The ımpact of tourism actıvıty on the land consumptıon: The case of Catalonıa

Yraida Romano
Centre of Land Policy and Valuations, UPC, Av. Diagonal, 649, 08028 Barcelona, Spain
e-mail: yraida.romano@upc.edu

Lidia Beltran
Centre of Land Policy and Valuations, UPC, Av. Diagonal, 649, 08028 Barcelona, Spain
e-mail: beltrancarlos.lidia@gmail.com

Josep Roca
Centre of Land Policy and Valuations, UPC, Av. Diagonal, 649, 08028 Barcelona, Spain
e-mail: josep.roca@upc.edu

Abstract

The Spanish Mediterranean coast has shown, since the rise of tourism as a major economic activity, being one of the geographic areas with higher growth dynamics of developed land. Proof of this is the high percentage of land occupation that has taken place in the first 500m of the coast, with up to 40%. This current situation has driven this study, aiming to find out what has been the involvement of tourism activity in land consumption. That is, how it affects the continuity, fragmentation, density and land use of urban growth patterns on the coastline and what is its level of impact, depending on the distance of these urban systems from the coastline. The result suggests that the influence of tourism on the spatial distribution favors urban sprawl, being location one of the most important forces.

Keywords: tourism, land consumption, developed land, urban sprawl

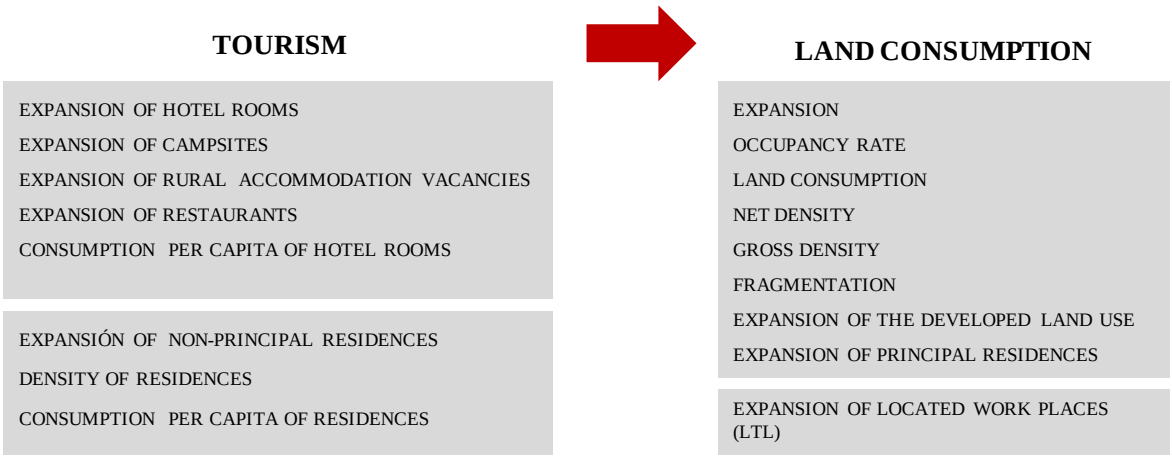
Introduction

In Europe there is a current concern about the urban development occurred in coastal areas, reason why there are nowadays considerable research studies on the subject. These studies aim to assess the driving forces that generate this urban development, among which mainly highlights the expansion of the population, the development of transport and tourism.

In 2006 the European Environment Agency (EEA) developed a diagnostic report on European coastal ecosystems (EEA, 2006b). This report highlights the increase of developed land produced between 1990 and 2000 in Portugal, Ireland and Spain, as well as stresses that the Mediterranean coastal area is one of the areas under greatest pressure from urbanization, not only of the Iberian Peninsula, but of the European Union. There are three strips of the Mediterranean Spanish coast with over 45% of urban land in the first km from the seafront. Such strips are the provinces of Barcelona, Alicante and Malaga.

