

## THE INTERACTION BETWEEN MAN AND HIS PHYSICAL ENVIRONMENT IN THE COUNTY OF HOLLAND BETWEEN CIRCA 1000 AND 1300 AD: A DYNAMIC RELATIONSHIP<sup>1</sup>

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### ABSTRACT

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This paper gives a summary of the archaeological and historical datings concerning the reclamation of the peatbogs, the formation of the Younger Dunes, sedimentation, erosion and lake formation. The size of the areas, in which these changes in the physical environment took place was estimated for parts of the provinces of North and South Holland. These estimates enabled us to demonstrate the differences in the effects of these events on the society in both areas.

### INTRODUCTION

In the period between circa 1000 and 1300 AD great changes took place in both human society and in the physical environment. The changes in the environment to a great extent determined the appearance of the provinces of North and South Holland as we know them today. Changes in human society found their expression in a marked expansion of the inhabited area and, in connection with this, undoubtedly in an increase of the population. In this period a large part of the extensive peatbogs was systematically reclaimed, which resulted in strip-shaped parcels of land that are grouped in bundles. A tendency to expand the inhabited area is noticeable from the Merovingian Period onwards.

At first sight the changes in the physical environment seem to contradict the increase in population: large areas of cultivated land disappeared or became useless as a result of the formation of the Younger Dunes, erosion and floods, and the formation and expansion of lakes. There was only a very limited area where accretion took place.

To understand these changes, it is necessary to gain an insight into their chronological succession and their spatial distribution. Therefore an attempt is made to compile maps of the landscape around 1000 and 1300 AD of parts of the present provinces of North Holland and South Holland and to use these maps to calculate the areas that were affected by the changes during that period (Figs. 1 and 2, Table 1). For the geological setting around 1000 AD the circumstances as they were in the Roman Period are taken as a starting-point, because no fundamental geological changes took place between then and circa 1000 AD (HALLEWAS ET AL., 1978; HALLEWAS, in press; HALLEWAS & VAN REGTEREN ALTENA, 1980, p. 181). The morphology around 1300 AD is based on present topography. To place the reclamation activities and the extent of the changes in the physical environment in perspective, an estimate was made of the area of the land inhabited and exploited in the Carolingian Period. In addition to this, the area of the district in South Holland where *botting* (a kind of tax) was levied, can be approximately determined. This area gives an indication of the extent of the cultivated land in around 1000 AD.

In view of the ambivalent meaning of the word "reclamation" in English this word will be used here only to indicate the Dutch term *ontginnen*, i.e. to clear and cultivate previously

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uncultivated land. For the Dutch term *herwinnen*, i.e. reclamation of flooded cultivated lands, the word "recuperation" will be used.

### THE RECLAMATION OF THE PEATBOGS

Archaeological and toponymical data reveal that the region inhabited in the Merovingian Period included parts of the Older Dunes and the clay areas near river-mouths and along the rivers. From then onwards the inhabited area was gradually expanded inland, at first mainly in the clay-area, but later also in the nearby peat-region. In the second half of the 10th century expansion into the peat-region was possibly fostered by dry climatic circumstances (HEIDINGA 1984, this volume) and large-scale reclamation of the peatbogs started. Initially reclamation-work concentrated probably on the relatively high, oligotrophic, sphagnum peat areas of the peatbogs (BERENDSEN 1984, this volume). This reclamation produced the now familiar patterns of bundles of strip-shaped parcels, mostly with direct access from the farmsteads.

Place-names ending in *more* indicate that part of the peat region was being exploited as early as the 9th century (DE COCK, 1965, p. 10; 1969, pp. 157-159; KOCH, 1970, no. 13 and 25). The way in which that area was used before the large-scale reclamations started may well be comparable to the pre-drainage situation in the Somerset Levels (WILLIAMS, 1970, pp. 21-25). It is not at all certain whether we are dealing with a strippattern here. The distribution of Carolingian finds in the region near Medemblik-Wervershoof does not bear any relation to the bundle of stripshaped parcels in that area. Therefore, it can be concluded that the finds are older than this field pattern. During the excavation of settlements in the vicinity of Medemblik, no evidence was found that might prove the existence of strip-shaped parcels in the Carolingian Period (BESTEMAN, 1974; HALLEWAS, 1978). The ditches that are mentioned in the description of a Viking raid which took place around 936 probably were not part of a strip-field system either (BLOK, 1979, pp. 123-125).

