Urbanism and changing land use patterns

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Abstract

Land use patterns in Spain are changing following the path of other western countries, ignoring Mediterranean cities' urban tradition and values. In the last decades, there has been an important development of infrastructures and linked to it, of low-density residential areas and of facilities, commercial and leisure uses scattered across the countryside.

The research focuses on the process followed in the inland regions of Spain, Region Centro (Castilla y León, Castilla La Mancha, Extremadura). Over the last fifteen years artificial areas have expanded rapidly, growing much faster than population. Artificial land areas have grown by 32 % between 1990 and 2000 while population has practically remained the same (only 0,18% growth). The emerging territorial scheme has well-known negative effects on sustainability and on ecosystems.

This paper aims to understand the processes of urban sprawl in a region that, although excluded from economic globalizing processes, is influenced by cultural and ideological trends and models derived from a context of increasing cultural convergence. CORINE land cover databases for 1990 and 2000 have been compared to evaluate changes in land consumption efficiency, as well as in urban and territorial patterns.

This paper explores how public interest can be best served, and which new urbanistic approaches and strategies could be applied to cope with the problems, to orientate land transformations, to reduce negative impacts on natural areas and landscapes, and to preserve biodiversity and natural and cultural elements of interest within the urban areas.

1. A rural region in a globalized world

In 1995, as reports about land cover changes were published, Spanish data raised the alarm. Urbanization had spread at a speed never seen before. Between 1987 and 2000 land occupied by artificial uses in Spain increased by 25% while population only increased by 5%. Right away newspapers and media focused on coastal areas and Madrid Region. However also inland regions deserve attention. In Region Centro artificial land areas have grown by 32 % between 1990 and 2000 while population has practically remained the same (only 0,18% growth).

Spanish Región Centro includes three different regional governments: Castilla y León, Castilla La Mancha and Extremadura. It surrounds Madrid region, which exert large influence. But its character and evolution differs completely from Madrid's capital city and metropolitan area.

Región Centro, with more than 215.000 sq km is larger than eighteen of the twenty-seven UE member estates (Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Greece, Hungary, Ireland, Lithuania, Latvia, Luxembourg, Malta, Netherlands, Portugal, Slovakia and Slovenia). Big as it is, less than 5,5 million people live there (data 2005), that means it is a very low dense populated region, under 25 hab/km^2.

