

# 20 European Coastal Dunes: Ecological Values, Threats, Opportunities and Policy Development

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## 20.1 Introduction

This chapter describes international policy to conserve coastal dunes. Because it is not possible to describe all policy instruments of the world, the authors selected those of Europe as a case study. Perhaps more than other continents, Europe aims at a common and consistent international nature policy for the whole of its coastline. As a result, countries in the European Union have national as well as international legal instruments to protect dunes. This is of interest to other coastal regions of the world where attempts are made for an international cooperation in the management of the coastline.

Compared to other continents, Europe's winding and indented coastline is very long, roughly 3.5 times the Earth's perimeter (European Environmental Agency 1995). Europe's coastal landscapes are highly varied due to differences in geology, climate, coastal processes, geomorphology, biogeography, history of land use and actual human influence (Klijn 1990; Arens et al. 2001). Coastal habitats in Europe are therefore valued for their geological and geomorphological, historical, ecological and scenic properties (e.g. Bennet 1991; Doody 2000). Coasts, especially so-called soft coasts such as the coastal dunes, are very vulnerable to coastal erosion, and to a host of human influences. Coasts attracted man since prehistoric times. Settlement, fishing, hunting, agriculture and possibilities for easy transport were traditional attractors. Later, land reclamation, afforestation, water extraction, coastal defence works, urbanisation, industrial expansion, harbours, infrastructure and tourism became important. Well over one third of Europe's population of 200 million inhabitants lives within 50 km of the coastline. In many Mediterranean countries the great majority of urban areas (85 %) are situated near the coasts which attracts industries and transport of people and goods. Low-lying, fertile coastal plains are inductive to intensive agricultural land use.

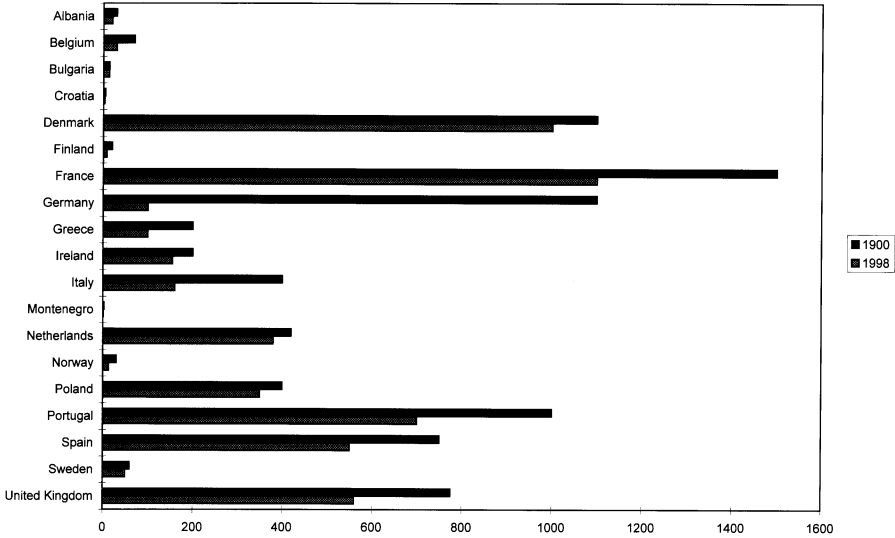


Fig. 20.1. Size of dune area in 1990 and 1998, in km<sup>2</sup>. (Delbaere 1998)

All over Europe a net loss of coastal dunes of 25 % has been reported since 1900 (Fig. 20.1) and some 55 % of the remaining coastal dune area has lost its natural character (Delbaere 1998). It has been estimated that roughly 85 % of the present area is under threat (World Resources Institute, see Various Internet sites; European Environmental Agency 1999). Coastal erosion affects roughly 25 % of Europe’s coastline, much of which concerns soft coasts (European Environmental Agency 1999; Bird 1985). Increased erosion can be expected in the future due to sea level rise. To cope with all forthcoming changes in land use and coastal dynamics requires insight in the distribution and values of coastal dunes, expected trends, cause – effect relationships, resulting threats and opportunities, and possibilities to intervene by policy and adequate management.