The fact that settlements located in the peat-region are mentioned in a charter dating from 1049 AD or a somewhat earlier date implies that the reclamation of the peatbogs was well under way in the first half of the 11th century (BLOK, 1974; KOCH, 1970, no. 84). In the province of South Holland the boundary of the district where *botting* was levied gives an insight into the area that was inhabited and exploited around 1000 AD (GOSSSES, 1946). A few of the settlements listed in the charter mentioned above did not have to pay *botting*. On account of this and of the fact that no *botting* was levied in settlements in the area north of the Maas which were mentioned in 1018 AD, it is assumed that *botting* became fixed in about 1000 AD (VAN DER LINDEN, 1956, p. 360; 1982<sup>a</sup>, p. 56). The area populated and exploited at that time was possibly larger than the *botting* district; it may have stretched further inland along the Oude Rijn and the banks of the Maas.

Indications that *botting* was also levied in a large part of the peat-region in North Holland possibly means that those areas had already been reclaimed by about 1000 AD (VAN DER LINDEN, 1982<sup>a</sup>, p. 78).

The *cope*, the form of reclamation that is characteristic of the South Holland peat region, probably existed already at the beginning of the 12th century (VAN DER LINDEN, 1956; 1982<sup>a</sup>, p. 60). The first records of place-names ending in *-cope* have come down to us from the 13th century. The many records of new reclamations in South Holland in the 13th century reveal that land was still actively brought under cultivation at that time. By the 14th century almost the entire peat-region had been reclaimed here. Historical evidence which may shed some light on the reclamation of the peat-region in North Holland is almost totally lacking. This could also be an indication that reclamation work was completed here at an earlier date than in South Holland, in any case before the Count of Holland had permanently taken over command in that whole area at the end of the 13th century.

Archaeological datings of the colonization of the peat-region are scarce in South Holland. In the area of Midden-Delfland reclamation probably started in the 11th century (BULT, 1983). In North Holland archaeological data from excavations, field surveys and more incidental finds give a rough dating for the reclamation of the peat. The majority of finds from the (former) peat-area can be dated to the 11th and 12th centuries (BRAAT, 1932; DU BURCK, 1959; SMIT, 1972; DEKKER & DE WEERD, 1975; VAN REGTEREN ALTENA, 1977; BESTEMAN & GUIRAN, 1983). We must, however, bear in mind that it is very difficult to recognize material from the 10th century as such with certainty. In the Westerkogge (to the southwest of Hoorn) most finds date from the 13th century (cf. DEKKER, 1980).

Datings and palaeobotanical data from a sample cut from underneath the West-Frisian ringdike at Enkhuizen (VAN GEEL ET AL., 1983) clearly reveal that by the time the Zuiderzee was formed, most of West-Friesland had already been brought under cultivation. This refutes the theory that a fall in the level of the Almere as a result of the formation of the Zuiderzee, in which a storm surge in 1170 played a mayor part, would have triggered the reclamation work (BORGER, 1975, p. 218; 1977, p.p. 370-381). This presumed fall in the water level would have occurred after most of the reclamation work had been completed. It is, moreover, unlikely that the level of the Almere differed much from sealevel (cf. VAN DER SCHRIER, 1978). This conclusion can also be drawn from the fact that at Deventer campsheets from the 10th or 11th century along the river IJssel, which debauched in the Almere, lay at levels between + 2.15 m (bottom) and + 3.50 m (top) NAP (Dutch Ordnance Datum).

It may be concluded that the systematic reclamation of the peatbogs in both North and South Holland was under way in about 1000 AD. In North Holland large-scale reclamation probably started at an earlier date than in South Holland, whereas in South Holland reclamation work continued for

almost a century longer than in North Holland. The distribution of oligotrophic versus eutrophic peat possibly played a part in this chronological disparity.

## THE CHANGES IN THE PHYSICAL ENVIRONMENT

### *The Younger Dunes.*

Historical evidence regarding the formation of the dunes was collected by RENTENAAR (1977). From this evidence we may conclude that dunes were formed in the second half of the 10th century and in the middle of the 11th century. (RENTENAAR, 1977, p. 366, p. 372). In the last case we are certainly dealing with Younger Dunes; the first case may concern either Older Dunes III or Younger Dunes. From the *Annales Egmundenses* it appears that dune formation was a fairly novel phenomenon in the area around Castricum in ca. 1100 AD (HALLEWAS, 1984; OPPERMAN, 1933, pp. 28-31).