In this context, this paper evaluates the impact of tourism on the dynamics of expansion of developed land, Figure 1, for the past 16 years in the autonomous community of Catalonia (one of the major international tourist destinations in Spain), assuming that tourism has been one of the main driving forces behind the land consumption on the Spanish coast.

Figure 1. Proposed relationship between Tourism and Land Consumption Patterns



Source: Own elaborated

Case study area

Figure 2. Catalonia, Spain

Source: Own elaborated

The study area includes 584 municipalities of Catalonia, which cover an area of 190,005 km^2, as shown in Figure 2. According to the census, in 2006 this area had a population of 6,995,214 inhabitants, thus representing 16% of the spanish population.

The main objective was initially to analyze the 946 municipalities of Catalonia. However, in the absence of the necessary information of all the municipalities in the developed land database, were discarded 362 municipalities, which account for only 2% of the total population of Catalonia and 40% of its territory.

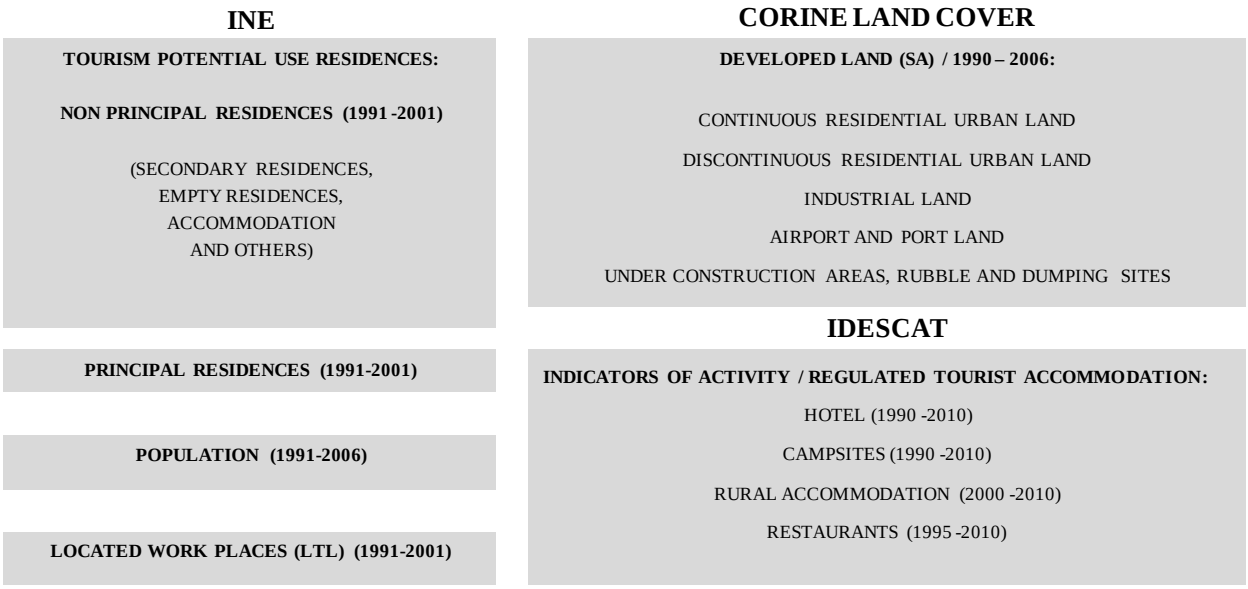
Database

The database used in this research comes from three different sources, which are summarized in the Figure 3. The CLC is a European project managed by the National Geographic Institute in order to make an inventory of land use from photo interpretation of Landsat TM images in 1990, Landsat 7 in 2000 and SPOT4 pictures in 2006. On the other hand, the census is managed by the National Institute of Statistics and provides information on population numbers. Finally, the Statistics Institute of Catalonia (IDESCAT) also provides information related to population.