## 20.2 Distribution of Coastal Dunes Along Europe’s Coast: A Short Geography

The total area of Europe’s coastal dunes has been estimated at over 5300 km<sup>2</sup> (Delbaere 1998). Coastal dunes are widespread along Europe’s coastline, though their distribution is uneven (Fig. 20.2). Some rocky coasts harbour small and isolated dune areas in protected embayments, whereas an almost uninterrupted and kilometre-wide fringe of coastal dunes is found in sedimentary regions with favourable conditions (Klijn 1990; Doody 2000). Geo-

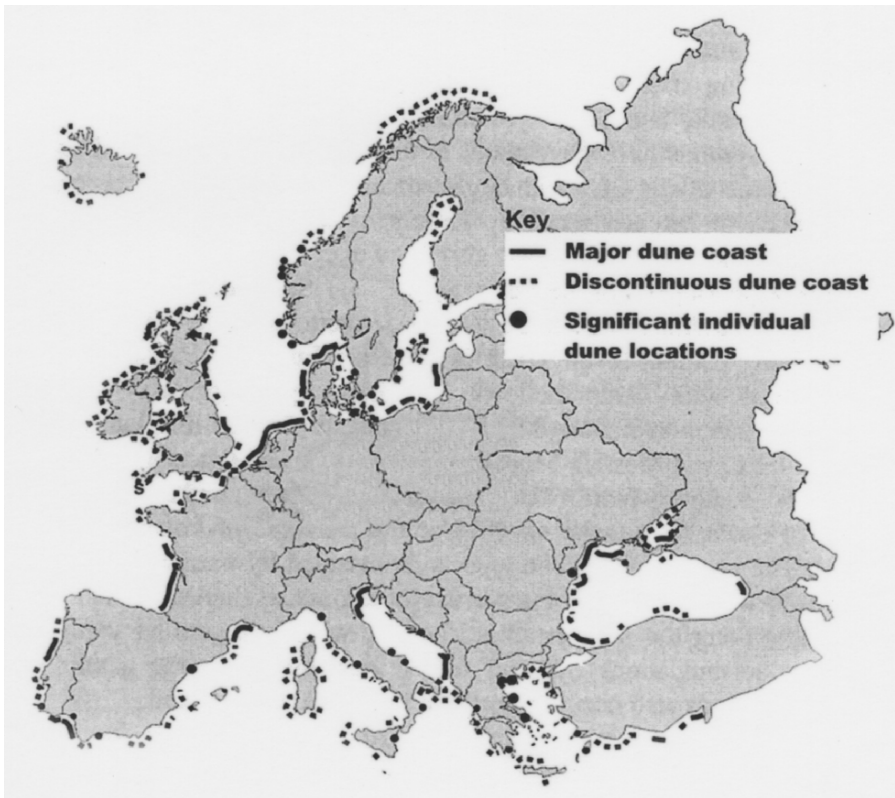


Fig. 20.2. Major dune areas along the European coasts. (Courtesy of J.P. Doody 2000)

graphically we can distinguish five major regions: the Baltic region, the North Sea region, the Atlantic region, the Mediterranean and the Black Sea region (European Union for Coastal Conservation 1997). Some characteristics of these regions are (Van der Maarel 1993):

1. Formerly glaciated mountainous Scandinavian coasts harbour small and isolated dune areas. The southern Baltic, however, is a sedimentary, periglacial region with ample material for beach barrier and dune formation (e.g. Poland, northern Germany).
2. The North Sea region includes the whole sweep from Calais to the tip of Jutland (northern France, Belgium, the Netherlands, Germany, Denmark) which is liberally beset with wide and almost uninterrupted dunes on barrier islands, along nearly straight coastlines and estuaries thanks to favourable sedimentary conditions, tidal range, wind and wave direction and energy.
3. The Atlantic region, Ireland and the UK have mostly small dune areas in sheltered bays, though larger areas occur both along the North Sea and the

western coasts. In France, south of the Normandy and Brittany promontories, the extensive sedimentary basin of Gascogne promoted extensive dune fields in Les Landes. North-western Spain is rather poor in dunes, whereas Atlantic Portugal and south-western Spain are again relatively rich.

