Dune Management in Denmark: Application of the Nature Protection Act of 1992

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ABSTRACT


Most of Jutland's coastline along the North Sea consists of dunes. Primarily due to excessive usage by the peasant population during the Middle Ages, sand drift became a catastrophe and the drifting sand covered farmland, roads, houses and even churches. Hence from 1553 to 1992, legislation concerning dunes mostly dealt with how to fight the drifting sand. Of the different dune types, the grey dune with its crisp vegetation mainly of lichens is the most vulnerable. With the Nature Protection Act of 1992, a more varied attitude towards dune management is introduced. The intrinsic value of the dunes is acknowledged; but at the same time, devastating sand drift must be fought and the public have free access by foot to the dunes. The ecological environment of the dunes is threatened by coastal protection works, damages caused by sand drift, attrition, tourism, and overgrowth with conifers. Of these threats, attrition develops with increasing tourism. Attrition is counteracted by appropriate dune management and through information to the public of the proper way of using the dunes considering the value and fragility of the dune and dune vegetation.

ADDITIONAL INDEX WORDS: Dune afforestation, Denmark, dune legislation, dune management, dune types, European Union for Coastal Conservation, Little Ice Age, sand drift, tourism, threats to dunes.

INTRODUCTION

Most of Jutland’s coastline along the North Sea consists of dunes. For centuries, the main objective for all land management was maximum agricultural or forestry output. In dune areas and areas adjacent to dune areas, sand drift was a major problem for agriculture and the objective of all legislation concerning the dunes was to stop sand drift. During the latest decades, more and more focus has been placed on protection of the ecological environments. The Nature Protection Act of 1992 gives a legal framework for management balancing utilization and protection of the ecological environments.

THE HISTORY OF SAND DRIFT IN DENMARK

In 1792, Denmark had its first Sand Drift Act. For centuries, ordinances which gave restrictions against excessive usage of the vegetation in the dune areas had been given. Already in 1539, Christian III of Denmark issued an ordinance aiming at protection of dune vegetation. The background for all the ordinances and the first Sand Drift Act was that the intensive usage of the poor dune areas had been a contributory cause to the increased sand drift experienced in the western parts of Denmark in these centuries. Cattle grazed in the dunes and the vegetation was collected for fodder, roofing materials and fuel. The sand drift problems became more serious in the period of the great sand migration from 15th to 19th century. The period is often quoted as “The Little Ice Age” with winter and summer temperatures a couple of degrees lower than today (Hauebach, 1992). It was not a coincidence that the Swedish King Karl X in 1658 could march across the Danish icebound belts with a whole army—Earth was in the middle of a colder period with global effects where polar sea ice and inland glaciers attained their greatest extent in recent history. This led to a general lowering of sea-level. Thus, the foreshore was stretched farther seawards than before and this exposed a greater sand area to wind erosion. More sand was available for drifting and large migrating dunes started their way eastwards. Going further back in history, it has been shown at Rubjerg that at least three periods with fierce sand drift conditions have coincided with periods of colder climatic conditions (Christiansen et al., 1990).
The result of the massive sand migration was a social catastrophe. The sand covered farmland, farms, houses, roads and churches.

With the first Sand Drift Act, regular stabilization works were introduced and organized. Later, tree-plantings were considered the final solution of sand drift problems; and with the Sand Drift Act of 1857, it became possible for the state to buy or if necessary to expropriate sand drift areas for afforestation.

In the beginning, it was the idea to stop the drifting sand by tree-planting directly on top of the moving dunes. This turned out to be a failure because the conditions here were so difficult that the plants never grew and the act was changed again in 1867 in such a way that it was made possible for the state to buy or to expropriate not only dune areas but also adjacent lower areas for afforestation (Thaarup, 1953). Additionally the heatlands between the dunes could be acquired and it is after this time and up to the 1950's the large plantations in the dune areas of Denmark were established.

Today, sand drift is under control in Denmark but reminders from the great sand migration can still be seen in the dune landscape, the most well-known landmark token being the tower of the Sand Buried Church at Skagen (Figure 1), which was given up as a church because of sand drift in 1792.

THE NATURE PROTECTION ACT OF 1992

In July 1992, Denmark had its first Nature Protection Act (Miljøministeriet, 1992). The act is a compilation and modernization of different previous acts; i.e., acts about nature conservation, nature management, and sand drift. The aims of the act are to protect and improve nature and at the same time improve access and possibilities for outdoor activities. It is also an aim of the act to fight devastating sand drift. The act deals with a number of protected ecological environments and it is worth noting that the basis for legislation about dunes in Denmark is not a recognition of dunes as a valuable ecological environment which needs protection but protection against sand drift. Still, in the remarks to the bill, it is stated that in management of dunes and sand drift, consideration should be taken of nature and landscape values.

