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History continuous: Drowning and desertification. Linking past and future in the Dutch landscape

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ABSTRACT

Whether people like it or not, landscapes change. Accepting this and understanding processes of landscape change are prerequisites for the maintenance and development of specific landscape- or 'natural' values. This paper discusses the relevance of landscape historical information and insights to the management of landscape change. The focus is on the Netherlands, especially the Pleistocene inland part of the country and on the period 1000BP - present. Two dominant (seemingly contradictory) long-term processes of landscape change can be distinguished: drowning and 'desertification' (severe land degradation). Both will be outlined. The first of these historical processes, 'drowning', is also highly relevant to one of today's most pressing topics: how to cope with the consequences of climate change. Long-term studies of landscape formation processes and the associated landscape dynamics can provide essential contributions to the formulation of historically acceptable solutions to current challenges and problems, and to the dissociation of processes of policy making, planning and decision from current fashions. Linking the so-called 'Landscape Development Plans' to research guided by the concept of 'landscape biography' proves to be an effective strategy to achieve this. Insight into the long-term history of people and landscapes can effectively inspire and shape future developments, especially on a regional and local level.

1. Introduction

Any landscape *"is dependent on human and social processes that cannot always continue or on ecological interactions which do not exist in a vacuum but as part of the humanly-modified biosphere that continues to be modified"*. This is a quotation from a paper presented by Graham Fairclough in Ljubljana in 2006 during the Council of Europe Workshop for the Implementation of the European Landscape Convention (Fairclough, 2006, 41-43). Whether people like it or not, 'landscape' cannot be protected. Any landscape ('landscape' being defined as…..: an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors': Council of Europe, 2000) is inevitably and constantly changing under the influence of human and natural factors and the complex interaction between them. '*Mobilis in Mobile*' ('changeable in a changing environment') was the motto not only of Jules Verne's Captain Nemo but also of Dirk Sijmons, one of the leading Dutch landscape architects and a former national advisor on landscape. In the words of Freek Coeterier, the Dutch founder of the study of landscape experience: *"Fixation makes you step outside reality, outside the flow of culture"* (Coeterier, 2000).

Accepting that change is inevitable and understanding the processes behind it is essential for any effective maintenance and development of specific landscape or nature values. For landscape change can indeed be managed, even sustainably, and the continuation of appropriate forms and practices of land use can be a realistic target. However, whether or not this is successful depends on, first, an identification of, and then a thorough understanding of the processes, past or present, that are active (Fairclough, 2006, 42). To neglect to do so is hazardous. As the Dutch art historian and landscape architect Willem Overmars recently put it when discussing nature development: *"Disrupting the historical continuity and neglecting authentic morphological and ecological processes severely threaten the coherence, spatial quality and cultural/natural unity of our landscape"* (Overmars, 2010, 45). An awareness of such threats lies behind the increasing prominence of the position of landscape historical research within heritage management. Therefore I believe research for the purpose of archaeological heritage management should be guided by the following three main issues:

1. Present-day challenges. The focus there is always on specific current issues, problems and demands, an approach which requires research in fields where science and policy meet, especially spatial policy.

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2. Present-day landscapes. What are the historical roots and the underlying processes of today's landscapes, and how can they be explained?
3. Preserving historical integrity. How can processes of landscape change be managed while respecting the past? What additions and alterations, forms and patterns make sense from a historical point of view? How can a landscape's 'identity' be strengthened?

Answering such questions requires targeted landscape archaeological research, including both natural and cultural developments.

In this paper the focus will be on the Netherlands, especially the Pleistocene inland part of the country and on the period 1000BP – present.