The Younger Dunes covered a large part of the Older Dune area that had been inhabited and exploited from the Merovingian Period onwards and rendered it unsuitable for cultivation. In many places medieval arable land was found beneath the Younger Dunes; in some cases the drift of the sand could be dated to the 12th century or to the beginning of the 13th century (BLOEMERS & DE WEERD, 1983; JELGERSMA ET AL., 1970; VAN DER ROEST & WAASDORP, 1983). Profiles of the dunes often reveal that sand had already started to drift over the arable land before it was abandoned. In many cases clean sand that was ploughed into the furrows reveals the last time when the earth was ploughed. Technical means to effectively arrest the movement of the dunes were probably unknown at that time. The discovery of a low bank and traces of wattle-work in Katwijk (BLOEMERS & DE WEERD, 1983) indicate that attempts were made to bar the way of the moving dunes. It is possible that the construction of the banks and ridges found on Ockenburg near The Hague, on Voorne, and on Goeree (BRAAT, 1956; KLEPPER, 1979) was connected with the formation of the Younger Dunes.

ZAGWIJN (1984, this issue) arrives at a time around AD 1000 for the beginning of the formation of the Younger Dunes on the basis of datings and by calculating the rate at which these dunes moved inland.

### *The influence of the sea: floods, erosion and sedimentation*

In the provinces North and South Holland there are layers of clay which, with the help of sherds found beneath and on top of the layers, can be dated to the 11th/12th centuries (BRAAT, 1932; DU BURCK, 1959; HOEK, 1962, pp. 1-4; 1965, p. 4; SARFATIJ, 1971; DE JONG & VAN REGTEREN ALTENA, 1972, p. 61; SMIT, 1972; HALLEWAS & VAN REGTEREN ALTENA, 1980, pp. 196-197). This clay was probably partly deposited by storm-induced floods (as in AD 1134, 1164, and 1170, GOTTSCHALK 1971, HOEK, 1962). The

mention of the *Zanddijk* (= sand dike) at Egmond and records of flood damage in the region between Egmond and Castricum in about 1100 is also in keeping with this picture (OPPERMAN, 1933, p. 26-31).

It is likely that strong erosion occurred at the time of the deposition of this clay. Especially in North Holland a large part of the peat-region was eroded, as a result of which the Waddenzee was enlarged and the Almere developed into the Zuiderzee. The Marsdiep estuary probably also formed at that time (SCHOORL, 1973). The sea gradually intruded and submerged the northern part of North Holland and this area was not reclaimed until in modern times. Not only were small dwelling mounds thrown up in areas affected by floods, but more and more dikes were built to protect the cultivated land and to "recuperate" flooded areas (BULT, 1983; HALLEWAS, 1984).

In the unrecuperated submerged land many sites were discovered, underneath a layer of clay at the top of the peat (DU BURCK, 1959; BRAAT, 1932; SMIT, 1972), which probably indicate that these areas and also the eroded area were almost entirely cultivated before submersion.

### *Lakes*

The expansion of existing lakes and the formation of new lakes is not well dated in North Holland. There is probably a relation between lake formation and the Late Medieval floods. The total area of lakes is supposed to have markedly increased in about the 11th/12th centuries (DE JONG & VAN REGTEREN ALTENA, 1972<sup>a</sup>, p. 56; 1972<sup>b</sup>, p. 67; PONS & VAN OOSTEN, 1974, p. 63). In the Beemster polder pits or so-called *daliegaten* are found over large areas (DEKKER, 1972). These pits were dug in peat areas to extract lime-rich clay and were later filled with peat. They must therefore have been dug before the Beemster lake expanded over these areas. It follows that the Beemster did not gain its present size until after the peat had been reclaimed. In the Daalmeer, late Kugeltopf sherds of the end of the 12th and the first half of the 13th century were found in a ditch underneath lake-deposits (WESTERHOF, 1984, this issue). The lakes were certainly, although to a varying degree, enlarged in the period after 1300 (HAANS, 1954; GOTTSCHALK, 1975; RAMAER, 1892).

In or about the 12th century a few lakes were also formed in the province of South Holland. Datings for these lakes are derived from the same kind of information as that which supplied the datings for the lakes in North Holland. In around 1200 AD it is mentioned that two areas in the peat region became very wet. This also might support the dating of the beginning of lake formation; however, in these cases no lakes were formed (VAN DER LINDEN, 1982, p. 64). Most lakes in South Holland were formed after 1300 as a result of peat-cutting and dredging to meet the demand for fuel of the nearby towns. They are usually called *plassen* (SCHÖNFELD, 1955, p. 203).