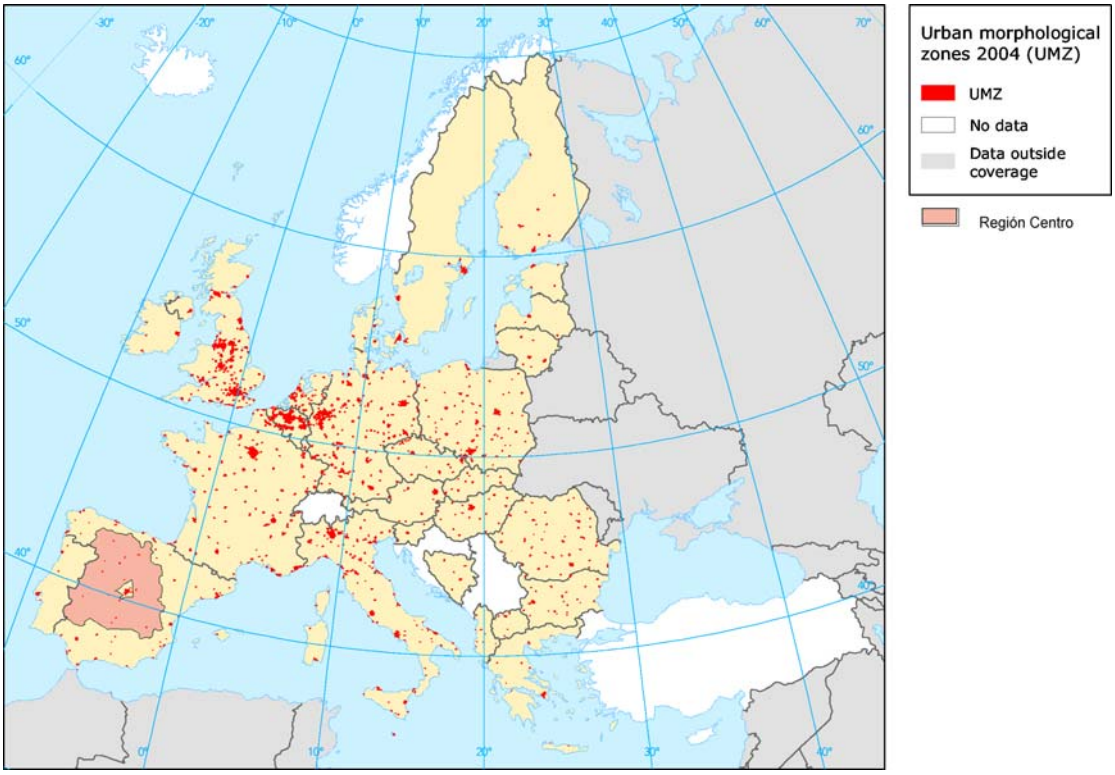

Figure 1. Region Centro in the UE

The territory has a weak polycentric urban system, with small and medium cities non-connected or related one to each other. In 1991 more than half the population (52%) lived in towns smaller than 10.000 habitants. Population is polarized between small villages or towns and few main cities. There are almost no medium-size cities. We can find the explanation in 1960's and 1970's demographic processes. In those decades growth took place mainly (if not only) in a very few cities. Actual territorial structure is due to the historical process of population concentration, driven principally by the main roadway system and political-administrative structure. Migration movements towards Madrid and coastal regions had a parallel in inside movements from rural areas towards the main city of each province.

Population is still shrinking, especially in small interior towns and villages. The population crisis of rural spaces, suffered more intensively in mountain regions, intensifies their fragility and threatens their economic capacity, legacy and even the mere existence of these places. On the other hand, some province capital cities experience shrinking population and demographic growth is diverted into their suburban and metropolitan areas.

Spanish' Region Centro in the periphery of the Union does not have the spatial and productive conditions, either the technological and human resources essential to be attractive in an increasingly competitive international context. The territory plays no international role and it still exhibits a weak specialization in tertiary services (basically public administration and trade). Even though the share of services is increasing, agriculture still remains significant. The region holds several predominantly agrarian areas, mostly in the south. Manufacturing has witnessed a reduction in productive activities as a result of asset take over by multinational groups which have then divested and moved production elsewhere.

Nevertheless the Region has a lot to offer, with remarkable landscapes and natural and cultural values. Several strategic plans reveal that the natural environment is one of the main attractions of the region. This provides an important development potential if oriented towards leisure and entertainment services. Therefore, in theory the region envisions becoming a space able to meet the growing demand of environmental quality, offering attractive nature and premium quality urban spaces. In practice, uncontrolled expansion has prevailed as a response to improved transport connections and increase in personal mobility, which in turn has been stimulated by European Union public funds that finance infrastructure development.

This paper aims to understand the processes of urban expansion in a region that, although being excluded from economic globalizing processes, is influenced by cultural and ideological trends and models derived from a context of increasing cultural convergence.

2. Heritage and environment under pressure

The European Spatial Development Perspective (ESDP) recognises that cities and towns are part of European heritage, that its cultural variety is "*potentially one of the most significant development factor for the EU*" (EC 1999, pg 7) and that it is "*endangered by economic and social modernisation processes*" (EC 1999, pg 10). Urban and territorial planning should help to preserve that important patrimony. Nevertheless, in spite of this recognition, this valuable heritage –cultural, social, economic and environmental– is threatened indeed by urban sprawl, which has turned to be a matter of great concern in the UE. Urban sprawl is defined as "*unplanned incremental urban development, characterized by a low density mix of land uses on the urban fringe*" (EEA 2006). According to European Environment Agency (EEA) more than a quarter of the European Union's territory is directly affected by urban uses.