For many years, it has been reckoned that there is about 80,000 ha of dune area in Denmark. This is about 2% of the total area of the country. A survey from the 1970's and 1980's by The Danish Institute of Plant and Soil Science, Department of Land Data, Vejle, shows a dune area of about 160,000 ha (Figure 2) (Jensen et al., 1985). A major part of the dune area is owned by the state, the Ministry of the Environment. The National Forest and Nature Agency is managing these areas through its local forest districts. In the private areas along the North Sea, a minimum of 100 m from the foot of the dune and landward must be "preserved dune".

When a dune area has been selected for preservation, the right of use is very restricted. The public has free access by foot to the preserved dunes. In a dune preserved area, the owner has the joy of ownership, he may hunt and he may pay his taxes but otherwise he must not do anything. If he has a house or a summer house in the area, the house may stay there and he may maintain the house but must not enlarge it. If the dune preserved area becomes narrower due to coastal erosion, the forest district must see that the dune preserved area is moved farther inland so that the preserved area always is at least 100 m wide.

The extent of the dune preserved areas is shown on special maps, and the dune preservation is registered by the authorities for each individual property. In the field, the preserved areas are marked with concrete poles with a royal crown and a K for dune preserved (klitfredet in Danish) (Figure 3).

In most cases, the local state forest district performs the duty of the local dune authority and the decisions of the forest district may be appealed to the National Forest and Nature Agency. More vital decisions may be appealed to the Ministry of the Environment (Skov- og Naturstyrelsen, 1993).

MAJOR DUNE TYPES

In Denmark, there are several common dune types (Feilberg and Jensen, 1992).

The foredunes are formed on the beach sheltered by subaqueous seaweed, rubbish or any other material which gives shelter from the wind. The foredunes are extremely exposed and can easily be flushed away by the waves. At stable conditions, the foredunes may develop into white dunes. Coastal dunes are often white dunes because of the white sand seen through the vegetation. The dominating plant in the vegetation is marram grass, Ammophila arenaria, which thrives best
Figure 1. The sandburied church of Skagen. The church was given up as a church in 1792. The tower was left as a landmark and the rest was pulled down.

with continuous mild accretion of sand. Marram spreads vegetatively and this ability is used when marram is planted to stabilize the drifting sand.

Fertile dunes sheltered from the sea may develop into green dunes. The green dune has a rich and vigorous flora with *Ammophila arenaria*, *Galium verum*, *Salix repens*, *Rosa pimpinellifolia*, *Geranium sanguineum*, etcetera.

The grey dune consists of leached sand and the fertility is very poor. The vegetation is sparse and fragile—often crisp under dry conditions—with characteristic species as *Carex arenaria*, *Corynephorus canescens*, *Cladonia* spp. and *Cornicularia* spp.

Especially in Northern Jutland, we find a number of stone flats and stone deserts. The stone flat
The major threats to the free development of the dunes in Denmark today are (FELDBERG and JENSEN, 1992):

1. Coastal protection works
2. Sand drift damages
3. Attrition
4. Tourism
5. Overgrowing

1. On the sandy westerly shores of Denmark, the beach and the adjacent dune systems constitute a dynamic landscape with a coastline which may move both ways. In many places, a coastal erosion rate of 1–2 m a year has been normal for a long time; but in the last 15 years, the erosion rate has increased to 3–5 m a year due to more frequent and violent gales in this period (ANDERSEN, 1993). Where infrastructure and other social assets are threatened by coastal erosion, coastal protection works are erected. Massive coastal protection works may “freeze” and impoverish the dynamic landscape.

2. Damages caused by sand drift are the classic and historical problems with dynamic dunes. Today sand drift is under control but there are still sand drift problems for instance in connection with the summer houses and recreational facilities in or near the dunes. Buildings may be endangered by the drifting sand and it is quite often necessary to stabilize the drifting sand. This supports nature’s own dynamic processes to perform a natural transition to a stable situation. In a traditional situation, all overhanging duneparts are cut down at a sloping angle so that the wind may pass with a minimum of erosion. A major blow-out in the dune has to be refilled with sand. This can be achieved by burying pinetrees of about 2 m’s length in the sand. The trees collect the sand the way a snowfence collects the snow. When the dune has been levelled, it is stabilized by planting of marram—Ammophila arenaria.

