



I A S O N

Deliverable to WP4

**MEDITERRANEAN SEA
COASTAL ZONING AND DESCRIPTION**

by **Sigal Calderon and Dov S. Rosen**

May 2006

IOLR Report H67/2006

דו"חות חיא"ל
I O L R R E P O R T S



**National Institute of Oceanography
ISRAEL OCEANOGRAPHIC & LIMNOLOGICAL RESEARCH**

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MEDITERRANEAN SEA COASTAL ZONING AND DESCRIPTION

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Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
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Albania	Durres	<i>Lalzi bay with the Erzeni river mouth</i> ¹	The coastline of the Rodoni-Bishti i Palles Capes, of which 35 % are cliffs exposed to mild erosion stretching along both capes. The remaining parts of this unit are alluvial beaches (actually, the Lalzi bay) of which 18 % is exposed to erosion and 47 % to deposition.	The area of Porto Romano and Lalzi bay is a narrow, reclaimed part of the coastal plain. There are some natural habitats left along the coastline, such as a belt of pine trees, temporary marshes, roadbeds and salt marshes.	The loss of large wetland parts by land reclamation, the quality of natural environment of that area continues to deteriorate due to the input of the polluted Erzeni river (contaminated mainly by sewage disposed upstream), direct discharge of untreated urban and industrial wastewater in the Porto Romano bay, excessive felling of trees for fuel, and uncontrolled hunting	Recognizing the importance of these issues, the government of Albania has embarked on implementing a water sector strategy (Rural Water Supply and Sanitation Strategy, recently endorsed by the government) focussing on both urgent system repairs and sector reforms. The government also adopted a Biodiversity Strategy and Action Plan in 2000 that include the Kune Vain marshland as one of the priority areas in the network of protected areas and identifies lack of adequate management capacity as a key issue for sustainability. The government recently approve a law on protected areas that supports a

¹ Intergrated Water & EcoSystems Management GEF(2003), http://www.iwlearn.net/publications/prd/pb/File_112866892247

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					and fishing	more advanced management concept based on long-term sustainability ² . The proposed project fits with and supports the government strategy on water and biodiversity by introducing new approaches to integrating wastewater management into an overall ecosystem management.
Albania	cape of Palla (Durrësi)	Porto Romano ³	The Porto Romano bay is a section attacked by erosion. direct discharge of untreated urban and industrial wastewater with the presence of pathogens is the potential contamination of seafood, particularly shellfish, which are commercially very	<i>Posidonia oceanica</i> and very well developed marine communities are found along Porto Romano bay. A narrow, reclaimed part of the coastal plain. There are some natural habitats left along the coastline, such as a belt of pine trees, temporary marshes,	The city itself is a concentration of environmental problems, because of the near-total lack of environmental services. flawed implementation of industrial (Porto Romano) or tourism (Lalëzit Bay) policies, may disappear very soon.	The Durrës area is the biggest “hot spot” on the Albanian coast, and is the most obvious example of what might happen if non-sustainable coastal development takes place. The central open channel is now the final receptor of all sewage waters of the Durrës District, whose discharge at sea can provoke pollution effects and damages to the marine environment in the area of Porto Romano.

² Integrated Water and Ecosystems Management Project (blended with IDA Municipal Water and Wastewater Project)(2003), http://www.gefweb.org/Documents/Council_Documents/GEF_C21/Multi_Focal_Area_-_Albania_-_Executive_Summary.pdf

³ Republic of Albania(2002), http://nfp-al.eionet.eu.int:8180/convention/other_conv/1075458781

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			important for Albanian fishery.	roadbeds and salt marshes ⁴ .		
Albania		<i>Karavasta Lagoon</i> system together with <i>Shkumbini and Semani River</i> mouths ⁵	The Semani River has changed the position of its mouth on several occasions in historical times, at least six times in the last 100 years along a corridor 25 km long. in the 1950s a new outlet became the main river mouth at the southern edge of Karavasta, building up a small delta complex whose eroded sediment is currently creating the new spit.	Karavasta Lagoon is separated from the sea by the spit stretching southward from the Shkumbini Delta , it has maximum length of 10 km, width of 4.5km and water depth of 1.5m.) It can be described as a system with low wave energy, predominant longshore sand transport, limited overwash	Economical and social liberalization of the country has caused a massive and uncontrolled migration of the people towards the coast, and hence an increase of the human pressure and demand on marine and coastal resources ⁶ .	As a contracting Party to many international conventions, such as Barcelona Convention, Ramsar Convention, Biodiversity Convention, and Bern Convention, Albania is committed to create an effective system for the administration of its coast. An important part of this system is the preparation of management plans for areas of particular conservation concern ⁷ .

⁴ Intergrated Water & EcoSystems Management GEF(2003), http://www.iwlearn.net/publications/prd/pb/File_112866892247

⁵ Source: Y.N. Krestenitis & I.S. Androulidakis (2006)

⁶ Source: Vjose-Narta Landscape Protected Area Administration 2005, http://www.medwetcoast.com/IMG/Narta_Vjosa_MPanglishtja.pdf

⁷ See prev. note.

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				processes and widely spaced tidal channels		
Albania	Otranto Strait	<i>Vlora Bay - Narta Lagoon - Vjosa River Mouth⁸</i>	The Narta Lagoon is one of the most important lagoons of Albania. The southward shift of the Vjosa River mouth during the XX century has created serious erosion problems in the northern coast of the Narta lagoon. The sediments input to the old delta ceased, the latter has almost been completely eroded and the sediment was removed to create a spit, which formed an accumulative	Narta Lagoon is situated in the northern part of the Vlora Bay, about 3 km from Vlora City. Two islands are located in the south part of the lagoon, with an approximate surface of 7 ha. The bigger of the two is covered with cypress. The famous Monastery of St. Mary, built in XIV century is situated in this island.	The soil industry is extracting water from the lagoon without a preliminary study. In the surrounding area of the lagoon , oil is drilled and gas is extracted from deep wells. But intensive agricultural and industrial activities, as well as the development of tourism, without being based on a management plan, may provoke serious problems to the lake in the	Anthropogenic activities have a great impact on Vjosa River Mouth- Narta Lagoon- Vlora Bay water system. Both Albania and Greece do not have a regional or international program for pollution monitoring in Vjosa-Aoos River System.

⁸ Pano.N, Frasher.A, Lazaridou.M (2002)

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			<p>zone in the southern part of the Vjosa River old mouth. This spit tends to vide of the littoral cordon of the Narta Lagoon in the west direction.</p>	<p>The total Vjosa River sediment discharge in the Adriatic Sea is $W_T=7.5 \times 10^6$ tons/year. About 20% of total sediment load equivalent to $W_F=5.6 \times 10^6$ tons are the bottom-load, and about 80% equivalent to $W_P=1.9 \times 10^6$ tons are the sediment load. This river discharge is the main source of coastal sediments in Vlora Bay (Pano N., 1984). The dynamics of solid deposits along the coastal zone and the accumulation intensity of sand</p>	<p>future. The most important danger that the lagoon confronts is the imminent isolation from the sea. In the Narta Lagoon are observed intensive solid deposits of the Vjosa River on the coastal area tending to stop the active water exchange between the lagoon and the sea resulting in lack of fresh water in the lagoon. Dirty untreated urban water flow also exists in the lagoon. Vlora bay: flow of the dirty untreated urban and industrial</p>	

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				are closely tied up with the warning process and particularly with the maximum wave effect.	water in the sea, exploitation of the sand and gravel from beaches for constructive materials, deposition of the solid industrial waters (Cu, mercury, clay etc) in the onshore and offshore coastline.	
Algeria	Wilaya of Alger ⁹		The coastal zone of central part of Algeria face heavy erosion due to man made causes. The site is threatened by water pollution (organic, chemical and physical pollution), bad agricultural practices leading to destruction of the natural vegetation, erosion,		heavily urbanized and industrialized, affected by untreated wastewaters One of these causes is sand mining on beaches and dunes. huge demand of sand and gravel to feed ambitious programme of	Regulations exist but implementation of the legislation is made difficult due to the huge demand of sand and gravel to feed ambitious programme of housing and industrial development. lack of urban and industrial development planning.

⁹ A. Abdelbaki and M. Boudouma (1995)

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			bad water management (irrational water pumping), destabilisation of the shore which leads to destruction of the dunes and modification in the food chains. Habitat destruction is caused by bad ploughing, overgrazing, and the cutting of <i>Typha latifolia</i> and <i>Tamarix africana</i> .		housing and industrial development.	
Croatia	Dalmatia, East Adriatic Dalmatia:	County of Split-Dalmatia, County of Šibenik-Knin, County of Zadar and County of Dubrovnik-Neretva ¹⁰	coast, wetland, estuary, coastal forest, rocky coast, lakes/rivers, bay, island, peninsula, sandy beach;	water pollution, sediment movement, coastal erosion, endangered species, habitat loss,	tourism/recreation, over-fishing,	overall policy, pollution control, development control, resource management, institutional strengthening, biodiversity conservation, planning, capacity building, education/awareness, monitoring, networking; Integrated Coastal Zone Management at the national, regional/county, local and sectoral level, sustainability and

¹⁰ Source: Priority Action Plan (website), Mediterranean ICAM Clearinghouse, <http://www.pap-medclearinghouse.org/eng/page001b.asp?zemljaID=20&shortID=91&start=start>

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						biodiversity conservation, integrated ecosystem approach
Croatia		Kaštela Bay ¹¹	intensive degradation		uncontrolled industrial development and urban sprawl, and fast growth of surrounding villages and the town of Split. This area became, in the mid eighties, one of the largest and most widely known pollution "hot spot" areas in the Mediterranean region.	total absence of adequate measures for the reduction of urban and industrial pollution.
Croatia, Bosnia and	Split-Dalmatia	River Cetina ¹²	river basin and the adjacent coastal	water shortage, sediment	urban expansion, water pollution,	The greatest problems occur with conflicting demands for land-use

¹¹Source: Priority Action Plan (website), Mediterranean ICAM Clearinghouse http://www.pap-medclearinghouse.org/eng/page_frameset.asp?Page=KastelaDugi.htm&IDLong=13&IDShort=84

¹² Source: Priority Action Plan (website), Mediterranean ICAM Clearinghouse <http://www.pap-medclearinghouse.org/eng/page001b.asp?zemljaID=20&shortID=91&start=start>

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Herzegovina	and Šibenik		<p>area (approx. 1,200 km²)</p> <p>Coastal degradation is caused by coastal erosion. After construction of hydro power plants and storage reservoirs in the watershed and riverbed, the dynamics of sediment creation and transportation were completely transformed, triggering great changes to the sediment dynamics of the coastal area. The sediment is constantly being reduced by the action of waves and sea currents, while the sediment transported by the river is considerably reduced, causing the sediment deficit in the river mouth</p>	<p>movement, coastal erosion, endangered species, habitat loss. The coastal area of the Cetina River watershed is characterised by narrow coastal flysh strip bordered by steep mountainous hinterland.</p>	<p>air pollution, soil pollution, population growth, tourism/recreation, mineral extraction, over-fishing, transport congestion, The development of tourism and industry on the coast, has been responsible for the current higher population density in the coastal strip nearly 64,000 people occupying the coastal area and the islands have been supplied with water from the Cetina River. The immediate hinterland is devastated by intensive uncontrolled building in</p>	<p>for housing, tourism, and economic development in the most attractive part of the watershed (fertile fields and coastline). Uncontrolled immigration and building directly threaten the natural resources, which are the basis of development and survival in the area. This refers to both the river basin and the coastal area. The coastline has been completely built up so that open access to the sea is almost impossible, and its use for recreation and other sea-related activities proves very difficult. Uncontrolled, construction of houses and tourist structures. The river mouth area is used for several, often conflicting purposes, such as settlement growth (Omiš) and the development of industry and tourism, despite the fact that the protection of the unique natural characteristic of the Cetina River canyon and mouth is a priority. The process was initiated by PAP/RAC. The first step taken was the preparation of the "Conceptual Framework and Planning Guidelines for Integrated Coastal Area and River Basin Management".</p>

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			area.		continuum.	
Cyprus	from Cape Kiti to Zigi	Dolos-Kiti ¹³	The 30% of the total coastline of the island suffer from erosion (in some areas reaches about 0.5m/yr). Erosion of the coastline due to natural but mainly to manmade causes, coupled with shortage of fine sandy beaches became a serious problem of growing concern the last 20 years. At the same time the growing pressure for utilisation and exploitation of the coastal zone was making the whole picture worse.	Type of coast: Shingle beaches Tidal regime: microtidal Range of waves : dominant sea, Hs up to 1,5 m high, H max about 5m. The total length of the coastline is 36km. The coast is generally relatively low and flat, and it is mainly characterised by accumulations of gravel and pebble and few tiny poor sandy beaches	Socio-economic activities: Agriculture, Industry (cement), fisheries, and tourism. There are 10 villages in the coastal area, with a total population of 9,173 and several conflicting uses. The land uses of the coastal area have been mainly agricultural until recently, when by a reform of the Town Planning regime most of the agricultural areas have been characterised as tourist or	Engineering techniques: Harbour breakwaters, groynes, detached breakwater, revetment. Policy options: Limited intervention, Do nothing. Since late 1980s, Cyprus Government has realised that coastal zone is a natural resource for the island which was under the threat of extinction due to the over pressure resulting from intensive tourist development. The problem of erosion still exists in several coastlines of the island, although there have been efforts to implement Integrated Coastal Zone Management. Eventually the problem of beach quality became very important and efforts started to combat erosion, some using legal and some illegal methods.

¹³ Source: EuroSION (website), Shoreline Management Guide <http://www.euroSION.org/shoreline/index.html>

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					development areas.	
Egypt		Nile Delta ¹⁴	coast, rocky coast, bay, sandy beach	sediment movement, coastal erosion	preparatory activities, institutional strengthening, planning, capacity building; the shore protection Master Plan was the result of a comprehensive study and contains detailed plan for 13 selected sites on the delta.	
Egypt		The <i>Rosetta</i> waterway ¹⁵	One of the two main branches of the Nile River in Egypt and it is located on the eastern side of Abu Quir Bay coast and at about 60 km to the	During the period from 1500 to 1900 the eastern and western parts of the promontory were extended by about 11 and 8.5	It is considered the life artery for fishermen who live at the Rosetta district in Egypt. The closure of the Rosetta estuary	The typical engineering solution to defend a mouth from a progressive sediment accumulation implies two jetties to either totally or partially block the littoral drift. This solution had negative impacts on the adjacent beaches.

