trends of location of the urban areas are very similar than in the last period. The urbanization is in 1998 more compact than in 1985 because the coalescence of the different urban areas.

Urban polygons are more dense and continuous in 1998 than in 1985. They are located along main roads between the biggest urban centres. More of them are related with industrial and commercial activities. Dense urban areas are located in the North-East of Alacant and in Santa Pola (Figure 4). The UAD class percentage in the metropolitan area (41.57%) is higher than in 1985. UBD class is continuous in the periphery of Crevillent, Elx, Sant Vicent del Raspeig and Alacant and next to some roads. The UBD class is located mainly in the North of Alacant, in Sant Vicent del Raspeig, Mutxamel, Sant Joan d'Alacant, in the coastal area of El Campello and in the North-East of Alacant (Table 4).

IV. HETEROGENEOUS DEVELOPMENT MODEL. INTER-MUNICIPALITY DIFFERENCES

The process of urban growth between 1956 and 1998 is heterogeneous in the municipalities of the metropolitan area (Table 5).

The metropolitan centres: Alacant and Elx. These municipalities have had a continuous population growth from 1950 to 2005. There are strong economical relations between them. Therefore, the land use change in the area between both cities has been very important in the last fifty years, mainly the expansion of industrial states. A recent research identifies a high rate of urbanization in Elx from 1998 to 2005.

Municipalities located in the periphery of the metropolitan centres: Sant Joan d'Alacant, Sant Vicent del Raspeig, Mutxamel and Crevillent. These municipalities take advantage of their proximity to the main roads and the metropolitan centres. In Sant Joan d'Alacant, Sant Vicent del Raspeig and Mutxamel the urban and population growth is higher than in Crevillent.

Tourist coastal area: El Campello and Santa Pola. Urban and population growth in El Campello and Santa Pola are similar than in Sant Joan d'Alacant, Sant Vicent del Raspeig and Mutxamel. The dynamic is related to tourist activities.

Municipalities located in steep slopes: Agost, Busot, Aigües and Xixona. In the last group are included the municipalities of lower urban and population growth from 1956 to 1998. Agost, Busot, Aigües and Xixona are worse connected to the metropolitan centres and the main growth axis. A rugged topography difficults urban growth processes. Xixona and Aigües have had null or negative population growth and the lowest urban growth of the metropolitan area related to a rugged topography.

V. CONCLUSIONS

This paper analyses the spatial and temporal dynamics of the urban use during the second half of the 20th century in the Metropolitan Area of Alacant-Elx. Photo interpretation of aerial photographs dated from 1956, 1985 and 1998 and map analysis based on GIS was performed to establish the urban use changes at a detailed scale (1:10,000). Results show a very large transformation to urban use. Whereas in 1956 only 2,226 ha (1.98% of the total area) were occupied by urban use, in 1985 this land use covered 10,513 ha (9.34%). In 1998, the urban use was 6 times higher than in 1956. However, there are major differences between municipalities of the study area.