Journal of Coastal Research	11	3	858–874	Fort Lauderdale, Florida	Summer 1995

Local Government Planning for Coastal Protection: A Case Study of Cantabrian Municipalities, Spain

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ABSTRACT

FISCHER. D.W.; RIVAS, V., and CENDRERO, A., 1995. Local government planning for coastal protection: A case study of Cantabrian municipalities, Spain. *Journal of Coastal Research*, 11(3), 858–874. Fort Lauderdale (Florida), ISSN 0749-0208.

This paper describes a survey of Cantabrian local public officials to determine the degree of coastal protection within their municipal jurisdictions. The Cantabrian coastal zone has been intensively studied by physical scientists and Span implemented a recent coastal protection law. Given the growing development pressures in coastal Cantabria, the study was undertaken to assess the emphasis given to coastal planning by local governments. The findings show that the municipalities lack basic knowledge of their coastal zones and strive to develop them for greater tourism use rather than create management plans for coastal protection.

ADDITIONAL INDEX WORDS: *Local officials, coastal protection, coastal hazards, Spain.*

INTRODUCTION

Spain's coastal zone spans some 7,880 km of coastline bordering on three seas: the Cantabrian, the Mediterranean and the Atlantic. While Spain's capital is located in the center of the country, it is a coastal-oriented nation.[1] Spain's coastal zone receives massive foreign and domestic tourism (tourism accounts for 10% of total earnings in the country, according to the Ministry of Industry, Commerce and Tourism; press releases, January 1994). Spain's fishing fleet represents about half of the European Community fishing fleet, and Spaniards consume high amounts of seafood. As a manufacturing nation, Spain has the eighth largest economy in the world (OECD, 1993).

All of this economic interest in the coastal zone means that the Spanish coast is under enormous development pressure. While fishing and industry are large users of the coast, tourism is the driving force behind much of new coastal development and urbanization. Spanish citizens are moving from inland areas to settle in urban enclaves along the coast and presently over 54% of the population live within 50 km of the sea. With a depopulating interior and a highly populated coastal fringe, major investments in infrastructure have been targeted for the coastal zone to include modernization of ports, airports, highways, sewage treatment facilities and parks. New housing development also concentrate to a great extent on the coast. Coastal protective works are a large item in the national budget based on a recent national plan that contemplates an investment of U.S. $1500 million over a period of 15 years (GALLARDO, 1993).

During the last two or three decades coastal development in Spain has taken place mainly along the Mediterranean coast and the Balearic and Canary Islands because of their popularity with northern European tourists. The resulting developments have generated considerable environmental damage along many coastal segments. The northern coast, with relatively high rainfall and fewer hours of sun per year, has experienced less development pressure and is, as a result, in better environmental condition. Development pressures have increased in the northern coastal zone, and there is growing concern of degradation similar

94022 received and accepted 5 May 1994.

[1] A recent study noted that large coastal nations with inland capitals did not tend to be oriented to their coastal zone. This statement would appear not to apply to Spain. See SORENSEN, J; MCCREARY, S., and BRANDANI, A. (1992). Arreglos institucionales para manejar ambientes y recursos costeros. Kingston: Coastal Resources Center, University of Rhode Island, p. 26.

to that observed along the Mediterranean. However, the northern coast is in a better position for ensuring a balanced development of this coastal area that integrates environmental aspects.

Given these major coastal concerns, it is not surprising that Spain has moved to legislate for the protection of the coast. The Shores Act of 1988 was founded on several premises (MINISTRY OF PUBLIC WORKS AND URBANISM, 1989):

—shift in population to the coast with a density four times higher than the national average;
—rapid privatization and development of the coast with reduced public access, increased shorefront construction, high density transport routes and unprocessed waste;
—shoreline erosion and loss of salt marshes from public and private development;
—loss of inherent public values through the degradation of the natural coastal environment;
—fragmented legislative coverage of coastal uses and rights of use.

Because of these concerns The Shores Act sets forth a new approach to the coastal zone to include:

—creation of a 100 m protection easement in undeveloped areas of the coast and a 20 m protection zone in urbanized areas[2];
—creation of 500 m zone of influence inland from the landward limit of the shoreline to ensure adequate public access and stricter zoning of building density;
—shift in the concept of coastal property to public uses that involve no fixed installations;
—declaration of public property for all areas of shoreline accretion, small islands, sea flooding, cliffs, *etc.*
—beaches declared as public property with strict limits on locating concessions and installations supporting beach uses;
—forbidding drainage of all salt marshes and mining of sand and gravel in rivers and beaches;
—regulating waste disposal and fill in the coastal area of influence;
—regulating coastal development construction and concessions in cooperation with regional and local governments.

The distribution of powers with respect to the coastal zone between the central, regional and local governments is not completely clear. The regional level of authority, only established in 1982, are autonomous levels of government which have only begun to legislate in the area of coastal planning. The region of Cantabria is one of these new regional authorities which are similar to states in the U.S. The key matters of approvals within 100 m public shoreline easement and local municipal zoning plans affecting the coast require approvals from the appropriate field offices of the Ministry of Public Works and Urbanization (MOPU). However, the regional authority is responsible for final approval of local zoning plans, general land use planning, urban planning and housing development. Because most regional governments have not yet passed coastal legislation, active planning of coastal lands is done by municipalities through their general land use plans. These plans must conform to the general guidelines established by regional master plans, but the lack of precise definition of the coastal zone within the region and how it is integrated into this three tiered system means that municipalities set the stage for coastal planning (SUÁREZ DE VIVERO, 1992).

The objective of this paper is to report on the status of coastal planning in Cantabrian municipalities relative to their general plans. A secondary objective is to assess the extent of existing knowledge about the natural environment and hazards in this coastal area by local officials responsible for planning and development decisions. This research relies on a case study approach to understand how the coastal municipalities in one autonomous region of northern Spain respond to development pressures.

SELECTED PREVIOUS STUDIES

Most research focusing on coastal planning and development is at the national and state or provincial levels. Far fewer studies have focused on broad surveys of municipal planning in the coastal zone. One of the earliest efforts was research on the response of coastal municipalities to coastal flood hazard (BURTON *et al.*, 1969). This research reported on the adaptions municipalities were making to coastal storm experience in order to reduce the associated losses of life, property and local revenues. The study area covered the eastern

[2] These public protection zones are landward from the limit of the sea shore which itself is delimited by the "zone between the lowest water mark of high spring tides and the highest limit reached by the waves in the greatest known storms, or, the highest water mark of spring tides, whichever is higher" The 100 m begins from the highest water mark landward and can even be extended another 100 m upon agreement of all three levels of government (Ministry of Public Works and Urbanism, 1989, pp. 20, 26). The 500 m zone influence includes the 100 m zone (Ministry of Public Works and Urbanism, 1989, p. 29).