¹⁴ Source: Priority Action Plan (website), Mediterranean ICAM Clearinghouse <http://www.pap-medclearinghouse.org/eng/page001b.asp?zemljaID=3&shortID=25#25>

¹⁵ Source: Y.N. Krestenitis & I.S. Androulidakis (2006)

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			east of Alexandria city. The ¹⁶ impact of climate change including SLR and salt-water intrusion is also another threat to the region land ¹⁷ based pollution to water resources and international water, urban encroachment in agricultural land	km into the sea due to the large amount of sediments brought by Rosetta branch.	caused by sedimentation will not only affect their livelihood but also endangers the people live upstream of the mouth due to releasing a probable emergency flood.	shortage ¹⁸ of urban and environmental planning
Egypt	Located in the central northern part of the Nile delta between Rosetta and Damietta branches.	Burullus headland ¹⁹	It was built up by the sediments brought by the very active Sebennetic old Nile branch. This hump has been eroded from more than 1000 years when the feeding branch seems to have		fishery	The dynamic processes and environmental forces affecting the coastal changes along Burullus area have been monitored for about 25 years. These measurements include the collection of wave data, daily measurements of longshore currents, beach profiles and bottom sediment samples. Water level variations and

¹⁶ Source: "SMART: Sustainable Management of Scarce Resources in the Coastal Zone", <http://www.ess.co.at/SMART/b5.html>

¹⁷ Source: "SMART: Sustainable Management of Scarce Resources in the Coastal Zone", <http://www.ess.co.at/SMART/b5.html>

¹⁸ Source: "SMART: Sustainable Management of Scarce Resources in the Coastal Zone", <http://www.ess.co.at/SMART/b5.html>

¹⁹ Source: Y.N. Krestenitis & I.S. Androulidakis (2006).

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			ceased its importance and died out. The problems of the area vary from serious erosion on both sides of the lake outlet to siltation and shoaling of the outlet itself which is important for fish and fry.			discharge through Burullus outlet are also being measured. Longshore sediment transport rates have been evaluated using standard formulae. The accumulated data, account for the processes responsible for the recession of Burullus hump, have been used in the design of shore protection structures and to improve the existing ones.
Egypt		<i>Port Said</i> headland & <i>Bardawil</i> lagoon ²⁰	the shoreline has shifted southward (retreated) at the northern Sinai coast of Egypt. Prior to the construction of these structures, sediment continuously nourished the entire coast of Sinai. In the absence of significant Nile sediment input, driving forces (waves and currents)	Increasing numbers of engineering protective structures along the Nile delta coast, which blocked sediment transport to the east and thus decreased sand supply to the Sinai beach. In addition, the delta coast has been substantially		The change in the coastline along the northern Sinai coast probably results from the increasing numbers of engineering protective structures along the Nile delta coast. large numbers of coastal structures have been built to protect the beach and stabilize the lagoon inlets. The last decade, there were constructed two large-scale detached breakwater systems on the Nile delta coast of Egypt at <i>Baltim</i> and <i>Ras El Bar</i> beaches (~18.3 km shoreline length). The two protective systems were installed in a water depth of between 3 and 4 m and consist of 17

²⁰ Source: Y.N. Krestenitis & I.S. Androulidakis (2006).

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			actively erode the protruded coat of Sinai. beach erosion has been substantially increased in the downdrift sides of these protective systems, being -20 m/year at Baltim and -9 m/year at Ras El Bar. Further seaward, the two protective systems at Baltim and Ras El Bar have accumulated seabed sand at maximum rates of 30 and 20 cm/year and associated with downdrift erosion of -45 and -20 cm/year, respectively	modified as a result of controlling the Nile flow by two dams at Aswan.		units in total (each ~250 m long). The preconstruction beach erosion at Baltim (-5 m/year) and at Ras El Bar (-6 m/year) has been replaced, respectively, by the formation of sand tombolo (35 m/year) and salient (9 m/year).
Egypt		<i>Alexandria coast</i> ²¹	The major headlands occurring along the	Characterized by high wave	For the Governorate of	

²¹ Source: Y.N. Krestenitis & I.S. Androulidakis (2006).

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			shore of Alexandria extend into the surf zone and confine the beach sands to littoral-cell embayments and pocket beaches, with little or no bypassing. This, in effect, makes the Alexandria resort cell area an extended pocket beach and implies that the long-term net littoral drift is close to zero. sand accumulation patterns adjacent to the groins constructed along the Alexandria coast, where sand is being deposited both to the immediate east and west of the groins. The seasonal reversal	energies particularly in winter. Waves induce opposing SW and NE longshore currents (Frihy et al., 2004). The higher proportion of SW currents is attributed to the large angle between the incident waves and the average shoreline orientation and geometry, as well as to the irregularity of the seabed and the undulating coastline. This situation differs from that recorded at the	Alexandria, two main economic areas appear most vulnerable: the Alexandria lowlands and the Alexandria beaches (El-Raey et al., 1995). The Alexandria lowlands-on which the city of Alexandria originally developed-are vulnerable to inundation, waterlogging, increased flooding, and salinization under accelerated sea-level rise. The two surviving Alexandria beaches (Gleam and El Chatby)	

²²Source: Watson Robert T., Zinyowera Marufu C. , Moss Richard H. and Dokken David J. (Ed.s)(1997).

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			in the direction of sand transport along the beach is predominantly northeast during the winter and summer months, and southwest during autumn and spring, but with a zero net littoral drift when averaged over several years.	Nile delta and indicates that southwesterly littoral currents at Alexandria are strong enough to transport sediment along the coast. By contrast, easterly littoral currents are more dominant along most of the Nile delta coastline, with only occasional reversals to the west	will be lost even with a 0.5-m rise in sea level. Based on the 0.5-m scenario, estimated losses of land, installations, and tourism will exceed US\$32.5 billion. An average business loss is estimated at US\$127 million/yr because most tourist facilities such as hotels, camps, and youth hotels are located within 200-300 m of the shoreline ²² .	
Egypt	west of the Nile delta	Abu Kir Bay ²³	It includes important Abu Kir is located overlooking the	It includes a large lagoon (Lake Idku) as one of	Recently, the region has attracted attention	The Governorate of Alexandria has recently decided to upgrade environmental and tourist conditions

²³ Source: SMART: Sustainable Management of Scarce Resources in the Coastal Zone Project Work Plan. <http://www.ess.co.at/SMART/b5.html>

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			western side of historic Abu Kir Bay. It is also close to Lake Idku and historic sites of Rosetta city and Rosetta region, which includes Lake Idku and associated wetland. Lake Idku is situated about 30 km east of Alexandria. It is a shallow (1.0-1.5 m depth) brackish water lake with one connection to the Mediterranean at El Meadia. It has an area of about 125 km ² . Rosetta region has been suffering from various aspects of mis-management, neglect and deterioration in the	the less polluted lakes of the five northern lakes of Egypt, nourished by the Rosetta branch of the River Nile (average flow of about 4-5 billion m ³ per year) The lake receives water from three drains along the southern and eastern sides. Seawater is primarily affecting the western side of the lake near the outlet. After construction of the Aswan High Dam, the annual drainage in the lake has increased. This	for development because of recent discoveries of sunken historic ships and cities. Resources in the region include beautiful and scenic view of the Bay, Lake Idku, Lake Burullus and coasts, historic tourism in Rosetta city, Alexandria city and in the Bay, ecotourism in lake Idku and adjacent area, religious tourism for Islamic area in Rosetta and Near by Alexandria, diving, snorkeling and yachting in the bay, with a unique mixture of urban, rural and marine	along the coast. Extensive waterfront developments have been introduced only recently. Integrated upgrading of both marine resources through conservation of biodiversity in the bay, better monitoring and assessment of international water dumped in the region as well as planning and development of urban coastal area will render this area into a highly desired area for tourism.

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			<p>past. Problems of coastal erosion, land based pollution to water resources and international water, urban encroachment in agricultural land, vulnerability to sea level rise (e.g. El Raey et al, 1997,1998,1999) and shortage of urban and environmental planning. Loss of marine biodiversity due to increased load of dumped waste in the bay and loss of agricultural and bird biodiversity due to deterioration of soil conditions and water quality in the region. The impact of climate change including SLR and salt-water intrusion</p>	<p>has caused an increase of the level of the lake and induced flow from the lake into the sea and the lake became less influenced by salt water from the sea. Historic cities such as Rosetta, Abu Kir and Idku.</p>	<p>culture</p>	

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			is also another threat to the region. Losses of resources in the region have caused large-scale deterioration of socioeconomic conditions.			
France		Mediterranean and Corsica Region ²⁴	urban expansion, water pollution, coastal erosion, tourism/recreation, over-fishing, endangered species	Coast, river basin and the adjacent coastal area, lakes/river; mountains.		pollution control, resource management, institutional strengthening, biodiversity conservation, planning, monitoring, networking; water management/rehabilitation/information system
France	Régions Provence-Alpes-Côte d'Azur and Languedoc-Roussillon	Rhône ²⁵ delta	The coastline of the Rhone delta (90km long) is subjected to predominant coastal erosion (on average, 4m/yr over the last 60 years) arising from	Coastal characteristics Study area: 90 km ; Sedimentary cell: 4 km Type of coast: delta and	This stretch of coast is greatly influenced by economic, industrial, harbour and touristic activities, which are sometimes in	Engineering techniques: Groyne, seawall, breakwater, revetment, nourishment, wind trap sand ripping Policy options: Hold the line, limited intervention, do nothing.

²⁴ Source: Priority Action Plan (website), Mediterranean ICAM Clearinghouse <http://www.pap-medclearinghouse.org/eng/page001b.asp?zemljaID=11&shortID=66&start=start>

²⁵ Source: EuroSION (website), Shoreline Management Guide <http://www.euroSION.org/shoreline/index.html>

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			<p>structural reasons (sedimentary deficit, very fine sands, energy of the swell). The spatial distribution of the sectors in erosion/accumulation can be divided into four coastal units</p>	<p>beaches (with fine sand; D50 =0.2 mm) Tidal regime: micro tidal (0,3 m) Range of waves : mean Hsig =0,8 m and T = 4,5 s ; annual storms Hsig= 3m and , T : 7 s</p>	<p>conflict with the protection of the landscape and natural heritage. Major public works are effective and justified on sectors with high economic value, where such structures are necessary to block coastal erosion. However, their effectiveness is limited in time and they can produce negative effects. The choice of less-costly techniques (ganivelles) is effective provided that sedimentary input is sufficient. A number of innovative techniques (rebuilding up of beaches,</p>	<p>The management choices are thus very different according to human and economic requirements: either to stabilise the position of the coastline or to accept a moderate retreat.</p>

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					sedimentary bypassing on river courses...) have not yet been put into application.	
France	Corsica	Calvi Bay ²⁶	a reduction of gravel and sand delivery from the Figarella and Fiume Seccu coastal streams. Recent assessment of bedload transport during a 1 in 2 year flood and stream bed changes evaluated from aerial photographs and field measurements (cross-sections, long profiles, sediment size analysis) show these streams deliver less and less sediment to the beach, thereby		Two main causes explain this trend: (1) in-channel gravel-mining has been operated on these streams since the 1970's and (2) significant land-use changes have taken place in their watershed since the end of the 19 th century.	

²⁶ Source: Y.N. Krestenitis & I.S. Androulidakis (2006),

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			explaining its erosion.			
Greece	western part of the Thermaikos Gulf (NW Aegean)	<i>Pieria</i> ²⁷		This coastal area is characterised by extended sandy beaches, with a length of 15 to 20 km, which have been formed as a result of the interaction of small rivers and tributaries' discharges and the dominant waves, from SE direction.	During the second half of the 20th century, the coastal area was progressively developed as a tourist resort area. The man-made constructions have led to the erosion of the most important part of the beach of this area.	During the end of the 1980s and at the beginning of the 1990s, measures were undertaken along the coastal area to protect it from erosion. Five groins were constructed using natural stones. These constructions prevented erosion in the parts of the coastline lying between them, but not the degradation of the beaches. The erosion continued in the non-protected coastline areas. New groins were constructed (up to 10 groins) without a positive result. The erosion continued to affect the non-protected areas (Anagnostou, 2005).
Greece	Mesollogi West Greece	Mesollogi ²⁸ Lagoon area	The barrier islets separate the Messollogi lagoon in Western Greece from the Patraikos gulf. The erosion of the sandy barrier	Coastal characteristics: Study area: 15 km; Sedimentary cell: 30 km Type of coast: beaches (with	Socio-economic activities: Fishery activities	Policy options: Hold the line

²⁷ Source: Y.N. Krestenitis & I.S. Androulidakis (2006)

²⁸ Source: EuroSION (website), Shoreline Management Guide <http://www.euroSION.org/shoreline/index.html>

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
					Social –Economic Facts	Policy & Management
			islets due to significant changes in the sediment balance of the coastline was introducing risk of ecological disaster for the Lagoon, which is protected by the Ramsar convention. The rehabilitation measures consisted of a groin system the engineering design of which is presented. Engineering techniques: Groyne	medium sand, D50 = 0,2 – 0,6 mm), saltmarsh. Tidal regime: micro tidal (0,18 m) Range of waves : 2.25-3.20m		
Greece	Peloponese, Achaia Province NW edge of Peloponese 10km east from the	Lakkopetra ²⁹	Engineering techniques: Detached breakwaters	Coastal characteristics: Study area: 150m (+future extension of 140m)	Socio-economic activities: Tourism	Policy options: Limited intervention

²⁹ Source: EuroSION (website), Shoreline Management Guide <http://www.euroSION.org/shoreline/index.html>