Accretion

On the northern bank of the Maas estuary accretion occurred in the form of recurved spits. The formation of these spits was accompanied by coastal erosion north of these spits. Owing to

the strong erosion of the coast between Texel and Petten in North Holland, two islands were formed: Callantsoog and Huisduinen. Further erosion and the formation of spits caused these islands to migrate southeastward (SCHOORL, 1979).

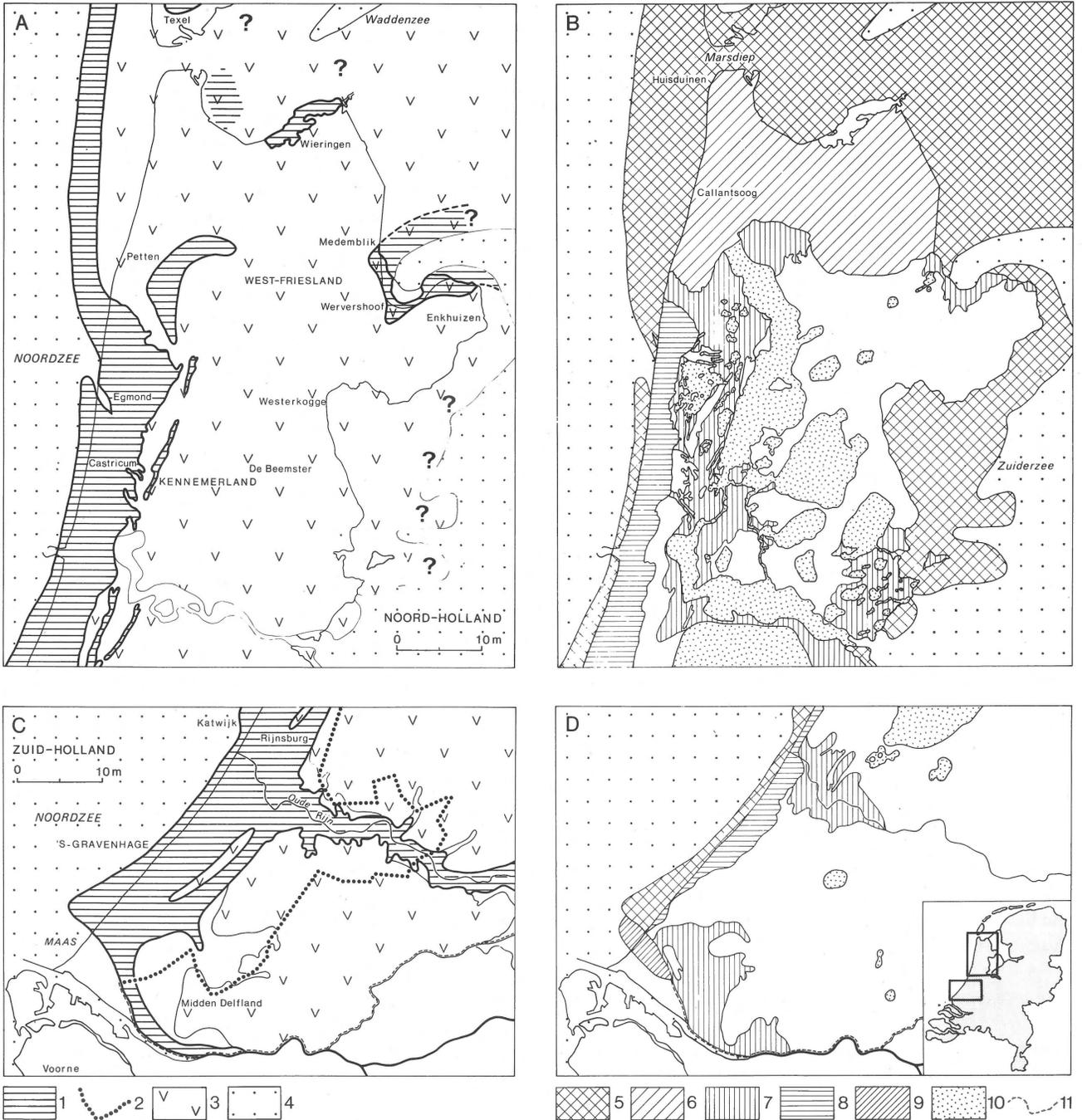


Fig. 1 Areas of North Holland (top) and of South Holland (bottom) in ca. 1000 AD (A and C) and ca. 1300 AD (B and D). B and D include the changes in the physical environment that occurred between 1000 AD and 1300 AD. Legend: 1. area exploited in the Carolingian Period; 2. border of the *botting*-area; 3. peat area (on A and C); 4. sea; 5. eroded between 1000 and 1300 AD (in Fig. 2. also: flooded and not recuperated); 6. flooded and not recuperated; 7. flooded and recuperated; 8. Younger Dunes; 9. accretion; 10. lakes; 11. boundary of the area discussed in this paper.