U.S. coast from Maine through to North Carolina from which 15 municipalities were selected for case studies. A major finding was that land use zoning is best left to local governments, and their regulations of land use recognize flood hazard planning on the basis of the degree of hazard faced at each location. In this way the type of use and construction can be adjusted to fit the degree of hazard involved.

A survey of all coastal counties in Florida having a sandy beachfront (FISCHER *et al.*, 1984, 1986) focused on local officials' perceptions and responses to shoreline erosion. Detailed questionnaires sought information on local coastal objectives, physical beach trends, beachfront land uses and planning, erosion control measures favored, and coastal issues encountered in beach management. Results showed coastal county officials were on the whole responding to beach erosion and developing measures for reducing dune and beach loss via their general plans. In addition, the economic and policy issues associated with shoreline erosion were enumerated in FISCHER (1990).

The study of growth management without specific reference to coastal concerns was prominent in the U.S. in the 1980's. For example, both state and local levels of concern were addressed in surveys of development growth pressures and planning responses by the appropriate government agencies (BROWER *et al.*, 1989; DE GROVE, 1984; DE GROVE and STROUD, 1988; MANTELL *et al.*, 1990). In general, these studies show that innovative yet aggressive approaches by state governments were successful in guiding local growth planning in order to preserve the physical environment. At the local government level, the use of mandated comprehensive planning fostered innovative approaches to balancing the demands for environmental quality with new development (DE GROVE, 1991).

Two studies of local government responses to coastal hazard were recently completed. The first concentrated on California's municipal effort to develop and protect their coastal zones via municipal ordinances and regulations (GRIGGS *et al.*, 1992). This study relied on a questionnaire and interviews noting the use of setback standards, technical study requirements, regulation of seawalls, and desired changes from state agencies. The second study used a telephone survey to determine Louisiana coastal residents' and local officials' views on the impacts of sea level rise (LASKA and EMMER, 1992). The California and Louisiana surveys showed the need for clearer policies from state governments to assist local land use planning in potentially hazardous coastal areas. Coastal hazard information was deemed lacking, as well as the regulatory measures needed to reduce development in threatened areas. Surprisingly, only four out of the 48 California local governments surveyed had a specific ordinance dealing with geologic hazards. Even though the Louisiana study dealt specifically with sea level rise and the California study dealt with coastal erosion and flooding, both studies showed that local officials felt they lacked the regulatory measures to address the problems they faced. While no official wanted to restrict development in response to coastal hazard, local governments seemed increasingly aware of the conflicts they faced between public and private concerns.

The above research is centered on U.S. experiences. No studies could be found which surveyed local official attitudes or opinions toward coastal management concerns in Spain. While Spanish government reports may exist on this topic, none of these efforts were found in the published literature.

The north coast of Spain (Figure 1) is characterized by a mild climate with relatively high rainfall (average yearly temperature 14 °C and rainfall 1,200 mm). It includes a rocky, cliffed coast punctuated with sandy pocket beaches and larger beaches, as well as wetlands along riverine estuaries. Mountains with altitudes of 2,000-2,600 m are situated within 35–50 km from the coast.

The population in the three autonomous regions bordering the Cantabrian Sea numbers some 4 million people, of which close to 3 million live within a 15 km coastal strip (CENDRERO, 1989). The autonomous region of Cantabria, located in the central part of this stretch of coastline (Figure 1), is representative of the "average" conditions in the area. This region is neither subject to high urban-industrial concentrations, such as in the Basque Country, to the east, nor does it have long stretches of undeveloped coast as in Asturias, to the west. The economy of the region is in reasonable balance between the major sectors of tourism, industry, agriculture and fisheries.

Cantabria has a population of 530,000 and includes an area of 5,200 km^2. Out of the 102 municipalities in the region, 33 have part of their territory bordering the open coast or an estuary. These municipalities represent 66% of the total population. There is a growing domestic tourism,