4. The Mediterranean region has a complex and heterogeneous coastline. The larger dune fields are correlated with deltas and coastal plains, like in parts of Italy. Elsewhere, e.g. in Greece, dunes occur in smaller areas in embayments between promontories and cliffs. The latter relate to mountain ranges. The eastern Mediterranean littoral is a strip of varying width.
5. The coastline of the Black Sea region is very diverse. It includes deltas (Danube), estuaries (Dnjepr), systems of lagoons and sand-dune barriers and limans. Sand dunes are widespread along the north-western Black Sea. The coastline of Turkey is generally rocky. Dunes occur where lowlands border the sea.

Generally, it can be concluded that extensive coastal dune areas occur where an abundance of sediments from glacial, periglacial or fluvial origin can be found and where tidal regimes, storm floods and prevailing winds stimulate a dynamic environment and a high aeolian transport capacity (Davies 1972; Klijn 1990; Doody 2000).

### **20.3 Ecological Values Related to Biodiversity**

Landscape values of coastal dune areas comprise ecological, geomorphological, geological, historical, archaeological and scenic values. We restrict ourselves to ecology because it is mainly for ecological values that international agreements are presently being developed. Ecological values of coastal dunes are generally large. A good example are those of the Netherlands where more than half of all higher plant species occur in a coastal dune area representing no more than 1 % of the country (Bakker and Doing 1987).

We selected biodiversity to represent the ecological values of the European coastal dunes, because biodiversity, comprising the subspecies level, the species level, the ecosystem and the landscape level is presently an operational and politically acknowledged issue (Treaty on Biological Diversity, Rio de Janeiro 1992). Other ecological values, for instance life-support functions related to regulation processes (water purification, coastal protection among others, for a more comprehensive overview; see De Groot 1992) are not dealt with. Accepted criteria for nature protection are species data, species protection statuses and habitat requirements.

Species listed in various European directives include mammals, birds, reptiles, amphibians, fishes, butterflies and higher plants, and were selected on

the basis of their international rareness, endemism, presence of so-called characteristic species and the rate of decline or possible extinction. National and regional policies have comparable or additional criteria and selections. Sustained ecological values depend first on species protection, e.g. by regulations on hunting or fishing, secondly on safeguarding basic environmental and spatial conditions such as sufficient area size and quality, and thirdly on apt management inside the areas and restrictions concerning land-use in adjacent areas (see Table 20.1).

**Table 20.1.** The main ecological conditions according to Adriani and Van der Maarel (1968) and Bakker et al. (1981)

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*Ia. Area and width of dunes*

- These dimensions are relevant for (1) gradients from sea to inland (e.g. wind, salt spray), (2) buffering for outside influences (e.g. pollution or disturbance), (3) living area and carrying capacity of populations of a minimal size, (4) increase in age and successional stage related to natural zoning of dunes from the beach to the inner margin

*Ib. Connectivity*

- The extent to which dune areas are connected enables exchange of organisms (for migration, dispersal or other functions, such as foraging and resting)

*IIa Parent material*

- Parent material rich in lime and/or other minerals enables a variety of plants and plant communities (Grime 1979; Adriani and Van der Maarel 1968)

*IIb Presence of water and moist environments*

- Wet and moist dune slacks and open water (dune lakes) favour habitat diversity

*IIc Variety of soil conditions*

- The presence of various development stages of the soil (soil profile development, decalcification, humus formation, etc.) encourages variation in plant communities

*IId Gradients towards other environments*

- Gradients from dunes towards marshes, salt marshes, bogs and rocks add to habitat diversity

*IIE Lack of adverse outside influences*

- Absence of adverse external influences e.g. leading to lowering of groundwater tables, input of nutrients, pollution by air or water, and disturbance of fauna or flora by man, increases the vitality of the ecosystem

*III Occurrence of a certain degree of natural dynamics,*

- These dynamics (e.g. sand blowing) cause a renewed start of the succession and favour the presence of pioneer and successive communities. They also enable the dune system to adapt to coastal erosion by natural retreat

*IV Continuity of extensive management*

- Extensive use (e.g. grazing), adds to ecosystem diversity by sustaining semi-natural habitats
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## 20.4 Trends, Threats and Opportunities

Protection and possible restoration of dune ecosystem should focus on basic conditions that offer enough counterforces against adverse developments. It is crucial to translate this insight into effective, pro-active strategies. Trends or expected trends in Europe may vary from region to region. We present a rough and qualitative indication of trends, threats and opportunities grouped in large clusters of activities or processes, for the broad regions listed in Section 20.2 (largely after European Environmental Agency 1998; European Union for Coastal Conservation 2000).