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
					Social –Economic Facts	Policy & Management
	physical entrance of Patras Gulf			Type of coast: beaches (with fine-medium sand) Tidal regime: micro tidal (mean range 0.18m) Range of waves : 1.5-2.5m		
Greece	northwest Peloponnisos	<i>Kato Achaia</i> ³⁰	At the end of the 1970s a small port was constructed. It has resulted rapid accumulation of beach sediments to the east of the construction. The fine sediments bypassed the wave wall and were deposited in the basin of the small port, creating problems for the fishermen's boats. At	Sandy beaches were formed by the sediment supply of the river Peiros.	fisheries' activities, Tourism	To avoid the accumulation of sediments in the port basin, new constructions were undertaken in the 1980s, extending the former wave walls, which solved the problem of sediment accumulation for a short time. New constructions and installation of groins during the 1990s formed the modern type of man-made constructions in the area. To avoid erosion in front of a big hotel in the area large rocks were placed there, changing the physiognomy of this area

³⁰ Source: Y.N. Krestenitis & I.S. Androulidakis (2006)

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
					Social –Economic Facts	Policy & Management
			the same time erosion started westerly of the construction, creating some serious problems to a relatively large hotel in the area.			
Greece	Cyclades Archipelago, Region of Southern Aegean	islands of Anafi, Donousa, Thira (Community of Oia), Ios, Kimolos, Koufonissia, Milos, Paros, Serifos and Sifnos ³¹	A group of islands in Greece located in the center of the Aegean Archipelago, consisting of 24 inhabited small and medium size islands and a significant number of uninhabited small islands and islets. The total surface is approximately 2,528 km ² while the total population increased from	These islands are characterised by small surface area, limited natural resources, Tourism development poses pressure to existing traditional, in decline, activities like agriculture due to increased demand for land and manpower.	Population decline in some of these islands, major population's fluctuation. Rich cultural heritage, a natural and built environment of unique value, domestic and international During the past decades there were economic	limited administrative and organizational capacity, major deficiencies in respect to technical infrastructure and services, weak access to technological applications and innovation. Several of the islands host areas, which it has been suggested to be included in the Natura 2000 network. The main problems are: pollution problems, the salinization of underground water resources, illegal building, significant deterioration of build and natural

³¹ Source: Priority Action Plan (website), Mediterranean ICAM Clearinghouse

<http://www.pap-medclearinghouse.org/eng/page001b.asp?zemljaID=12&shortID=65#65>

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
					Social –Economic Facts	Policy & Management
			<p>94,005 in 1991 to 111,181 in 2001. Intense tourism development which threatens the fragile balance between economy, society and environment. Variety of ecosystems such as small wetlands, coastal forest, rocky coast, sandy beaches, grass and rangeland, cropland with significant ecological features.</p>	<p>Land speculation and fragmentation of agricultural land into small plots are some of the problems resulting from tourism development. Conflicts between recent tourism development and mining activities are gradually emerging along with conflicts between development and conservation goals.</p>	<p>recession and population decline. Recently, tourism development contributed for a regional development, providing opportunities for employment. Agriculture is gradually declining, completely abandoned in cultivation in terraces. Tourism development poses additional pressure mainly due to the increased demand for land and manpower. Land speculation and fragmentation of agricultural land into smaller plots.</p>	<p>environment and of landscape quality and to the loss of agricultural land, loss of habitats and overgrazing, loss of vegetation, soil erosion and desertification. Soil erosion has also resulted from the abandonment of agricultural activities in terraces.</p>

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
					Social –Economic Facts	Policy & Management
					As the main economic activity is tourism, there is a high dependance on the use of the coasts. Tourism is mainly seasonal. Most of the tourist infrastructure are located along the coast.	
Greece		The Island of Rhodes ³²	The island of Rhodes with its 220 km of coastline is situated at the northeastern corner of the Dodecanese Archipelago in the Aegean Sea. geographic concentration of tourism development along the north and east coasts; The coasts of Rhodes	It is 80 km long and covers an area of 1400 km ² . The central mountains are relatively high (1215 m at Mount Attaviros), surrounded by plains northwards and southward. The plains are boarded by sandy beaches. The	The economy is caught up in a saturated mass tourism market, environmental resources are stretched and the hinterland rural communities are marginalized. over-dependence of the economy on coastal tourism, geographic	weak enforcement of planning and environmental controls. The existing planning laws are particularly important for environmental policy: the Framework Planning Law (Ekistics Law) for physical planning, and the Environment Law for environmental planning and control. Both are elaborate pieces of legislation but several limitations result in poor enforcement: • lack of an integrated planning process (no framework for regional

³²Source: Priority Actions Programme, Regional Activity Centre(1996).

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
					Social –Economic Facts	Policy & Management
			are exploited by mass tourism leading to an important urbanization and local degradation of areas such as in the northern part of the island and to a lesser extent on the east coast. There is a gradual deterioration of the quality of the beaches (beach erosion and coastal reshaping) in the city of Rhodes, the bay of Ixia, parts of the coastal strips along the Kremasti-Theologos-Soroni-Kamiro-Skala area.	continental shelf is narrow and depth increases rapidly close to the coasts. There are four main marine habitats: near shore sandy bottoms, forests of cystoseira generally on shallow rocky substrate, seagrass meadows at a greater depth, and then coralline algae concretions in poor light conditions between 20 and 80 metres depth.	concentration of tourism development along the north and east coasts;	planning and consideration of socio-economic issues); <ul style="list-style-type: none"> • Planning Law is not enforced as a whole but selectively, occasionally and reluctantly; • land property plays an important role in society and family solidarity. Planning controls affecting development rights are generally resented and often actively resisted seen as a state threat to individual rights. Land use planning as a centrally administered governmental responsibility is poorly enforced.

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
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Israel	area from Rosh Hanikra on the Lebanese border to Zikim on the border with the Gaza Strip	Mediterranean coastline of Israel ³³	<p>The Mediterranean coastline of Israel extends about 190 km from Rosh Hanikra on the Lebanese border to Zikim on the border with the Gaza Strip.</p> <p>KEY ISSUES:</p> <p>Development pressure in the coastal zone.</p> <ul style="list-style-type: none"> - Impact of marine structures on the shoreline. - Public access to the coast. - Beach and cliff protection. - Pollution prevention. <p>Main conflicts arise mainly from population pressure,</p>	<p>The coastline can be divided into four morphological sections according to physical characteristics and sedimentological properties:</p> <ul style="list-style-type: none"> · Rosh Hanikra to Acco - a sedimentologically isolated region with abraded rocky platforms and narrow beaches; · Haifa Bay - bounded by the Acco promontory on the north and the Carmel mountain range 	<p>Roughly 70% of Israel's population, which reached 5,5 million in 1995, lives within 15 km of the Mediterranean coastline.</p> <p>Intensive settlement along the coastal strip over the last 50 years now dominates the land-use pattern of the area, particularly the two major population centres of Tel Aviv and Haifa. The narrow coastal strip is the focus of the country's</p>	<p>Linear development along the coastline has been restricted. Much of the coastline is designated for various types of public open space. Areas of particularly high natural value, mainly river mouths and rocky shores, have been designated as Nature Reserves. Beaches of high value for recreation in natural surroundings and sites of archaeological interest for visitors have been designated as Nature Parks. Marine reserves have been designated or are in the process of designation. They include offshore rocky areas rich in marine flora and fauna, and offshore rocks and sections of sandy shores important for sea turtles.</p>

³³ Source: Priority Action Plan (website), Mediterranean ICAM Clearinghouse

<http://www.pap-medclearinghouse.org/eng/page001b.asp?zemljaID=12&shortID=65#65>

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
					Social –Economic Facts	Policy & Management
			urbanization and land-use conflicts on the coastal zone.	<ul style="list-style-type: none"> · on the south; · The Carmel coastal plane - between Cesarea and Haifa, consisting of three low parallel ridges of calcareous sandstone, parts onshore and parts offshore with relatively narrow sandy beaches; and · South of Cesarea - here, sandy beaches are occasionally interrupted by sections of calcareous sandstone cliffs up to 40 m high. 	<p>economic and commercial activity. The coastal strip also contains the most fertile agricultural land of Israel, especially for citrus production. The coastal strip encompasses several nature reserves (mainly river mouths and rocky shores), national parks (beaches of high value for recreation in natural surroundings and sites of archaeological interest) and marine reserves.</p>	
Israel	some 50 km north of Tel-Aviv	<i>Hadera river</i> ³⁴	During mid 1978 to mid 1980 the cooling basin of the Orot Rabin electric power			

³⁴ Source: Y.N. Krestenitis & I.S. Androulidakis (2006).

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
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			<p>station was built on the northern bank of the Hadera river. Since the construction of its breakwaters significant changes were detected on the beaches south to the cooling basin, but a significant accretion occurred on the beach north to the lee breakwater for a distance of about 1.5 km, and erosion some 2 to 2.5 km further north. The accretion has been attributed mainly to special local conditions which are predominant there (closed sedimentary cell), while the erosion was attributed to local</p>			

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
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			coastal developments lacking coastal engineering involvement.			
		<i>Herzliya coast</i> ³⁵	A very large marina was constructed between 1991 and spring 1992 at Herzliya coast 4km south of the ancient Apollonia harbour site. Following the completion of the marina and of the detached breakwaters, beach erosion of up to 25m occurred north to them along about 3km of coast.			
Israel		<i>Tel-Aviv Marina</i> ³⁶	Construction of the Tel-Aviv Marina was performed between September 1970 and fall 1972. Its			Since its construction it requires periodic dredging of its entrance, almost every year.

³⁵ Source: Y.N. Krestenitis & I.S. Androulidakis (2006).i

³⁶ Source: Y.N. Krestenitis & I.S. Androulidakis (2006).

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
					Social –Economic Facts	Policy & Management
			entrance is at –5m water depth			
Israel	30 km south of Tel-Aviv	<i>Ashdod</i> ³⁷	During 30 years of operation the port induced trapping of about 4.5 million m ³ of sand at its upstream coast side but no erosion was detected on the near downstream rocky coast, as it has been eroded by sand mining prior to the port construction.		The largest coastal structure built on the coast of Israel has been modern deep water port at <i>Ashdod</i> .	
Israel	south to Ashdod port	<i>Ashdod marina</i> ³⁸	Ashdod marina was built with its main breakwater head at –5m water depth. It already trapped a significant amount of sand south to the marina, and is encountering significant			Requiring frequent dredging operations.

³⁷ Source: Y.N. Krestenitis & I.S. Androulidakis (2006).i

³⁸ Source: Y.N. Krestenitis & I.S. Androulidakis (2006).i

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
					Social –Economic Facts	Policy & Management
			sedimentation in its entrance.			
Israel	south to Ashdod	<i>Ashkelon</i> ³⁹	Marinas as well as 3 new detached breakwaters to the north of it were built at Ashkelon, north to the Dlila beach, where 3 detached breakwaters were built in the late 1980's. It resulted in sedimentation behind the detached breakwaters and significant erosion on about 3km of coast north to them.			
Israel	10km south to Ashkelon	<i>Zikim</i> ⁴⁰	Between fall 1973 and summer 1974 a small service anchorage was built at <i>Zikim</i> for the Eilat-Ashkelon oil			To protect it against silting, two groins were built, one north of the harbour, only 80m long, in 1974, and another one 160m long to the south, in 1975. to prevent further beach erosion a

³⁹ Source: Y.N. Krestenitis & I.S. Androulidakis (2006).i

⁴⁰ Source: Y.N. Krestenitis & I.S. Androulidakis (2006).i

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
					Social –Economic Facts	Policy & Management
			pipe-line, with its entrance in 3m water depth. Sedimentological changes at the beach resulted almost immediately. The erosion to the north was so significant that the beach rock was exposed			rubble mound low coverage was placed there.
Italy	Regione Campania, Province of Napoli, Isle of Procida	Cirgaccio - Ciracciello ⁴¹	A sandy beach of reduced extension. From the land side, the shoreline appears like a thin strip of sand bordered by a cliff on the back-beach, whose height decrease slightly going from Punta Serra to the far South of the beach. The violent sea-storms provoked	Coastal characteristics: <ul style="list-style-type: none"> • Study area: 1km (850m of BMS); • Sedimentary cell: 1km • Type of coast: sandy beach (fine to medium sand) • Tidal regime: microtidal (0.3m) • Range of 	Socio-economic activities: Tourism The most important economical activity in the island is the fishing. Because of the nearness of the island to Napoli a lot of Procida inhabitants work in Napoli and travel daily.	Engineering techniques: Beach drainage system, breakwater Policy options: Hold the line In Procida island, except for few breakwater, there is not a beach protection policy, but the public administration wants to avoid the use of severe protection works and for this reason they are testing the BMS solution. A complete monitoring program is performing in the beach interested by BMS. The program includes morfological and hydraulics (i.e. water table

⁴¹ Source: Euroasion (website), Shoreline Management Guide <http://www.euroasion.org/shoreline/index.html>

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
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			<p>both the coastal erosion and cliff damages with consequent slides whose results are still evident on the beach.</p> <p>The coastal erosion has significantly cut down the beach and the sea attack has already reached the foot of the cliff, threatening its integrity.</p> <p>The erosion reasons are due partly to natural phenomena and partly to man actions. Causes are:</p> <ul style="list-style-type: none"> • lack or reduction in sedimentary contributions coming from progressive dismantling of cliffs neighbouring to the site • lack or reduction in sedimentary 	<p>waves: max. 4m</p> <p>The south Tirreno weather conditions are strongly connected, as for the rest of Mediterraneo sea, to the Azores anticyclone position. During the summer this high pressure system is situated to the northern part of its annual cycle protecting the dock from the influence of Atlantic depression systems. During the winters the Azores anticyclone moves southward failing its protecting effect,</p>	<p>The second economical activity is the tourism, connected with the very nice beaches of the island.</p>	<p>level) measures. These measures, at the moment partially available, have to be processed in next months.</p>