The tourist accommodation offer has been divided into two categories according with the different models of tourism management. The first category is composed by unregulated tourist accommodations (secondary residences, empty residences and others) which are called non-principal residences. The

second one is composed by regulated tourist accommodations (Hotels, campings, restaurants and rural accommodations.)

Figure 3. Database Sources



Source: Own elaborated

Methodology

The work is divided into four parts; The first part is based on a study of the structure of the territory of Catalonia according to population size in 2006, which subsequently results in their classification into five different groups. Secondly, from these groups, a set of urban indicators are applied as shown in Table 1. With these indicators a diagnosis of the territory is made through the population structure and the developed land consumption, according to their different uses. Third, the development of tourism is analyzed in the studied period, and finally a comparative analysis between the dynamics of expansion of developed land and the expansion of tourism is carried out.

Table 1. Scheme of Urban Indicators

VARIABLE	INDICATOR	FORMULA	UNITS
Population	Expansion of population	Pop. 2006 - Pop. 1990	hab.
Developed land (DL)	Expansion of DL	DL 2006- DL 1990	km^2
Developed Land and Administrative area[1]	Percentage of occupation 2006	Adm. Area/DL	%
Developed land (DL) and Population	Land consumption 2006	DL/ Population	m^2/hab
Developed land (DL) and Population	Net Density	Population/DL	hab/km^2
Administrative area and Population	Gross Density	Population/ Adm. Area	hab/km^2

[1] Tele-Atlas 2004

Developed land (DL)	Fragmentation		
• Continuous residential • Discontinuous residential • Industrial and comercial • Airport and port • Under construction areas, rubble and dumping sites	Expansion of development land uses	DL(type) 2006- DL(type) 1990	km^2
Located Work places (LTL)	Expansion of LTL	LTL 2001- LTL 1991	place
Principal and Non-principal residences	Expansion of Principal and Non-principal residences	Res. 2001 – Res. 1991	res.
Residences and Developed land	Density of residences	Res./ DL	$res./km^2$
Residences and Population	Consumption per capita of residences	Pop / Res.	hab/m^2
Regulated tourist accommodation: (hotel, campings and rural accommodation, restaurants)	Expansion of Regulated tourist accommodation (RTA)	nº RTA(type) ^{199x} – nº RTA(type)^{200x}	vacancies
Population and hotel vacancies	Consumption per capita of hotel vacancies	Pop. / hotel vac.	hab./vac.

Source: Own elaborated

Results

The 584 municipalities studied were classified into 5 groups according to their population size as shown in the Table 2. The municipality of Barcelona has been studied independently, due to its peculiarity, as it alters significally the results of the analysis.

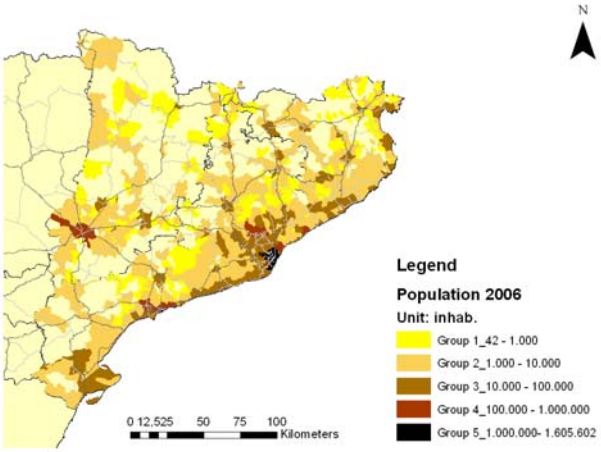
Table 2. Classification of municipalities of Catalonia by population (2006)

	Group 1	**Group 2**	**Group 3**	**Group 4**	**Group 5**	TOTAL
Population 2006	1 to 1.000 hab.	1.000 to 10.000 hab.	10.000 to 100.000 hab.	More than 100.000 hab.	Barcelona	
Total area (km^2)	4.385	11.243	2.825	450	100	19.005
	23%	59%	15%	2%	1%	100%
Total population	90.205	1.142.499	2.792.237	1.364.671	1.605.602	6.995.214
	1%	16%	40%	20%	23%	100%
nº of municipalities	158	315	102	8	1	584