### 20.4.1 Agriculture: Intensification as well as Marginalization

Agriculture was traditionally a common land use type in many coastal areas. Its effects vary from disastrous in case of overgrazing, excessive drainage and levelling for specific cultures (e.g. bulbs or onions), to real added ecological values where extensive grazing over centuries promoted rich plant communities. The decline or complete abandonment of grazing implies loss of ecological values as seen in the machairs along the west coast of Ireland and Scotland (Bakker et al. 1992). Changes in agricultural land-use are discussed by, e.g. the OECD (2000), explaining processes of marginalization (even land abandonment) in less-favourable areas and intensification elsewhere.

Expectations for the European dunes depend on the regions. The Baltic region will undergo both processes: intensification and land abandonment. The North Sea coasts are part of a region that will show a further decline of agriculture in the future, dunes making place for buildings and infrastructure. More pressure on dunes themselves is not expected unless from intensive horticulture. In the Atlantic region, the most remote areas will witness a loss of traditional extensive pastures in some places and intensification in other places. The coasts of the Mediterranean and Black Sea regions will probably experience more pressure from agriculture and horticulture in river valleys and coastal plains, due to the growing population and tourist industries, affecting coastal habitats through water availability, water quality and reclamation.

### 20.4.2 Urbanisation, Industries, Harbour Development

Urban sprawl and growth of industrial (power) plants and harbours are common features along coasts. There are several types of impact on the environment and on biodiversity, such as net loss of habitats, fragmentation of living areas, water and soil pollution by sewage and waste disposal, air pollution,

water extraction, and sand quarrying. Investments in urban or industrial sites almost automatically lead to the construction of artificial coastal defence works.

The Baltic and Black Sea regions will undergo local developments, though spatial policies try to counteract. The North Sea countries show less urban development due to spatial policies as well as a decline of heavy industries. Ports are expanding. The Atlantic region seems to undergo further urban and industrial development in coastal areas. In the Mediterranean region the tendency of strong growth seems to continue due to population growth and immigration as well as touristic development affecting many areas. Pressure on coastal areas seems to go on.

### **20.4.3 Infrastructure**

Railroads, highways and roads as well as airfields tend to increase in density and dimensions, thereby causing loss of habitats and fragmentation, disturbance and pollution of habitats. Coastal routes mostly require artificial constructions and sea defence works. The development of ports has the same effects and moreover often affects coastal dynamics by disturbing sediment flows by dredging and by constructing harbour entrances such as dams or piers.

Regional expectations indicate that increase of networks will occur everywhere, locally in the Baltic region and in other accession countries wanting to join the European Union. The North Sea region is already heavily developed. The Atlantic region will show a moderate increase. Most increase is expected in Mediterranean countries, notably near airports.

### **20.4.4 Tourism/Recreation**

Coastal dunes, which often border attractive sand beaches, are favoured by tourists. The tourist industry is the world's fastest growing economic sector having major impacts on coastal regions. Construction of holiday houses and camping sites, hotels, marina's, transport routes, water supply, waste disposal, parking lots and golf courses consumed already many dune areas or added to their decline. Uncontrolled use of dune areas by tourists has other adverse effects such as trampling, disturbance of wildlife, and leaving litter.

Expectations indicate a general increase everywhere, although most pressure is to be expected in the Mediterranean countries. The Black Sea region seems to experience the same trends; assessments of growth between 1984 and 2025 show almost a doubling of the area consumed by tourist developments in coastal areas (European Union for Coastal Conservation 1997). The Atlantic and North Sea coasts are subject to growth as well, as are some coasts in the Baltic region.

### 20.4.5 Forestry

Traditionally, many coastal dunes have been planted with trees for reasons of stabilisation or wood production. Often, exotic species were used (pine, eucalyptus). Economic profits are limited. The effects on ecosystems are largely negative, though forest plantations created some new habitats and caused the arrival of new and sometimes valued species. Forest fires are a realistic and frequent threat endangering ecological values and causing large economic losses. Fixation of dunes prevents natural dynamics and brings a halt to succession processes.

