

Naturbanization and local development in the mountain areas of the Catalan Pyrenees

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ABSTRACT: A process of urbanization has developed around the alpine ski resorts and the Natural Protected Areas (NPA). There are also processes of abandonment of settlement populations and mountain cultures by the disappearance of traditional economic activities. This entails a contradiction: the natural features of a territory can facilitate naturbanization, but it can also deteriorate the natural and socioeconomic environment of the territory. Local development, in the mountainous areas of Europe, can be explained by the existence of comparative advantages with regard to urban areas. In the Catalan Pyrenees, the theory of comparative advantage and the use of the territorial embeddedness theory enable us to demonstrate that, in the future, this short term analysis will have to be replaced by longer term analyses that also take into account environmental, social and cultural externalities.

1 INTRODUCTION: NATURBANIZATION VS URBAN SPRAWL IN EUROPE

Many concepts and theories attempt to explain urban expansion in rural areas or in the urban fringe (Pacione 1984), but processes of urbanization in alpine ski resorts, close to Natural Protected Areas (NPA), have not been seriously analysed. This chapter develops the conceptualization and redefinition of these areas through an analysis of the economic geography of new developments in the fringe of natural protected areas in the Catalan Pyrenees. Framed as part of a research project conducted by our group, we intend to identify and evaluate the effects on the territory of tourism and new activities, which are attracted by the quality of the landscape and environment, and the perception of freedom included in the natural aspects of these territories.

Definitions of urban sprawl and counterurbanization need to be clarified (Champion 1989). Urban sprawl is conceptualized as the phenomena of unplanned urban development, characterised by a low density mix of land uses on the urban fringe (European Environmental Agency EEA Report No. 10/2006: 5-6) and is associated with the rapid low-density expansion of cities in the USA in the early 20th century (Berry 1976). Nowadays, urban sprawl also includes planned urban expansions, but related to impacts on natural and rural environments with an increasing consumption of energy, land and soil. Specifically, the EEA has described sprawl "as the physical pattern of low-density expansion of large urban areas, under market conditions, mainly into the surrounding agricultural areas. Sprawl area is a leading edge of urban growth and it implies little planning control and land subdivision..." (EEA Report No. 10/2006: 5-6). However, at the end of the last century and the beginning of twenty-first century, the idea has arisen among planners and politicians in Spain that compact cities have more social, economic and environmental advantages than urban sprawl territories (Nel•lo 2001). Transport, energy, water, land use and the price of housing, among other

reasons, are highly supportive factors to induce the belief that compact urban areas with well provided services are more energy efficient, and offer high scale economies.

Complementarily, Prados (2006) argues that NPA are an attraction for urban populations to move to remote rural areas because of the associated quality of landscape and environmental factors. This constitutes a competitive advantage in comparison to rural areas in urban fringes, which do not have the qualities of an enhanced environment and landscape (Elbersen 2001). Of course, there are important differences between rural areas. Mostly, we can differentiate those areas that are affected by the urban sprawl process; those involving counterurbanization, where tourism and second homes are the main land uses; and finally, naturbanization areas, where housing is built in close proximity to natural protected areas. Naturbanization areas are associated with economic activities related with natural park activities and daily tourist visits, but also traditional activities, such as livestock rearing or craftsmanship. Nowadays, new activities related to new technologies, and ecotourism are very likely to be found in these areas.

Our research group, involved in the project *Local Sustainable Development in the Mountain Areas and the Threshold Between Territory Abandonment and Naturbanization* (SEJ2006 – 04009), funding Ministerio de Educación y Ciencia (2006-2009), proposes to identify and evaluate the effects on the territory, in economic, social, and natural terms, of the abandonment of some mountain zones and impacts of the leisure and tourism activities that have been attracted by the quality of the social, economic and natural landscape and environment. The naturbanization process is seen as a path towards local sustainable development. We base this project on three objectives: firstly, to analyse naturbanization; secondly, to study in detail the present state of the decline in population in some parts of the study area and its diverse repercussions; and thirdly, to propose strategies on the basis of sustainable local development and territorial policies. In order to explain the naturbanization process we are going to use Comparative Advantage and Territorial Embeddedness theories because we assume that local sustainable development in a mountainous area takes care of environment and landscape quality as a basic aim (fig. 1).

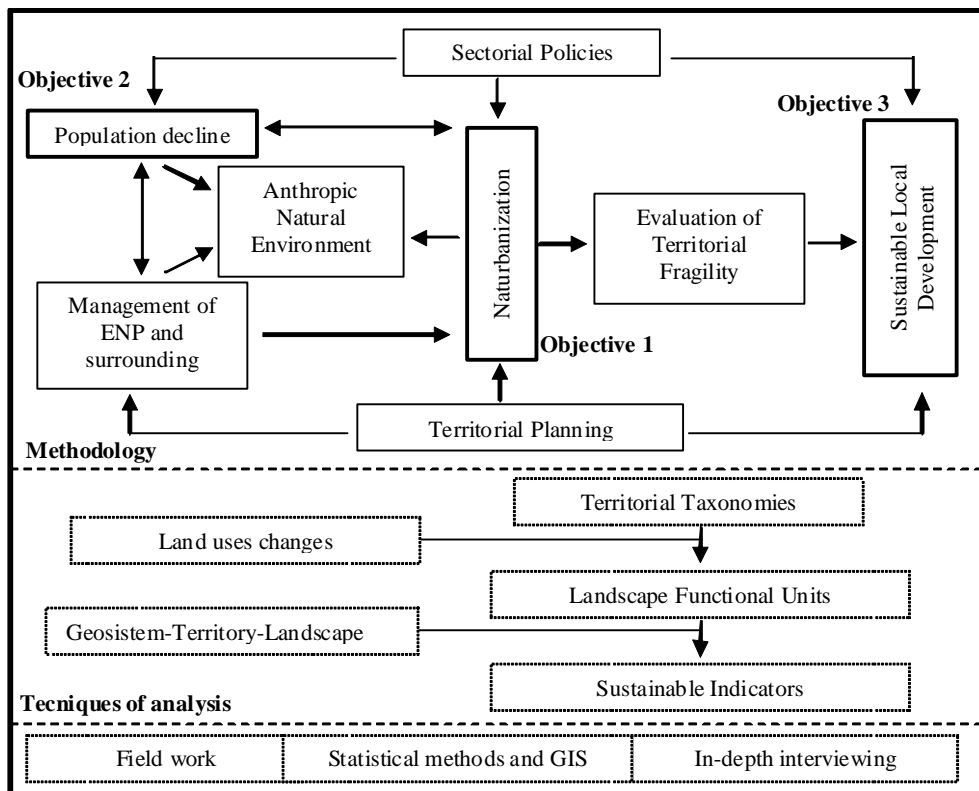


Figure 1. Graphic of local sustainable development in the mountain areas and the threshold between territory abandonment and naturbanization.