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
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			<p>contributions coming from the mainland (not due to the human presence);</p> <ul style="list-style-type: none"> • a sand withdrawal in the submarine beach happened some years ago • making of human structures close to the emerged and back beach. 	<p>so the Mediterraneo sea is interested to the transition of Atlantic depression crossing the dock during few days. Coastal characteristics:</p> <ul style="list-style-type: none"> • Study area: 5 km ; • Sedimentary cell: 5 km • Type of coast: Sandy beach • Tidal regime: microtidal • Predominant wave direction: E or SE 		
Italy	Sicilia, Province of Messina, municipalitie	Giardini – Naxos ⁴²	The bay of Giardini Naxos is situated in the Northern sector of the Ionian coast		Socio-economic activities: Tourism The town of Giardini Naxos	Policy options: Hold the line Engineering techniques: Breakwaters, groynes, beach

⁴² Source: EuroSION (website), Shoreline Management Guide <http://www.euroSION.org/shoreline/index.html>

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
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	s of Taormina and Giardini		of Sicily (Italy), between the towns of Messina and Catania. Over recent years several stretches of the coast of Giardini have been victims of an intense erosive activity, caused and aggravated by a series of man-made constructions: within the hydrographic basin (check dams); along the coast (subparallel breakwater barriers); or directly at sea (harbour quays).		has about 10,000 inhabitants and it is characterized by a strong tourism with plus than 1 million tourists per year.	nourishment, seawall, detached breakwater. In the 1970s and 1980s and until the early 1990s, the only projects for erosion prevention were for a rigid type of barrier, consisting of structures oriented in various directions with respect to the shoreline. These structures were always emergent and were rarely placed at a sufficient distance from the shore to be effective, in consequence of that they had a limited efficacy causing further erosion problems downdrift. On the basis of these observations the Regional Department of the Environment (ARTA) under the pressing of the EU, published a public announcement, within the project for public works from 2000 to 2006, which contained the guidelines for the definition of priority areas to be protected and the type of projects to be adopted, as well as the various stages. The aim of the announcement was “removal of the causes of deterioration and/or erosion in the coastal areas, by means of the

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
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						restoration of the natural conditions which led originally to the formation of the shoreline, with particular reference also to building activities inland, to the recovery and restitution to their natural state of the wet and dry river courses and the restoration of the solid littoral transport; particular attention is to be paid also to the effects on an increase in tourist potential, the recovery of state property and the protection of private and public goods from sea storms”.
Italy	Sicily	<i>San Vito lo Capo</i> ⁴³	Consistent erosion along the east portion of the beach has been observed over the last decades. The extension of the harbour is largely responsible for the	Sea cliffs and inlets, stony beaches, coastal sand dunes and sand beaches, sclerophyllous scrub, garigue and maquis ⁴⁴ .	Human activities include arable and stock-farming, fishing, hunting, tourism and leisure ⁴⁵ .	A gradual extension of harbor breakwaters.

⁴³ Source: Y.N. Krestenitis & I.S. Androulidakis (2006).i

⁴⁴ Source: United Nations Environment Programme World Conservation Monitoring Centre (UNEP-WCMC)(website), <http://ims.wcmc.org.uk/ipieca/species/iba/ITALY.html>

⁴⁵ Source: United Nations Environment Programme World Conservation Monitoring Centre (UNEP-WCMC)(website), <http://ims.wcmc.org.uk/ipieca/species/iba/ITALY.html>

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
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			erosion taking place along the San Vito Lo Capo beach. A removal of a previous harbour extension would, for the major portion of the beach, result in an accretion			
Italy	Po delta	Goro mouth ⁴⁶	The examined area is located in the right side of the Goro Po mouth. This is a deltaic littoral area, mainly characterized by bars sometimes related to wide spits evolution, that edge large inner land lagoons with high anthropic pressure. Nowadays, in Goro Po area, a sandy beach edged by	Coastal characteristics: <ul style="list-style-type: none"> • Study area: 6km • Type of coast: delta and beaches (with fine- medium sand) • Tidal regime: micro tidal • Other: Land subsidence The physical processes induce a longshore	The most important activities of this area are referred to fishery that, from '80 years, became the main profit for the inhabitants, after the introduction of breeding of clams (<i>Tapes philipinarum</i>) inside the lagoon, and of mussels in the in front sea.	Engineering techniques: Nourishment, groyne, revetment, dune rebuilding Policy options: Limited intervention, hold the line Many policies concur to sustain the maintenance of this area: the regional policy (Environment Councillorship-Soil and coasts Defense) aims to safe the areas, when populated or industrial activities could be damaged by natural hazards. Po Delta Natural Regional Park policy is to keep relevant natural areas and, when possible, to restore the natural

⁴⁶ Source: EuroSION (website), Shoreline Management Guide, <http://www.euroSION.org/shoreline/index.html>

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
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			coastal dunes ridges and submerged bars on the bottom are present. In the last tens years 8 million m ³ of sediments have nourished the sea bottom in front of Goro spit, but great part of these counterbalance the local natural and human induced subsidence.	transport connected to Sirocco and Levanter winds; The sedimentary supply for the Goro spit are mainly due to Goro Po river contribute and, partially, comes from reworked sediments coming from northern beaches with a transportation average about of 180 millions m ³ every year.		value of damaged areas, mainly trough eco-compatible actions. The Goro Municipality and the Ferrara Province policies aim to safe the economic activities and the natural value of this land.
Italy	La Licia, Regione Autonoma della Sardegna, Province of	Lu Litarroni ⁴⁷	The distribution of the dike set strongly affects coastal morphology by creating natural barriers to	Coastal characteristics: • Study area: 20km; sedimentary cell: 5km +	Socio-economic activities: Tourism, camping, agriculture, nature	Engineering techniques: No Actions Policy options: Do Nothing Of fundamental importance is the analysis of “progettualità” deriving from the socio-economic energies used for planning, programming (in

⁴⁷ Source: EuroSION (website), Shoreline Management Guide <http://www.euroSION.org/shoreline/index.html>

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
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	Sassari, Comune di Aglientu		<p>longitudinal transport, defining physiographic entities and creating tombolos and isolated rocks. La Liccia, Rena Majori and Bureddaggia are highly exposed beaches, liable to very intense swell with modest SW-NE net energy flow. Naracu Nieddu and Lu Litarroni beaches are poorly exposed, liable to intense swell with mild SW-NE net energy flow.</p>	<p>5km</p> <ul style="list-style-type: none"> • Type of coast : hard rock coast, beaches (from fine sand to coarse sand, pebbles, cobbles) and dunes • Tidal regime: microtidal • Range of waves: maximum h = 11 meters, 1 s period <p>The coast under study has been subdivided into 5 physiographical units. The physiographic area includes about 22 km of coastline, 10 of which of sandy beach, 5 of low rocky coast and 7 of cliffy coast. The outcropping rocks are those</p>	<p>conservation</p> <p>Tourism represents one of the predominant sectors of the local economic systems and has influenced all other forms of the use of those parts of coast and sea, who have oriented themselves towards an organisation suitable for the needs of tourism. Tourist activities include various compartments of quality of the agricultural nutrition sector (to think about wine, cheese, bread and so on) and furthermore traditional and artistic trade or craft (fabrication</p>	<p>particular of the local development programs, the instruments for urban development) and from those which regard actions in the area of the Quadro Comunitario di Sostegno also with the recent instrument of "Progettazione Integrata Territoriale" (PIT). With these reports it will be possible to verify a new scheme of territorial order, which directly originates from knowledge about the intentions of the local administration and the economic world in relation to the two principal objectives of development:</p> <ul style="list-style-type: none"> • Strengthening and re-establishing entrepreneurship by productive investments in principally tourism-related activities, • Realisation, alignment and completion of infrastructural devices to be provided by the public (water pipes, the net of sewers, recycling...) and services

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
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				<p>related to the Hercynian cycle, with the typical sequence of intrusive events represented by tonalites, granodiorites and leucogranitic plutons. The studied area includes only the sectors B and C. The wave-cut (cliff) stretches of coast, oriented according to these lineations are considerably fractured and crossed by tectonic lines perpendicular to the coast, on which processes of linear erosion and deep valleys have evolved. All physiographical units under study</p>	<p>of baskets, carpets, ceramics, knives, leather, wooden objects etc.).</p>	

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
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				present maximum exposure to the winds and waves from west and north-west. The morphology of the submerged beaches of north western Gallura is strongly affected by the outcropping of the crystalline basement that determines its geomorphological arrangement		
Italy	Toscana	Marina di Pisa, Marina di Massa ⁴⁸	Approximately 7km of beaches at Marina di Massa are experiencing severe erosion as a consequence of the construction of an industrial harbor at	Coastal characteristics: • Study area: 8.5 km (Massa), 4 km (Pisa); sedimentary cell: 65 km	Socio-economic activities: Tourism	Engineering techniques: Seawalls, detached breakwaters, submerged breakwaters, groynes, beach nourishment, submerged nourishment, geotextiles Policy options: Hold the line The new structure intercepts the southward longshore sediment

⁴⁸ Source: EuroSION (website), Shoreline Management Guide, <http://www.euroSION.org/shoreline/index.html>

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
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			Marina di Carrara in the early 1920s. The new structure intercepts the southward longshore sediment transport, inducing a sedimentary deficit to downdrift beaches.	<ul style="list-style-type: none"> • Type of coast: beach (fine to medium sand), artificial coast • Tidal regime: microtidal • Range of waves: Hs =5.5 m and Ts=10 s with recurrence time of 20-30 yr. 		transport, inducing a sedimentary deficit to downdrift beaches. Different types of hard structures, such as seawalls, breakwaters and groins, were built in the study area in order to protect the seaside resort and the coastal highway from shoreline retreat. Nevertheless, beach erosion proceeded and tourist industry is now suffering from this retreat.
Italy	northern Adriatic Sea	<i>Comacchio coast</i> ⁴⁹	Sandy coast between Porto Garibaldi and Porto Corsini. The main problem in the area is beach erosion. This is due to the evolution of the delta of the Reno River, and to the effects of past anthropogenic impacts that modified the sediment transport	the study area can be divided into three physiographic sub-unities, extending from the southern jetty of Porto Garibaldi and the Reno River mouth, to the Casal Borsetti, and from this latter to the	Tourism, fishery	In 1990 local defences with Tubi Longard and artificial nourishment (40,000m ³ of sand) were used to protect the coastline, but this management was insufficient. The eroded sediment was transported northward accumulating south of the Porto Garibaldi jetty, where an average beach accretion of 50-70m (with peaks of 120m) was detected from 1978 to 1993. The unit from the Reno River mouth to Casal Borsetti is heavily armoured with beach

⁴⁹ Source: Y.N. Krestenitis & I.S. Androulidakis (2006).i

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
					Social –Economic Facts	Policy & Management
			dynamics of the beach. An important factor affecting the morphological evolution of the site is land subsidence. This caused an important modification of the relative elevation of the ground at sea level, increasing the beach erosion. From the start of the 1980s the first unit of beach was affected by severe erosion, because of the migration of the Reno River mouth 2km south, causing significant coastal modifications. In the 1978-1983 period, the beach eroded 120m.	northern jetty of Porto Corsini.		revetments, which were installed in the 1980s. The unprotected beaches in this area are affected by strong erosion, 80m in the last 15 years (figure 11). The third physiographic unit is characterised by a southward littoral drift, which has experienced accretion of about 4 m/year in the last decade or relative stability. This is due to the drift of the artificial nourishment which was put in place at the end of the 1980s and also because of other protection works. In the last 30 years, because of coastal erosion, the littoral strip that separates these lagoons from the sea became narrower, and was artificially defended. In the same time the Canale Gobbino mouth closure took place, reducing even more water exchange between the lagoon and the open sea
Italy	Lido Adriano, Regione	Marina di Ravenna ⁵⁰	During the last century, the entire	Coastal characteristics:	Socio-economic activities:	Engineering techniques: Seawalls, submerged, non submerged

⁵⁰ Source: EuroSION (website), Shoreline Management Guide, <http://www.euroSION.org/shoreline/index.html>

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
					Social –Economic Facts	Policy & Management
	Emilia Romagna, Provincia di Ravenna, Comune di Ravenna		coastline has been strongly influenced by two main factors: the building and progressive extending of Ravenna Port jetties (whose present length is about 2800 m) and the lack of sediment supply, formerly coming from the river consider all the negative effects caused by subsidence and the high anthropic impact due to beach-tourism management. The coast have experienced a subsidence grater than 1 m in the last 40-50 years; natural rates of 2-3 mm/y of magnitude have been in fact	<ul style="list-style-type: none"> • Study area: 10,5 km • Type of coast: beaches (with fine sands) • Tidal regime: micro tidal • Range of waves : Hs=1.5-2m (Ts=5-6 s.); Hmax=4m • Other: land subsidence <p>The coast is characterised by sand-beaches covering muddy-clayey materials derived from more ancient swampy and alluvial deposits. This area is the result of the interaction between river-delta and marine coastal processes.</p>	Tourism and recreation The major function of the coastal area is tourism and recreation.	breakwaters, groynes, jetty and nourishments. Policy options: Hold the line The actual beach management strategy, according to the present knowledge, began in 1997, with the design of a new coastal semi-submerged protection structures required because the previous submerged breakwater and groins made of sand bags resulted ineffective.

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
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			<p>greatly accelerated in the last half century by fluid (water and gas) extractions from the underground. At present, along the coastal areas, the subsiding rates are, on average, 5- 6 mm/y, with peaks of 9- 10 mm/y. The coastline experienced a huge erosion rate in the southern part (from the Fiumi Uniti river mouth to about Punta Marina) and a significant accretion in the northern part (close to the jetty). In Marina di Ravenna the emerged beach shows a marked accretion (about 140-150 m in the last 50 years) while, where water depth exceeds 3-4m, a</p>	<p>The seawater level rising in the North Adriatic Sea is also due to an intense wind action coming from south-east, the Sirocco wind, associates to depressional fields, which move towards the East. The prevailing sea is from the SE (influenced by Sirocco wind) close to the shoreline, and from the NE (influenced by Bora wind) where water depth is higher than 3 m.</p>		

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
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			slight negative altimetric budget can be observed. More than 100 bathhouses are located on the 10.5 km of beaches. These structures damaged and destroyed the dune bar and, because of an uncontrolled use of the beach, they caused heavy and continuous impacts on the existing residual dune bars and on the pinewood.			
Italy	Genoa	The beach of <i>Vesima</i> ⁵¹	Has been subject to a strong erosive trend. On the contrary, in the 1970s there was a period of temporary and limited progradation of the beach due to the		The construction of a coastal road, the main railway line, and some breakwaters, to protect fragile coastal areas, has changed the coastal dynamics and the	After the nourishment work in March 2000, the width of the dry beach was stable; the estimate of nourishment material (20,000m ³) and of the material left on the dry beach after 2 years (4800m ³) indicates that a remarkable quantity of sediment was taken from the shoreface to form the nearshore zone.