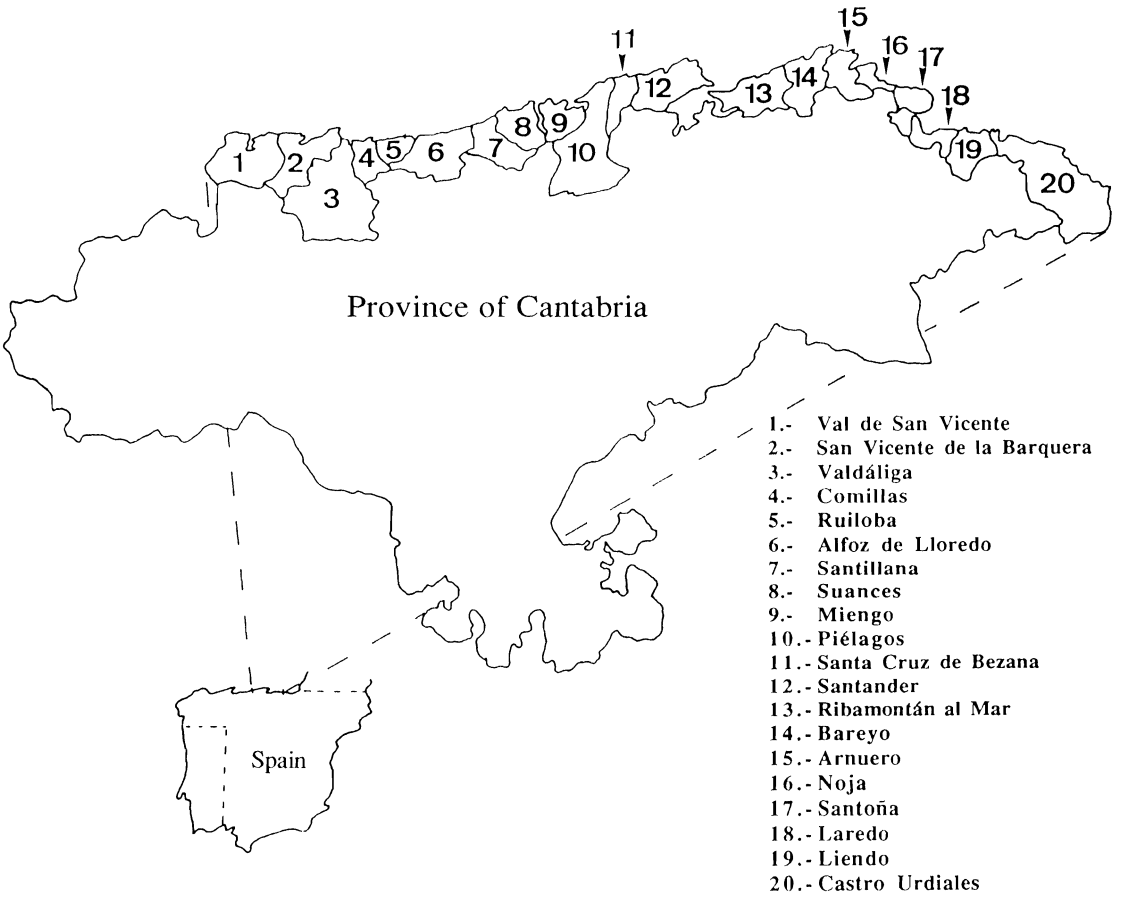

Figure 1. Location map showing Cantabrian municipalities with an open coast.

particularly during July and August when existing coastal populations may increase from 4 to 20 times. This tourism has promoted the rapid development of housing in rural areas of these coastal municipalities. Spaniards vacationing in Cantabria prefer to buy or rent flats in new high-rise buildings or separate dwellings rather than staying in hotels or camping areas. This demand for ownership of seasonal housing has extended urbanization into areas formerly occupied solely by dairy farms during the past.

Within Cantabria, a series of studies on the analysis and assessment of environmental conditions and natural hazards for planning purposes has been conducted. These studies ranged from general analyses of the historical evolution of the coastline and of land uses along it (RIVAS and CENDRERO, 1991) to the assessment of hazards (RIVAS and CENDRERO, 1993), the determination of the erosive condition of cliffs (RIVAS and CENDRERO, 1992), detailed analyses of specific areas for urban planning (FRANCÉS *et al.*, 1990a, b), natural park planning (FRANCÉS *et al.*, 1990a, b), and restoration of degraded areas (FRANCÉS *et al.*, 1992; RIVAS *et al.*, 1992). However, it is not known to what extent these findings have been incorporated into the planning of the Cantabrian coastline.

METHODOLOGY

The data for this study were obtained from a questionnaire that asked local officials to describe

Table 1. *Cantabrian coastal municipalities from west to east, as in Figure 1*

	Population	Coastal Length	Population/ Coastline	Cliffs	Beaches	Estuaries
Val de S. Vicente	2,487	19.2	129.7	9.5	1.1	8.5
S. Vicente de la B.	4,349	40.5	107.4	6.0	4.0	30.5
Valdáliga	2,618	6.0	436.3	0.0	1.5	4.5
Comillas	2,461	8.0	307.6	4.0	0.5	3.5
Ruiloba	731	6.0	121.8	6.0	0.0	0.0
Alfoz de Lloredo	2,778	8.7	317.5	8.5	0.2	0.0
Santillana	3,839	4.5	853.1	4.5	0.0	0.0
Suances	5,842	19.1	305.8	6.5	1.6	11.0
Miengo	2,964	28.4	104.1	5.0	1.4	22.0
Piélagos	9,537	19.1	499.3	5.0	2.6	11.5
Bezana	5,280	4.4	1,193.2	3.0	0.3	1.1
Santander	196,218	30.7	6,391.5	14.0	2.7	14.0
Ribamontán al Mar	2,892	19.9	144.9	7.5	5.4	7.0
Bareyo	1,576	20.6	76.5	9.0	0.3	11.2
Arnuero	1,884	13.7	137.5	5.0	0.2	8.5
Noja	1,562	13.7	113.6	2.5	4.7	6.5
Santoña	10,929	17.3	631.0	6.0	2.3	9.0
Laredo	13,019	13.5	964.3	5.0	4.5	4.0
Liendo	787	5.1	155.0	5.0	0.1	0.0
Castro	13,575	33.3	407.3	21.5	2.1	9.7

Note: All coastal features are measured in kilometers. Population is based on official census, 1991

their planning for the coastal zone within their respective municipalities.

The municipalities selected were all, as indicated above, in the autonomous region of Cantabria. It was chosen as the study area not only because of its representative character, but also because of the ability to build on earlier contacts, existing knowledge of the area, and the ease and economy of administering the interviews. All coastal municipalities with cliffs and/or sandy beaches were incorporated into the study regardless of population size and length of coastline. Municipalities without an open coast or without a substantial part of the coast of a bay were eliminated from the study. Thus, 20 municipalities with open coast were included and are shown in Figure 1 and in Table 1. This table summarizes two key aspects: the size of the permanent municipal population and the length of its coastline in terms of its physical features and the number of residents per kilometer of shoreline. The table ignores tourist populations. Santander, the capital of Cantabria and its largest city, ranks the highest in terms of the population/coastline ratio. On the other hand, Bezana, ranking second, has a more balanced relationship between population and its length of coast. Bareyo, ranked last, has a very low population in relation to its coastal length. Thus, this table indicates the geographic scope of the study using selected indicators of population and length of geomorphic features.

The questions asked of these local officials included the topics of what coastal problems were being experienced, what coastal features were protected, what coastal hazards were avoided, what economic activities were promoted, their knowledge of sea level rise, response to conflicts involving coastal protection and development, and their preferences for the protection of selected coastal features.[3] Both open-ended and closed-ended questions were used. The questions used were drawn in part from the California and Louisiana studies previously described.

It is recognized that coastal planning can be influenced by the national, regional and local levels of government as well as non-governmental organizations and the general public. However, this study focused on local government because it is a central arena where coastal plans are forged, interpreted and implemented. Local government officials integrate the requirements of other governmental levels with demands from their constituents to create the plans that shape the development of their respective coastal zones. Therefore, this study was directed solely to local

[3] For a copy of the questionnaire in either English or Spanish write the lead author.

governments in the first such survey conducted in Spain.