Regional expectations do not foresee much expansion of forests. Natural expansion can take place where existing land use disappears. In some countries a return to more natural ecosystems with endemic tree species is promoted.

### 20.4.6 Coastal Processes, Climate Change and Sea Level Rise, Aeolian Processes

Coasts are dynamic systems responding to sea level movement, land subsidence or rise, tidal currents, wave action and, related to all these factors, to longitudinal or onshore or offshore movement of sediments. Sandy coasts respond quickly to changing conditions. On a geological time-scale, these coastlines tend to shift seaward and landward, preserving their characteristic though changing their position. Climate change and associated increased sea level rise or an increase in storm frequency can affect coastal dunes detrimentally (1) when losses cannot be compensated by sand input, or (2) when natural systems cannot shift landward because they are squeezed between the sea and a high or steep hinterland, or hard defence works (Klijn 1995). Sea levels rose 20–25 cm in the last century and will rise another 25–95 cm during this century due to global warming, possibly accompanied by a more vigorous wave attack exacerbating erosion rates (IPPC 1995). This results in net loss of dunes, estimated to amount to several hundred metres, with lowering of water tables among other impacts (Van der Meulen 1990; see also *Coastal defence works* below).

Regional differences are associated with geological conditions and climate zones. Especially countries in subsiding areas of the North Sea region are likely to be affected by an increased rate of sea level rise. Other regions however will also show more coastal erosion.

Aeolian processes are a natural phenomenon lying at the base of the history of coastal dunes. Both an excessive degree of sand blowing and an unnatural degree of sand fixation by man could result in loss of ecological values. Generally, dune managers show an overcautious attitude, leading to unnatural



fixation of dunes and the disappearance of initial succession stages (Bakker et al.1981).

Management towards dynamic dunes should be promoted. A dynamic dune system is more resistant to erosion processes, is cheaper to maintain, has higher natural values and it is more sustainable than fixated dunes. A good example is the dynamic dune complex of the Polish Slowinski National Park. The dunes are over 40-m high, very dynamic and almost not influenced by humans. This dynamic system has already existed for thousands of years.

#### **20.4.7 Coastal Defence Works**

Artificial defence works comprise hard elements such as groynes, revetments, concrete walls, dikes and alike, or 'soft' measures such as (repeated) beach nourishment. The first group of measures affects the natural character of coastal dunes more than the second group. Artificial defence of retreating coasts logically helps to prevent a net loss of dune areas, but it has to be remembered that a shifting coastline is a natural phenomenon as such and dunes can move landwards and seawards under natural conditions by aeolian redeposition. A natural adaptation by retreat and landward shifting of dunes however is seldom accepted in regions where agriculture, infrastructure or built-up areas directly border dune areas or beaches. In fact, most countries have a very defensive attitude and prefer hard defence works. But some countries changed their strategies and adopted a more natural defence, using sand nourishment, either on the beach or on the shore face, which is even more natural and moreover much cheaper.

### **20.5 Policy Analysis of Dune Conservation in Europe**

Many dune areas in Europe are under threat, as described above. However, almost every country has a number of instruments available that can be used to conserve the European dunes. It is impossible to evaluate all instruments of all countries in this chapter, so only the most relevant instruments are dealt with here.

There are three main instruments that are important for the protection of coastal dunes: the Bern Convention (including its Emerald Network), the EU Habitat Directive and national policies. Furthermore, three categories of countries can be distinguished: (1) the EU countries, (2) accession countries, which will enter in the (near or far) future, (3) the remaining non-EU countries.

### 20.5.1 Bern Convention

The legal instrument with the largest geographical (European) range of importance for coastal dunes is the Convention on the Conservation of European Wildlife and Natural Habitats. This 'Bern Convention' aims at the conservation of wild fauna and flora and their natural habitats, especially those species and habitats whose conservation requires the co-operation of several countries, and promotes such co-operation.

Over 40 European countries, including most of the member states of the Council of Europe have ratified the Convention or intend to do so. The member states are all EU and accession countries and most non-EU countries (the so-called contracting parties). Some countries are not (yet) member but have the status of observer states. However, the convention has little power, because it has almost no sanctions.