The description of the main project objectives are organized into ten specific research lines and three main groups of methodologies (Fig.2) that allow the analysis of the process of naturbanization. The main aspects to consider are:

- 1) Implementation of the Territorial Taxonomies Method (TAXTER)
 - a) Typology of residents and motivations for choice of residence.
 - b) Inventory and classification of social and economic activities in the area of influence.
 - c) To quantify the naturbanization process and evaluate territorial fragility.
- 2) To delimit Functional Landscape Units (FLU)
 - d) Land use evolution analysis and evaluation of landscape impacts.
 - e) To mark out Functional Landscape Units (FLU).
 - f) To quantify the process of population decline and evaluate the territorial fragility.
- 3) Application of Geosystem, Territory and Paysages Method (GTP) Integrated Analysis of the Landscape.
 - g) Diagnosis, synthesis and comparative valuation of different areas.
 - h) Identification of landscape changes as indicators
 - i) Revision of limits of NPA on the basis of natural protection policies and landscape integration.
 - j) Proposals within the framework of the existing or suggested planning.

OBJECTIVES	METHODOLOGIES	RESEARCH
<p>Objective 1. To analyse, for the present and the next future, the impact in the study area of leisure activities and tourism, and to quantify the naturbanisation process (new urban network under construction because of the landscape's attractiveness).</p>	<p>Formulation of Territorial Taxonomies (TAXTER)</p>	<p>1.1. Socio-demographic analysis of the population and basic characterization of the study zone. Typology of the residents and motivations for the residential election. 1.2. Inventory and Classification of the Social and Economic Activities in the Areas of Influence. Valuation of the investment in the matter of environmental conservation. 1.3. To quantify the naturbanisation process, to evaluate the fragility of the territory from TAXTER.</p>
<p>Objective 2. To analyse in detail the present state of the population decline of the study area and its repercussion on the natural and cultural patrimony of the study area.</p>	<p>To quantify land use changes. To delimit Landscape Functional Units (UFP)</p>	<p>2.1. Land use evolution analysis and evaluation of landscape impacts (from 1956 to 2006). 2.2. To delimit Functional Landscape Units (UPF) from formulation of TAXTER and landscape changes. 2.3. To quantify the population decline process, to evaluate the fragility of the territory from UFP.</p>
<p>Objective 3. On the basis of the expositions of sustainable local development, to propose strategies that abate the population decline and the abandonment of the territory on the one hand and allow, on the other hand, to avoid the excessive, intensive and speculative use of the territory.</p>	<p>Geosystem (GTP Integrated Analysis of the Landscape) Characterization of the Landscape and indicators of sustainability</p>	<p>3.1. Diagnoses, synthesis and compared valuation of the scope of study. 3.2. Identification of landscape changes as indicators 3.3. Geographic revision of the ENP (natural protected areas), and its management and limits, in light of the new policies of natural protection and landscaping integration. 3.4. Revision and analysis of the Territorial Planning (Regional Planning) and the Sectoral Policies. Proposals within the framework of the existing or suggested planning.</p>

Figure 2. Objectives of local sustainable development in the mountain areas and the threshold between territory abandonment and naturbanization.

The Study Area includes different counties in the Pyrenees (Fig.3 and Table 1), both in the High Mountains and in the low ranges to the south. In order to provide a general outline, Table 2 shows some of the results of a model to count seasonal populations (Mendizabal 1993) for two years, 1991 and 2001, where it can be seen that in the mountain counties there were 44% more inhabitants (permanent plus a seasonal average for the whole year) than in the census in 1991, and 77% in 2001, when the total increases for the whole of Catalonia were only 5% and 10%. Table 1 shows how the population diminished until 1991 but began to recover in 2001. This, together with the growth in secondary housing (Table 3) means that there is a major attraction of urban populations to these areas. In this study, we analyse each municipality that is close to or in the NPA, which will make these two situations even clearer. In Figure 4, we present the three main NPA located in the study area: the Cadí – Moixerò Natural Park (410.6 km²), the High Pyrenees Natural Park (698.5 km²) and the Aigüestortes i Estany de Sant Maurici National Park (core 139.0 km² and periphery 260.8 km²), which covers a large proportion of the total surface of these 9 mountain counties: 1.508.9 km² to 8.825.6 km² (17.1%). There are also other smaller NPAs in the framework of Natura 2000 with a total surface of 200-300 km², which makes around 20% of the total mountain region.

Table 1. Population changes in the Catalan Pyrenees.

County	Surface km ²	Total Population				Population density
		1950	1970	1991	2001	Inhab./ km ² 2001
Alta Ribagorça	426.80	5681	5116	3514	3623	8.49
Alt Urgell	1446.90	22134	19,874	19,010	19349	13.37
Berguedà	1182.50	41933	45,843	38,965	38606	32.65
Cerdanya	546.40	11582	12,465	12,396	14239	26.06
Pallars Jussà	1290.00	20069	18,074	12,860	12817	9.94
Pallars Sobirà	1355.20	10355	7747	5418	6120	4.52
Ripollès	958.70	32700	33,851	27,617	26365	27.50
Solsonès	998.60	12482	10,734	10,797	11560	11.58
Val d'Aran	620.50	6555	4174	6184	7956	12.82
Total Mountain	8825.60	163491	157878	136761	140635	146.93
Total Catalonia	31901.10	3218596	5107606	6059494	6331231	198.46
% Mountain/Catalonia	27.67	5.08	3.09	2.26	2.22	74.04

Source: Own elaboration using data of IDESCAT i INE population services 1950 - 2001.

Table 2. Inhabitants by time.

County	1991			2001		
	Estimated Population	Population Census	Inhabitant /day indicator	Estimated Population	Population Census	Inhabitant /day indicator
Alta Ribagorça	5140	3514	1.46	7144	3623	1.97
Alt Urgell	23029	19010	1.21	27185	19349	1.40
Berguedà	47559	38965	1.22	52322	38606	1.35
Cerdanya	24771	12396	2.00	41897	14239	2.94
Pallars Jussà	16872	12860	1.31	19342	12817	1.51
Pallars Sobirà	10681	5418	1.97	17337	6120	2.83
Ripollès	34599	27617	1.25	38466	26365	1.46
Solsonès	13197	10797	1.22	16479	11560	1.43
Val d'Aran	20689	6184	3.35	28972	7956	3.64
Total Mountain	196537	136761	1.44	249144	140635	1.77
Total Catalonia	6340255	6059494	1.05	6988973	6331231	1.10
% Mountain/ Catalonia	3.10	2.26	137.14	3.56	2.22	161.05

Source: Own elaboration using data of Mendizabal, 1993 and estimation of stationary population (IDESCAT 2004).

Table 3. Evolution Secondary and Primary housing 1981-2001.