Urbanization exert also considerable pressure on the environment, it erodes soil and changes vegetation cover, surface moisture availability, wetness and radiant surface temperature. As a result soil loses its structure and function as the elementary basis for life.

EU concern about unsustainable urbanization processes is translated into programs to share and compare information, and into indicators to evaluate progress. One of those programmes is CORINE (Coordination of Information on the Environment), which coordinates the compilation of data and the organization of information within the Member States and ensure that information is consistent and that data are compatible. Because "*If our environment and natural heritage are to be properly managed, decision-makers need to be provided with both an overview of existing knowledge, and information that is as complete and up-to-date as possible on changes in certain features of the biosphere*". (Corine)

3. Land consumption

3.1. Methodology

This paper is based on the analysis of CORINE land cover database. To evaluate changes in land consumption efficiency, as well as in urban and territorial patterns different indicators have been developed. Each indicator has two versions, one referred to artificial surfaces for the whole municipality (historic, accumulated, total), and another one for the new developments. The former takes into account total land consumption for artificial uses and when needed relates it with total population or number of

dwellings. In the latter only considers new artificial land developed between 1990 and 2000, and only the respective new population (or number of new dwellings).

Artificial surfaces include areas occupied by buildings, urbanization and general systems (urban direct uses), and also those areas linked to urban uses like infrastructures, or minery and dump sites.

Efficiency indicator divides artificial surface among population (or number of dwellings).

Urban pattern indicator divides continuous urban fabric among total urban fabric.

Territorial indicators establish the relationship between each artificial use surface (level 2 according to Corine nomenclature) and the total artificial surface. They give information about land use changes and intensity of the processes. Map analysis allows identifying where those changes are taken place.

Five ranks, with thresholds of 10.000, 25.000, 100.000 and 500.000 inhabitants have been defined. In Region Centro only three of them are analysed:

- Six large cities (population over 100.000 inhabitants, as there are no cities over 500.000 hab)
- Twenty-one medium cities (population between 25.000 and 100.000 inhabitants)
- Thirty-two small cities (population between 10.000 and 25.000 inhabitants)

3.1. Efficiency of self-contained urban areas

As can be observed in Figure 2, in 1990 Spain, along with other mediterranean neighbours, were the most efficient European countries regarding artificial land consumption per capita. Mediterranean city patterns –compacity, self-containment, relatively dense areas, mixed uses…– were behind that efficiency. In the nineties, as well as in previous decades, vivid discussions about urban sprawl, sustainability and smart growth were hold. And the values of Mediterranean cities were recognized. Nonetheless by that time urban developments in Spain were also following the path of suburbia. And urban expansion is not due to population pressure, other factors like growing number of households and average residential space per capita, inner city problems, improved motorways and road connections, new lifestyles in suburban environments, an increased number of second homes and speculative inversions in housing are driving the process. Hence, the artificial surface per capita in the areas developed between 1990 and 2000 was four times bigger than that of 1990.