In response to an increasing need to protect natural habitats it was decided to establish a Pan-European network: the Emerald Network. This is a network of Areas of Special Conservation Interest (ASCIs), which is to be established in the territory of the contracting parties and observer states. The aim of this network is to protect specific flora and fauna species and endangered natural habitats. The responsibility for the designation of the ASCI's and their protection and management rests with the governments of the states concerned. There is, however, no precise recommendation to give legal protection to a designated site. Designation of ASCI's has started in 1997 (see "Various Internet Sites" after the references to this chapter).

### 20.5.2 EU Policy

Up to now, 15 European countries are united in the European Union. The EU has its own legal instruments. The most important EU instruments for the conservation of natural habitats are the Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (the 'Habitat Directive', see "Various Internet Sites" below) and the Council Directive 79/409/EEC of 2 April 1979 on the conservation of wild birds (the 'Bird Directive').

The Habitat Directive aims to guarantee the biological diversity through the maintenance of natural habitats and the wild flora and fauna. It distinguishes the protection of areas ('natural habitats') and the protection of flora and fauna species. The protection of areas is the most important for the conservation of sand dunes. But also the presence of a priority species of the Habitat Directive can give a natural habitat a certain degree of protection. The Bird Directive aims to protect endangered European birds by protecting specific areas that are habitats of selected birds.

For every habitat type, the five most important areas (with a minimum surface of 100 ha) are designated within each EU country. These areas are selected by the national governments, based on criteria of the EU. The European Commission will make the definitive list of selected habitats (Bekker et al. 2001). Several types of sand dunes are included in the list of priority habitats of the Habitat Directive (see Table 20.2).

The Habitat and Bird Directives designate the establishment of an ecological network, Natura 2000, in which each member state has to nominate Special Areas of Conservation (SACs), also based on criteria of the EU. Natura 2000 is also the contribution of the EU to the EMERALD-Network under the Bern Convention.

**Table 20.2.** Coastal habitats of Community interest (sand dunes) which form the basis for the selection of Special Areas for Conservation (SACs). (Free after Doody 2000; from the Interpretation Manual of European Union Habitats, European Commission 1999)

Geographical area	Directive Name	
<i>Atlantic, North Sea and Baltic</i>	Embryonic shifting dunes	
	Shifting dunes with <i>Ammophila arenaria</i>	
	Boreal Baltic dunes sandy beaches with perennial vegetation	
	Fixed dunes with herbaceous vegetation (grey dune)	
	Decalcified dunes with <i>Empetrum nigrum</i>	
	Eu-atlantic decalcified fixed dunes ( <i>Calluno-Ulicetea</i> )	
	Dunes with <i>Hippophae rhamnoides</i>	
	Dunes with <i>Salix arenaria ssp. argentea</i> ( <i>Salicion arenariea</i> )	
	Wooded dunes of the Atlantic, Continental and Boreal region	
	Humid dune slacks	
	Machairs in Ireland only	
	<i>Mediterranean coast</i>	Crucianellion maritimae fixed beach dunes
		Dunes with <i>Euphorbia terracina</i>
Malcolmietalia dune grasslands		
Brachypodietalia dune grasslands with annuals		
Coastal dunes with <i>Juniperus ssp.</i>		
<i>Cisto-Lavanduletalia</i> dune sclerophyllos scrubs		
Wooded dunes with <i>Pinus pinea</i> and/or <i>Pinus pinaster</i>		

The EU countries are required to implement the regulations of the Habitat Directive in their national laws and policies. So, national laws have to be adapted. The consequence of this is that the Natura 2000 areas will attain a legal protection status. If the area is affected by human activities, sanctions will be implemented. These sanctions can vary from fines to large-scale compensation.

The Habitat Directive (and in some aspects also the Bird Directive) has a large impact also on countries outside the EU. The accession countries have to fulfil the requirements of the Habitat Directive before they can enter the EU (e.g. preparing to identify sites which later will be included in the Natura 2000 Network). Other countries which are not selected to enter the EU (mainly in central and eastern Europe, CEE) use the Habitat Directive as a guideline for their nature conservation policy. They do so to adapt their policy to EU standards to prepare the country for entering the EU in the future. In this way, the Habitat Directive has an influence on dune conservation not only in the EU, but also far beyond the borders of the EU.

The early approximation of nature conservation legislation of the accession and non-EU countries proves to be the best and most cost effective way to safeguard the existing natural areas of high conservation value and to ensure that they are not damaged or destroyed before accession (see Véghe and Szücs 1999).