⁵¹ Source: Y.N. Krestenitis & I.S. Androulidakis (2006).i

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
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			beginning of new dumping, which was carried out for the building of a new railway and a motorway. During the 1980s and 1990s, the beach showed a new and greater erosional trend, essentially because of reduced contributions made by the local watercourses and littoral drift		equilibrium of this stretch of the coast. from 1800 to 1960, there was increasing erosion along the entire shoreline, due to the quarrying of sandy sediments from the rivers and the beaches. This process culminated in the 1950s and 1960s with the additional impact of demand for beachside housing and holiday structures.	
Italy	Regione Liguria, Province of La Spezia – Municipality of Sarzana	Marinella di Sarzana ⁵²	The pilot zone of Marinella di Sarzana is characterized by a sandy beach with a total length of approximately 2.7 km, which extends	Coastal characteristics: <ul style="list-style-type: none"> • Study area: 2,5 km ; Sedimentary cell: 70 km • Type of coast: 	Socio-economic activities: Tourism	Engineering techniques: Groynes, detached breakwater, jetty, artificial island, nourishment Policy options: Hold the line Currently, the beach of Marinella di Sarzana is protected by different kinds of hard structures like groins,

⁵² Source: EuroSION <http://www.euroSION.org/shoreline/index.html>

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
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			<p>from the Magra River mouth -on the northwest- to the Parmignola Creek mouth to the southeast. The study area constitutes the northern part of the physiographic unit that extends from the Magra River mouth to Livorno, and the Magra River is the only source of sediments for the beach. The beach at Marinella di Sarzana experienced severe erosion since the end of the XIX Century as a consequence of the strong reduction of the Magra River's sediment load due both to changes in land use and, later, to human action in the river basin, with intense sand and</p>	<p>beaches (with fine sand)</p> <ul style="list-style-type: none"> •Tidal regime: micro tidal •Wave climate: storm waves coming from WSW (240°) 		<p>breakwaters and circular artificial islands made of rocky stones around a concrete ring. This hard engineering stopped shoreline retreat but induced heavy impact on the coastal zone. The Administrations of Regione Liguria and Regione Toscana recently co-financed an innovative project aimed at reducing these impacts and increasing the beach surface in order to re-launch tourist activity in the area.</p>

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
					Social –Economic Facts	Policy & Management
			<p>gravel dredging from the river bed. Being a deltaic area, erosion started in proximity to the river mouth and moved gradually downdrift toward the southern limit of the study area. In the meantime, the southern neighboring beach at Marina di Carrara experienced accretion because of the construction of the Marina di Carrara harbor which begun in the 1930's. The construction of the harbor created a physiographic sub-unit between the Magra River mouth and the harbor itself.</p>			

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
					Social –Economic Facts	Policy & Management
Italy	located on the shore of the Ligurian Sea, in Tuscany, located 4.5 km north of the of the Arno River outlet	the shoreline south of Gombo ⁵³	Particularly, from the mid-19th century to 1954, retreated continuously. Extreme retreat occurred north of the Arno outlet and gradually decreased northwards. In the period 1938–1954, Gombo enjoyed some sand supply from the eroding beaches located to its south and became an inversion point, i.e., north of the site the shoreline started to prograde. During the 1954–1967 period, shoreline retreat continued to the north and included the Gombo area up to Serchio river.			In order to protect the coastal segment in front of the presidential villa at Gombo, a pair of detached breakwaters, were built in 1962, two other segments were completed in 1966 and the fifth segment was built in 1968 further north. The three southernmost tombolos facing the longshore current became the main sediment trap, causing a lee-side erosional effect to emerge within the protection scheme of the segmented detached breakwaters. The oblique incident waves enter through the gaps and maintain in the inshore the depleted longshore drift, causing the shoreline configuration in the lee of the northern breakwaters to develop into a prograding log-spiral bay.
Italy	located in	Cecina River	experienced severe	Surveys	Reducing the	Beach stabilization conducted from

⁵³ Source: Y.N. Krestenitis & I.S. Androulidakis (2006).i

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
					Social –Economic Facts	Policy & Management
	central Italy	mouth ⁵⁴	erosion. The main cause of beach erosion is river bed quarrying carried on up to 1978 along the Cecina River.	conducted before, during and after project completion indicate that the shoreline prograded for approximately 5.65 meters along the northern beach, and for approximately 5.50 meters along the southern beach. Bathymetric surveys show a sediment surplus of 140,000 cubic meters in the northern area, and of 220,000 cubic meters in the southern area	recreational use which contributes a large part to the economy of the area.	1987 to 1992, has included a stretch of coast approximately 1.7 kilometers north and 1.1 kilometers south of the River mouth. Emerged and submerged groins were constructed, and approximately 92,500 cubic meters of sediment were used to nourish the beach during the period under study. In addition, a submerged breakwater was placed at the 2 meter isobath on the southern beach and on a very limited area of the northern beach. In addition, a submerged breakwater was placed at the 2meter isobath on the southern beach and on a very limited area of the northern beach.

⁵⁴ Source: Y.N. Krestenitis & I.S. Androulidakis (2006).i

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
					Social –Economic Facts	Policy & Management
Italy	Regione Lazio, Provincia di Roma, Lido di Ostia	Vecchia Pineta ⁵⁵	<p>Coastal band of the examined site is constituted by a sandy beach of reduced extension. From the land side the beach is bordered by a string of dunes slightly decreasing going towards the shore. The coastal girgle is constituted by a low extension sandy beach, of approx 40 m and weak gradient nearly 1:40. On the sea side the sounding-depth outline shows a system of one or two longitudinal bars.</p> <p>The shore erosion forecasts pointed out a global mass of approx. 220.000</p>	<p>Coastal characteristics:</p> <ul style="list-style-type: none"> • Study area: 400 m • Type of coast: beaches (with fine and coarse sand) • Tidal regime: micro tidal (0,4 m) • Wave climate : Direction of waves = 3rd quadrant <p>The main wave motion, as far as intensity and frequency, is from S and SW event though there is a significant frequency from W and NW. The sea currents are mainly a wind result, therefore</p>	<p>Socio-economic activities: Tourism</p> <p>Tourism is the main socio-economic activity of this place. Thus, hinterland and beach, in spite of its remarkable tourist interest, appear barely built with the exception of the restaurant and the cabins over the wharves which do not weightily interfere with the shore-line morpho-dynamic.</p>	<p>Engineering techniques: Historical: submerged breakwaters, nourishments. Present: beach drainage system. Policy options: Hold the Line</p> <p>The Regione Lazio carried out a lot of intervention firstly aimed to hold the line and to a subsequently its advancing. In order to guarantee a long stability, every non-protected action must be combined with a suitable maintenance service. In this contest, it has been carried out the installation of a new system of erosion maintenance and coast resetting, BMS (Beach Management System). This new system has a double aim:</p> <ul style="list-style-type: none"> • shore-line stabilisation and consequently maintenance low-costs • get a further advancement <p>During the previous years a lot of passive protection interventions have been performed, but this</p>

⁵⁵ Source: EuroSION <http://www.euroSION.org/shoreline/index.html>

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
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			m3/year, shared in 100.000 m3/year toward North and 120.000 m3/year South direction, with a net difference of 20.000 m3/year in favour of the south side. During the previous decades this was compensated by Tevere contributions but today, thanks to the works of river regimentation and ground stabilisation, they are decreased helping to trigger erosion phenomena along the entire shoreline.	strongly conditioned by the weather variability and, near the cost, by the structure of the bathymetric lines. The wind climate shows a strong frequency predominance from NNE and NE. The greater intensity events seem to be due to the areas between SE and SW also showing a good frequency.		actions allowed the erosion phenomena to shift southward.
Italy	Liguria	Ligurian coastal area ⁵⁶	coastal erosion, habitat loss	coast, river basin and the adjacent	urban expansion, population	overall policy, pollution control, development control, infrastructure

⁵⁶ Source: Priority Action Plan <http://www.pap-medclearinghouse.org/eng/page001b.asp?zemljaID=12&shortID=65#65>

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
					Social –Economic Facts	Policy & Management
				coastal area, rocky coast, lakes/ivers, island, peninsula, sandy beach	growth, tourism/recreation, transport congestion,	development, planning, monitoring
Italy	Abruzzo	Pescara ⁵⁷	sediment movement, coastal erosion, Funding of the Structural Funds has part-financed coastal protection works, which have contributed to beach and dune erosion further along the coast, necessitating further expenditure on yet more coastal protection with similar effects ⁵⁸ .	coast, river basin and the adjacent coastal area, rocky coast, grass and rangeland, lakes/ivers, sandy beach	urban expansion, water pollution, tourism/recreation	

⁵⁷ Source: Priority Action Plan <http://www.pap-medclearinghouse.org/eng/page001b.asp?zemljaID=12&shortID=65#65>

⁵⁸ Source: Coastal Guide ICZM Information System, <http://www.coastalguide.org/icm/abruzzo.pdf>

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
					Social –Economic Facts	Policy & Management
Lebanon		Tyre Beach ⁵⁹	<p>The site is situated along the Mediterranean coastline of southern Lebanon near the town of Tyre. Seawater at the site is polluted by organic (sewage) and inorganic waste. The latter is caused by illegal disposal of oil, and by heavy metals, detergents, etc. Dumping and littering are a problem too. Urbanisation from the Tyre area has been going on for over a century. Coastal erosion by storms and illegal sand mining also threaten the site. Disturbance of wildlife is a problem</p>	<p>The area consists of sandy stretches, at some places interspersed with pebble areas and rocky shelves with pools. The beach and sand dune area are made up of a mixture of quartz and carbonate sands which have locally been compressed and transformed into rocks. Cretaceous limestones underneath form an aquifer that provides the major part of the region's water, and overlying impermeable layers have</p>	<p>No information is available about the ownership of the site. Parts of the area are irrigated for the cultivation of vegetables. Palm and citrus plantations occur further back. Stabilised dunes are used for grazing by small herds of cattle, which are also led to freshwater sources on or near the beach. In summer, the area is visited by a large number of tourists and at that time, some fishing also takes place. At Ras el Ain there are three artesian wells of</p>	

⁵⁹ A Directory of Wetlands of International Importance (1996).

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
					Social –Economic Facts	Policy & Management
			during the tourist season.	allowed the development of artesian wells from cracks and faults.	which the walls were built by the Phoenicians	
Malta	Island of Malta (NUTS level 3), San Pawl il-Bahar Local Council Mgarr Local Council	Xemxija - Ghajn Tuffieha ⁶⁰	The case study areas of Xemxija and Ghajn Tuffieha are located within the Pwales graben, which is defined by two faults. The beach material comprises sand with a varying admixture of silt and some clay. The sea bed in Ghajn Tuffieha is relatively shallow in the embayment. In contrast to Ghajn Tuffieha Bay, the seabed in Xemxija is marked by a gentle slope where depths reach 25m at the mouth of St. Paul's Bay. The sandy beach at	The Maltese Islands are almost entirely made up of sedimentary rock deposited in a marine environment during the Oligo-Miocene period. These limestones and clays form a series of stratigraphic layers of varying composition and hardness. Xemxija Coastal characteristics: • Study area: 3,6 km • Type of coast:	With a total land area of 316 km ² and a total population of 378,132 (Census, 1995) the Maltese Islands have one of the highest population densities in the world. Due to its small size the economy depends heavily of foreign trade and the Islands rely substantially on imports for energy, industrial supplies and consumer goods. Tourism is a significant contributor to the	Evidence from aerial photography suggests that the sandy beach at Xemxija Bay (although relatively small) has eroded in a period of almost 4 decades, as a result of measures to artificially realign the coastline. An afforestation project was carried out along the clay slopes at Ghajn Tuffieha, in the late 1960s. It is assumed that such a project was undertaken to stabilise the slopes. It is evident that throughout the development of Xemxija and provision of infrastructure, no consideration has been given to coastal erosion issues. In the absence of any policy measure, the shoreline has been subjected to considerable changes that have led to the loss of the sandy beach and the saline marshland behind it as well. The legal protection afforded

⁶⁰ Source: EuroSION <http://www.euroSION.org/shoreline/index.html>

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
					Social –Economic Facts	Policy & Management
			<p>Ghajn Tuffieha occupies half of the bayhead in the form of a wedge-shaped belt, approximately 150m long and 25m wide, tapering gradually towards the south where it turns into a narrow, 100m long sand/cobble beach. Geological formation of the Xemxija area in the absence of significant clay exposures, suggests limited material availability. The aerial photos indicate that erosion is predominant in the areas where human intervention took place, primarily on the clay slopes with more debris accumulating at the base of the cliff.</p>	<p>beaches (with fine sand) <ul style="list-style-type: none"> • Tidal regime: micro tidal <p>Ghajn Tuffieha Coastal characteristics: <ul style="list-style-type: none"> • Study area: 1,3 km • Type of coast: beaches (with fine sand) and soft rock coast (with limestone cobbles) • Tidal regime: micro tidal </p> </p>	<p>local economy. Southern coast, dominated by cliffs has been dominated by agriculture development. Xemxija Socio-economic activities: Tourism and recreation, fishing berths Ghajn Tuffieha Socio-economic activities: Nature Conservation, cultural heritage; tourism and recreation</p>	<p>to Ghajn Tuffieha has slowed down the process if not eradicated completely the source of coastal erosion. Xemxija Engineering techniques: Revegetation. Policy options: Do Nothing Ghajn Tuffieha Engineering techniques: Revegetation. Policy options: Limited intervention</p>