Source: Own elaborated

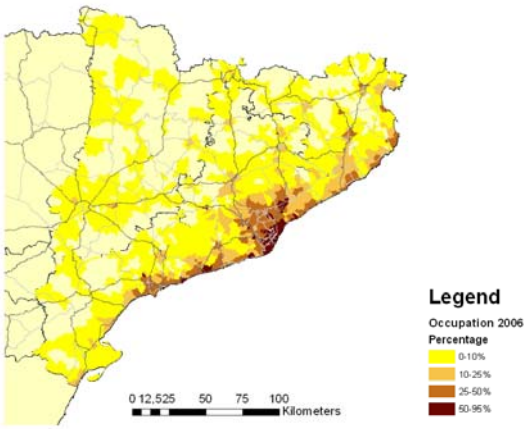
Figure 4 shows the groups classified geographically; a strong relationship between population size and its location: Group 1 is composed of those interior municipalities of Catalonia with rural character; Group 2 spreads out along a stripe parallel to the coast and rarely in the interior of Catalonia; Group 3 is mainly concentrated on the coast; Group 4 is composed of those provincial capitals and municipalities adjacent to these; and finally Group 5 covers only the municipality of Barcelona. It is very significant to see how the population in Catalonia is concentrated mainly on the coast, represented by groups 2 and 3, which likewise happens with developed land occupation, as shown in Figure 5.

Figura 4. Classification of municipalities of Catalonia by population in Groups (2006)



Source: Own elaborated

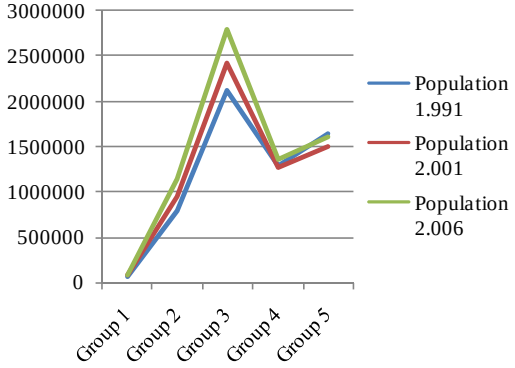
Figura 5. Occupation 2006



Source: Own elaborated

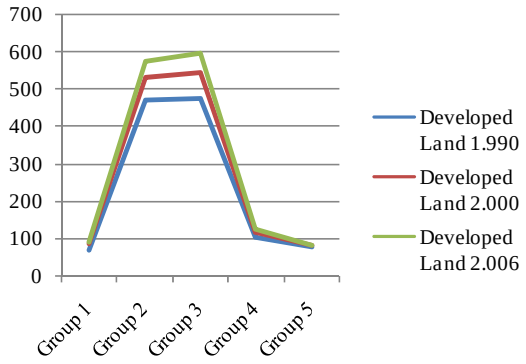
In the analysis of the expansion of the developed land between 1990 and 2006, we can see at the Figure 7 and Table 3, that Groups 2 and 3 are composed by the municipalities which suffered a greater land consumption during this period. However, there is a difference between both groups, since the expansion of developed land in Group 2 was not accompanied by an important population growth, as shown in Figure 6. While in the other groups, both expansions were less significant. On the other hand, the municipality of Barcelona has a negative population growth during this period and a low consumption of land (keep in mind its occupation in 1990, 80%). (Table 3)

Figure 6. Population (1990-2006)



Source: Own elaborated

Figure 7. Developed land (1990-2006)