### 20.5.3 National Policies

Next to the above-mentioned international instruments, each European coastal country has its own coastal policy. There is a wide variety of protection, from almost none (like Albania and Georgia) to countries that have made special arrangements for the regulation of activities on the coast, especially for the dunes. Van Koningsveld et al. (1999) give three interesting examples of the last category.

In many countries, the coastal strip is protected. In Portugal, for example, this strip depends on the type of the coast. The coast is public domain. Outside urban areas, the protected belt on dunes is located 200 m inland from the land limit of the dune. Besides this protected belt, approximately 25 % of the coast in Portugal is protected. All planning instruments for this protection are submitted to the public for comments.

In Poland, 68 % of the open seacoast is protected for its natural values. Of this area, 10 % lies within national parks or nature reserves where all natural features are protected. This includes the Slowinski National Park, with its extended landscape of wandering dunes. The remaining area consists of landscape parks and protected landscape areas where the status of protection is less strict but new building and other developments are severely restricted. The shoreline consists of a technical belt (including beach, dune ridge and a

zone up to 200 m behind the dune ridge) and a protected belt (a buffer of the technical belt which extends 2 km inward from the shoreline).

The Danish coast has a protection zone of 300 m. The protection of the coast is mainly regulated through environmental legislation (Van Koningsveld et al.1999).

Several countries use the principles of Integrated Coastal Zone Management (ICZM) in their policy to protect the coastal dunes. ICZM involves the comprehensive assessment, setting of objectives, planning and management of coastal systems and resources, taking into account traditional, cultural and historical perspectives and conflicting interests and uses. It is a continuous and evolutionary process for achieving sustainable development (Intergovernmental Panel on Climate Change 1994). ICZM can be an important instrument for the conservation and development of coastal dunes in Europe, including the connection between isolated dune areas (Van der Meulen and Udo de Haes 1996).

## 20.6 SWOT Analysis

A SWOT analysis can be used to evaluate the situation of the European dunes. It is a tool which originates from project management, but which is also very frequently used to give a good and brief overview of many other subjects, e.g. landscape or nature conservation (e.g. European Union for Coastal Conservation 1998). It helps to formulate strategies for nature conservation taking into account the strong and weak points of the values of landscapes in view of threats and opportunities set by changes in land use or natural conditions.

A SWOT analysis for each of the three categories of European countries is shown in Table 20.3. The valuation of each category is not absolute but relative to the other categories. Conclusions and recommendations can be derived from this overview. It must be made clear which actions are necessary to enlarge the strengths and opportunities and to decrease the weaknesses and threats.

## 20.7 Conclusions

### 20.7.1 EU Countries

Large dune areas in the EU countries are damaged or even destroyed, especially along the Mediterranean coast. Conservation of present dunes and restoration of damaged dunes is needed, which can be achieved by the imple-