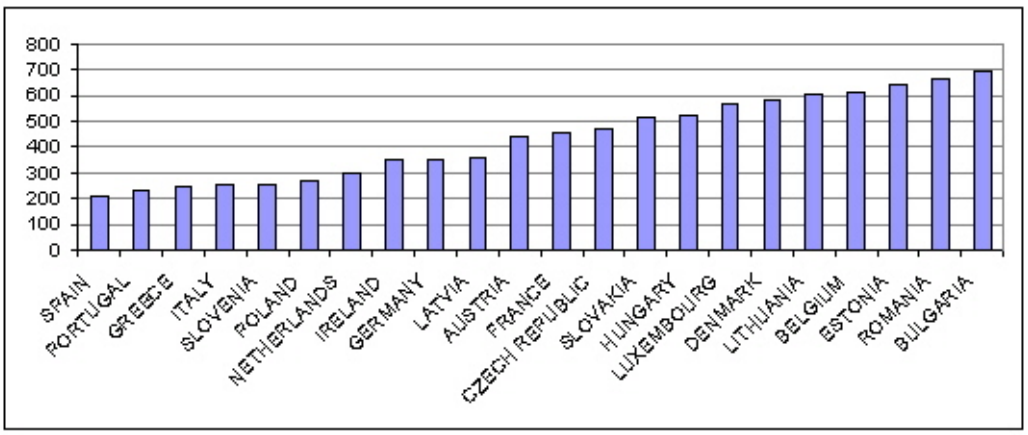

Figure 2. Artificial land per capita in European countries. 2000

Source of data: Eurostat and ETC/TE

3.2 Size and pattern

It has to be noticed that the ratio of land covered by artificial uses in a municipality depends on its demographic evolution. The bigger the population, the lower the amount of artificial land per capita. On average, in those Spanish municipalities smaller than 10.000 habitants each person consumes five times the surface of artificial land than one who lives in a city over 500.000 habitants.

In Region Centro, in small cities (10.000-25.000 inhabitants) land consumption has been particularly intense, it increased by 41% between 1987 and 2000. And in large cities land consumption per capita has increased most. That was because although in most of them population was stabilized or even shrinking, artificial land kept on expanding (34%). The exception was the biggest city in the south of the RC (Albacete).

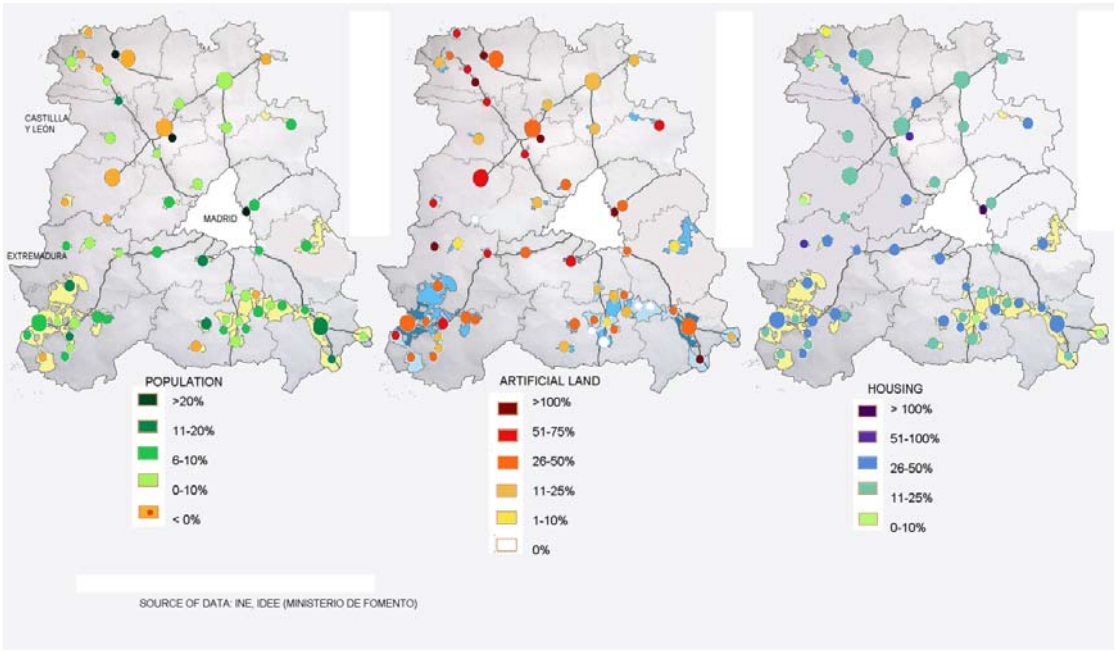

Figure 3. Artificial land, population and housing in Region Centro. 1990-2000

4. Urban fabric, changing patterns

CORINE Land Cover nomenclature identifies two different sorts of urban fabric: continuous and discontinuous. In the former more than 80% of the ground is covered by artificial surfaces (and therefore, soil is sealed); in the latter, vegetated areas and bare soil occupy discontinuous but significant surfaces. EIONET explains that "*the discrimination between continuous and discontinuous urban fabric is set from the presence of vegetation visible in the satellite image illustrating either single houses with gardens or scattered apartment blocks with green areas between them. The density of houses is the main criteria to attribute a land cover class to the built-up areas or to the agricultural areas. In case of patchwork of small agricultural parcels and scattered houses, the cut-off-point to be applied for discontinuous urban fabric is 30 % at least of urban fabric within the patchwork area*".