Source: Own elaborated

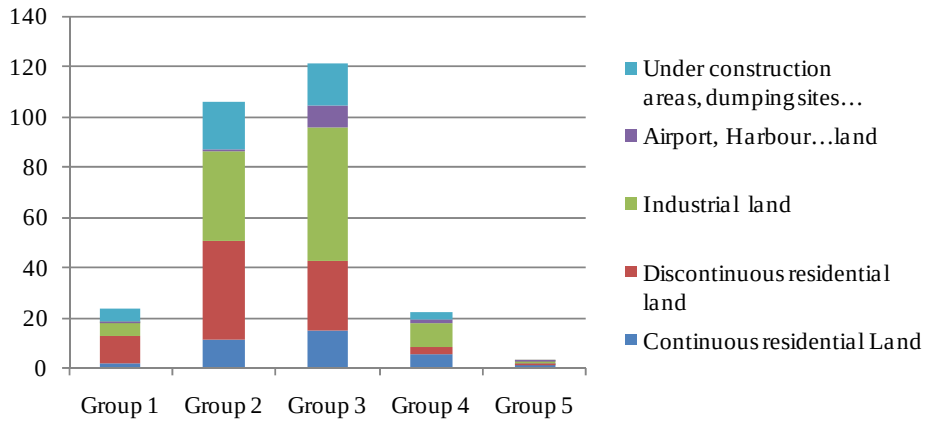
Table 3. Expansion of Developed Land (1990-2006)

		Group 1	Group 2	Group 3	Group 4	Group 5	TOTAL
Development land 2006 (km^2)		91,37 6%	572,50 39%	593,69 41%	125,09 9%	81,36 6%	1.464,00 100%
Occupation 2006		2%	5%	21%	28%	80%	8%
Net Density 2006		987	1.996	4.703	10.910	19.736	4.778
Gross Density 2006		20,57	101,62	988,34	3.028,30	15.862,31	368,06
Fragmentation 2006		0,49	1,09	1,64	1,68	1,62	1,36
Expansion of population (1990-2006)		21.328	344.191	671.308	69.007	-37.940	1.067.894
Expansion of Development Land (1990- 2006)		23,6	106,1	121,4	21,7	3,1	275,9
Expansion of Development Land by Uses (1990- 2006)	Continuous res.	1,8	11,2	14,7	4,8	1,1	33,6
	Continuous res.	10,5	39,2	27,9	3,6	0,7	81,9
	Industrial	5,8	35,5	53,2	9,1	1,2	104,7
	Airports, ports…	0,4	0,6	8,1	1,2	0,1	10,4
	Under construction areas, rubble and dumping sites.	5,1	19,6	17,5	3,1	0,0	45,2

Source: Own elaborated

When the expansion of developed land was analyzed by groups and land uses (Table 3 and Figure 8), we note that the continuous residential land predominates in those Groups with urban character (Group 4 and 5) and discontinuous residential land in those Groups which spread out over a strip parallel to the coast (Groups 2 and 3). The industry is particularly remarkable in Group 3, in which it reaches the largest expansion of LTL (Table 6) and the land aimed at airports and ports grows mainly on the coastline (Group 3). As might be expected from the results of developed land, the areas under construction are located especially in Groups 2 and 3, recording an insignificant percentage in the municipality of Barcelona,(Figure 8).

Figure 8. Percentage of expansion of developed land by land uses (1990-2006)



Source: Own elaborated

In relation to indicators of gross and net density, we observe a progressive increase as we get closer to the coast and in terms of fragmentation; all municipalities denote a decline between 1990 and 2006. However both in the analysis of fragmentation as in the population density analysis, it's seen a noticeable difference

in the behavior of Groups 1, 2 and 3 versus Groups 4 and 5, since from Group 3 there is a pronounced increase in density, while in parallel the fragmentation index is stable. (Table 3 and Figure 9, 10).