An advance copy of the questions was sent to the mayor of each municipality with an open coast. Along with the questions, a cover letter was enclosed to request that the questions be discussed with the municipal planner to ensure that political and technical considerations were integrated prior to an interview. Each respondent was asked each of the open-ended questions in the order presented in the questionnaire and their responses were recorded by the interviewer. At the end of each open-ended response, a set of prescribed options was presented to the respondent to see if any of these new possibilities could be added to their open-ended response. In this way, both open-ended and closed-ended responses were obtained.

The respondents interviewed included both elected and appointed officials. The personal schedules of the mayor and planner dictated the schedule for interviews; although in the beginning of the study, both were interviewed to test the degree of corroboration between mayors and planners. It was found that the request to discuss the questions between the mayor and planner prior to the interview assisted in integrating relevant points of view. Also the small number of municipal officials and the small size of each of the municipalities meant that both mayors and planners had intimate knowledge of local politics and coastal concerns. Table 2 indicates individuals interviewed in each of the municipalities. All 20 sets of local officials cooperated fully with the study team.

Since the focus of the study was on describing the degree of coastal-centered planning done by the municipalities, the data from the questions were subjected to a qualitative analysis. For each question, the number of municipalities responding to that element were counted, totaled and placed into a table that grouped similar questions and responses. Because the number of municipalities in the study universe was only 20, no summaries of the data were made other than percents.

Table 2. *Positions of local government officials interviewed.*

Municipalities	Officials Interviewed		
	Mayor	Planner	Both
Val de S. Vicente		X	
S. Vicente de la B.			X
Valdáliga			X
Comillas		X	
Ruiloba		X	
Alfoz de Lloredo	X		
Santillana	X		
Suances	X		
Miengo	X		
Piélagos			X
Bezana		X	
Santander		X	
Ribamontán al Mar	X		
Bareyo	X		
Arnuero	X		
Noja	X		
Santoña	X		
Laredo		X	
Liendo	X		
Castro	X		

SURVEY RESULTS AND DISCUSSION

As shown in Table 3, only eight out of twenty coastal municipalities define their coastal zones beyond the required 100 m. The remainder either use the definition of 100 m contained in The Shores Act of 1988 or use the boundaries of provincial parks as their defined zones. Within their coastal zones (regardless of width), eight municipalities do not emphasize any particular features of the coastal zone, even though some have outstanding features. For example, Val de San Vicente has the highest coastal cliffs with the least coastal development, yet it has not planned for its cliffs as a coastal asset. Santillana del Mar has a cliffed coast with significant scenic features and a small pocket sandy beach, yet its orientation to its historical village and the Altamira Cave has resulted in a deemphasis of its coastal zone. Other municipalities clearly emphasize selected coastal landforms within their zones such as Piélagos which has large dunefields, albeit protected through provincial park status. Noja, on the other hand, has conferred municipal park status on its small dunal area within the 100 m zone.

Table 3 also shows the range of problems experienced by these municipalities. For example, 13 out of 20 municipalities reported water pollution as a recurring problem, making it the largest reported problem afflicting these areas. On the other hand, erosion is not seen as a major problem on the Cantabrian coast as only one municipality noted beach erosion and three others cliff erosion. The most recent coastal problems consisted of growing urbanization, scarcity in availability of public services, waste disposal and wetland loss respectively. Nearly half of the municipalities re-

Table 3. *Officially recognized aspects of the coastal zone by Cantabrian municipality in order from west to east as shown in Figure 1*

Municipalities	Coastal Zone Definition	Coastal Zone Emphasis	Coastal Zone Problems															
			N	BE	WP	CE	WL	CF	LNA	WD	IU	C	SI	SD	LD	RC	EI	SPS	O
Val de San Vicente	a	-			■					◪			◪					■	
S. Vicente de la Barquera	b	a-b-c-d-e-f			■		◪	■		◪	◪		■					■	
Valdáliga	b	a-b-c-d-e-f				■	■											■	
Comillas	c	-			■														
Ruiloba	c	b-d-f			■														
Alfoz de Lloredo	a	-			■								■					■	
Santillana	a	-			■														
Suances	c	a-b-c-d-e-f			■			■	◪	◪	◪		◪					◪	
Miengo	a	b-c			■		■		◪		■		■						
Piélagos	a	a											■						
Sta. Cruz de Bezana	c	b			■					■					◪			◪	
Santander	c	b-c			■			■									■	■	
Ribamontán al Mar	c	a-b-c-d-e-f		■							◪							■	
Bareyo	c	?											■					■	
Arnuero	a	-					◪			◪	◪		■					■	
Noja	a	a-b-c						■	◪	◪	◪				■			■	◪
Santoña	b	a-b-c-d			■		◪			■							■		
Laredo	c	b			■					■	◪	◪			◪	◪	◪	◪	
Liendo	a	-				■							■					■	
Castro Urdiales	a	-			■						■	■						◪	
Total number			0	1	13	3	2	4	1	4	2	1	9	0	1	0	2	9	0
%			0	5	65	15	10	20	5	20	10	5	45	0	5	0	10	45	0

◪ = recent problems, ■ = persistent problems

Coastal zone definition: a = only 100 m zone, b coastal parks, c wider than 100 m. Coastal zone emphasis: a = dunes, b = beaches, c = wetlands, d = cliff tops, e = parks, f fauna/flora, ? don't know. Coastal zone problems: N = none, BE = beach erosion, WP = water pollution, CE = cliff erosion, WL wetland loss, CF channel filling, LNA = loss of natural areas, WD = waste disposal, IU = intense urbanization, C congestion, SI scarcity of infrastructure, SD = scattered development, LD = landscape degradation, RC = recreational conflicts, EI engineering infrastructure impacts, SPS = scarcity of public services, O = others

ported having recently occurring coastal problems.

Table 4 is more specific and shows that all 20 municipalities protect certain natural features found in their coastal zones. The first three municipalities protect the most features since they contain parts of the provincial Natural Park of Oyambre. Beaches appear to be the most protected feature; although, Comillas, Ruiloba, Noja and Castro Urdiales do not mention beach protection, even though these municipalities depend upon them for their tourism industry. Cliff tops also are noted as being protected, but since they are within the 100 m national protection zone, they cannot be developed. The least protected features are those beyond the 100 m zone which include coastal open space, coastal farms, and coastal flora and fauna. Only six municipalities would be willing to protect additional features. This lack of protection implies a coastal zone ripe for development pressures. Indeed, political pressure is building among the western municipalities for reducing the development restriction contained in the Natural Park of Oyambre (CORTABITARTE, 1993).