2. Managing change

To illustrate how this works out in practice, I will draw on recent research into the landscape history of the eastern Netherlands (Van Beek and Keunen, 2006; van Beek et al., 2008; van Beek, 2009). The focus will be on 'drowning' and 'desertification'. It has been established that these two processes increasingly influenced both the physical appearance of, and forms of land use within the sandy landscapes of the interior of the country from late prehistory onwards. The guiding principle was the concept of 'landscape biography', a concept that is frequently used in modern Dutch landscape studies because it enables researchers to describe a landscape not only as a physical, but also as a social and a mental reality. This is important, for a multiple reality is precisely what a landscape, any landscape, represents (Jacobs, 2006). In the course of this paper the geographical scope will be widened to include other parts of the country, after which it will return to the regional level by presenting a case study that includes suggestions concerning the use of landscape historical data and insights.

The impossibility of landscape protection in the sense of 'preserving it unchanged forever' does not in any sense diminish the value of attempts to protect specific valuable landscape elements or (relatively small) areas, provided the conditions necessary for long-term preservation can be guaranteed. The suggestions made in the case study range from general to very practical. After all, many landscapes are shaped predominantly by economic forces. Probably the best guarantee for the preservation of specific landscape values is maintaining their usefulness: landscape as commodity.

In addition to a thorough understanding of the processes involved, inventories and assessments of existing objects and structures remain crucial to the effective management of historical landscapes. A strategically clever mix between process management and management action aimed at preservation is the key to this.

3. Two dominant processes of landscape change

3.1. Drowning

For millennia, rising groundwater levels and increasingly waterlogged conditions, or 'drowning', have been fundamental processes affecting Dutch landscapes and land use, not only in the low-lying coastal zone but also in the somewhat higher Pleistocene parts of the country (Fig. 1). As a result of this 'drowning' process, mires and bogs developed and expanded, and especially after ca. 6000–7000 cal BC (i.e. the Atlantic period) substantial parts of the research area became overgrown by peat, particularly towards the present German border in the northeast (Fig. 2). Here, along both sides of the border, stretched the immense *Bourtanger Moor*. The total area covered by raised bog in Lower Saxony (Germany) and the Netherlands amounted to about 1,000,000 ha at its maximum (e.g. Tacke and Lehmann, 1912, 22; Brühne, 1952). According to C. Sprengel, one of the few scholars who described these immense mires in their heydays, the thickness of the peat layers sometimes exceeded 10 m (Sprengel, 1827, 537, 543). Peat bogs were essentially deserted places. An anonymous witness to the founding of a monastery in AD1403, in the middle of a vast bog near Sibculo, stated: "We started at this place, I say, because it had been horribly deserted and uninhabited since the beginning of the world, for we did not see the least sign that any human being had ever lived here. The place was also very wet, so that we had difficulty getting from one spot to another…." (As cited by Van Haaff, 1977, 15). In addition to the large raised bogs, there were many smaller ones, most of which had already disappeared by the time the first detailed maps covering most of the area were produced (late 18th century). Ca. 30% of the Achterhoek region was covered by smaller bogs (Fig. 3), as could recently be demonstrated on the basis of field names, soil types and historical sources (de Rooij, 2006; van Beek, 2009).

Causes for the expansion of bogs included a surplus of precipitation, poor drainage and, especially near the coast, rising sea levels. In general, peat formations are progressively younger the further they are situated from the coast (Petzelberger et al., 1999). A good example is the rapid expansion of bogs along the edge of the Frisian-Drenthian plateau in the north of the Netherlands. Here, from the Subatlantic onwards, large areas which had been settled until the Iron Age became overgrown by peat (Fokkens, 1998; Waterbolk, 2006), partly as a result of climatological changes (van Geel et al., 1996). It seems that this reduction in the total area of land that was suitable for settlement did not proceed evenly (Groenendijk, 1987; van Geel et al., 1996). A relatively dry period between AD500 and 1300 possibly slowed down the process (Streefkerk and Casparie, 1987, 24). Locally, the surface covered by bogs seems to have increased right up to the beginning of large-scale drainage, commercial peat cutting and subsequent reclamation, which in the Eastern Netherlands and adjacent parts of Germany did not start until the middle of the 16th century (Westerhoff, 1936, 35–36; Brühne, 1952; Borger, 1992, 160–164, 17; Gerding, 1995). This is much later than in the coastal wetlands in the west and north of the country (10th–12th centuries; Henderikx, 1989; Leenders, 1989; Borger, 1992; de Bont, 2008) but earlier than in the south-eastern Peel area, where it did not begin until 1830–1840 (Joosten, 1991, 93).