Figure 9. Population density 1990-2006

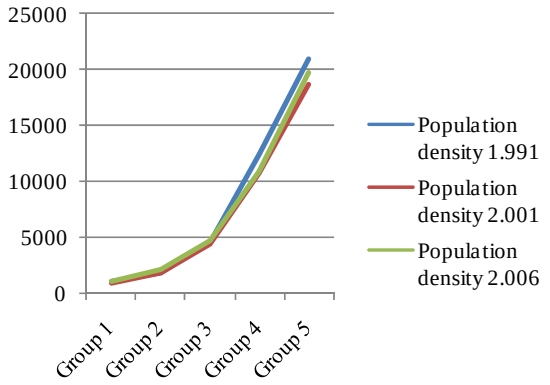
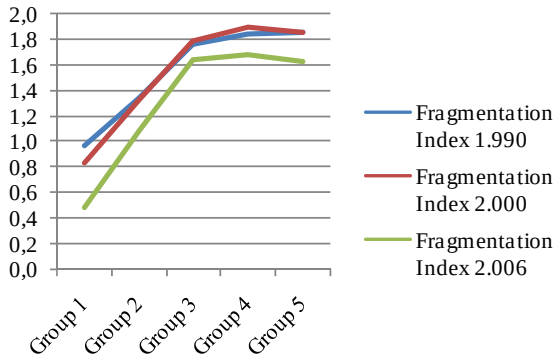


Figure 10. Fragmentation Index 1990-2006



Source: Own elaborated

In the analysis of the expansion of residences between 1990 and 2001, we see that Groups 2 and 3 are those that further expansion of developed land suffer; are Groups 3 and 4 those with higher expansion of residences, highlighting the Group 3 with the higher number of Non-Principal residences. (Figure 11, Table 4). While the density of residences increases progressively from Group 1 to 5, as occurs with the population.

Tabla 4. Expansión of livings (1990-2001)

		Group 1	Group 2	Group 3	Group 4	Group 5	TOTAL
Expansion of residences (1991-2001)	Principal res.	6.384	93.384	208.753	47.641	22.227	378.389
	Non-Principal res.*	-1.624	4.516	82.357	42.344	47.881	175.474
Residence density (res/km^2 DL)		641,8	1.103,71	2.344,38	4.757,05	9.405,37	2.382,53
* (Secondary and empty residences, accommodation and others)							

Source: Own elaborated

Tabla 5. Expansion of accommodation (1991-2010)

	Group 1	Group 2	Group 3	Group 4	Group 5	TOTAL
Expansion of hotel vacancies (1990- 2010)	1.767	18.915	29.318	5.709	38.971	94.680
	2%	20%	31%	6%	41%	100%
Expansion of campsites (1990- 2010)	413,0	-8.394	-46.611	-2.194	0,0	-56.786
Expansion of rural accommodation vacancies (1990- 2010)	1.872	3.231	342,0	0,0	0,0	5.445
Expansion of restaurants (1995-2000)	39,0	247,0	565,0	128,0	214,0	1.193

Source: Own elaborated

When comparing the regulated tourist accommodation by groups, we observed that the largest expansion of hotel vacancies occurs in Groups 2, 3 and Barcelona; while the expansion of campings and rural accmmodation vacancies are located mainly in Group 2, (Table 5 and Figure 12). As these groups are those closest to the coast.

Figure 11. Residences class 1990-2001

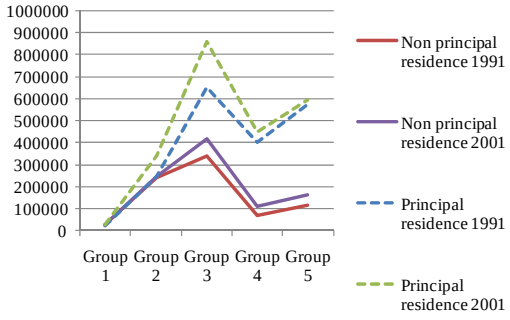
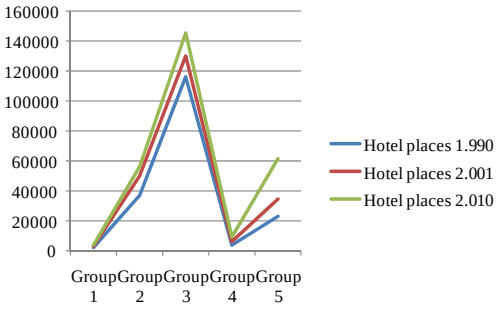