**Table 20.3.** Overview of the SWOT-analysis. Relevant data of Table 20.1 are included

	<b>Strong</b>	<b>Weak</b>
<b>EU countries</b>	<ul style="list-style-type: none"> <li>- Relatively good protection schemes</li> <li>- Awareness of the need to protect dune areas</li> <li>- Availability of funds and public support</li> </ul>	<ul style="list-style-type: none"> <li>- Limited area and width of dunes</li> <li>- Poor conductivity</li> <li>- Until now large damage to dunes due to large investments</li> <li>- Sharp transitions to surrounding areas</li> <li>- Few dynamic dune areas left</li> <li>- Fragmentation in isolated dune areas</li> <li>- Much pressure from surrounding areas</li> </ul>
<b>Accession countries</b>	<ul style="list-style-type: none"> <li>- Dunes relatively unspoilt</li> <li>- Almost complete dynamic dune networks (good connectivity)</li> <li>- Well-developed gradients to surrounding areas</li> <li>- Good future protection due to the need to implement the Habitat Directive before entering the EU</li> <li>- Availability of EU funds after entering the EU</li> </ul>	<ul style="list-style-type: none"> <li>- Present lack of good protection</li> <li>- Occasional lack of awareness of the need for dune conservation</li> </ul>
<b>Non-EU countries</b>	<ul style="list-style-type: none"> <li>- Dunes relatively unspoilt</li> <li>- Almost complete dynamic dune networks (good connectivity)</li> <li>- Well-developed gradients to surrounding areas</li> </ul>	<ul style="list-style-type: none"> <li>- Lack of good protection and funds</li> <li>- Lack of awareness of the need for dune conservation</li> </ul>
	<b>Opportunities</b>	<b>Threats</b>
<b>EU countries</b>	<ul style="list-style-type: none"> <li>- Conservation of remaining dunes</li> <li>- Funds and awareness available for development and restoration of dunes</li> <li>- Rehabilitation of affected dunes</li> </ul>	<ul style="list-style-type: none"> <li>- Damage to unprotected dunes (especially in the Mediterranean region)</li> </ul>
<b>Accession countries</b>	<ul style="list-style-type: none"> <li>- Safeguarding of unique extensive dune areas by quick acceptance of legislation</li> </ul>	<ul style="list-style-type: none"> <li>- Future flow of EU funding can negatively affect unprotected dunes by stimulating adverse land use</li> </ul>
<b>Non-EU countries</b>	<ul style="list-style-type: none"> <li>- Safeguarding of unique extensive dune areas by prompt introduction of protection measures (legal instruments, funds and awareness)</li> </ul>	<ul style="list-style-type: none"> <li>- Damage to relatively unspoilt dunes, due to lack of protection measures</li> </ul>

mentation of the Habitat Directive. Compared to countries outside the EU, there is relatively large funding available for conservation and development of coastal dunes.

### **20.7.2 Accession Countries**

It seems that accession countries are in the best position for sustainable development of their dune areas. The dunes are relatively unspoilt and they have to be protected according to the Habitat Directive before these countries can enter the EU. When they have entered the EU, these countries will have access to the EU funds that are available for the conservation and management of the dunes.

### **20.7.3 Non-EU Countries**

The dunes in these countries are relatively unspoilt, but they are under heavy pressure. There is little awareness of the need of dune conservation: economical development is more important. The Habitat Directive is used to give some guidelines, but there is no large funding available to conserve the dunes.

## **20.8 Recommendations**

1. Draw up an international long-term strategy for coastal protection and development with clear objectives and tasks for each of the participating countries. This should comprise an integral strategy for nature, natural processes and sustainable land use, with adequate spatial planning for activities in the surrounding land and sea areas, with active involvement of local communities.
2. Promote the inclusion of Integrated Coastal Zone Management (ICZM) in the national policy of all countries. With ICZM, a network of (dynamic) dunes can be developed in EU countries and conserved in the accession countries and the non-EU countries. An example can be the European Coastal Code of Conduct of the Council of Europe (see Various Internet sites, [www.eucc.nl](http://www.eucc.nl)). In this Code, recommendations are given on how each actor should behave to achieve sustainable coastal development.
3. Involve all actors in the coastal zone, such as industry, transport, tourism, forestry, etc. in the implementation of ICZM. This is a very complex process. Good communication between the parties is the main condition for success.

4. Encourage a change of mentality for dune management. Dunes should not be fixed by afforestation. Instead, dynamic dune systems should be promoted.
5. Promote international exchange of knowledge and experience to learn from other countries. An example is the Coastal Guide on Dune Management of the European Union for Coastal Conservation (European Union for Coastal Conservation 2000). This provides a platform for dune managers all over Europe to exchange information.
6. Use part of the EU funds to finance dune conservation projects in non-EU countries. In that way it is possible to conserve the large dynamic dune areas that have disappeared from the EU. An example is the EECNET Action Fund (see Various Internet sites, [www.eucc.nl](http://www.eucc.nl)) which finances the purchase of land with high natural values by local governmental and non-governmental organisations in central and eastern Europe.

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- [http://europa.eu.int/eur-lex/en/lif/dat/1992/en\\_392L0043.html](http://europa.eu.int/eur-lex/en/lif/dat/1992/en_392L0043.html) (text Habitat Directive)
- European Centre for Nature Conservation: <http://www.ecnc.nl/doc/Europe/legislat/conveu.html> (comments on Habitat and Bird Directives)
- European Union for Coastal Conservation: <http://www.eucc.nl/>
- World Resources Institute: <http://www.wri.org/wr2000/coast>