County	1981			1991			2001		
	Primary housing	No Primary housing	Total	Primary housing	No Primary housing	Total	Primary housing	No Primary housing	Total
Alta Ribagorça	1128	542	1670	1124	1073	2197	1367	1203	2570
Alt Urgell	5413	2885	8298	6190	3054	9244	7017	3867	10885
Berguedà	12412	6295	18707	12747	6794	19541	14177	6855	21032
Cerdanya	3498	5441	8939	4050	8027	12077	5543	10312	15855
Pallars Jussà	4419	3166	7585	4480	3490	7970	4753	4864	9619
Pallars Sobirà	1603	2244	3847	1796	2565	4361	2486	2602	5092
Ripollès	9067	4721	13788	9260	5776	15036	9837	6753	16591
Solsonès	2887	1952	4839	3254	2233	5487	3826	2808	6634
Val d'Aran	1607	3352	4959	1893	4255	6148	2848	5027	7876

Source: <http://www.idescat.net> (2007).

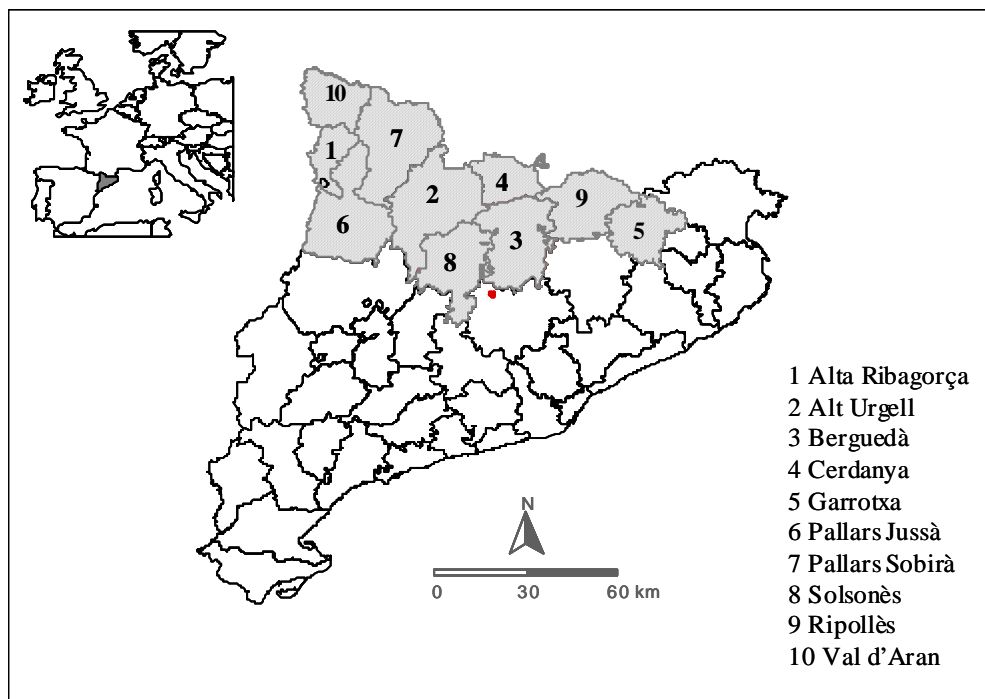
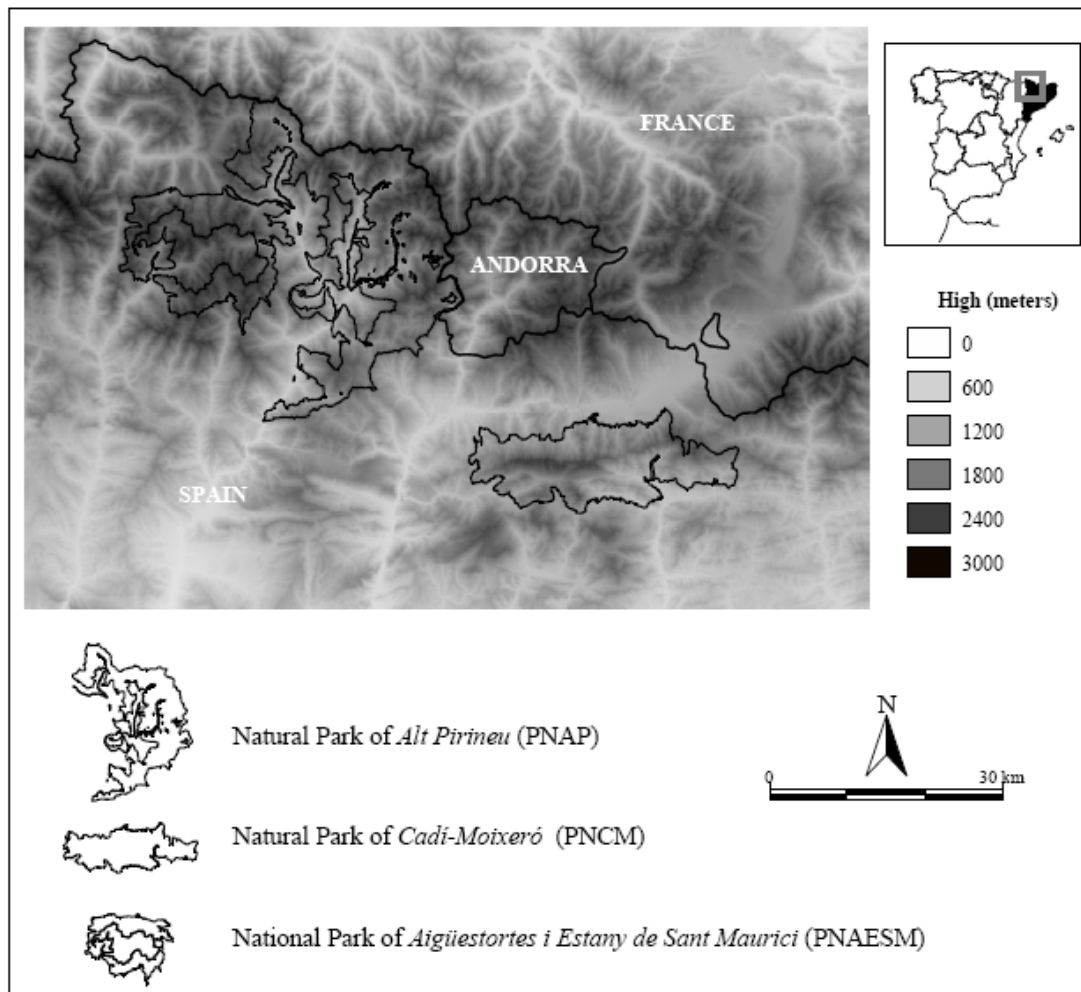