## THE EXTENT OF THE CHANGES IN THE PHYSICAL ENVIRONMENT

A calculation was made of the total area of the regions eroded by the sea, of the regions that were submerged, of the land covered by the Younger Dunes, of the land that disappeared when lakes were formed, and of the extent of accretion, using Fig. 1. The results are given in Table I. In view of the hypothetical nature of the various boundaries defined on the maps of Fig. 1, the surfaces measured are only crude estimates. Moreover, an estimate was made of the overall area of the land in ca. 1000 and ca. 1300 AD, the area exploited in the Carolingian Period and the area of the *botting* district. In Fig. 2 these data are represented in diagrams so that the various areas can be easily compared. Owing to the loss of land in North Holland, no reliable estimate can be made of the land that was exploited in the Carolingian Period; the area indicated therefore is a minimum approximation only.

Table 1 Approximation of the areas of the regions given in Fig. 1; in  $\text{km}^2 \times 10$ .

	North Holland	South Holland
area circa 1000 AD	346	149
area exploited in the Carolingian Period	58	42
<i>Botting</i> -area	?	61
area circa 1300 AD	161	38
eroded/flooded, not recuperated	188	5
flooded, recuperated	25	16
Younger Dunes	16	5
lakes	47	5
accretion	—	2
total, disappeared/unusable	251	51
total recuperated	25	16

