

THE IMPACT OF AGRICULTURE AND TOURISM ON THE COAST: EVOLUTION OF CHANGES IN LAND USE IN THE WATERSHEDS OF THE REGION OF MURCIA (1956-2013)

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I. INTRODUCTION

During the late nineteenth century and the first decade of the twentieth century, mining have altered large sections of the coastal mountains of La Union, Cartagena and Mazarrón, although no appreciable effect on the coasts. The revival of open pit mining in Sierra de Cartagena in the 80s of the twentieth century, changed the landscape abruptly and caused the complete grounding of Portman Bay.

Since the 60s it has been producing an urbanizing process in the area of the Mar Menor lagoon, which has led to the almost complete urbanization of the sandbar of La Manga and 80% of the coast of the lagoon.

The changes reflect the increase in the occupied area of intensive agriculture, market-oriented, both irrigated and fruit vegetables. Agricultural occupation of the broad sandy beds of coastal RAMBLAS have led to increased soil sealing surfaces emissions and increasing artificial surfaces (urban, industrial and irrigation reservoirs).

II. STUDY AREA

The study area includes the coastal watersheds of southern Murcia. These watersheds have an area of 709.62 km² (70,962 ha) located in the municipalities of Cartagena, Mazarrón, Lorca and Águilas. The area extends from Punta Parida (southwest, on the border with the province of Andalusia) to the Torrosa Island (near the port of Cartagena).

It is a territory where the coastal reliefs of the southern foothills of the Cordillera Bética, belonging to the Internal Betic, rise with an arrangement of concentric arcs, concave toward the sea, defining small Neogene basins in which mixed marine and continental deposits contrasting with the metamorphic reliefs.

The climate of this area is the driest in the region of Murcia. The average rainfall ranging between 282 mm and 266 mm per year. According to the aridity index Martonne, the area is among the arid and semiarid Mediterranean. Average annual temperatures range between 18 and 20 °C.

III. METHOD

We have analyzed land use by identifying changes in spatial and thematic components (Rosete Verges et al., 2009) The analysis also have relied on temporal processes in order to express the differences between different periods (Gutiérrez and Gould, 2000).

We have identified the different land uses for each year of study. The characteristics of the photo interpretation were as follows:

- The work unit is the polygon, which is the spatial unit of land presents a homogeneous coverage.
- The data model for hedges only recognizes the polygon as an entity with its own geometry. In the case of road they have been used polylines.

The hedges are classified as:

- Arable (mainly horticultural crops irrigated)
- Rainfed (trees with a planting between 8 and 10 m)
- Irrigation (trees with a planting between 5 and 7 m)
- Greenhouses
- Water (irrigation ponds and other water surfaces)
- Urban areas
- Forest
- Reforestation
- Other uses (scrub, scrub, or uncultivated land to pasture)
- Highways and roads.

Digitization was carried out on a scale not exceeding 1: 5000. We have identified different coverages and land use for the three periods (1956, 1981 and 2013) (Figure 2).

There are several models of exchange rate to calculate the evolution of coverage for this work we used the exchange rate of the FAO (1996) for each year.

$$\delta n = \left(\frac{S_2}{S_1} \right)^{1/n} - 1$$

IV. RESULTS

In the first period, the changing trends show a large decrease in “other uses” (scrubland, scrub or wasteland) in favor of other uses, except for the use of dry fruit agriculture also they descend that is less profitable than irrigated agriculture. Arable land that increases between 1956 and 1981, while dry fruit drops. The increase has reached the 5,282 during the period 1956 and 1981, reaching the last year of the period 11,327.52 ha. The interbasin transfer between the Tagus River and the Segura River created many expectations agriculture market.

The first greenhouses in the Iberian Peninsula were installed in the mid-60s, so this use is nonexistent in 1956. But in 1981 in the coastal basins studied reach 519.23 ha. The increase in urban areas is due to the start of the tourist activity. The surface passes of 94.86 ha in 1956 to 300 ha in 1981, largely linked to the real estate boom of 1970-1974 and, la superficie forestal se multiplica por 5 pasando de 159 ha forestales de 1956 a 836 ha en 1981 and forest areas is multiplied by five rising from 159 ha forest has from 1956 to 836 ha in 1981.

In the second period arable land area is 2,261 ha, losing 43% of experienced increase in the previous stage and the area of irrigated fruit is multiplied by eight, from 519 ha in 1981 to 3,409 ha in 2013. Furthermore, in this second stage, also the forest area increases very slightly. Urban areas increase their surface, in fact this is one of the most easily identifiable changes in the coastline. The real estate boom of the 1997-2006 period is exceptional for its intensity and duration. This growth is accelerated by improving the transport network that allows the surface with buildings pass 300 ha in 1981 to 1268.48 ha in 2013.

The change matrix shows the transformation of agricultural uses in areas of irrigation fruit trees. This use has gained ground, especially at the expense of scrub and wasteland (other uses) receiving from them, 1258.59 ha. 69.5% of the forest area in 1956, 110.37 ha, remains as such in 2013. The increase in this use occurs mainly at the expense of wasteland that contributes to Mediterranean forest 845.21 and 311.93 has to new reforestations. The increase in urban areas at the expense of all uses.

V. DISCUSSION AND CONCLUSIONS

Other studies of changes in land use in the Mediterranean area offer similar results. Thus, in the southern province of Alicante, 26,000 ha of irrigated land in the early seventies they pass 59,940 ha in 2006.

In recent decades, due to the boom in tourism, the built area has grown significantly in the Mediterranean coast. Agriculture has evolved from traditional farming to modern agriculture irrigation market-oriented.

Such studies offer multi-temporal data that can be helpful in making decisions and offer the possibility of being useful in planning.