Features are protected through a variety of measures such as normal building codes, land use planning, bans on selected activities and construction permits. In addition, buffer zones (meaning 100 m zone) are noted in 14 out of the 20 municipalities. Financial incentives are not used. Land purchase to protect features is done in two municipalities, while two others use educational programs to assist in the protection of coastal features. Clearly, there is a need to standardize the use of protection measures by these

Table 4. *Parts of natural coastal zone legally protected by municipalities.*

Municipalities	Natural features protected													Measures used to protect																
	B	R	D	By	CT	V	F	W	OS	Fl	HB	Fn	O	B	R	LUP	CP	PS	BC	I	PL	E	TI	S	Z	HT	EP	BZ	EIS	P	O
Val de San Vicente	■		■	■	■		■	■		■	■	◪		■	■	■	■	■	■	■								■		■	
S. Vicente de la Barquera	■		■	■	■			■		■	■	■		■	■	■	■	■	■						■			■			
Valdáliga	■	■	■	■	■	■		■		■	■	■		■		■		■	■									■			
Comillas		■			■	■		■	■					■		■		■	■									■			
Ruiloba						■								■	■		■		■			■						■			
Alfoz de Lloredó	■	■			■									■		■		■	■									■			
Santillana	■	■			■									■	■	■	■	■	■		■									■	
Suances	■	■	■		■	■		■	■			■		■	■	■			■			■						■			
Miengo	■	■	■	■	■									■	■	■			■						■						■
Piélagos	■		■			■								■	■	■	■	■	■												
Sta. Cruz de Bezana	■	■									■			■	■		■	■	■						■			■			
Santander	■													■	■	■	■	■	■						■			■			
Ribamontán al Mar	■				■									■	■	■	■	■	■									■		■	
Bareyo	■				■									■	■	■	■	■	■									■			
Arnuero	■				■						■			■	■	■	■	■	■						■			■		■	■
Noja		◪			■			■			■			■	■	■	■	■	■									■			■
Santoña	■		■	■	■			■			■			■	■	■	■	■	■						■		■		■		
Laredo	■		■					■			■			■	■	■	■	■	■								■	■			
Liendo	◪		◪		◪					◪		◪																			
Castro Urdiales		◪									■	◪																			
Total number	15	7	10	6	15	10	4	8	3	4	11	4	0	18	8	18	15	15	17	8	2	3	0	0	8	0	2	14	6	6	2
%	75	35	50	30	75	50	20	40	15	20	55	20	0	90	40	90	75	75	85	40	10	15	0	0	40	0	10	70	30	30	10

■ = protected, ◪ = would like to protect

Natural features protected: B = beaches, R = rivers, D = dunes, By = bays, CT = cliff tops, V = vegetation, F = farms, W = wetland areas, OS = open spaces. Fl = flora, HB = historical buildings, Fn = fauna, O = others. Measures used to protect: B = ban activities, R = regulation, LUP = land use planning, CP = construction permits, PS = performance standards, BC = building code, I = investments in infrastructure, PL = purchase of land, E = expropriation, TI = tax incentives, S = subsidies, Z = zoning, HT = higher taxes, EP = educational programs, BZ = buffer zone, EIS = environmental impact studies, P = police power, O = others

Table 5. *Actions taken or considered in the process of granting legal protection to the coastal zone by municipalities.*

Municipalities	Studies done to support protection										Indicators used to assess need for protection												Potential solutions willing to consider														Impact of EEC Regulations			
	N	B	E	V	G	ES	SE	EIA	UP	O	PO	DP	RHG	LI	LR	LA	MR	ES	OM	IC	RC	O	PC	BC	LPS	LPD	RPI	LT	HES	BZ	RLP	ES	EP	PCC	RPA	O	P	N	I	DK
Val de San Vicente	■										■															■			■			■	■				■			
S. Vicente de la Barquera		■		■	■	■		■	■				■					■																				■		■	
Valdáliga		■		■	■	■	■	■	■				■																								■	■			
Comillas	■										■							■																							■
Ruiloba	■										■									■													■							■	
Alfoz de Lloredo	■												■																			■		■						■
Santillana	■																														■						■			
Suances			■		■		■	■	■		■	■	■	■		■		■			■											■	■			■				
Miengo	■										■														■						■						■			
Piélagos	■										■		■																								■			
Sta. Cruz de Bezana	■												■									■										■								■
Santander									■									■											■				■	■					■	
Ribamontán al Mar		■			■				■		■																											■	
Bareyo	■												■																								■			
Arnuero	■										■																			■		■					■			
Noja				■	■			■	■	■	■							■		■			■		■				■	■		■	■						■
Santoña	■										■																													■
Laredo									■												■	■	■	■		■												■			
Liendo	■										■										■																■	■			
Castro Urdiales											■	■										■				■	■												■	
Total number	13	3	1	3	5	2	2	4	7	1	14	2	7	1	0	1	0	6	0	4	4	0	2	1	3	3	0	0	5	4	1	7	3	2	2	2	9	1	5	5
%	65	15	5	15	25	10	10	20	35	5	70	10	35	5	0	5	0	30	0	20	20	0	10	5	15	15	0	0	25	20	5	35	15	10	10	10	45	5	25	25

Studies done to support protection: N = none, B = biological, E = engineering, V = vegetation, UP = urban planning, G = geological, ES = endangered species, SE = socioeconomic, EIA = environmental impact studies, O = others. Indicators used to assess need for protection: PO = personal observations, DP = demands for protection, RHG = required by higher level of government, LI = loss of activities incomes, LR = loss of residents, LA = loss of accessibility, MR = media reports, ES = expert studies, OM = other municipalities, IC = informal communication, RC = resident complaints, O = others. Potential solutions willing to consider: PC = prohibit construction, BC = building code, LPS = limit of parcel size, LPD = limit of parcel density, RPI = restriction new public infrastructure, LT = lower taxes, HES = higher engineering standards, BZ = buffer zone, RLP = restriction on land parcelling, ES = expert studies, EP = educational programs, PCC = planned carrying capacity, RPA = restriction on private actions, O = others. Impact of EEC regulations: P = positive, N = negative, I = indifferent, DK = don't know

municipalities to further enhance the protection of their natural coastal features above and beyond the national 100 m zone.

Table 5 reveals that few of the municipalities have undertaken or know of studies that can be used as a basis for protection of coastal features. Those that have done the most studies have significant parts of their coastal zones included in the Natural Park of Oyambre. However, Suances and Noja with high development pressures also have commissioned studies. Of the types of studies noted, urban planning, environmental impact assessment and geology are done the most often. There is room for greater use of studies to support coastal protection.