So the distinction is based on vegetation, not on house or building density. In figure 3 it can be observed how discontinuous urban fabric (an area of high blocks of flats) can be much denser than a continuous one (core centre of a small city). Anyway in new developments discontinuous urban fabric, –at least in small and medium cities– can be identified with low-density residential areas. For that reason urban

pattern indicator provides easily information about the shift from traditional compact city to scattered suburban areas.

Discontinuous urban fabric (Large city)

Continuos urban fabric (small city)

Figure 4. Continuous and discontinuous urban fabric

Table 1. Evolution of Urban fabric in Region Centro 1990-2000

	10.000-25.000 HAB		25.000-100.000 HAB		100.000-500.000 HAB	
ÁMBITO	1990	NEW DEVELOPMENTS	1990	NEW DEVELOPMENTS	1990	NEW DEVELOPMENTS
CONTINUOUS URBAN FABRIC / URBAN FABRIC (%)						
ESPAÑA	49	18	53	18	59	20
REGIÓN CENTRO	85	0	66		46	
CASTILLA Y LEÓN	79	0	75	0	50	0
CASTILLA LA MANCHA	84	0	68	13	49	10
EXTREMADURA	91	0	66	52	39	2
RESIDENTIAL DENSITY (VIV/HA URBAN FABRIC)						
ESPAÑA	28	46	35	65	53	58
REGIÓN CENTRO	26	54	32	52	41	31

In Spain 1990, according to the data available (see Table 1), as towns get bigger the proportion of discontinuous urban fabric enlarges. In Region Centro it was just the opposite. In cities between 100.000 and 500.000 inhabitants continuous urban fabric accounted for less than half the total urban fabric. That means that those cities had already been expanding following discontinuous urban patterns before 1990, though mostly with blocks, not with low-density residential typologies. Medium cities were shifting patterns, while small cities had not experienced significant changes in their urban tissue. The difference is due to the historical evolution, as in the previous decades demographic and urban growing were concentrated almost exclusively in the bigger cities. The rest saw almost no grew at all. And as it was a time when expansion started to be based on discontinuous tissues (mainly high blocks of flats) in those cities with large amount of new urban areas changed the proportion of historic and traditional areas was reduced.

However between 1990 and 2000 **there has been a radical shift** almost everywhere that has been particularly acute in smaller cities (see Figure 4). In those years, most of the municipalities studied had no continuous urban fabric developments, only in three municipalities continuous urban fabric did increase. In other 13 municipalities the whole urban fabric surface remained the same, while for 43 only discontinuous tissue was developed. So residential urban sprawl has started to develop, regardless of consolidated cities' characteristics and at an unprecedented rates.