Figure 12. Hotel places 1990-2010



Source: Own elaborated

Consumption Analysis

The consumption per capita of the variables analyzed in the previous paragraphs, shows significant differences between the different groups. In terms of developed land consumption, a progressive increase is observed from Group 5 to Group 1. Note the large difference between the two groups, as in Group 5 the land developed consumption is lower than 50m^2/hab and in Group 1 it is greater than 1.000m^2/hab. (Figure 13)

Regarding the continuous and discontinuous residential land consumption per capita, the most significant matter is that whereas in Groups 4 and 5 the consumption of both variables is quite similar, in the rest of the Groups the discontinuous residential land consumption is considerably much higher than the continuous residential land consumption. For example in Group 5 there is approximately 0.4 m^2/hab of discon.res. land consumption and 0.7 m^2/hab of con.res. land consumption, while in Group 2 there is 34.2m^2/hab of discon.res. land consumption and 9.7 m^2/hab of con.res. land consumption. (Table 6)

Table 6. Consumption per capita of Developed Land, Residences and Tourist Accommodation

	Group 1	Group 2	Group 3	Group 4	Group 5	TOTAL
Developed Land (m^2/hab) (2006)	1012,94	501,09	212,62	91,66	50,67	209,29
Continuous Residential Land (m^2/hab) (2006)	19,91	9,79	5,27	3,50	0,70	4,80
Discontinuous Residential Land (m^2/hab) (2006)	116,50	34,29	10,00	2,62	0,43	11,71
Industrial Land (m^2/hab) (2006)	64,06	31,08	19,04	6,63	0,75	14,97
Airport, port…Land (m^2/hab) (2006)	4,55	0,48	2,90	0,91	0,06	1,49
Under construction areas, rubble and dumping sites (m^2/hab)	56,64	17,18	6,25	2,24	0,00	6,47
LTL (ltl/hab) (2001)	0,35	0,39	0,41	0,34	0,52	0,42
Residences (res/hab) (2001)	0,59	0,51	0,46	0,41	0,47	0,46
Principal residences (res/hab) (2001)	0,37	0,36	0,35	0,35	0,39	0,36
Non-prinicpal residences (res/hab) (2001)	0,33	0,26	0,17	0,09	0,11	0,15
Hotel (vac/hab) (2010)	0,05	0,05	0,05	0,01	0,04	0,04
Regulated Tourist Accommodation 2010 (vac/hab)	0,18	0,15	0,08	0,01	0,04	0,00

Source: Own elaborated

On the other hand, the consumption per capita of principal and non-principal residences is very differentiated. The consumption of non-principal residences grows very significantly from Group 4 to Groups 3, 2 and 1, unlike the consumption of the principal residences whis is much more stable in all the Groups. This happens likewise with the regulated tourist accommodation, as Groups 1, 2 and 3 are those with higher consumption per capita (Table 6 and Figures 14, 15)

Of all the analysis carried out, those with a more direct relationship with the developed land consumption are the non-principal residences consumption and regulated tourist accommodation consumption, as shown in Figures 13, 14 and 15. This fact indicates that there is a direct relationship in the area studied between tourism and land consumption.