It appears that coastal protection needs are influenced by the personal observations of local officials, and by the requirements laid down by higher levels of government. Expert studies, as noted above, are used by six of the municipalities, while the role of other sources of concern over coastal protection appears minimal. Not many municipalities consider different approaches to coastal protection. For example, only seven of the municipalities saw expert studies as something they are willing to consider. The use of direct development restrictions such as limiting parcel size and density are not viewed by many municipalities as appropriate for coastal protection. Even educational programs do not rate highly among these municipalities.

The role of the European Economic Community (EEC) in setting regulations for environmental protection was viewed favorably by nine of the municipalities. However, half of them claimed not to know or were indifferent to the impact of the EEC on environmental protection. Clearly, if the financial implication of EEC regulation were known in advance less indifference or lack of knowledge could be expected (SETON, 1993).

Table 6 shows the municipal officials' preferences for new projects in their respective coastal zones. Most wish to have new or enlarged sewage treatment plants because of the water pollution problem identified earlier. Construction of coastal promenades, greater parking capacity and marinas reveal the increasing role of tourism in these areas. Specific environmental projects include not only sewage treatment but cliff top parks followed by a desire for wetland restoration. This latter is not surprising since aquaculture is a growing use of wetlands. For example, the protected wetlands in Val de San Vicente, San Vicente de la Barquera, Miengo and Santoña produce fish and shellfish which are marketed nationally.

The third portion of Table 6 deals with the hypothetical question of what the municipalities would do if they were given a significant amount of money (*ca.* $ 1 mil. U.S.) with no restrictions on how it was to be spent. Both a mix of coastal and non-coastal projects were proposed. As shown, most officials would spend the money on sewage treatment, even if they had to pay 50% of the cost. This latter part of the hypothetical question was designed to test their willingness to pay for their desired project. Of course, their answer depends in part on the fact that EEC regulations require the upgrading of the quality of coastal waters. Coastal promenades and marinas were preferred by only two municipalities each, and no other project stands out among more than one municipality.

Finally, Table 6 shows the kinds of planning powers desired by the municipalities. Technical assistance and increased funding had the highest frequency of response because of the need for these areas to implement national requirements, as well as to carry out their own projects. Reduction in permit delays at regional and national levels also were seen as important. One crucial issue for these coastal municipalities is the need to build infrastructure to support a summer population that often vastly exceeds the permanent population.

Table 7 shows that tourist-oriented projects and parks followed by upgrading and maintaining agricultural areas were ranked highest by most municipalities. When asked about the kinds of development projects actually permitted over the previous year, most projects were housing and related urban infrastructure rather than open space protection projects. The lack of preferred development projects funded may reflect the current economic recession in Spain. Only one development project in Noja was denied permission to build.

When asked about restricting development in the coastal zone, the concept of joint restrictions among adjacent municipalities received the greatest support among local officials. The ability to undertake open space planning to restrict development also was of interest. When the officials were asked about the degree of support for building restrictions among their respective constituencies, a mixed picture emerged. Some municipalities would receive high political support from

Table 6. *Municipal preferences for new coastal zone projects and planning measures.*

Municipalities	Kinds of desired infrastructure									Kinds of desired environmental projects						If had 100 million pesetas/ If had to match 50%											Desired planning powers						
	T	C	Pk	WD	ST	FP	M	CP	O	ST	CP	WR	DR	RES	O	R	PkC	PkT	WP	EP	PT	ST	S	Mm	M	CP	O	NL	ITC	IJP	IF	TA	RD	O
Val de San Vicente			■		■			■		■		■										■											
S. Vicente de la Barquera		■	■		■			■		■		■										■								■	■	■	
Valdáliga	■		■		■			■				■										◪					◪			■			
Comillas					■			■			■											■					◪				■		
Ruiloba					■					■												■					◪				■		
Alfoz de Lloredo					■					■												■				■							
Santillana					■			■		■												■										■	
Suances	■				■			■		■	■	■	■									■						■		■	■	■	
Miengo					■					■			■									■									■		
Piélagos	■		■		■					■						◪						◪					◪	■		■			
Sta. Cruz de Bezana	■				■				■		■			■								■								■			
Santander	■		■		■									■								■										■	
Ribamontán al Mar	■						■				■			■			■																
Bareyo							■	■			■															■				■	■		
Arnuero							■	■			■					■														■	■		
Noja			■				■	■			■	■	■						■	■					■			■		■	■		
Santoña					■		■		■		■	■			■							■		◪	■					■	■	■	
Laredo	■							■	■		■											■											
Liendo			■	■	■					■			■				◪				◪	■					◪			■	■	■	
Castro Urdiales										■	■											■											
Total number	7	2	8	3	16	2	6	10	4	11	10	6	4	3	1	2	2	0	1	2	0	15	0	1	2	2	4	3	2	7	12	12	7	0
%	35	10	40	15	80	10	30	50	20	55	50	30	20	15	5	10	10	0	5	10	0	75	0	5	10	10	20	15	10	35	60	60	35	0

◪ = coastal investment, ◢ = interior investment, ■ = same project in both cases

Needs of infrastructure: T = transport infrastructure, C = communication infrastructure, Pk = parking, WD = waste disposal, ST = sewage treatment, FP = fishing port, M = marina, CP = coastal promenade, O = others. Kinds of desired environmental projects: ST = sewage treatment, CP = cliff parks, WR = wetland restoration, DR = dune revegetation, RES = remove engineering structures, O = others. If had 100 million pesetas/If had to match 50%: R = new roads to coast/beach, PkC = new parking lots on coast, PkT = new parking lots in city, WP = wetland protection, EP = erosion protection, PT = new parks in city, ST = sewage treatment plant, S = new school, MM = museum, M = marina, CP = coastal promenade, O = others. Desired planning powers: NL = new laws, ITC = increase tax capability, IPC = increase power to decide, IF = increased funding, TA technical assistance, IJP = increase jurisdictional power, RD = reduce delays in permits, O = others

Table 7. *Compatibility of development projects and environmental impacts in the coastal zone*