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
					Social –Economic Facts	Policy & Management
Malta	Northwest area of the Maltese Islands	from Wied iz-Zurrieq to Salini Bay ⁶¹	water pollution, air pollution, soil pollution, water shortage, coastal erosion, habitat loss	coast, river basin and the adjacent coastal area, wetland, rocky coast, grass and rangeland, lakes/streams, bay, island/peninsula, sandy beach	population growth, tourism/recreation, over-fishing,	overall policy, preparatory activities, pollution control, development control, resource management, institutional strengthening, infrastructure development, biodiversity conservation, urgent measures development, planning, education/awareness, monitoring, networking
Morocco		<i>Moulouya River</i> ⁶²	Before the construction the lower Moulouya River pattern was sinuous to meandering and the river's mouth was much wider than it is today (figure 20). The fluvial load was significant enough to lead to the progradation of deltaic deposits in the eastern part of	The largest river in Morocco, draining approximately 53,500 km ² in the eastern Morocco. The upper basin is separated from the lower floodplain by the large Mohamed V reservoir which traps most of the sediment delivered from the		

⁶¹ Source: Priority Action Plan <http://www.pap-medclearinghouse.org/eng/page001b.asp?zemljaID=12&shortID=65#65>

⁶² Source: Y.N. Krestenitis & I.S. Androulidakis (2006).i

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
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			<p>the river's mouth. After construction of the Mohamed V dam, the river's mouth and the coastline reacted with remarkable adjustments. Indeed, given the weak fluvial hydraulic power, the marine influences have been reinforced, leading to the reworking of the shoreline sediments, narrowing of the mouth area, and the accumulation of mouth bars. The most effective waves and the induced sand transport are directed westwards.</p> <p>The net littoral transport was estimated at approximately</p>	<p>upstream region Sediment trapping by the dam's reservoir affected the morphological evolution of the coastline</p>		

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
					Social –Economic Facts	Policy & Management
			165,000 m ³ year ⁻¹ . The sand transported was responsible for the accretion of the west coast, whereas the east coast retreated because it was not fed by fluvial inputs.			
The Palestinian Authority		<i>Gaza coast</i> ⁶³	During 1997, a fishing port was built off <i>Gaza coast</i> , extending with its breakwater head to a water depth of 5.5m. Significant sedimentation resulted to the south of the harbour and correspondingly erosion on the coast downstream to the harbour occurred.			
Slovenia	Municipality of Piran and	Slovenian coast ⁶⁴	Slovenian coast is a	Coastal characteristics:	Socio-economic activities:	Engineering techniques: Seawall, submerged breakwater,

⁶³ Source: Y.N. Krestenitis & I.S. Androulidakis (2006).i

⁶⁴ Source: EuroSION <http://www.euroSION.org/shoreline/index.html>

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
					Social –Economic Facts	Policy & Management
	Municipality of Izola		shallow marine basin, with maximum depths in its central part 20-25 m and average depth of 17 m, situated at the junction of the Dinaric Alps and the Alps. Sea erosion of rock coastline through the waves and tide, is of low intensity due to small driving forces. It is comparable to erosion due to weathering on slopes inland. Shifting of coastline inland due to sea erosion is pronounced only in uninhabited areas and nature reserves, while the majority of inhabited coastline is erosion	<ul style="list-style-type: none"> • Study area: 10 km • Type of coast: hard and soft rock coast, saltmarshes, beaches (with shingle), artificial coastline. • Tidal regime: micro tidal 	<p>Nature conservation, tourism</p> <p>Tourism development in Piran, and other parts of the coast, sprawls outside the city creating needs for new infrastructure, is excessive beyond the carrying capacity of the coast and the road network. The urbanisation of the coastal strip together with the increasing employment opportunities led to intensive migration of inhabitants from hinterland to the coast.</p>	<p>dyke</p> <p>Policy options: Hold the line, limited intervention, move seaward</p> <p>These parts of the coast are protected by various artificial structures ranging from seawalls and rip rap breakwaters to rock dikes. Cliffs in inhabited areas are protected by wire mesh, in exceptional cases also by concrete sills, stone walls and concrete walls. Areas of the coastal plains are protected by seawalls and submerged rip rap breakwaters.</p> <p>The most important policy option that was chosen and adopted is "hold the line", which is implemented in most parts of the coastal zone, that are urbanised or occupied by intensive uses. Only the parts of the coast, that are either nature reserves or uninhabited areas are subject to natural processes, and are left to natural dynamics, with the soft policy option of "limited intervention". In the area of the</p>

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
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			<p>protected by artificial structures. However, during extremely high tide events the stretches of low coast are flooded for some hours short periods several times a year.</p> <p>The major changes in the narrow coastal strip in the last decades (abandoning of salt production in Luclja, the construction of tourist facilities including yachtmarinas, the development of the port of Koper, infrastructure) resulted in a serious loss of natural coastline and degradation of the coastal ecosystems. There is less than 20 % of natural coastline left. Salt</p>			<p>Port of Koper, the policy option is to “move seaward”In general, the approach to solving erosion problems of the coastline is local, using proper technical solutions and appropriate land use. Only the problem of filling up the Gulf of Trieste with sediment transported by rivers, is delt with regionally and internationally, trying to retain the sediments inland.</p>

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
					Social –Economic Facts	Policy & Management
			extraction used to be one of the important economic activities in the area.			
Slovenia		<i>Gulf of Trieste</i> ⁶⁵	Shifting of coastline inlands of the Gulf of Trieste due to sea erosion is pronounced only in uninhabited areas and nature reserves, while the majority of inhabited coastline is erosion protected by artificial structures. The highest erosion progress is to be 6 cm per year, deduced from skeleton washing away from the grave cut in the cliff about 900 years ago. All other available published sources are citing		Because the Gulf of Trieste is shallow, sedimentation of the eroded material to the bottom of the sea poses serious problem to navigation of transoceanic ships.	several technical solutions were introduced into the river systems to retain the eroded material inland. In the last decades, the process of natural reforestation of agricultural land is also taking place due to abandonment of agricultural production. This results in a trend that shows decline of sedimentation in the sea.

⁶⁵ Source: Y.N. Krestenitis & I.S. Androulidakis (2006).i

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
					Social –Economic Facts	Policy & Management
			<p>lower erosion rates. Historical data of cliff erosion next to protection wall of Piran Sv. Jurij church show erosion progress of 1 cm a year. Measurements at other sites gave values between 1 cm and 2 cm. In general, it could be taken that average speed of cliff shift at Slovenian Coast is in the range from several mm to several cm a year. Inland landslides, torrential erosion and riverbank erosion are the most hazardous phenomena in Slovenia. Inland Erosion endangers about 44% of Slovenian territory and causes an annual</p>			

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
					Social –Economic Facts	Policy & Management
			loss of 2,5 million m ³ of soils			
Spain	Illes Balears (Isle of Mallorca), Alcúdia	Can Picafort ⁶⁶	<p>Mallorca Island, located at the western Mediterranean Sea (Balearic Sea), is the greatest of the Balearic Islands. The area of interest is located at the north-western sector of the Alcudia Bay (Can Picafort beach). Alcudia Bay has a structural origin, as it is limited by NE-SW Neogene normal faults at its margins, where Mesozoic materials outcrop. At the subsiding sector a sand beach system with a wet zone onshore is present (Albufera</p>	<p>Coastal characteristics:</p> <ul style="list-style-type: none"> • Study area: around 4 km ; Sedimentary cell: around 10 km • Type of coast: beaches (with fine-medium sand bioclastic origin) • Tidal regime: micro tidal • Range of waves : max H = 4 m <p>The origin of the sediments is mainly Bioclastic (89%), being the lithoclastic fraction very low (11%). The grain size of the</p>	<p>Socio-economic activities: Tourism, Nature conservation</p> <p>The major function of the coastal zone is tourism and recreation. If the beach disappears the economic engine of the area will also disappear. For that reason the impacts of the beach retreat in this area will affect the inhabitants residing inland, not also those who has a house near the beach.</p>	<p>Engineering techniques: Nourishment</p> <p>Policy options: Limited intervention</p> <p>The biological activity is strongly related to the Posidonia Oceanica. Almost all the beings that form the sediment of the beaches live around or depend on that plant. For that reason when we reduce the Posidonia Oceanica prairies we kill the sediment factory of the Mallorca beaches. As there is not any external supply when the Posidonia Oceanica prairies are destroyed we are inducing a beach retreat.</p> <p>The adopted policy options in this area have been a limited intervention: sand renourishment of the most affected beach, the Can Picafort beach.</p>

⁶⁶ Source: EuroSION <http://www.euroSION.org/shoreline/index.html>

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
					Social –Economic Facts	Policy & Management
			<p>d'Alcudia). On the other hand, at the stable sector sand beaches and gently rocky coast (Plio-Pleistocene eolianites) appears alternatively.</p> <p>The studied sector of coast consists on 5 km long beach (from Can Picafort to S'Oberta) with a NW-SE orientation and opened to the NE.</p> <p>The studied shore shows erosion and accretion at different places. The distribution of the erosion and accretion sites is mainly controlled by human constructions (dikes and harbours) together with the longshore transport and storms. The type of erosion</p>	<p>Alcudia bay sand has a 60 % of medium sand (between 0.25 and 0.5 mm), a 25 % of coarse sand (between 0.5 and 1 mm) and a 15 % of fine sand (between 0.125 and 0.25 mm). Tidal processes are almost imperceptible and height wave do not overpasses the 4 m in the open sea. The bathymetry of the Alcudia bay is also gentle. Two independent sedimentary cells can be defined in the Alcudia Bay, a northern cell (studied area) and a southern one. Wave</p>		

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
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			observed at Alcludia Bay is a gradual sediment loss due to the S-N longshore transport.	induced longshore transport can be considered as the most important process along the Alcludia Bay, which at the studied sector has a main SE-NW direction. Aeolian transport has also a great importance but in this case the sand dunes evolve from North to South (Servera, 1997). Thus in the studied zone the longshore sea transport has a S-N direction and the eolian one has an N-S direction.		
Spain	Valencia	Castellón ⁶⁷	The study zone is	Coastal	Socio-economic	Engineering techniques:

⁶⁷ Source: EuroSION <http://www.euroSION.org/shoreline/index.html>

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
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	Autonomous Community, Castellón Province, Almazora		<p>known the Valencian Oval, from the Port of Castellón to the mouth of the Mijares River, including the beaches of the Serrallo, Ben Afeli and De la Torre.</p> <p>The section is regressive by the concurrence of factors that affect their feeding. On the one hand, the section is leeward (downdrift) of the Castellón Harbour and on the other hand, the regulation of the Mijares River and the city-planning pressure on beaches. This causes an important erosion of adjacent beaches, characteristic of a dominant coastal transport towards</p>	<p>characteristics:</p> <ul style="list-style-type: none"> • Study area: 3,05 km • Type of coast: beaches (with pebbles, gravel and sand) • Tidal regime: micro tidal (around 1m) • Wave climate: predominant wave direction= NE 	<p>activities: Industry, agriculture and tourism</p>	<p>Serrallo Beach: groyne Ben Afeli Beach: detached breakwater and artificial nourishment De la Torre Beach: short breakwaters and artificial nourishment</p> <p>Policy options: Hold the line The main functions of the coastal zone are related to the industry and agriculture (orange trees). The problems of erosion have been tried to mitigate with hard works of engineering, that have made vary the alignment of the coast (2° in average value), being faced the resultant of the surge and a net coastal solid transport in this insignificant zone:</p> <ul style="list-style-type: none"> • Serrallo beach: 1,400m long, located after the Port of Castellón, only has submerged beach, being the coastline a great longitudinal revetment made to restrain the erosion and to protect of the marine invasion. • Ben Afeli beach: 450m long and 40m of average width, present two detached breakwaters that form a gravel beach.

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
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			<p>the south, causing the disappearance of the dunes, exposing to low territories to continuous floods.</p> <p>The variation of the sea level next to 1m, is crucial because in the precoastal area, great zones with level next to the sea level exist, since they are formed by coastal barriers and old saltmarshes, reason why any variation of the same one can have influence in the future evolution of the coast.</p>			<ul style="list-style-type: none"> De la Torre beach: 8 groins cause its width variation between 45m and 15m. Its length is of 2,200m and is composed by gravel. In these beaches the works have been oriented nonsingle to the fight against erosion but also to beach creation. <p>The total barriers to the sediment passage, as in this case are the Port of Castellón, suppose the maintenance by means of artificial works of hard engineering of the beaches that are to leeward of the obstacle. Of this form, while the obstacle stays, the erosive problems of the adjacent coastal zone waters down will be more and more severe, needing continuously to invest in projects of regeneration and sand contribution, as well as in new defensive installations that maintain the coast and avoid the backward movement of the coastline. In fact, in the coast section, the Ministry of Environment has projected new engineer installations that will reinforce the existing ones already.</p>

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
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Spain	Catalunya Autonomou s Community, Tarragona province, Amposta	Ebro Delta ⁶⁸	The Ebro Delta is located in the northeast coast of Spain, in the province of Tarragona. It represents the main coastal delta of the Iberian Peninsula and one of most important of the Mediterranean. Morphologically it presents a deltaic front, in which locates the present mouth of the Ebro River and two spits that partially close the Fangar and Alfacs lagoons, located north and south respectively. The spit of El Trabucador, that shows an approximated width of 250m and 6km	Coastal characteristics: <ul style="list-style-type: none"> • Study area: 50 km • Type of coast: delta, beaches (with fine - medium sand) and dunes • Tidal regime: micro tidal (0,25 m) • Range of waves : mean Hsig = 0,7m and T = 4s ; Predominant wave directions: N, E, S. 	Socio-economic activities: Natural park, agriculture, fishery, aquiculture, hunting, industry (salt), tourism At the moment, the performances in the deltaic coast are marked by the presence of the Natural Park of the Ebro Delta.	Engineering techniques: Dune nourishment, wind traps, revegetation, beach drainage Policy options: Hold the line, Do nothing, managed realignment The actions of coastal engineering have gone fundamentally to the preservation and recovery of the environment, trying to palliate and/or to diminish the impacts of hard engineering measures. The performances will have to be directed to the integration of the natural and human aspects, using criteria of sustainable development, that allows to make compatible the different uses of the delta (fishing, agriculture, extraction of salt, tourism) with natural and unique ecosystems from biodiversity (flora and fauna).