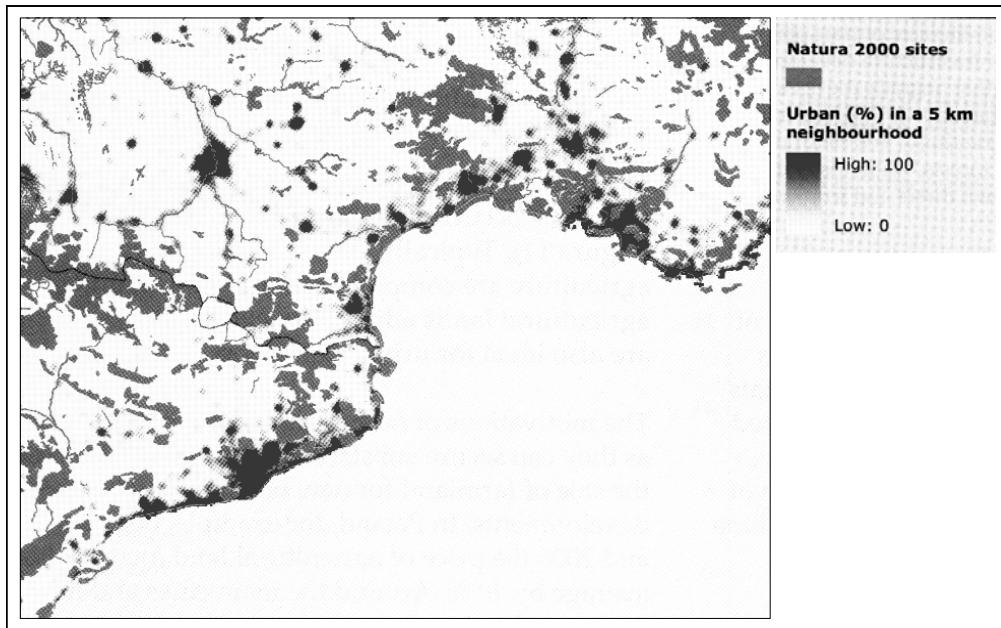
Figure 3. Planning as a base for sustainable development in mountain areas.



Source: Own elaboration using MDE to 30 m and cartography of <http://www.gencat.es/mediamb> (21-1-2005).

Figure 4. General Situation.

Figure 5 shows the urban pressure on Natura 2000 sites in the north-western Mediterranean, and provides a more general view of the main urban land use in comparison to NPA areas. Our study area is half way between the Urban and Metropolitan Catalan Coast and the Toulouse conurbation and Perpignan. This situation presents an important urban demand on the NPA but also promotes a stricter environmental and territorial planning of mountainous areas. The Catalan Government has recently approved different territorial and urban planning schemes in these mountain counties to prevent urban growth, to maintain primary and sustainable economic activities and to regulate the so called 'free space'.



Source: EEA Report No. 10/2006; Urban Sprawl in Europe, pp. 32

Figure 5. Urban pressure on Natura 2000 sites in the north western Mediterranean.

The Active Population in this region has changed very quickly in recent years (Tables 4, 5 and 6). Table 4 presents the distribution of active and occupied population in 1986 and 1996. The primary sector was 20-35% in some counties in 1986 and ten years later was only 11-17%, while in Catalonia as a whole it had changed from 5 to 3% in the same period. However, some counties such as Val Aran are similar in proportion to Catalonia as a whole and this seems to be the general model for the future. An important characteristic of the area is the importance of the manufacturing industrial sector (20-45%) and energy, twice that percentage for Catalonia. Recently, the building sector has become the most specific mountain sector with 7-18% while Catalonia has an average of only 7%. Tourism and personal and public services now provide around 50% of total employment, slightly more than the figure for Catalonia as a whole.

Table 4. Active and occupied population 1986 and 1996.

County	1986		1996	
	Active Population	Occupied Population	Active Population	Occupied Population
Alta Ribagorça	1382	1209	1526	1345
Alt Urgell	7436	6939	7877	7021
Berguedà	15438	13290	15421	12922
Cerdanya	4506	4150	5607	5149
Garrotxa	19573	17,878	20588	18709
Pallars Jussà	4561	4136	5035	4599
Pallars Sobirà	2179	2001	2569	2387
Ripollès	12903	11381	11720	10422
Solsonès	4004	3681	4855	4419
Val d'Aran	2421	2273	3430	3138
Total Mountain	74403	66,938	78628	70111
Total Catalunya	2311806	1839097	2731672	2204652
% Mountain/ Catalunya	3.22	3.64	2.88	3.18

Source: IDESCAT 1988. *Padrons municipals d'habitants de Catalunya 1986. Estructura socioeconòmica de la Població*. Generalitat de Catalunya: Barcelona and IDESCAT 1996. *Estadística de població (1996)*. Generalitat de Catalunya: Barcelona.

Table 5. Active population and economic sectors 1986

County	% from occupied population								
	A & B	C & E	D	F	G & H	I	J	L,M & N	K,O,P & Q
Alta Ribagorça	20.62	8.81	13.25	10.81	15.20	4.64	3.41	9.93	13.34
Alt Urgell	21.17	2.91	20.20	7.03	18.89	4.32	3.82	9.18	12.47
Berguedà	8.52	10.07	39.22	7.27	14.45	3.05	2.27	6.76	8.39
Cerdanya	16.84	1.93	8.29	17.06	24.14	3.93	3.93	8.22	16.55
Garrotxa	8.22	2.93	49.76	6.05	13.67	2.67	2.58	8.49	5.63
Pallars Jussà	20.62	8.81	13.25	10.81	15.20	4.64	3.41	9.93	13.34
Pallars Sobirà	34.98	6.40	7.35	11.39	16.29	3.55	2.90	6.20	10.94
Ripollès	6.42	4.88	47.78	6.12	15.57	3.34	2.02	5.82	8.05
Solsonès	26.43	3.91	20.67	10.08	13.23	3.23	2.93	6.47	13.04
Val d'Aran	5.28	5.68	6.82	9.77	37.84	2.42	4.14	9.90	18.17
Total Mountain	8396	3571	23,064	5339	10,934	2218	1864	5175	6378
% Total Sectors Mountain	12.54	5.33	34.46	7.98	16.33	3.31	2.78	7.73	9.53
Total Catalunya	90,311	118,198	538,895	96,615	300,300	109,468	110,484	244,713	230,113
% Total Sectors Catalunya	4.91	6.43	29.30	5.25	16.30	5.95	6.01	13.31	12.54
% Mountain/ Catalunya ¹	9.30	3.02	4.28	5.33	3.64	2.03	1.69	2.11	2.77
Relative weight mountain ²	255.40	82.89	117.62	152.00	100.18	55.63	46.26	58.08	76.00

Sectorial codes of economic activities (CIDC-86): (A) Agriculture; (B) Fishing; (C) Mining extractives and chemistry; (D) Metallic manufacturing; (E) Energy; (F) Building; (G) Trade; (H) Hostelry; (I) Transport and communication; (J) Finances; (L,M,N) Public administration; Education, Health and Social Services; (K,O,P & Q) housing; productive services, personal services.

¹ Percentage in mountain region / Total Catalonia

² Ratio of % mountain * 100 / % Catalonia

Source: Own elaboration from IDESCAT 1988. *Padrons municipals d'habitants de Catalunya 1986. Estructura socioeconòmica de la Població*. Generalitat de Catalunya: Barcelona.