Municipalities	Type of compatible development desired							Development decisions		Change necessary to restrict development					Degree of political support
	T	M	H	P	F	FP	O	Granted	Denied	BZ	TA	JMP	OSP	O	
Val de San Vicente	■			■	■	■		0	0			■	■		Low
S. Vicente de la Barquera	■			■	■	■		0	0						Low
Valdáliga	■			■	■			0	0			■			Low
Comillas	■		■	■	■	■		6	0		■	■			Somewhat high
Ruiloba	■				■		■	0	0					■	Very high
Alfoz de Lloredo							■	0	0	■					Very high
Santillana				■				0	0	■		■	■		Low
Suances	■			■				0	0			■	■		Somewhat high
Miengo	■							6	?			■		■	Low
Piélagos	■	■	■	■	■	■		0	0						Don't know
Sta. Cruz de Bezana	■	■		■	■			0	0	■		■	■		Very high
Santander	■	■	■	■	■	■		0	0			■			Somewhat high
Ribamontán al Mar	■	■	■	■	■			0	0						Low
Bareyo				■	■			9	0						Low
Arnuero	■	■	■	■	■	■		0	0			■			Low
Noja	■	■	■	■				4	1		■	■	■		Somewhat high
Santoña	■	■	■	■		■		?	0			■			Low
Laredo	■						■	5	0						Very high
Liendo	■		■					0	0	■					Low
Castro Urdiales				■				0	0				■		Very high
Total number	16	7	9	15	10	6	3			5	2	11	6	2	
%	80	35	45	75	50	30	15			25	10	55	30	10	

Type of compatible development desired: T = tourism, M = marina, H = housing, P = parks, F = farms, FP = fishing port, O = others. Change necessary to restrict development: BZ = create setback/buffer zone, TA = hire technical assistance, JMP = joint municipal projects, OSP = open space plans, O = others

constituents while others would not. However, municipalities with high development pressure (Comillas, Suances, Bezana in the west and Noja, Laredo, Castro in the east) now appear to be moving toward higher support for development restrictions. The municipalities of Ruiloba and Alfoz de Lloredo have such support simply because very little demand exists for development since they have no beaches.

Coastal municipalities also face major hazards because of bordering the sea and because of growing urbanization and technological development. Table 8 lists those hazards which are noted officially in municipal ordinances, bylaws and general plans. Pollution is the overwhelming concern expressed by respondents. This is followed by slumping cliffs and floods. Five municipalities do not officially recognize hazards, and almost none have undertaken hazard studies. The only municipality to have done a specific risk study involved water pollution since it is adjacent to a large bay with a shellfish aquaculture industry.

Table 9 shows most municipalities do not use any measures to avoid natural hazards, even when such hazards may be officially recognized in plans. Engineering structures and land use plans are the most frequently used measures. When respondents were asked which measures they might consider to avoid hazards only eleven were willing to consider new measures. Out of these, Noja showed interest in a range of possible hazard mitigation measures. Since it is also a municipality with a rapid development profile, buffer zones and risk studies were viewed favorably.

The possibility of sea level rise and its potential impacts on the municipalities is summarized in Table 10. First, the respondents were asked which development projects each sought to promote within their coastal zones. As seen, most municipalities opted for tourist oriented projects followed by housing, marinas and expanded fishing harbors in traditional fishing ports. Since these kinds of developments could be potentially subject to sea level rise, it was surprising to find four

Table 8. *Types of natural and technological hazards applicable to coastal municipalities.*

Municipalities	Hazards officially recognized												Hazard studies undertaken							
	N	S	W	F	WF	SC	P	BE	AS	SLR	E	O	N	UP	E	V	G	R	SE	O
Val de San Vicente				■		■	■								■					
S. Vicente de la Barquera						■												■		
Valdáliga						■							■							
Comillas						■	■						■							
Ruiloba						■	■						■							
Alfoz de Lloredo							■						■							
Santillana	■												■							
Suances		■		■	■		■	■	■				■							
Miengo				■			■		■				■							
Piélagos				■			■						■							
Sta. Cruz de Bezana	■												■							
Santander							■						■							
Ribamontán al Mar					■								■							
Bareyo	■												■							
Arnuero					■								■							
Noja	■												■							
Santoña							■	■	■						■					
Laredo		■		■									■							
Liendo	■												■							
Castro Urdiales		■							■				■							
Total number	5	3	0	5	3	5	10	2	4	0	0	0	17	0	2	0	0	1	0	0
%	25	15	0	25	15	25	50	10	20	0	0	0	85	0	10	0	0	5	0	0

Hazards officially recognized: N = none, S = storms, W = winds, F = floods, WF = wildfires, SC = slumping cliffs, P = pollution, BE = beach erosion, AS = accidental spills, SLR = sea level rise, E = explosions, O = others. Hazards studies undertaken: N = none, UP = urban planning, E = engineering, V = vegetation, G = geological, R = risk studies, SE = socioeconomic, O = others

officials saying no effect was expected. Beach loss and wetland flooding were the two most noted impacts expected. Three respondents with significant beachfront development did not know what impacts could be expected, even though it is clear from the position of the developments that housing and urban infrastructure would be affected.

Since sea level rise is not an immediate issue, it is not surprising that most municipalities would wait the longest possible time before formulating a moving plan for this hazard. When asked which basic strategy might be employed to deal with this hazard, most preferred to have engineering structures as a means to protect the shoreline. Three municipalities were willing to restrict new development, and only two opted for abandoning the shoreline and moving inland. Since they are both low-lying urbanized areas surrounded by wetlands, it is hard to see how this approach would work. Naturally, most of the municipalities wanted some other source of funding to pay for the engineering devices. Only five respondents expressed a willingness to pay for any necessary strategy. Clearly, these municipalities do not take a proactive approach to the problem of sea level rise.

CONCLUSIONS AND RECOMMENDATIONS

The results of this case study show that local officials tend to rely on personal observations, national requirements, and tourism for making decisions affecting their respective coastal zones. Scientific information in the form of expert studies has not played the role one would expect in a small province with available university resources. The views of these officials with respect to the need for coastal protection and the coastal hazards to be avoided are at variance with scientific studies of this same region.