⁶⁸ Source: EuroSION <http://www.euroSION.org/shoreline/index.html>

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
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			<p>long, is closing the bay of Els Alfacs in the south. The coast length is of about 50km and presents an emerged area of 325km².</p> <p>The predominant wave directions are North, South and East, which produce sediment transport towards the northern and southern hemideltas. The morphologic configuration of the Ebro Delta causes the existence of zones with different behavior with respect to coastal dynamics, alternating beaches with erosive character (river mouth, Marques and Pal beaches and Trabucador Spit) with beaches whose</p>			

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
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			tendency is accretion (Fangar Spit, Alfacs Spit and Eucalyptuses Beach). Other factor that affect their erosion is the river damming. The Ebro Delta presents exceptional values of natural heritage. Represents the second more important aquatic habitat of the western Mediterranean, after the French Camarga. Its low altitude causes a high vulnerability to erosion putting in danger all these values of difficult economic assessment.			
Spain	Autonomous	Mar Menor ⁶⁹	The Mar Menor is a	Coastal	Socio-economic	Engineering techniques:

⁶⁹ Source: EuroSION <http://www.euroSION.org/shoreline/index.html>

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
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	com. of Murcia, San Pedro del Pinatar – San Javier- Cartagena		<p>hypersaline coastal lagoon of 135 Km² in surface area, located at the SE of the Iberian Peninsula, between the parallels 37° 38' and 37° 50' North latitude and the meridians 0° 43' and 0° 57' West longitude. The mean depth is 3 to 4 m, and the maximum depth is over 6 m. Such characteristics made the Mare Menor one of the bigger coastal lagoons from Europe and the Mediterranean. A sandy bar, called La Manga with 22 km of long, acts as a barrier between the lagoon and the Mediterranean Sea. It is crossed by five, more or less functional, channels</p>	<p>characteristics:</p> <ul style="list-style-type: none"> • Study area: 25 km ; • Sedimentary cell: 50 km • Type of coast: beaches (with sand) • Tidal regime: micro tidal • Range of waves : mean Hsig = < 1m 	<p>activities: Tourism and urban</p> <p>In relation to human occupation, the Mar Menor has experienced varying changes over the last 40 years. From being a practically uninhabited place, with only a few families of fishermen living permanently on its shores, there is now a large human presence, above all in the months of summer.</p> <p>The human activities developed close to the lagoon include: salt mining, agriculture, fishery, industry,</p>	<p>Nourishment and groynes Engineering techniques: Nourishment and groynes</p> <p>Policy options: Hold the line, limited intervention</p> <p>There is no a real, active policy concerning coastal erosion. Regarding the few interventions performed (beach nourishment and construction of groins), the main policy option has been to “Hold the Line”, as promoted by public administration, commonly on a national level. It is important to point out that most of the nourishment performed on the continental shore of the Mar Menor is aimed at the creation of new beaches in a place where there was originally no morphology of sandy beaches. The main goal of these interventions was to try to attract more tourism.</p>

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
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			<p>or "golas". (Perez-Ruzafa, 1996). Erosion factors include mainly natural driving forces - winds, storms, waves and a rise in sea level. La Manga was created by marine currents and the effect of the wind and waves. The wind is the main factor influencing sediment transport in this area. Prevailing winds in the area are from the East component. The modification of the sea level will lead to important consequences for low coasts such as the Mar Menor, in which the backward movement of the coast is ranked at around a meter per</p>		<p>tourism and recreation, urbanisation and military uses. This conjunction of many interests and uses made the Mar Menor the target of all type of aggressions during its recent history (land reclamation, the opening or deepening and extending channels, mining, urban and agricultural wastes, urban development, building sporting harbours, artificial beaches creation, etc) (Pérez-Ruzafa, 1996).</p>	

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
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			centimetre of rise in sea level. (Mas, 1994). The Mar Menor lagoon is an accumulation coast dominated by sedimentation rather than erosion, although in some specific places erosive phenomena are quite evident, emphasizing the full exterior of La Manga. The main erosion causes are land urbanization on dune system, updrift construction of the San Pedro del Pinatar Port (1954) and enlargement of the El Estacio channel for the construction of a harbour.			
Spain	Catalonia	Sitges ⁷⁰	The town of Sitges	Coastal	Socio-economic	Engineering techniques:

⁷⁰ Source: EuroSION <http://www.euroSION.org/shoreline/index.html>

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
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	autonomous community, Barcelona province, Garraf		is located on the Mediterranean coast, 40km south of Barcelona. It has a coastal area of 18.840km long, which is made of cliffs and sandy beaches. There are 18 pocket beaches in the municipality's coastal area, 10 of which are in front of the urban area. Beach and bottom sediments are sands of siliciclastic origin, of light gold colour and fine to medium grain size. The driving forces that cause erosion in the coast are mainly the lack of sediment transport by the southwestwards longshore drift, and the east storms,	characteristics: <ul style="list-style-type: none"> • Study area: 16 km. • Type of coast: beaches (fine to medium sand, shingle) and soft rock coast • Tidal regime: microtidal • Range of waves: dominant SEA <1 m high, H max about 4 m. 	activities: Tourism, industry, marinas. Sitges economy depend enormously on tourism (basically the summer tourism), so the loss of beach is the main worry for all the stakeholders involved. Quarries and recreational ports are other economic sectors of the municipality.	Detached breakwaters, T-shaped breakwaters, groynes, artificial islands, beach nourishment Policy options: Hold the line To face erosion, the policy adopted by the government is hold the line. The measures adopted are both hard measures, such as groynes, detached breakwaters, T-shaped breakwaters, artificial islands and seawalls, and soft measures (beach renourishment). The numerous groynes retain the sediments that circulate in a NE-SW longshore drift, avoiding the feeding of the southwest beaches, which are the most affected by erosion, and worsening the problem of erosion. The marina docks northly, deviate to the offshore a huge part of the sediment load carried by longshore drift.

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
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			combined with the effect of numerous groins and breakwaters, and marina docks, which retain sediments in their leeside. The major impact of the erosion is the loss of beach surface.			
SPAIN	Catalonia	Barcelona ⁷¹	The study area in the case of Barcelona is a coastal area in between the rivers Besos and Llobregat. The coast front of the Metropolitan area is 40,8 km long, 12 km of which in the city alone. The type of coast varies in relation to the geological nature of the region. There are numerous	coast, grass and rangeland; landscape/ports	Ancient history and great cultural identity and an economy historically linked to maritime activities, and with an increased dependence of the economy on the use of the coasts. The coast front of the Metropolitan area in the case of Barcelona has 3,8 million inhabitants. The	pollution control, resource management, institutional strengthening, infrastructure development, biodiversity conservation, education/awareness

⁷¹ Source: Priority Action Plan <http://www.pap-medclearinghouse.org/eng/page001b.asp?zempljaID=12&shortID=65#65>

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
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			protected areas and they cover almost all the coast. urban expansion, water pollution, air pollution, soil pollution, coastal erosion, tourism/recreation, transport congestion, endangered species, habitat loss, Environmental risks (volcanic, geological, hydro-geological) and demand for protection of environmental sites, Abandonment and deterioration of the natural and cultural heritage.		commercial port of Barcelona is in economic terms the principal Spanish port although it does not house any refineries and heavy industries. The principal sources of pollution of the coast are urban and industrial. The Llobregat river has no depurator at its mouth and the water of the Besos river are purified in the city's waste treatment plant.	
SPAIN	Tarragona	Montroig ⁷²	erosion due to up-drift barriers.	Morphodynamic “problems” in free-transport beaches are		

⁷² Source: Y.N. Krestenitis & I.S. Androulidakis (2006).i

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
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				normally associated to larger-scale modifications of the transport pattern. the resulting morphodynamic evolution depends on the selected timescale and cross- plus long-shore transport processes		
Spain	Catalonia	<i>Cape Tortosa</i> ⁷³	the area has suffered most erosion in recent years because it is the area of the delta that absorbs most wave energy (Serra, 1997). It is estimated that the linear regression has been close to 1,600m in 40 years (figure 13), which			

⁷³ Source: Y.N. Krestenitis & I.S. Androulidakis (2006).i

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
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			corresponds to a velocity of 39m/yr.			
Spain	Valencia	Castellon ⁷⁴	have faced extensive eroding problems caused by the existence of the port of Castellón and this has increased since 1961, when the last extension of its sheltering harbour wall was carried out. The result of preventive policy (see column) has been dramatic coastal erosion on Almassora beaches.	Southward littoral drift along this coast is interrupted by the Port of Castellon and the Serrallo industrial estate.		Local management actions carried out during the last thirty years, such as beach fill and dike construction, managed to prevent erosion and even to double beach area. However, seaside quality has considerably decreased and the nearby Mijares delta is now experiencing noteworthy erosion (Liquete et al., 2004).
Spain	Mallorca Island	Alcudia Bay ⁷⁵	A classical sandy beach and dune that shows erosion and accretion at different places. The distribution of the	The type of erosion observed at Alcudia Bay is a gradual sediment loss due to the S-N	Human activities can be divided in two main actions: Housing near or on the foredune and dune field	The first human construction that has influenced the studied area was the dikes of the “S’Oberta” channel (end of the XIXth century) at the northernmost sector of the studied zone. Those dikes provoke a rupture

⁷⁴ Source: Y.N. Krestenitis & I.S. Androulidakis (2006).i

⁷⁵ Source: Y.N. Krestenitis & I.S. Androulidakis (2006).i

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
					Social –Economic Facts	Policy & Management
			<p>erosion and accretion sites is mainly controlled by human constructions (dikes and harbor) together with the longshore transport and storms. It can be considered that there is a continuous or gradual erosion process related to the longshore transport, and intermittent erosion related to storm episodes. These two processes cause redistribution of the sediment. In some places of the studied zone the retreat has resulted in the destruction of the foredune, and at present waves are eroding the sand dune field. On the</p>	<p>longshore transport. During storm events acute erosion is observed. Probably, the subsidence related to the sediment compaction must be greater than the tectonic one, but data on this aspect are not available. above the sediment of the area has mainly a bioclastic origin (more than 80%). The longshore currents do not supply additional sediment to the Alcudia Bay zone. A unique sediment supply that is</p>	<p>(anthropic pressure), and sea activities. Housing on the foredune implies that the dune system is no longer part of the coastal zone. This makes the coastal zone (dune/beach and foreshore) more vulnerable for acute erosion. On the other hand, the sea activities, especially in summer, cause a retreat of the Posidonia Oceanica prairie is one of the most important organisms of the beach system.</p>	<p>of the longshore sediment transport that has induced a division of the northern sedimentary cell in two independent sedimentary cells</p>

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
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			<p>other hand, some places have undergone a sediment increase and the foredune is preserved. Causes of erosion are mainly related to the human activities in combination with restricted sediment supply. Moreover, it must be noticed that the fact that the zone is located within a subsiding area (Muro - Sa Pobla Basin) more intense erosion process associated with the relative sea level rise cannot be discarded. Nevertheless, taking into account the seismic activity of the area, we could not expect velocities</p>	<p>independent from the sea are sediments transported by the small creeks, which can be considered almost negligible, and those sediments coming from the erosion of the sea cliffs located at the extremes of the Alcudia Bay. The sedimentary cell of the Alcudia bay is nourished mainly by the biological activity that takes place in the sea. The biological activity is strongly related to the Posidonia Oceanica. Almost all the organisms that form the</p>		

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
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			higher than 0.1 mm/year of tectonic subsidence.	sediment of the beaches live around or depend on that plant. So, when we reduce the Posidonia Oceanica prairies we kill the sediment factory of the Mallorca beaches. As there is not any external supply when the Posidonia Oceanica prairies are destroyed we are inducing a beach retreat. Another important aspect related to the Posidonia Oceanica is that during storms, dead parts are deposited on the beach. Those fragments form a		

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
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				little wall reducing the wave energy, diminishing the effects of the storms on the beach system.		
Tunisia		northern coast ⁷⁶	the beaches are most often less sensitive to erosion problems and have, sometimes a rather excess sedimentary budget in the case of the beaches occupying the oueds mouths			
Tunisia	25 km from the established resort of Tabarka near the Tunisian	Zouaraa ⁷⁷	Serious erosion of the beach near the river mouth by up to two metres had been experienced within two years of the dam	A linear beach, approximately 17 km long, behind which is an extensive dune system that has	A dam plays an important role in the strategic development of the area through the provision of	

⁷⁶ Source: REPUBLIC OF TUNISIA, MINISTRY OF ENVIRONMENT, AND LAND PLANNING (2001).

⁷⁷ Source: REPUBLIC OF TUNISIA, MINISTRY OF ENVIRONMENT, AND LAND PLANNING (2001).

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
					Social –Economic Facts	Policy & Management
	border with Algeria		initiation.	been largely afforested.	irrigation and potable water.	
Tunisia		Gulf of Tunis ⁷⁸	the coasts configuration, and the importance of the lower level areas make different sectors of this zone very vulnerable to ASLR	The coast of the Gulf of Tunis, shows many forms of weakness caused by natural factors	it hosts the most important urban and industrial concentration of the country	The coast of the Gulf of Tunis, shows many forms of weakness caused by the conjunction of numerous anthropogenic interventions throughout a relatively long history.
Tunisia	north-eastern part of Tunisia	Cape of Bon ⁷⁹	coast, river basin and the adjacent coastal area, estuary, coastal forest, swamps/floodplains, rocky coast, grass and rangeland, island, lagoon, peninsula; dunes and dune massifs; lagoons, barriers This project covered: 1- The Dar Chichou	1.1. The Dar Chichou forests: 6,041 hectares. This is a group of forests which fix expanses of dune, which were first undertaken under measures to prevent crop fields from being swallowed up by the sand. In the	Human needs related to these natural systems (lagoon, forests, archipelago, oueds and estuary) are quite varied. In the case of the lagoons, they are used for discharging industrial and urban waste; for	The national policy is the coastal protection policy implemented by the APAL. Project's aims: overall policy, preparatory activities, development control, resource management, institutional strengthening, infrastructure development, biodiversity conservation, capacity building, education/awareness, monitoring, networking

⁷⁸ Source: REPUBLIC OF TUNISIA, MINISTRY OF ENVIRONMENT, AND LAND PLANNING (2001).