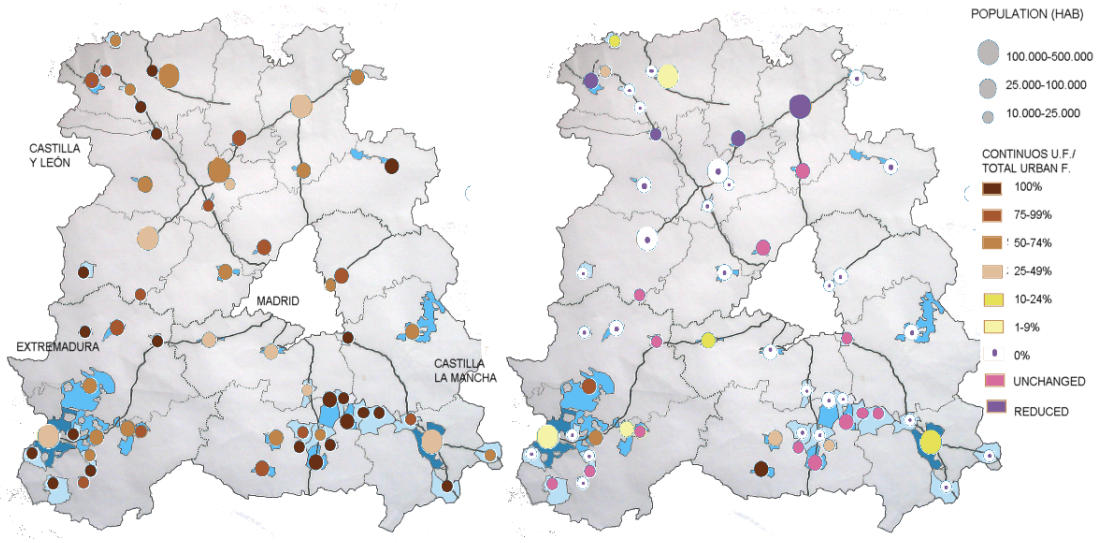

Figure 5. Evolution of continuous urban fabric in Region Centro 1990-2000

5. Shifts in territorial structure

Comparing land cover uses' maps in 1990 and 2000 shows whether artificial uses (non urban ones) are/were contiguous with urban areas or not. Besides spatial distribution, relationships between different uses are identified, and also to what extent they have been spread out in the hinterland.

In 1990 urban fabric covered in Spain 72% of artificial land, while in those areas developed between 1990 and 2000 urban fabric only entailed 43%. In Region Centro's biggest cities there was no such a significant change (65% in 1990 and 56% for new developments), but those municipalities between 10.000 and 25.000 inhabitants shifted from 70% to only 20%. In new developments urban fabric loses importance, while land occupied by **economic sites and infrastructures became the main factor of artificial land extension**, especially in small (64% of total artificial land for new developments and only 20% in 1990) and medium cities (52% in new developments and 20% in 1990).

It has to be noticed that new artificial land is partially oriented to provide services to the already pre-existing city. Obviously highways do not only serve to the municipalities they cross. The same can be said about dump and mine sites, leisure sites, golf resorts or about other supramunicipal facilities, like hospitals. Also big retail centres and mall's influence area is much larger than that of the municipality where they are located.

In small cities expansion of infrastructures has been the second main component of land consumption, and in medium cities they have also increased considerably. And it is commonly accepted that highways (and motorways in general) stimulate urban sprawl (Fomento 2005). Nevertheless in small and medium cities from Region Centro there has been no shift in the localization of urban uses (neither residential nor industrial or commercial). **New urban fabric developments are adjacent to the previous urban areas**, though sometimes new developments are bigger than the previous urban fabric. **New industrial sites have been developed along major connecting roadways**, following an already established pattern. We can find some new isolated industrial sites (Mérida) but they are very unusual. Mostly if new industrial sites are isolated from pre-existing industrial or urban areas it is due to their functions, for instance rubbish dumps.

In Region Centro only in large cities more than 20% of the “commercial or industrial units” surfaces is associated to big shopping centres, malls or facilities. There are no commercial areas big enough (25 ha) to be recognised in satellite interpretation. The rest of the cities have developed almost only industrial areas, many of them are not really industrial uses but rubbish dumps.