Table 6. Active population and economic sectors 1996.

County	% from occupied population								
	A & B	C & E	D	F	G & H	I	J	L,M & N	K,O,P & Q
Alta Ribagorça	8.70	5.72	11.67	15.32	24.24	5.20	2.16	15.76	11.23
Alt Urgell	11.23	1.54	18.22	12.02	22.57	6.88	2.66	15.95	8.92
Berguedà	7.17	2.94	31.40	12.04	17.67	4.12	1.96	15.53	7.18
Cerdanya	11.40	0.87	13.36	17.85	24.56	4.27	2.14	14.31	11.22
Garrotxa	4.93	1.06	45.59	7.71	14.80	3.42	2.12	13.08	7.30
Pallars Jussà	15.92	2.35	16.09	9.76	17.33	4.89	2.46	23.24	7.96
Pallars Sobirà	14.96	2.89	10.22	12.74	22.41	6.79	2.22	17.93	9.84
Ripollès	5.94	1.16	42.65	7.51	16.07	4.08	1.75	13.68	7.16
Solsonès	16.84	0.88	27.16	14.44	13.46	5.16	1.56	12.39	8.10
Val d'Aran	2.23	2.61	10.20	14.02	32.16	3.25	2.04	16.51	16.99
Total Mountain	5865	1228	21660	7581	12839	3086	1456	10510	5886
% Total Sectors Mountain	8.37	1.75	30.89	10.81	18.32	4.40	2.08	14.99	8.40
Total Catalunya	70891	20998	686315	153625	418953	140961	69012	355349	288548
% Total Sectors Catalunya	3.22	0.95	31.13	6.97	19.00	6.39	3.13	16.12	13.09
% Mountain/Catalunya ¹	8.27	5.85	3.16	4.93	3.06	2.19	2.11	2.96	2.04
Relative weight mountain ²	259.94	184.21	99.23	155.09	96.42	68.86	66.45	93.00	64.17

Sectorial codes of economic activities (CIDC-86): (A) Agriculture; (B) Fishing; (C) Mining extractives and chemistry; (D) Metallic manufacturing; (E) Energy; (F) Building; (G) Trade; (H) Hostelry; (I) Transport and communication; (J) Finances; (L,M,N) Public administration; Education, Health and Social Services; (K,O,P & Q) housing; productive services, personal services.

¹ Percentage in mountain region / Total Catalonia

² Ratio of % mountain * 100 / Total Catalonia

Source: Own elaboration from IDESCAT 1996. *Estadística de població (1996)*. Generalitat de Catalunya: Barcelona.

We will focus our contribution on the study of economic activities that make it possible to achieve sustainable local development with a clear transversal impact in the presented research lines, comparative advantage and territorial firm embeddedness. At the same time we will present a method, the second best option, which will help to choose some activities in the framework of regional planning.

2AN APPROACH TO MOUNTAIN AREAS: EUROPE AND THE CATALAN PYRENEES

In Europe, mountainous areas are quantitatively unimportant with respect to population. Nonetheless, they are important because of the size of the area they cover and the recognition of the value of their landscape for both the indigenous population and outsiders. For this reason, in these areas, local development should not just take into account economic factors but also social, environmental and territorial factors that contribute to creating the determining factors for local development. The high population density throughout Europe needs a distribution of activities and land uses that allows each territory to pursue the optimal economic activity that each area can offer. These should be the best of all possible activities for a given area, despite the fact that these uses might also be optimal for other areas as well.

In the future, not only should the pure economic profitability of activities be considered, but also the optimal social use of a given territory.

Within this framework, local development can be explained on the basis of a reinterpretation of the principle of the comparative advantage that was developed by economists in the eighteenth and nineteenth centuries. Within the framework of neo-liberal economics, it is necessary to revise a company's criteria for profitability, bearing in mind diverse external elements. The inclusion of externalities in the optimal benefit analysis of firms requires the business's economic behaviour to be related to the actions of outside agents. External economies can also modify costs and profits due to conditions in the natural, social and economic environment. Businesses' territorial embeddedness emphasises the network of institutions and socio-cultural elements that allow them to develop strategies to foster loyalty to a given territory among both suppliers and clients (Pallares-Barbera et al. 2004). Within the framework of the centre-periphery model, the urban 'core' acts as a counterpoint to the rural mountain 'periphery'. Thus, in a balanced territory, the most beneficial activities for each area must be preserved and promoted.

Our research was carried out in the counties located in the Pyrenees (Fig. 3). This territory occupies an area of 8.826 km² and had a population of 140,635 in the year 2001 (Table 1). It is characterised by valleys, some of them originating from glaciers and others through erosion caused by rivers, and the peaks range from 400 m to 3143 m at La Pica d'Estats, with the main habitats found between 400 m and 1000 m and especially in flat areas, around tectonic pits or where rivers converge. The active agrarian population constituted 9.43% of the total active population in 1999, although it was 23.18% in 1970. In certain counties, the industrial and mining traditions have been quite strong, accounting for almost 50% of the labour force (Tables 5-6). Currently, in addition to traditional residual activities in all sectors, both industrial renewal and the development of the service sector, basically all aspects of tourism are worth noting. Farms and certain industries involving agrarian transformation have also been renewed, both of which are organised into co-operatives and thus maintain a highly dynamic sector (Tulla et al. 2003).

Table 7. GDP of economic sectors 1995.

County	Million €CTS 1995		% Annual Variation	%GDP 1995			
	1995	2001		Primary	Industry	Building	Services
Alta Ribagorça	68.8	75.4	1.6	4.5	34.9	17.4	43.2
Alt Urgell	206.7	240.0	2.7	6.2	25.1	14.3	54.4
Berguedà	377.8	416.3	1.7	4.9	34.8	9.2	51.1
Cerdanya	154.8	185.8	3.3	6.9	9.6	17.2	66.2
Pallars Jussà	210.0	254.9	3.6	8.1	28.1	15.1	48.7
Pallars Sobirà	105.6	122.2	2.6	8.9	22.0	17.4	51.7
Ripollès	306.2	360.2	2.9	3.3	46.3	7.4	43.0
Solsonès	139.3	167.4	3.4	9.0	32.1	18.9	40.0
Val d'Aran	176.2	204.5	2.7	1.7	19.0	19.6	59.7
Total Mountain	1745.4	2026.7	2.9	5.2	34.2	11.5	49.3
Total Catalunya	76735.5	94003.3	3.8	1.8	30.3	7.4	60.4
% Mountain /Catalunya	2.27	2.16	-0.67	288.89	112.87	155.41	81.46

Source: BRUNET, J.M. *et alii.* (1980). *L'agricultura catalana. Estudi econòmic.* Fundació Jaume Bofill i Banca Catalana: Barcelona. OLIVER, J. i SOY, A. [Dirs.]. (1996). *Anuari Econòmic Comarcal 1996, Estimació del PIB Comarcal 1995.* Caixa de Catalunya: Barcelona.

