Spain's coastline land cover changes

Urban growth and Natura2000 sites network impact in the Spanish coastline

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Introduction

Coastal areas are considered as the most valuable parts of many countries' territories, either with respect to their natural and environmental qualities or with regard to the their potential for national socio-economic development. Therefore, it is not surprising that population has always been attracted to these areas. Trends in the European coastal zone showed that the growth rate of artificial surfaces was about 1/3 faster than inland. For this reason one of Europe´s main concerns is the changes in land cover and population in the coastal areas. According to the EEA 2006 Coastal Report at European level more than 2 720 km² of agricultural land and semi-natural and natural land were lost predominantly to artificial surfaces, spreading 190 km² per year between the 1990-2000 periods. One of the highest increases in artificial surfaces (20-35%) has been observed in the coastal zones of Spain [1]. Due to the irreversible nature of land cover change from natural to urban and infrastructure development, these changes are seen as one of the main threats to the sustainability of coastal zones. On the other hand the 2009 Spanish Environmental Profile shows that 22,6% of the 1 km coastline represent artificial surfaces, 10 times more than inland. Artificial land consumption has double from 1956 to 1990 period from 6,3 Ha to 12,5 Ha, and triple from 1990 to 2006 period to up to 35,37Ha every 1 000 inhabitants 0.

This contribution focuses on measuring and evaluating the main changes in land cover in the coastal area of Spain between 1990-2000 and 2000-2006 period using CORINE Land Cover (CLC) database and the relation between artificial surface growth and Natura2000 coastline sites network for the preservation of the coastline habitats. The indicators presented in the work include land cover changes, population changes and protected areas in coastal zones to understand the potential pressure and the land cover repartition of the Natura2000 sites. As development pressure continues to be very significant on the coast despite the fact that the degree

of occupation is already very high and the intensification of built up areas occurs especially in the first kilometre inland from the shoreline. Results indicate that the Spanish landscape is very rich and dynamic, diversity and fragmentation of land cover have generally increased, and that urban pressure is heavy along the coast and keeps rising.

Methodology

Using CLC from EEA database for 1990, 2000 and 2006, data was grouped according to PRUREL0 data set into the following categories: a) Urban Fabric, b) Industrial, commercial and transport units, c) Urban green area, d) Agricultural Area, f) Forest and semi-natural area, and g) Water bodies and wetland. Database was prepared by municipalities level (NUTS4) using GIS in order to add population data and the Natura2000 database. Municipalities cover changes were studied into three different scales: first and second coastline municipalities, province coastline, and Spain (Figure 1).

Figure 1: Studied Areas for Spain

The following indicators will be compared and analyzed, focussing on artificial surfaces (AS) and Natura2000 database; **density, fragmentation and compactness metrics** 0.
Density: by the built-up area density and city footprint density
Fragmentation: calculated according to the following metrics; openness index, city footprint ratio, infill, extension and leapfrog.
Compactness metrics: by the proximity and the cohesion index.

Results

The following table shows some results for the analyzed areas. It clearly shows that even if 46% of the 1,2 coastline is protected is the area which supports more pressure and a continues decline in its urban densities thus consuming more land as more than 40% of the population lives in the 1,2 coastline.

	Total Area		**Natura00**		**Difference**	
Spain	498.827	100%	133.713	27%	365.114	73%
Coast Province	141.051	28%	35.043	25%	106.008	75%
1,2º coastline	28.618	6%	13.057	46%	15.561	54%

	AS 00		**AS 06**		**Growth**	
Spain	7.988	2%	9.599	1,9%	1.611	20%
Coast Province	4.455	3%	5.116	3,6%	661	15%
1,2º coastline	3.069	11%	3.531	12,3%	462	15%

	Pop 00		**Pop 06**		**Growth**	
Spain	39.190.993	100%	42.569.143	100%	3.378.150	9%
Coast Province	22.120.341	56%	24.297.157	57%	2.176.816	10%
1,2º coastline	15.550.710	40%	17.215.728	40%	1.665.018	11%

	Dens00	**Dens06**	**Growth**	
Spain	79	85	7	9%
Coast Province	157	172	15	10%
1,2º coastline	543	602	58	11%

	UrbDens00	**UrbDens06**	**Growth**	
Spain	4.906	4.435	-471	-10%
Coast Province	4.965	4.749	-216	-4%
1,2º coastline	5.067	4.876	-191	-4%

Table 2: General data

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