Table 2. Evolution of artificial uses surfaces in Region Centro. 1990-2000

	10.000-25.000 HAB		25.000-100.000 HAB		100.000-500.000 HAB	
	1990	NEW DEVELOPMENTS	1990	NEW DEVELOPMENTS	1990	NEW DEVELOPMENTS
URBAN FABRIC/ARTIFICIAL SURFACES (%)						
ESPAÑA	66	43	67	34	71	35
REGIÓN CENTRO	70	20	64	38	65	56
CASTILLA Y LEÓN	68	25	70	12	65	59
CASTILLA LA MANCHA	67	15	62	46	51	65
EXTREMADURA	78	18	60	22	80	45
INDUSTRIAL OR COMERCIAL UNITS/ ARTIFICIAL SURFACES (%)						
ESPAÑA	17	28	16	26	12	23
REGIÓN CENTRO	12	36	16	37	18	23
CASTILLA Y LEÓN	8	26	17	68	25	33
CASTILLA LA MANCHA	12	39	17	25	14	6
EXTREMADURA	17	50	13	38	7	17
INFRAESTRUCTURES/ ARTIFICIAL SURFACES (%)						
ESPAÑA	8	18	6	19	7	21
REGIÓN CENTRO	8	28	4	15	12	11
CASTILLA Y LEÓN	0	27	2	23	3	8
CASTILLA LA MANCHA	16	38	9	6	34	13
EXTREMADURA	0	10	0	31	13	16
MINE AND DUMP SITES / ARTIFICIAL SURFACES (%)						
ESPAÑA	4	0,5	5	5	6	6
REGIÓN CENTRO	11	13	10	10	1	4
CASTILLA Y LEÓN	24	22	6	6	1	0
CASTILLA LA MANCHA	5	3	10	12	0	0
EXTREMADURA	5	15	17	8	0	11
CONSTRUCTION SITES/ ARTIFICIAL SURFACES (%)						
ESPAÑA	3	5	2	9	1	9
REGIÓN CENTRO	0	3	3	-3	2	2
CASTILLA Y LEÓN	0	0	5	-7	3	5
CASTILLA LA MANCHA	0	4	1	6	0	0
EXTREMADURA	0	6	7	-23	0	0
ARTIFICIAL VEGETATED AREAS / ARTIFICIAL SURFACES (%)						
ESPAÑA	2	6	2	7	1	6
REGIÓN CENTRO	0	0	1	3	2	10
CASTILLA Y LEÓN	0	0	1	3	2	11
CASTILLA LA MANCHA	0	0	1	3	2	9
EXTREMADURA	0	0	3	2	0	9

6. Public interest in perspective

Trends in land consumption by urban (direct and indirect) uses are not sustainable. It would be very illuminating to explore the evolution of socio-economics indicators after 2000 to point out where the investments in infrastructures and the urban developments have brought about worthy improvements.

At regional level alternatives to cope with unsustainable trends will not arise from urban planning tools. The problem is beyond urbanism’s influence; it is driven by powerful economic forces and catalysed by people’s demand for “higher quality of life”, (as paradoxical as it can sound). To revert tendencies both national and regional political level should be involved to change politics and development strategies. It’s there where land, infrastructures and housing politics are set.

At a sub regional level new relationships should be established with the global hinterland. Some municipalities are already immersed in larger networks, for instance Badajoz (Extremadura) and its surroundings faces cooperation with Portugal, Guadalajara and Toledo are increasingly connected to Madrid, in the north Valladolid is being shaped as the main central city... But the rest of the territory needs articulation, and small and medium cities have to provide urban functions and to improve their roles as motor of development for the countryside around. The whole territory should not gravitate around the main conurbations, but follow the "*tradition of maintaining the urban and rural diversity of the EU".* (European Commission, 1999).

Urban planning can of course play an important role at the local level. It should increase public participation and should be coherent with other comprehensive tools like Agenda 21. But it is also needed the involvement of regional government to foster environmentally friendly approaches. And they could provide guidance or codes about density, functionality, infillment, quality improvement, etc. They should also investigate how to incorporate restrictions to unjustified developments and optimise the areas already developed.

7. Acknowledgments

I would like to thank Agustin Hernandez, my PhD tutor at the Universidad Politécnica de Madrid, who together with Fernando Prats and through pleasant conversations has opened new perspectives about the problem of land consumption. I would like to thank also Guillermo Lozano for his support and cooperation with the research project, and Antonio Arozarena from the Instituto Geográfico Nacional and Francisco Ruiz from AUDES project for the data and information provided.

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