Table 8. GDP of economic sectors 2001. Relative erigh of primary sector of counties (1975, 1995, 2001).

County	%GDP 2001				% mountain primary sector GDP/ Catalunya		
	Primary	Industry	Building	Services	1975	1995	2001
Alta Ribagorça	2.1	40.9	12.7	44.3	...	0.14	0.09
Alt Urgell	6.5	19.1	12.1	62.3	1.11	1.12	0.92
Berguedà	5.5	35.6	11.3	47.6	1.40	1.39	1.35
Cerdanya	3.6	9.0	20.9	66.5	1.17	0.84	0.40
Pallars Jussà	4.1	36.7	19.4	39.7	1.35	0.82	0.62
Pallars Sobirà	4.6	28.7	18.1	48.6	0.69	0.40	0.33
Ripollès	2.2	34.3	16.5	47.0	0.95	0.81	0.47
Solsonès	12.7	24.8	13.4	49.1	0.91	0.85	1.26
Val d'Aran	0.9	26.3	11.8	61.0	0.10	0.14	0.11
Total Mountain	4.2	32.0	13.8	49.8	7.68	6.51	5.55
Total Catalunya	1.7	31.3	7.2	59.8	100.00	100.00	100.00
% Mountain /Catalunya	247.06	102.24	191.67	83.27

In the 1975 Alta Ribagorça was included in Pallars Jussà.

Source: OLIVER, J. [Dir]. (2002) Anuari Econòmic Comarcal 2002. Estimació del PIB Comarcal 2001. Caixa de Catalunya: Barcelona.

In the year 2001, the GDP of these mountainous areas constituted 2.16% of Catalonia's total (Table 7), while the population constituted 2.22% of the total (Table 2) and the area 27.67% (Table 1). When broken down into sectors, the GDP in the mountainous regions (as compared to Catalonia, in brackets) is distributed with 4.2% (1.7%) in the primary sector, 32.0% (31.3%) in industry, 13.8% (7.2%) in construction, and 49.8% (59.8%) in services (Table 8). We can therefore see that the figures, in mountain regions and Catalonia, are similar for industry, while the mountainous regions have more agrarian and construction activity and fewer service activities. There is a tight relation between distance to the economic center of Barcelona and the economic dynamics of each county. The mountainous counties that are closest to the centre of the Barcelona metropolitan area, such as El Berguedà, are between 90 and 100 km away, while those located the farthest are between 200 and 250 km away, and the middle counties including L'Alt Urgell and La Cerdanya are between 125 and 175 km from Barcelona, although the transport networks and communications in all the counties are worse than in the rest of the country.

3THE TRADITIONAL THEORY OF COMPARATIVE ADVANTAGE

Comparative advantage is a theory that was developed within the context of classical economics. Briefly, it posits that each country specialises in those goods and services which it is most capable of providing as opposed to producing the goods and services that it needs. This leads to territorial specialization in the production of goods and services, thus promoting intense international trade. David Ricardo (1817) founded the theory of comparative costs among the different regions in accordance with their natural or historical conditions (Ricardo 1950). The relationship between the costs of two types of merchandise in a certain country is the same as the relationship between their prices under the assumption of perfect competition. Henrich von Thünen (1826) added the costs of location to the previous analysis, and thus the cost of transporting goods and services, under the assumption of a homogeneous landscape.

In 1933, the Heckscher-Ohlin model introduced different characteristics of productive factors in each region, produced by geographical variations. A country will export more goods and services that require intensive factors of which it has the greatest supply, and import goods and services that require intensive factors of which it has the least supply. It is assumed that it is extremely difficult to alter the organization of each country's intensive factors over a short period of time. Among these factors, education, the capacity for innovation and technology are considered highly important. In 1971, Earling Olsen claimed that for all regions there is a 'relative advantage' within the comparative advantage analysis, which can be measured from the standpoint of the cost of opportunity, if they specialise in the production of the goods and services they are best endowed with. This is based on the centre-periphery theory developed by Gunnar Myrdal (1957) in which unequal development tends to increase as long as diseconomies or other negative effects are not generated due to excessive growth and congestion in the more developed regions. If this occurs, the more peripheral regions are given opportunities for economic localization with comparative advantages (Olsen 1971, Peet and Hartwick 1999).

This dilemma between balanced development and the polarization of unequal regional development suggests the possibility of some peripheral regions having a 'relative' comparative advantage in terms of certain goods and services. We have carried out various research projects in the Catalan Pyrenees along these lines, the locations of which are shown in Figure 3 and 4. The study of Tulla (1984) applied this theory to the production of dairy products in certain counties in the Catalan Pyrenees. Likewise, Pallares-Barbera and Vera (2000) demonstrated that El Berguedà, one of the counties in the Pyrenees, is undergoing an economic revival in industry and services due to the comparative advantages of a network of innovative small and medium enterprises.

4 THE ASSUMPTIONS OF THE CENTRE-PERIPHERY MODEL IN MOUNTAINOUS AREAS

Human settlements and activities have existed since time immemorial and so mountainous areas involve problems that should be considered along with the regional reality as a whole. The urban 'core' and the rural mountainous 'periphery' are highly interrelated territories, each with their own strong characteristics. Along these lines, four basic premises should be taken into account: a) limitations on the space available for certain uses; b) the most beneficial activities for each area must be preserved or promoted in a balanced territory; c) both the nature and society of mountains form a part of our human heritage. Finally, d) the existence of a double market for land invalidates open competition as the sole policy and makes territorial planning advisable. A plot of land can have a different price if it is required for an agrarian use, for industry or for a second home development. This has to be pointed out in the planning objectives of each region.

The transformation of dairy products allows a 'relative' comparative advantage, and it is suggested that there is an extremely limited amount of space available in mountainous areas for maintaining this activity. If we look at the prices received by farmers over a long period (1985-2002) through the 'Cooperative of Cadí', together with the prices paid by farmers compared with Spanish and French averages, we see that there is a clear comparative advantage (Fig. 6). In order to be minimally competitive, flatter, more irrigated spaces closer to communication networks are needed. Since there is also little land for developing and building infrastructures, territorial planning decisions must be taken in order to delimit areas for each use instead of leaving decisions to open competition.