Figure 13. Consumption per capita of Developed Land (2006) (m^2/hab)

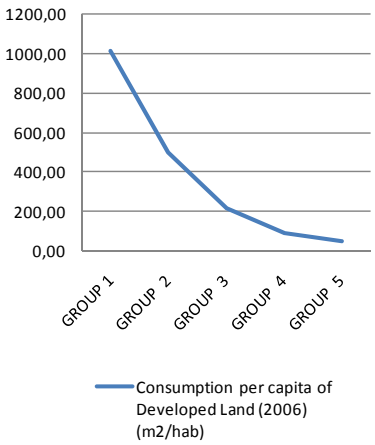


Figure 14. Consumption per capita of Regulated Tourist Accommodation (2010) (vacances/hab)

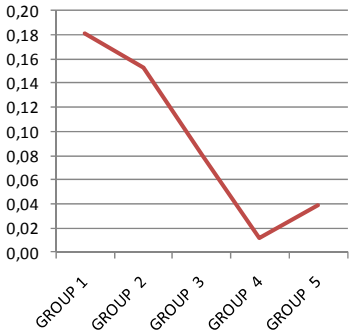
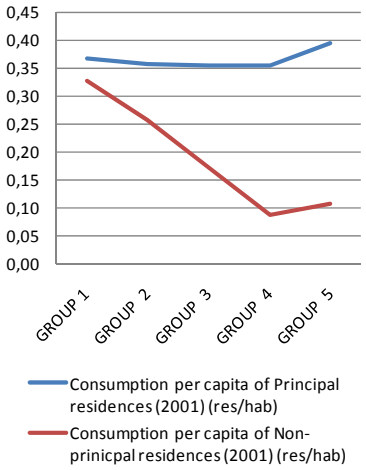


Figure 15. Consumption per capita of principal and non-prinicpal residences (2001) (residence/hab)



Conclusions

The fact that in the existing databases of land cover, the land set for tourism is not classified and distinguished from other land uses, cannot accurately assess the real influence of tourism on the developed land consumption. However, the analysis applied in this work indicates a clear relationship between tourism and the expansion of developed land.

The different indicators applied stress as in Groups 2 and 3 (the most closely related to the coast) there is further expansion of population and developed land. And these two Groups are simultaneously those with lower population density; further spreading of discontinuous residential land; largest number of areas aimed at ports and airports; and with the highest expansion of non-principal residences, hotels and restaurants, that is, activities related to tourism.

The marked difference between the results belonging to Groups 2 and 3 and the remaining groups, set out a direct relationship between tourism and land consumption patterns. This paper shows how in the field of study, the model of tourism that is taking place involves an important land consumption which spreads

discontinuously and with low density of population in many municipalities of catalonia, assuming an urban sprawl land development specially in those municipalities located on the Groups mentioned above.

It is evident that the coastal areas encourage more tourism development. However, the control of their tourist offer should be inprescindible, since the lack of a necessary balance in some cases between population growth and expansion of tourism, shows a possible lack of planning around the carrying capacity of the coastal areas.

References

EEA Report No/6 (2006) The changing faces of Europe's coastal areas. ISSN 1725-9177

Burns, M. et al. (2010), "El consume de suelo en la franja costera de la Región Metropolitana de Barcelona (1956-2006) y su coherencia con el Pla Director Urbanístic del Sistema Costaner (PEDUS)", ISBN 978-84-370-8009-3

De Lacour, R. (2010), Dinámicas Territoriales en el Litoral Andaluz y Estrategias de Futuro. II Congreso de Urbanismo y Ordenación del Territorio "Un nuevo modelo para una nueva época". Madrid

Deloitte, (2006), Impactos sobre el entorno, la economía y el empleo de los distintos modelos de desarrollo turístico del litoral mediterráneo Español, Baleares y Canarias, Resumen Ejecutivo, Madrid

Garay, L. et al. (2008) El desarrollo turístico en Cataluña en los dos últimos siglos: una perspectiva transversal, Doc Anàl. Geogr. 53, 2009 pp: 29 - 46

Romano, Y. et al. (2010), Urban Growth Dynamics: The Relation Between Land Occupation, Density and Spatial Fragmentation. (Spain, 1956-2006), Congreso ERSA 50, Jonkoping, Suecia.