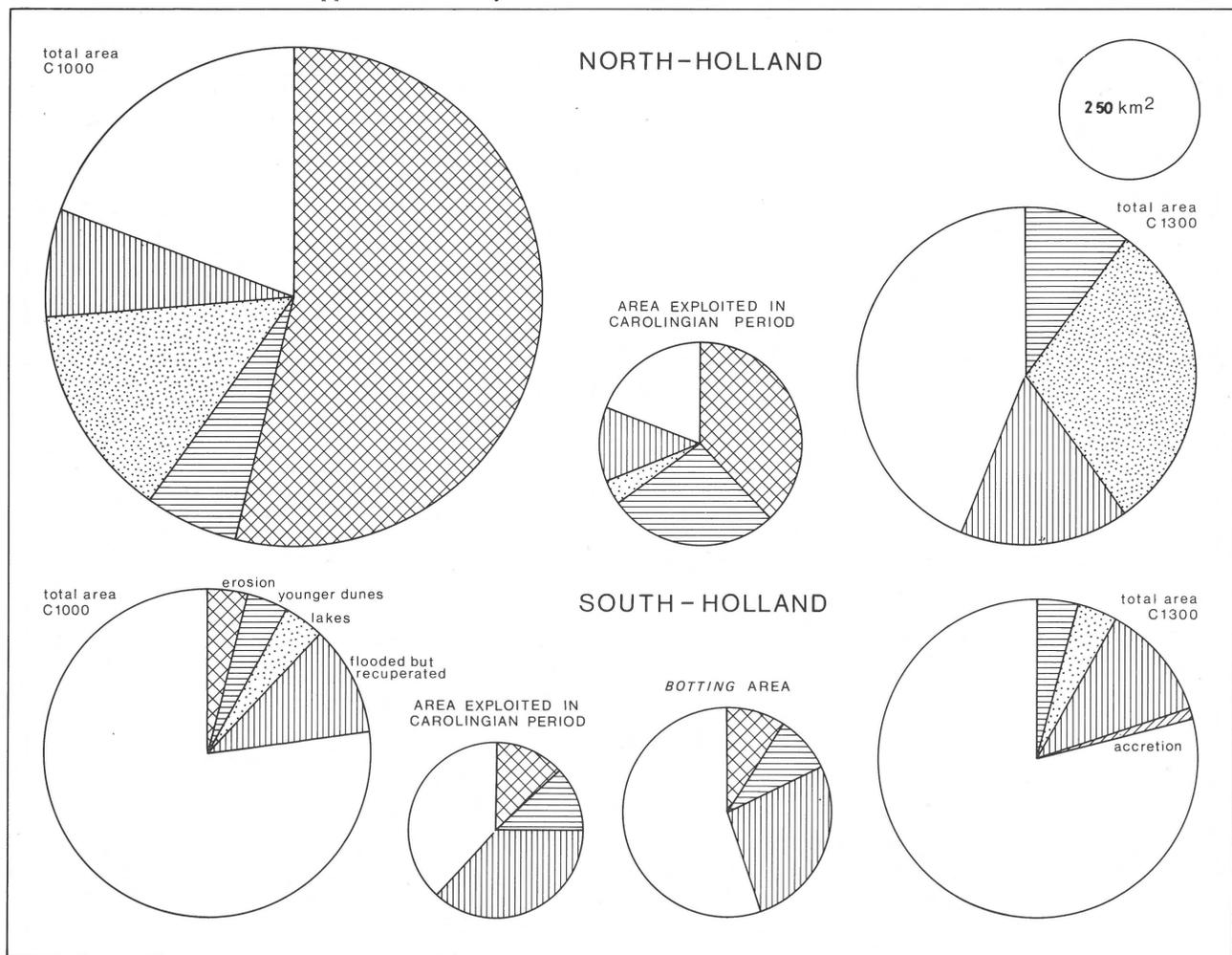


Fig. 2

The area of the regions shown in Fig. 1: the total area of the land in ca. 1000 and ca. 1300 AD; the total area exploited in the Carolingian Period, and the total area of the *botting*-area; In ca. 1300 AD almost the entire land was under cultivation. In the area of the land ca. 1000 AD, in that exploited in the Carolingian Period and in that of the *botting*-area is indicated which part was (temporarily) lost in the period 1000-1300 AD. In the total area of the land ca. 1300 is indicated which part of it was unusable because it was covered by Younger Dunes, which part was covered by lakes and which part was recuperated in the period between 1000 and 1300 AD. Legend see Fig. 1.

In calculating the areas, it was assumed that, the Older Dune region was completely occupied possibly already in the Carolingian Period and almost certainly shortly before the formation of the Younger Dunes. This is probably an over-estimation because we may assume that a strip of land along the coast and possibly the broader depressions between the Older Dune ridges did not belong to the productive agricultural land. In circa 1300 AD the area of the land covered by the Younger Dunes in North Holland was at least twice as large as that in South Holland.

The land that was temporarily rendered unsuitable in South Holland as a result of floods occupied  $\pm 11\%$  of the total land area that was available around 1000 AD. Roughly the same percentage was calculated for North Holland. This percentage however is too low, because part of the flooded area disappeared after 1300 due to the gradual expansion of the lakes (see below).

There is a great difference between North and South Holland in the size of the eroded and the not recuperated area; in South Holland this is only 4%, in that of North Holland it amounts to 54% of the total land area in ca. 1000 AD.

In South Holland this percentage is an underestimate because erosion in the Maas estuary was not taken into consideration. In North Holland it is an overestimate because very likely, the Wadden Sea was bigger at the beginning of this erosion phase than is here assumed. Moreover, the islands of Callantssoog and Huisduinen were not included in the calculations. In both areas the eroded area is overestimated because the present coastline was taken as the boundary in AD 1300.

From the calculated percentages it follows that the area covered by lakes in about AD 1300 in North Holland was about eight times larger than that in South Holland. In both cases the estimates are too high because the expansion of these lakes after 1300 was included in the calculations. That in North Holland the land was more open to the sea which could penetrate the peat-region explains the large size of the lakes in that area. Moreover, that region was more susceptible to lake-forming forces because it was probably reclaimed earlier than the peatbogs in South Holland, and therefore affected earlier by subsidence as a result of drainage. In about 1300 the area of the land formed by accretion in the Maas estuary amounted to no more than  $\pm 1\%$  of the overall area in South Holland.