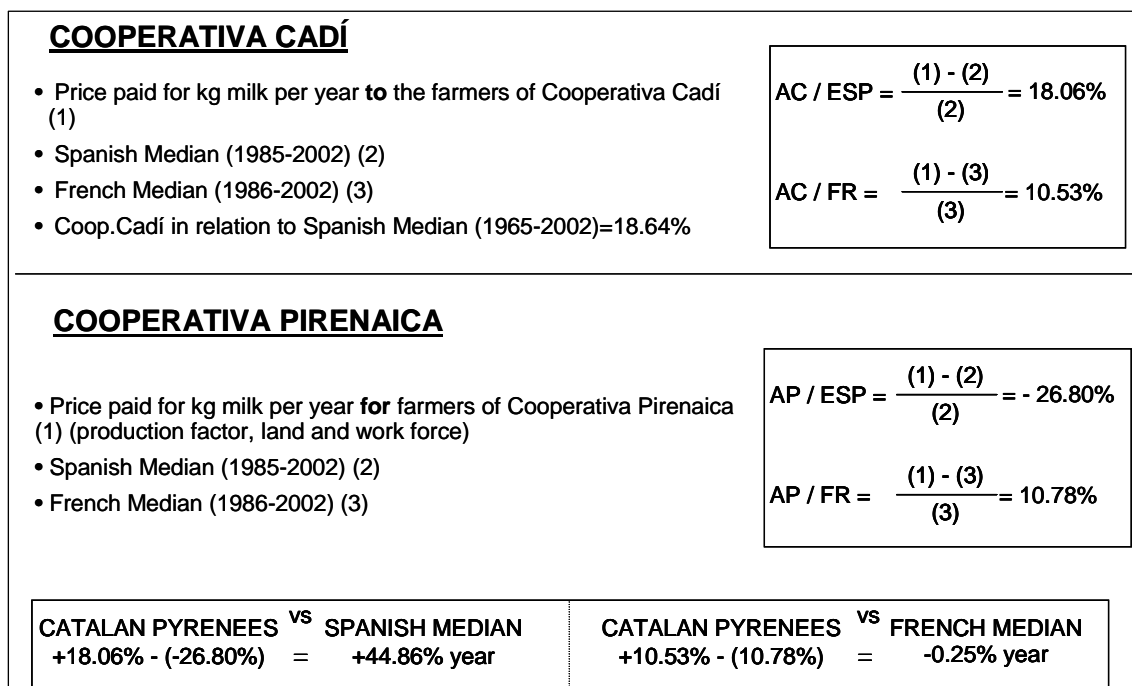


Figure 6. Comparative advantage. Source: Own elaboration using data of both cooperatives (Cadi and Pirenaica).

In order to maintain a balanced use of the territory in a region, an analysis must be made of which activities are most appropriate for each area, thus avoiding spatial congestion and conserving the human and natural heritage. Mountains are a kind of human heritage and must be viewed as ‘capital’ and not as a ‘renewable resource’. In this sense, we must avoid aiming for immediate results and instead make long-term economic planning a priority. The demand for land for each use constitutes a series of different markets since a housing promoter can pay much more than an industrialist, who in turn can pay more than a livestock farmer. The needs for a certain type of land can be an excluding factor, since second homes can be located on sloped lots, while certain agrarian activities require flat land. Thus, what is needed is territorial planning based on the ‘second best option’ method.

5COMPARATIVE ADVANTAGE AND ‘THE SECOND BEST OPTION’

The principle of comparative advantage, when applied using the ‘second best option’ method, is based on two assumptions: space is a scarce resource which obliges us to be discriminating when locating activities, and there can always be a second most optimal placement when distributing activities among different areas. Let us imagine a scenario in which there are three regions (A, B and C) and four land uses or activities to be assigned to a location in these regions, as presented in Figure 7. These uses can include, for example, a protected natural area, a housing development for second homes, a dam and reservoir, and an agrarian training school along with its experimental fields and forests. The determination of the suitability of a use for each region will be made while taking into account a series of parameters, each with a ‘weight’ value that has been decided in advance, such as the creation of workplaces, environmental impact, social use, biological characteristics, accessibility, and so forth. Thus, each use will obtain a certain value for each region, which is expressed as a percentage. The higher the percentage, the better is the value.

LAND USES AND ACTIVITIES	REGIONS		
	A	B	C
Protected natural Area	70%	80%	20%
Extensive Second Housing	50%	90%	40%
Dam and reservoir	40%	70%	50%
Agrarian Training School	60%	75%	30%

The percentage shows the maximum value that a specific area would obtain, with the location of one of these uses or activities (Solutions are acquired using different methodologies).

Figure 7. Comparative advantage and the 'second best option'. Source: Own elaboration

In our example, two technical assumptions are posited. The first is that all the regions are approximately the same size; and the second is that all the uses would occupy the same surface area. The best use for each region is chosen regardless of whether another region might have better conditions for that use. Thus, in Figure 7, the protected natural area will be located in region A (70%), despite the fact that B has better conditions (80%), since the other uses in region A have values of less than 70%. The housing development will be located in region B because it has the highest value of all the possible uses in B, and in this case it is also the region where housing development has the highest value. The dam and reservoir will be located in region C because it has the highest value (50%) among all the uses of this region, despite the fact that the dam and reservoir obtained a value of 70% in region B. Thus, all the regions will have the most highly valued use of land among all the possible uses in each region, even though this use may be more highly valued in a different region. In the second round of assignments, since there are more uses than regions, as shown in Figure 7, the agrarian training school will also be located in region B since it has the highest value (75%) and the other regions have already been assigned uses.

If the principle of comparative advantage along with 'the second best option' is not taken into account, the most likely outcome would be to choose the location of an activity based solely on the lowest costs or obtaining the highest value on a scale such as that used in our example. Thus, region B would attract the location of all four uses, leaving regions A and C with nothing, leading to the desertification of some regions and the congestion of others. In order to avoid this, the theory of comparative advantage operates using relative criteria and taking into account the best option for each region, even if this option is the second, third or n^{th} option among all the regions for a certain use. If we use a terminology of costs, we are suggesting a location based on the relative cost unit rather than 'total costs' for a given activity (Smith 1981). If we link this with Olsen's formulation, which was based on Myrdal's theory of unequal development that we have used to analyze the Catalan Pyrenees, we can then state that the transformation of dairy products (Tulla 1991) or industrial embeddedness (Pallares-Barbera & Vera 2000) demonstrate the theory of centre-peripheral comparative advantage.

6 TERRITORIAL EMBEDDEDNESS AS LOCAL DEVELOPMENT FOR MOUNTAINOUS AREAS

The concept of territorial embeddedness is defined within the dynamic incorporation of small and medium enterprises in a given area, where institutional organizations, local networks of economic activity and social collectives generate an economic space, which constitutes a favourable bed for establishing industrial enterprises. Territorial embeddedness refers to the enmeshing of economic and cultural relationships within broad social structures, which can be used to provide the basis for local economic policies (Pallares-Barbera 2002).

In counties like El Berguedà, which has remained on the sidelines of the economic development generated by the Barcelona metropolitan area, there is a frequent need to answer questions about the nature of its development. It is believed that textile colonies and lignite mining are activities in crisis, yet all the economic and demographic indicators show a clear recovery throughout the county. From our research, we can conclude that this county is turning into a 'container' (Dicken 2000, Porter 1990), which encompasses local institutions and practices that help to produce particular types of businesses. Despite the fact that business competition is global and remote regions thus appear less competitive, the role of the 'container regions' appears to be stronger than ever. This is only possible, however, if they are able to recover their productive structures by being differentiated from national structures through local values, cultures, institutions and history, becoming 'glocal' (Swyngedouw 2000), as is the case of El Berguedà.