⁷⁹ Source: Priority Action Plan <http://www.pap-medclearinghouse.org/eng/page001b.asp?zemljaID=20&shortID=91&start=start>

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
					Social –Economic Facts	Policy & Management
			<p>forests and the Oued Labid estuary: 11,991 hectares</p> <p>2- The western Cap Bon lagoons: 450 hectares</p> <p>3- El Haouaria mountain and the Zembra archipelago: 1,362 hectares</p> <p>The five sites studied contain a wealth of interesting biodiversity (around 35% of the endangered species on the Tunisian coasts). The following points were noted:</p> <p>- Degradation of biodiversity in the wetlands and coastal areas. The main cause of degradation is the growing pressure of economic</p>	<p>upstream stretch they include a complex of dunes made up of mobile, fixed and fossil dunes.</p> <p>1.2. Oued Labid estuary: the coastal site linking the Port aux Princes site to the Oued Labid, covering 5,950 hectares. The Oued Labid is the area's main watercourse, transporting around 7 million m³/year. Its estuary communicates with the sea on an almost constant basis.</p> <p>2. The eastern Cap Bon lagoons:</p>	<p>the forests, apart from the illegal and improper hunting which goes on, the supply of wood and its by-products is used, and additional land created to serve the needs of growing urbanisation; for their part, the oueds, estuaries and the archipelago face threats more related to human pressure and farming practices (creation of areas for intensive irrigated crops, over-grazing), unregulated hunting, tourist projects, and particularly the</p>	

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
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			<p>activity on the coastline.</p> <ul style="list-style-type: none"> - The presence of some biodiversity of international importance, requiring particular protection and a management method for specific sites. - A lack of consultation between the population and the users on the one hand, and local administrations and the associations on the other. 	<p>on the eastern side of Cap Bon. Comprises a string of lagoons stretching over 50 km, with an average length of 200m. They are separated from the sea by two low-lying dune systems. They communicate with the sea, but with the exception of Korba lagoon they dry up almost completely during the dry season.</p> <p>3.1. El Haouaria mountain: the site covers 970 hectares, embracing virtually the entire tip of Cap Bon</p>	<p>dam built on the Oued Labid, which will obviously change the parametres of the surroundings. We have also noted other environmental dysfunctions in the Dar Chichou forest, linked to intensive irrigated farming practices, use of chemical products, and over-exploitation of the aquifer.</p>	

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
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				and including the entire area of the coastal djebel. 3.2. Zembra archipelago: made up of two islands in the North-Eastern part of the Gulf of Tunis, the natural extension of Cap Bon. The largest of the two, Zembra, lies 115 km off the peninsula and is flanked by two rocks- the Entorche to the North and the Cathedrale to the West.		
Tunisia		Gulf of Hammamet ^{80,81}	the coastal segment is anthropic. In this	It is understood that, due to its	Over the last two decades, a major	depletion of water resources often accompanied by overexploitation of

⁸⁰ Source: REPUBLIC OF TUNISIA, MINISTRY OF ENVIRONMENT, AND LAND PLANNING (2001).

⁸¹ Source: SMART: Sustainable Management of Scarce Resources in the Coastal Zone Project Work Plan <http://www.ess.co.at/SMART/b5.html>

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
					Social –Economic Facts	Policy & Management
			<p>way, the sea sector erosion problems are raised in the tourist sector of Hammamet where some hotels have even lost an important part of their sandy beaches. faced with the threats caused by the accelerated sea level rise (ASLR), Tunisia is at risk to be more exposed and thus more vulnerable</p> <p>The Tunisian coast line concentrates 2/3 of the total population, more than 70% of the economic activities, 90% of the tourists accommodation total capacity, and a great part of the irrigated</p>	<p>geographical location and its climatic characteristics, Tunisia will certainly be very sensitive to the direct adverse effect of Climate Change</p>	<p>shift of population growth, urbanization, industrialization and tourism towards the coastal zone could be observed. The emerging problems involve a combination of rapid land use change, population growth driven to a migration from inland agricultural areas. The aesthetics and extent of the beaches could be highly affected by ASLR. In addition, the infrastructures, notably those very close to the coast,</p>	<p>groundwater resources and consequent salt water intrusion in the immediate coastal zone, and pollution from unchecked economic development and insufficient waste and waste water management. These development conflict with the parallel development of tourism, which depends on the same resource basis but also on a clean and attractive environment, inland and coastal areas. Tourism, which is among the main strategic lines of the development of Tunisia, could suffer as a consequence of ASLR.</p>

⁸² Source: SMART: Sustainable Management of Scarce Resources in the Coastal Zone Project Work Plan <http://www.ess.co.at/SMART/b5.html>

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
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			agriculture.		will be threatened ⁸² .	
Tunisia	Sfax South south-eastern region	Sfax ⁸³	coast, river basin and the adjacent coastal area, wetland, swamps/floodplains, grass and rangeland, island, sandy beach; Water Desalination Plan - Coastal erosion: Chaffar beach is undergoing intensive erosion, visible year on year, Threatened species and loss of habitats: land-based sources of pollution have contributed to the loss of the Posidonia meadows, and some marine species have become endangered. The project site is part of the Sfax	- Water shortage: rainfall has been decreasing for several years (less than 200 mm/year), whilst the population is growing, largely due to people abandoning rural areas. The ground water aquifers have become salinated. Drinking water is tapped from the aquifers in the north of the country, - Sediment movement: the oued Chaffar and the other watercourses	production of salt at saltworks Disorderly urbanisation and illegal land use, - Pollution of continental and seawater (from land-based sources), - Air pollution from the SIAPE plant (Industrial Phosphoric Acid and Fertiliser Company) and other plants in the adjoining industrial zone, - Soil pollution caused by the storing of phospho-gypsum, the public rubbish dump, and the former vegetable	Project's aims: overall policy, preparatory activities, pollution control, development control, resource management, infrastructure development, biodiversity conservation, urgent measures development, planning, monitoring, networking

⁸³ Source: Priority Action Plan <http://www.pap-medclearinghouse.org/eng/page001b.asp?zempljaID=20&shortID=91&start=start>

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
					Social –Economic Facts	Policy & Management
			<p>region in Southern Tunisia. This area is seen as the gateway to the desert, and the crossroads of routes between the Northern and Southern coasts. The relief of the area is relatively flat and monotonous, with a semi-arid to arid climate, and with rainfall levels barely exceeding 200 mm per year. The prevailing wind is from the North East.</p> <p>The area is shaped like a mini gulf, stretching from the new fishing port to Gargour village and then the village of Chaffar, over almost 20 km. The sea is calm with quite a pronounced tidal range, which can reach 1.8 m.</p>	<p>transport various sediments into their estuaries,</p> <ul style="list-style-type: none"> - The "red tide" phenomenon (algal blooms at sea) which persists from year to year, 	<p>water disposal points,</p> <ul style="list-style-type: none"> - Population growth: 2.1%/year (from 1984 - 1994), <p>Tourism/leisure: no tourism whatsoever in the area under study. The only tourism is in transit towards the South and vice versa. Recreational possibilities of minor import: bathing is officially banned on certain beaches. Recreational areas have been forgotten in many cases; they are currently starting to be rediscovered,</p> <ul style="list-style-type: none"> - Excessive fishing: the 	

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					<p>marine fishing fleet makes up more than 40% of the national fleet,</p> <ul style="list-style-type: none"> - Traffic congestion both on land and at sea: traffic in the town has eased somewhat since 2002, but when the study was conducted land traffic had reached saturation point. Sea traffic is also congested by the passage of fishing vessels (trawlers, etc.), cargo ships (phosphates, sulphur, salt, etc.), and oil tankers, - Intensive oil exploitation: oil and gas, and the passage of several pipelines both on land and at sea, 	

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					<p>Over recent decades, Sfax has undergone undeniable socio-economic development, allowing it to retain its position as second town after the capital. However, in spite of having 400,000 inhabitants in 1994, its population growth (2.1%/year between 1984 and 1994) is below the average for the country as a whole (2.3%), and also the national urban average (3.8%). This bears witness to the limited attraction which the town exercises over the out-lying areas in the immediate</p>	

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					<p>vicinity and further afield. The relatively low rate of population growth is compensated for by an employment rate of 32% in 1989 (compared with 31.4% for Tunisia as a whole), corresponding to an unemployment rate of 11.3% compared with 15.3% at national level.</p> <p>Sfax is also a leading producer of oil, poultry, fish and dairy produce, and many other products such as almonds and other dried fruits. It goes without saying that, as far as industry is concerned, Sfax</p>	

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					often acts as an important magnet, attracting large numbers of investors as well as consumers and middlemen, all of whom contribute to its enhanced economic development.	
Tunisia		From El Kantaoui port, to Sousse ⁸⁴ ,	Beach erosion		tourism	
Turkey		<i>Bay of Izmir</i> ⁸⁵	The Bay of Izmir is one of the largest bays in the Aegean coast of Turkey, and extends about 24 km in east-west direction, with an average width of	The water depth in the bay ranges from 10 m in the Inner to 60 meters in the Outer Bay.. On the south shores of the Bay , much of the	The existing population of approximately 2 million will, according to some estimates, double in the next 30 years. Izmir,	

⁸⁴ Source: REPUBLIC OF TUNISIA, MINISTRY OF ENVIRONMENT, AND LAND PLANNING (2001).

⁸⁵ Source: Priority Actions Programme, Regional Activity Centre(1996).

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
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			<p>about 5 km. it consis of three sections according to the topography and hydrology: the Inner Bay, the Middle Bay, and the Outer Bay. The Inner and Middle Bays do not have appropriate capacities for water exchange and autopurification</p>	<p>land is covered by high hills with steep slopes and there is a narrow alluvial plain along the shoreline. In contrast to the south shore, the north shore is characterized by low, flat river deltas. However, along the eastern side of the north shore, there is an area which is covered by fairly high hills. Similar to the south shore, the north shoreline is also characterized by a narrow alluvial plain. At the east end of</p>	<p>together with a number of “satellite” cities in its vicinity, is a major industrial area. In addition to large industrial establishments, a large number of small- and medium-scale enterprises have flourished in and around the city. Environmental control over these establishments does not seem to be very efficient. Their residues are discharged untreated into numerous streams running into the Inner Bay of Izmir, adding to its already high level</p>	

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
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				the bay, there is a valley known as the Bornova plain. This alluvial valley is about 5 km wide, and slopes gradually to elevations about 80-90 meters at its eastern end. This area is used both for agricultural and industrial purposes.	of pollution. The continuing industrialization of the area has been the response to an ever-increasing demand for new jobs. Some of the industries are located in watershed areas which are of vital importance for the water supply of the city.	
Turkey	Western Turkey	<i>Edremit Bay</i> ⁸⁶	There exists a significant decrease in the amount of sediment at the coast. In the last decade, the Altinova coastline has suffered from intense chronic and	Madra River, located between Altinova and Dikili, is the main sediment source of the coastline. Bathymetric measurements in Altinova and the	Urban development, reflecting high population growth, Urban waste waters are one of the major sources of pollution of the	The dam located on the Madra River, erosion-control works in the Kozak region, sand taken from the Madra River bed The system of resources management in the area is split between four administrative and decision making levels, namely, the central government, the Governorate of

⁸⁶ Source: Y.N. Krestenitis & I.S. Androulidakis (2006).i

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			permanent erosion, and thus, the shoreline has retreated approximately 600 m during the last two decades and 18– 20 m in the last year. Loss of cultivated land to residential purposes on the one hand, and increasing demands for agricultural produce on the other, have reduced the nature conservation areas, decreased the level of flood protection, and increased soil erosion.	vicinity of the Madra River mouth reveal the existence of a deep pit, which prevents the feedback of sand removed from the region through storms and accelerates the erosion rate at the coast, because the sand input through the Madra River has decreased dramatically. This deep pit is a dominant morphologic factor causing coastal erosion	bay Wastes discharged by the industries situated around the bay port facilities in the eastern part of the bay, and navigating vessels, present a constant threat to the bay ecosystem.	Izmir, the metropolitan, and the district level. The existing mechanisms of decision making require much better coordination among these levels. There is no single authority entrusted with the environmental management of the entire area.
Turkey		<i>Seyhan, Ceyhan and Goksu</i> deltas ⁸⁷	The Seyhan, Ceyhan and Goksu deltas are where the most			

⁸⁷ Source: Source: Y.N. Krestenitis & I.S. Androulidakis (2006).i

Country	Area	Name	Coast and Erosion Description	Physical Characterization	Anthropogenic Characterization	
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			active shoreline changes have been occurring in the northeastern Mediterranean.			
		<i>Seyhan</i>	on the mouth of the Seyhan River, progradation summed up to about 98,437,625 m ² with a rate of 28,304 m ² /yr until 1954. Construction of a dam on the river in 1954 greatly reduced sedimentation in the delta and erosion started at a rate of 24,696 m ² /yr. As a result, from 1954 to 1995, an area of about 1,012,536 m ² has been lost due to coastal erosion, and the delta became retrogradational.		dam	

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		<i>Ceyhan</i>	<p>On the mouth of the Ceyhan River, however, the total amount of progradation from 1947 to 1995 is about 3,097,745 m². About 90 percent of this progradation occurred with a rate of 74,977 m²/yr before the construction of a dam on the river in 1984. The rate of progradation after 1984 reduced to about 29,418 m²/yr, and only 323,597 m² prograding occurred from 1984 to 1995. To the northeast, an area of 835,779 m² was eroded by the sea due to no sediment influx on the abandoned</p>			

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			Ceyhan River channel in Yumurtalik Bay between 1948 and 1995. The total amount of progradation, from 1956 to 1995,			
		<i>Goksu</i>	on the mouth of the Goksu River is 398,445 m ² . To the southwest, due to coastal erosion at a rate of 4,548 m ² /yr from 1951 to 1995, the lighthouse at Cape Incekum is now lying under the sea. The total amount of retrogradation here is about 200,125 m ²			