### THE CONSEQUENCES OF THE CHANGES IN THE PHYSICAL ENVIRONMENT

In North Holland much more so than in South Holland, the changes in the physical environment must have deeply affected human society (Fig. 3). The reclamation of the peatbogs was probably not only necessary because of the increase in population that was apparent since the Merovingian Period. The area of the land that had been brought under cultivation by about 1000 AD was reduced due to the beginning of the formation of the Younger Dunes around that time. Thus the inhabitants were forced to migrate. The loss of cultivated land put pressure on the population in the unaffected cultivated regions, which resulted in more reclamation and possibly also in a more intensive use of the land

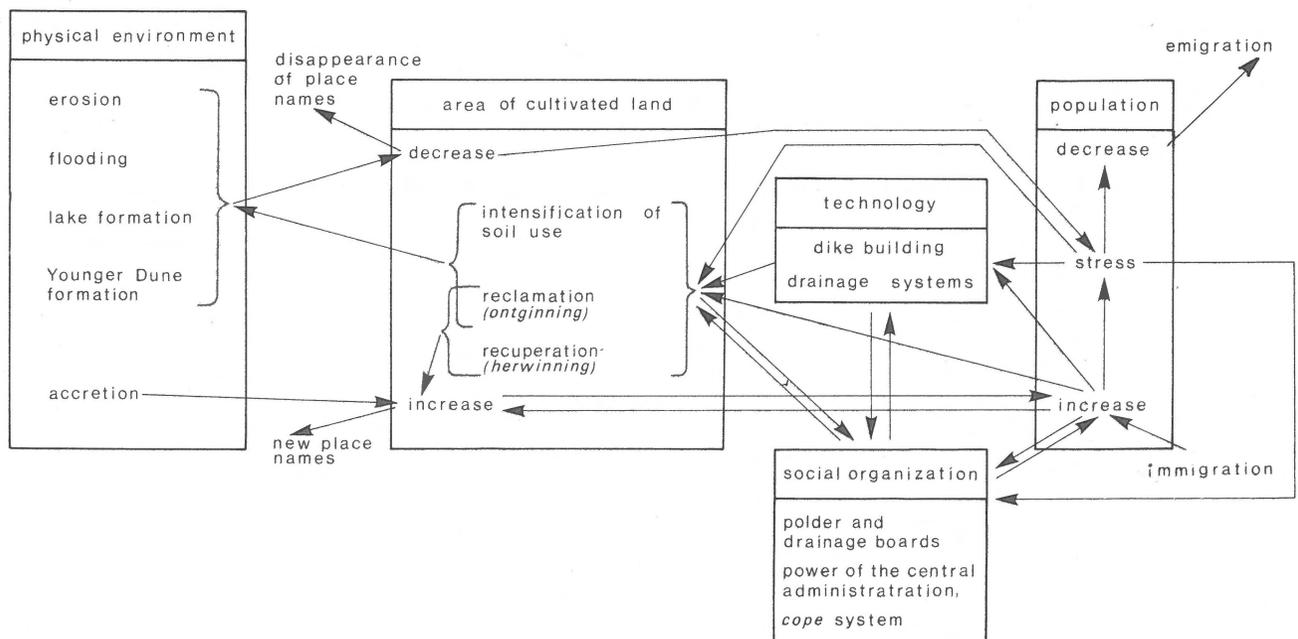


Fig. 3

Tentative model of the mutual effects of the changes in the physical environment and those of the human society. In North Holland a decrease in the area of the cultivated land and correlated effects are predominant, in South Holland the emphasis is on an increase in the cultivated area.

not covered by drift-sand in the Older Dune region. The period of drought in the second half of the 10th century (HEIDINGA, 1984, this issue) probably facilitated the reclamation of the peatbogs considerably. Favoured by good drainage, the border-regions of the peatbogs were already occupied in the Iron Age, in the Roman Period and in the Carolingian Period. Systematic reclamations, however, started in circa 1000 AD. This involved the digging of ditches and implies the existence of a certain form of social organization. These technological and social developments made it possible for the population to continue living in the peat region after a period of drought and even to continue reclamation work in that area.

#### *North Holland*

In North Holland the formation of the Younger Dunes was not the only factor affecting the cultivated land. Erosion caused the disintegration of Older Dunes north of Petten, estuaries came into existence, the Waddenzee was enlarged and the Zuiderzee formed. Partly under the influence of these developments, large lakes were formed in the southern part of this region.

These events and the resulting population pressure probably increased the rate at which the peatbogs were being reclaimed. The digging of ditches and the subsidence of the arable land caused by drainage in turn facilitated the penetration of the sea into the peat region and the expansion of the lakes. This undoubtedly had a positive effect on the techniques of dike-construction and on the formation of the necessary social organization (HENDERIKX, 1977; VAN DER LINDEN, 1982<sup>b</sup>). By the 13th century this development had made so much progress that the advance of the sea and the lakes could be arrested to a great extent. A favourable circumstance in West-Friesland was that in the "defensive retreat" a region was reached where, underneath the peat, clastic sediments lay at a rather high level. Consequently that area was less susceptible to erosion and dikes constructed in that area had solid foundations.