The businesses interviewed were developed with local capital, and the management and employees live in the county. Still, the fact that this business network has its roots in the place where it began is not only due to the fact that the employees and capital are local. The local socio-cultural 'milieu' is also responsible for spinning the network that 'captures' businesses for the territory, and in many ways it tacitly obligates them to include 'local' elements in their production, thus differentiating them from others. This is also a factor in their global competitiveness. This is not a case of cultural determinism (Dicken et al. 1994), in which all the businesses interviewed are similar or follow similar strategies. The businesses interviewed are all different, despite the fact that they have certain characteristics in common. The differentiation of the business systems depends on their integrated or separated natures, in accordance with the context in which they operate (Whitley 1992). A business's greater or lesser degree of cohesion with the territory is the result of the distinctive configuration of the social, political, financial and educational institutions and the organization of work. There are always different degrees of territorial embeddedness depending on the county, but it is always sustained through a network of family SMEs with local capital. The management and employees constitute the channels through which the socio-cultural framework and local knowledge circulate to the business and embed it in the territory.

El Berguedà can be distinguished from the neo-Marshallian industrial district, as reinterpreted by Becattini (1990), due to its low sector-based concentration and the low level of economic participation among businesses in the county. That is, one local business does not necessarily act as the supplier for another. While in a neo-Marshallian district, tacit knowledge makes information flow through direct contacts among businesses within a sector, constituting one of the decisive factors in competitiveness, in 'embedded industrial districts', direct action between businesses does not exist. They do not form a part of the same network, or process, of value added. However, they do share the existence of agglomeration economies, even though these may only be cultural, historical and social in the 'embedded industrial district', which serves to differentiate them. The concentration of many small businesses in El Berguedà characterises its territorial embeddedness and its significant variance from Perroux's model (1970), in which the engines of regional development are large businesses that produce regional multipliers.

7 COMPARATIVE ADVANTAGE AND MOUNTAINOUS AREAS

Our studies have generated many different results that highlight the importance of comparative advantage in promoting sustainable development in mountainous areas:

- 1) The analysis of comparative costs of the different activities. In rural mountainous areas, costs are frequently calculated on the basis of the acquisition of external factors for farming or small businesses, which are mainly family-owned, not taking into account all the hours worked or remuneration of the land factor, due to traditional rural culture (Tulla 1991, Servolin 1972). In certain counties in the Pyrenees, specialization in dairy production has become the most profitable activity because the farmers have received an average yearly price per kilo of milk that is 18.06% higher than the average for Spain (1985-2002), and 10.53% higher than the average in France (1986-2002). This is possible because it is a highly dynamic co-operative Cadí that produces high quality cheese and butter with value added in the transformation process, and it exports 50% of its production. At the same time, the production factors acquired during the 1985-2001 period by another co-operative – La Pirenaica – show an average price of 26.80% lower than the Spanish average, but 10.78% higher than the French average. There are also other advantages, such as activities that reduce the use of the individual work factor (Tulla & Pallares-Barbera 2003). This process of specialization has been undertaken in three phases. The first (1920s – 1960s) consisted of the decision to produce dairy products; the second (1960s – 1980s) was the decision to specialise only in producing dairy products for high quality transformation with value added; and the third (1980s – 2000s) was to improve the training, facilities, quality of the bovine breeds and organization of manufacturing and distributing in order to compete within the EU. Carrying out multiple activities also favours the competitiveness of costs as well as income in retired people's family units due to the proximity to small urban and tourist centres.
- 2) The evaluation of the negative and positive externalities of each activity or land use describes different aspects. First, an analysis must be made to know which activities generate negative externalities, such as industrial pollution or the process of building second homes in a high value landscape. Then, maintaining a well planned urban and natural environmental space with an attractive landscape generates positive externalities. Thus, if costs are calculated for the medium and long term and not just the short term, we can plan which activities and land uses are most beneficial for a sustainable development. For example, the promotion of hotels and tourist residences which will be occupied on a regular basis (hot beds) might be more desirable than an excess of second homes which will only be occupied periodically (cold beds), an average of 18 days per year in the Pyrenees (Martinez-Alier 1984).
- 3) The consideration of the external economy for certain activities or land uses. It is a fact that many businesses, both in the industry and the service sectors, are beginning to more highly value the quality of the landscape when deciding on their location. Thus, the extensive use of land, the existence of a high level of agrarian activity and the use of natural areas for non-damaging leisure activities can be more easily integrated into the landscape and become a positive externality (Claval 1998).
- 4) The use of non-monetary units to calculate efficiency in the production of goods and services. The energy balance, for example, can more clearly demonstrate the advantages of extensive agrarian activities compared to intensive ones. Economic efficiency can also be compared to ecological efficiency. This can be more closely related not only to the quality of the natural landscape, but also to the possibility of maintaining a minimum population threshold needed to preserve this landscape. There are several methods available to compare or refute the merely economic methods (Martinez-Alier 1984).
- 5) Limitations on the amount of useful land available needs a co-ordinated specialization in land uses based on the best relative situation of each location, as was explained using 'the second best option' method (Fig. 7).

8 CONCLUSIONS

In this presentation we have introduced a process of naturbanization in the Catalan Pyrenees and attempted to demonstrate, based on our research, that local development can be explained on the basis of a reinterpretation of the principle of comparative advantage.

Using counterurbanization theories, we have examined the specific growth in housing and population around NPA, because of the quality of the natural and social environment and landscape. In the High Catalan Pyrenees, there are new processes which have led to an increase in the number of houses and seasonal populations in these areas, with a ratio 2 and 3 times more than the permanent population. This new reality will make it possible to implement sustainable local development (Fig. 1).

If we start on the basis of the principle that European countries are very densely populated, then available land is becoming scarcer. Given this, the location of activities must be made a priority, not only because of businesses' internal costs but also because of both the positive and negative externalities generated, and because of external economies and diseconomies. Some of the problems with the economic feasibility of activities in mountainous areas are the result of a partial, incomplete calculation of the cost of activities other than intensive land use. In the comparative advantage of the specialization in dairy production, the leadership of the two co-operatives mentioned, which have recently formed an alliance with others in Catalonia, have accentuated the degree of specialization, quality and technology of the farms as well as investments (Tulla 1984). Territorial embeddedness is also a model of local development that can strengthen these 'relative' comparative advantages.

The industrial tradition in the embedded district of El Berguedà is highly competitive in the labour market, especially because of the transmission of tacit knowledge of industrial discipline acquired through the incorporation of the system of industrial colonies. Commercialization involves a reduction in location costs for companies in El Berguedà, to the extent that this county is becoming an attractive centre for new investment without any added costs, in order to build and encourage a labour market that on other occasions may have been a barrier for entry. Thus, an overall network of embedded institutions and socio-cultural elements is created in a territory to include territorial differentiation based on historical factors and cultural adaptation, in order to analyse the particular features of every place.

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