The survey also shows the need for a more proactive approach on the part of all the municipalities for exploring ways to protect and enhance their coastal zones, as well as to educate their

Table 9. *Type of measures used and willing to use to avoid hazards.*

Municipalities	Measures used to avoid hazards														Measures willing to consider																
	N	RZ	BA	ES	RC	I	BC	EP	PS	RS	EP	LR	LUP	BZ	ES	BC	RPI	PR	RI	PSR	BZ	RPL	BN	DR	DES	BES	ES	EP	LUP	RS	PHA	RI	O
Val de San Vicente				■						■			■						■			■				■			■			
S. Vicente de la Barquera													■								■	■			■							
Valdáliga	■																								■		■			■		
Comillas	■																										■					
Ruiloba	■																															
Alfoz de Lloredo	■																															
Santillana	■																															
Suances		■			■				■	■			■	■								■	■	■						■		
Miengo	■																												■	■		
Piélagos	■																															
Sta. Cruz de Bezana	■																				■		■									
Santander	■																		■				■			■	■			■		
Ribamontán al Mar	■																						■	■								
Bareyo	■																															
Arnuero	■																															
Noja	■														■			■			■	■		■			■	■	■	■		■	
Santoña				■												■																
Laredo	■																															
Liendo	■																															
Castro Urdiales		■		■			■														■						■					■
Total number	15	2	0	3	1	0	1	0	1	2	0	0	3	1	1	1	0	1	2	0	4	4	4	3	2	2	5	1	3	5	0	1	1
%	75	10	0	15	5	0	5	0	5	10	0	0	15	5	5	5	0	5	10	0	20	20	20	15	10	10	25	5	15	25	0	5	5

Measures used to avoid hazards: N = none, RZ = designation of risk zones, BA = ban activity, ES = engineering structures, RC = restriction to construction, I = require insurance, BC = building code, EP = evacuation plan, PS = performance standards, RS = risk studies, EP = educational program, LR = loss reimbursement by government, LUP = land use planning, BZ = buffer zone. Measures willing to consider: ES = erosion setback, BC = ban construction, RPI = restrict new public infrastructure, PR = paying for relocate, RI = remodel infrastructure, PSR = post-storm/flood restrictions, BZ = buffer zone, RPL = restrict privatization of public land, BN = beach nourishment, DR = dune revegetation, DES = destroy engineering structures, BES = build engineering structures, ES = expert studies, EP = educational program, LUP = land use planning, RS = risk studies, PHA = purchase hazard areas, RI = require insurance, O = others

Table 10. *The expected actions by municipalities to sea level rise.*

Municipalities	Actions promoted in coastal zone									Expected sea level rise to affect										Years to react	Strategy to combat						Paying for strategy						
	T	FH	HI	H	LI	M	Mn	F	O	N	F	LB	NB	FW	SC	LI	LH	DK	O		PNC	AS	RDS	EPS	O	N	PO	RG	M	NG	PG	D	EEC
Val de San Vicente	■	■						■				■		■		■	■			1-5			■	■									
S. Vicente de la Barquera	■			■		■		■							■	■	■		■	>20	■			■				■		■			
Valdáliga	■												■	■						-						■							
Comillas	■			■	■							■		■	■					1-5								■	■	■			■
Ruiloba								■	■	■										>20						■							
Alfoz de Lloredo										■										>20				■					■				
Santillana	■									■										>20						■			■				
Suances	■	■				■					■	■	■			■				6-10					■			■	■	■			
Miengo											■	■		■						>20	■			■									■
Piélagos	■			■							■									>20						■							■
Sta. Cruz de Bezana	■											■								-				■				■		■			
Santander	■								■							■	■			1-5			■										
Ribamontán al Mar	■					■							■							>20					■			■		■			
Bareyo	■									■										>20	■							■	■	■			
Arnuero	■													■						>20						■				■			
Noja	■			■														■		6-10			■	■						■		■	
Santoña	■	■		■	■	■												■		>20		■		■						■			
Laredo					■													■		-		■								■			
Liendo	■											■	■		■					>20						■							
Castro Urdiales	■					■					■									1-5				■				■	■	■	■	■	
Total number	16	4	0	5	3	5	0	3	2	4	4	6	5	5	3	4	3	3	1		3	2	3	8	2	6	1	8	5	15	2	2	3
%	80	20	0	25	15	25	0	15	10	20	20	30	25	25	15	20	15	15	5		15	10	15	40	10	30	5	40	25	75	10	10	15

Actions promoted in coastal zone: T = tourism, FP = fishing port, HI = heavy industry, H = housing, LI = light industry, M = marina, Mn = mining, F = farming, O = others. Expected sea level rise to affect: N = no effect, F = flooding of inhabited/cultivated areas, LB = loss of beaches, NB = narrowing of beaches, FW = flooding of wetlands, SC = slumping cliffs, LI = loss of infrastructure, LH = loss of housing, DK = don't know, O = others. Strategy to combat: PNC = prohibit new construction, AS = abandon shoreline, RDS = redesign structures, EPS = engineering protection structures, O = others, N = nothing. Paying for strategy: PO = personal owners, RG = regional government, M = municipality, NG = national government, D = developers, PG = provincial government, EEC = European economic community

residents on coastal assets and vulnerabilities. It is clear that the coastal zone of a municipality is an inherent part of the municipality itself and not an addendum to be treated superficially. The movement of population to coastal municipalities is based on their coastal zones and not simply the mere availability of buildable land. In the desire for more tourism projects, this facet appears overlooked.

The case study of Cantabrian municipalities matched closely the case studies conducted in California and Louisiana. Cantabria as well as California and Louisiana municipalities desired clearer policies from the next highest level of government to assist them in coastal planning. As well, few of these local governments from the three "states" had ordinances dealing with natural hazards, and nearly all local governments noted their lack of regulatory measures for mitigating the effects of coastal hazards.

For greater scientific input into local government decision-making concerning coastal protection, it would appear necessary for a higher level of government to require expert studies prior to new coastal development. Environmental impact assessment of municipal master plans is one avenue that could be pursued (RIVAS *et al.*, 1993). In addition, the regional university scientists could hold forums or short courses for local officials from coastal municipalities about the expected impacts of continuing development in their coastal zones.

Finally, the national and regional governments can work to clarify the inter-governmental roles in coastal zone decision-making and assist municipalities to understand and integrate coastal protection with their urban and infrastructure planning. The mere existence of a nationally created 100 m zone does not ensure coastal protection; rather, a proactive, integrated planning process involving all three levels of government is necessary to implement the level of protection desired. It is expected that the case of Cantabria is not unlike that of other Spanish regions with burgeoning coastal development pressures. Coastal management in Cantabria means growth management, and growth management requires the requisite measures to assist local governments in this task.

ACKNOWLEDGEMENTS

Financial support for this research was provided by the DGICYT, Spain (Project SAB92-0238).

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