According to BLOK (1966, pp. 13-14; 1979, p. 135), 55% of the Carolingian place-names have disappeared in the present provinces of North and South Holland and to explain this, he postulated a change in settlement patterns. It is likely, however, that the majority of the corresponding settlements disappeared due to loss of land.

The organization of the reclamations, the protection against the sea, and the recuperation of flooded areas, made it imperative that decisions regarding these matters should be taken locally. The loss of cultivated land put pressure on the population in unaffected areas. The resulting poverty and insecurity may well have driven the West-Frisians to repeated raids on Kennemerland in the 12th century (LAMBERT, 1971, p. 110). Moreover, Friesland and West-Friesland became separated by the formation of the Zuiderzee.

These developments in the northern, West-Frisian part of North Holland, undoubtedly all helped bring an end to the power of the Count in this region. This, along with the loss of large tracts of land to erosion and floods, placed the Count's abbey, founded in the 10th century near Egmond, in a remote corner of his domain. In 1133 a new abbey was founded near Rijnsburg, at that time in the centre of the county. Not until such times when large-scale loss of land had ended and relations had stabilized in the unaffected and reclaimed regions, could the count recover his command over West-Friesland (1288/9). In view of the fact that until 1064 Holland and West-Friesland were no antagonists (BLOK, 1969, p. 357), we may perhaps assume that the great changes in the physical environment did not take place until after that time.

The fact that settlements were moved from one place to another indicates that people migrated within the region itself. Gommerkarspel, Bovenkarspel, Grootebroek, Lutjebroek and Hoogkarspel in West-Friesland were moved to the south, possibly due to the influence of the salty Zuiderzee that began to form at that time (GUIRAN & HALLEWAS, 1979). Obdam and Hensbroek and other towns were also moved, perhaps in connection with the expansion of the lakes. Many people will have emigrated from this area.

Evidence of immigrants, probably from West Friesland, was found in the peat-region in South Holland and Utrecht. One of the *cope* reclamations in South Holland, for instance, is called Friezekoop and there are records of Frisians settling near Esselijkerwoude in 1252 (VAN MIERIS, 1753-1756, no. 566); the place-name "Boskoop" is composed of a Frisian man's name and the suffix *cope*. In the region around Woerden there are remnants of a West-Frisian dialect and near Rodenrijs a typical West-Frisian tax, the *Vronescout*, is found. The *Vriesen lant* near Nederlangbroek implies that West-Frisians also moved to Utrecht (BLOK, 1959, p. 26; VAN DER LINDEN, 1982<sup>a</sup>, p. 69).

#### *South Holland*

Loss of land played a much smaller part in South Holland. VAN DER LINDEN (1982<sup>a</sup>, p. 74) assumed an interruption in the reclamation activities that were caused by marine flooding in the second half of the 12th century. However, South Holland had suffered greater damage from floods in the first than in the second half of that century. Thus it is improbable that flooding caused a possible interruption of the reclamations.

Significant recuperation of flooded areas was carried out in the Westland, north of the Maas estuary, and near the mouth of the Oude Rijn. In South Holland the emphasis lay on the enlargement of the cultivated area and on increase of the population. The reclamations not only attracted inhabitants of the "Old Country", but also immigrants from regions such as West-Friesland, seriously affected by floods and related developments. Emigrants also moved from South Holland to northern Germany. The increase of the population possibly

also played a part in this. In any case the reclamation system of the *cope* was a good "export article" (VAN DER LINDEN, 1982<sup>a</sup>, p. 69).

The impact of changes in the physical environment here was much smaller than in North Holland; this helped the Count to exercise his rights over those parts of the peatbogs that had not yet been reclaimed and to regulate the reclamation activities in the form of the *cofes*. This strengthened the position of the central administration (VAN DER LINDEN, 1982, p. 74). The population growth increased the military and financial resources. The development of towns in the 13th century was a logical consequence.

## CONCLUSIONS

1 – The changes in the physical environment in the period AD 1000-1300 affected a far greater area in North Holland than in South Holland.

2 – In both provinces especially those areas were affected that were inhabited at least since the Carolingian Period.

3 – The disappearance of Carolingian place-names was largely due to these changes.

4 – Loss of land probably led to an acceleration in reclamation activities.

5 – The changes in the environment probably were an important incentive for innovations in technology and in social organization.

6 – Social instability caused by these changes played an important part in the conflict between the West Frisians and the Count of Holland.

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