3. Attrition ruins the vegetation and sand drift may start. Today, attrition is mostly due to the recreational usage of the dunes since very few people are living in the dunes the whole year and few perform intensive use of the dunes. Attrition may be counteracted by a sensible laying out of access roads and paths and by repair of the damage by the methods mentioned earlier or by means of straw or woodchips. It is considered most important to inform about the values of the dunes and to try to convince people that dunes have to be adequately protected.

Figure 2. Map of dune areas in Denmark from the Danish Institute of Plant and Soil Science, department of land data, Vejle—received as a print (JENSEN et al., 1985).
(4) In many dune areas, tourism is about to become the most important trade and everyone acknowledges that tourism must have reasonable terms and room for development. At the same time, there is an awareness of the fact that unhampered tourism can spoil cultural as well as natural values—the aim is a tourism that can be lived by and lived with. In Denmark, tourism in the dunes is very much linked to summer houses and bathing at the beaches. Because of the strict legislation, new summer houses are almost impossible to build in dune areas, but conflicts between interests are sure to come when greater investors offer big investments in tourist facilities and offer new local jobs—often in areas with high unemployment. Then, it is vital that politicians stay cool and ensure that all development is evaluated with regard to the existing environment and that sustainability is ensured.

(5) When the lasting stabilization of the dunes started around the middle of last century, afforestation was an effective means. From these plantations conifers—first, *Pinus mugo*—have spread to adjacent dune areas, and many of these areas will, if left to themselves, develop into pine plantations or pine shrub of a much less intrinsic value than the dune area. For many years now, self-grown pines have been cleared in valuable dune areas and this work has to be continued until all live residues of trees and seeds have been removed from the area. Furthermore, it is now being discussed to remove some of the established pine plantations and restore the areas. The afforestation of the dunes in Denmark has had its day—it has stopped the sand drift as it was the aim of the afforestation. Today, the pine plantations occupy areas which have higher nature and landscape values as dune areas.

**STRATEGY FOR DUNE MANAGEMENT**

In the National Forest and Nature Agency, a working group is working with a strategy for dune
management in Denmark and the main points are (Skov- og Naturstyrelsen, 1991):

(1) The ruling principle for dune management is "sustainable and multiple use". This means a kind of management which preserves the dunes, while at the same time, the dunes play their role in the dynamic coastal protection system against the sea, devastating sand drift is stopped, and the great landscape and recreational interests are considered.

(2) An element in management is the wish to restore a zone with so called Atlantic dune moorland behind the high coastal dunes along the North Sea. This implies in many places that dune plantations must be felled and restored with the original vegetation of grasses, dwarf bushes, etcetera.

(3) In suitable places with low recreational pressure, sample plots of reference are placed. Some of these may be part of the monitoring of European dune areas which has been proposed by EUCC (The European Union for Coastal Conservation).

(4) In 1992, a Danish sand dune seminar was held near Skagen with participants dealing with dunes from different scientific and managerial positions. Contacts established at this seminar should be maintained.

(5) A national survey of the Danish dune area shall be carried out during the next few years.

DISCUSSION AND CONCLUSION

For 500 years, legislators in Denmark have repeatedly considered dune management. For almost the whole period, the main aim was to stop the devastating sand drift that was caused by excessive use of the dunes. Sand drift was radically stopped by afforestation of major dune areas.

All over Europe, huge dune areas have been lost during this century. In Denmark, it has been estimated that 35% of the dune area has been lost to afforestation and recreation (Doody, 1993). It is a small proportion compared to the Mediterranean area, where 75% is estimated to have been destroyed (Geu, 1985), but it is still serious considering the scarcity of dune areas and the pressure on the dunes. Today, the excessive pressure on the dunes in Denmark mainly comes from recreational usage especially during the summer time.

With the Nature Protection Act of 1992, the priorities concerning dune management are spelled out. The intrinsic value of the dunes is acknowledged and the public is given free access by foot to the dune areas. Thus in Denmark, greater attraction must be envisaged due to the intensive recreational usage of the dunes.

To fulfil the aims of the legislators, it is necessary to have an active dune management to do the necessary repair works and to make visitors understand how important adequate protection of the dunes is. In a world with growing pressure on natural resources for recreational purposes, this last point is vital. If visitors do not understand and accept that the vegetation in many dune areas is extremely vulnerable and behave accordingly, the result may be that, in many places, it will be impossible to maintain the dune areas in an acceptable condition and an increasing demand will develop for restrictions on public access to protect the ecological environments.

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LITERATURE CITED