To some extent the terrestrial inland wetlands that are under discussion here differed from coastal wetlands (de Bont, 2008; Bazelmans et al., 2011). In general peat lands along the coast were more diverse both in terms of landscape and soil chemistry. In places they were somewhat richer and well-drained. This explains why coastal wetlands were settled and reclaimed relatively early.

Initially the causes of the 'drowning' process were natural ones, but from the Iron Age onwards human interference with the landscape had an increasingly important effect. Rapid deforestation during this period contributed to a rise in groundwater levels (Buishand and Velds, 1980; Dolman, 1988; Spek, 2004, 116–119), which probably accelerated during the Middle Ages (Bork et al., 1998, 2003) when much of the surviving woodland - predominantly in low-lying areas, which cover more than 50% of the research area - rapidly disappeared (Groenewoudt et al., 2007). Obviously these flat, low areas were particularly affected by rising groundwater levels, since there even a small rise resulted in significantly wetter soil conditions, which in turn stimulated peat growth. On the Holocene coastal plain the cutting and dredging of peat for heating and salt production (Dutch *'moernering'* and *'selnering'*) led to erosion, which quickly converted land into constantly

expanding lakes. The Wieden area along the edge of the former Zuiderzee in the centre of the Netherlands is a good example. Here, large-scale peat extraction from the 16th to the early 20th century not only resulted in large lakes (Fig. 4) but also led to the submersion of entire villages, such as Beulake in 1776. Large-scale peat extraction also made coastal wetlands even more vulnerable to marine flooding.

Because of continuous subsidence and oxidation of peat soils (both processes a result of drainage) in combination with rising sea levels, the peat areas became increasingly waterlogged, which had an adverse effect on their agricultural potential. (de Bont, 2008; van Tielhof and van Dam, 2006) (Fig. 5).

The drainage of lakes and bogs has a long history in the Netherlands, as does the battle against floods, in which the - typically Dutch - district water boards (regional water authorities) played an important part from the 13th century onwards (Raadschelders and Toonen [eds.] 1993). Their efforts were not always effective. "That the Rijnland Regional Water Authority, the body charged with flood defence, received a significant part of its funding from peat cutting – a major cause of land loss – is somewhat ironic" {Rippon (2008), reviewing 'Water management, Communities and Environment. The low Countries in comparative perspective, c. 1000- c. 1800 (Greefs and 't Hart, eds., 2006). Their efforts were not always effective. "That the Rijnland Regional Water Authority, the body charged with flood defence, received a significant part of its funding from peat cutting – a major cause of land loss – is somewhat ironic" {Rippon (2008), reviewing 'Water management, Communities and Environment. The low Countries in comparative perspective, c. 1000- c. 1800 (Greefs and 't Hart, eds. 2006)}.

The process of reclaiming the peat areas lasted roughly a millennium, (from ca. AD950 to 1950). Hydraulic projects such as the construction and improvement of dikes accelerated from the 11th to 12th century onwards and from the 16th to the 19th century many lakes in the west of the Netherlands were drained and converted into agricultural land ('polders'). Less visible but profoundly affecting most forms of land use, and therefore the landscape, was the large-scale artificial lowering of groundwater tables between ca. 1890 and 1985, which took place in the context of re-allotment schemes (Van den Bergh, 2004).

3.2. Desertification

'On a great and desolate heath, there stood both broom and juniper, as high as any man. Walking there was toilsome, for sand, as you should know, had been carried by the wind across the heath,

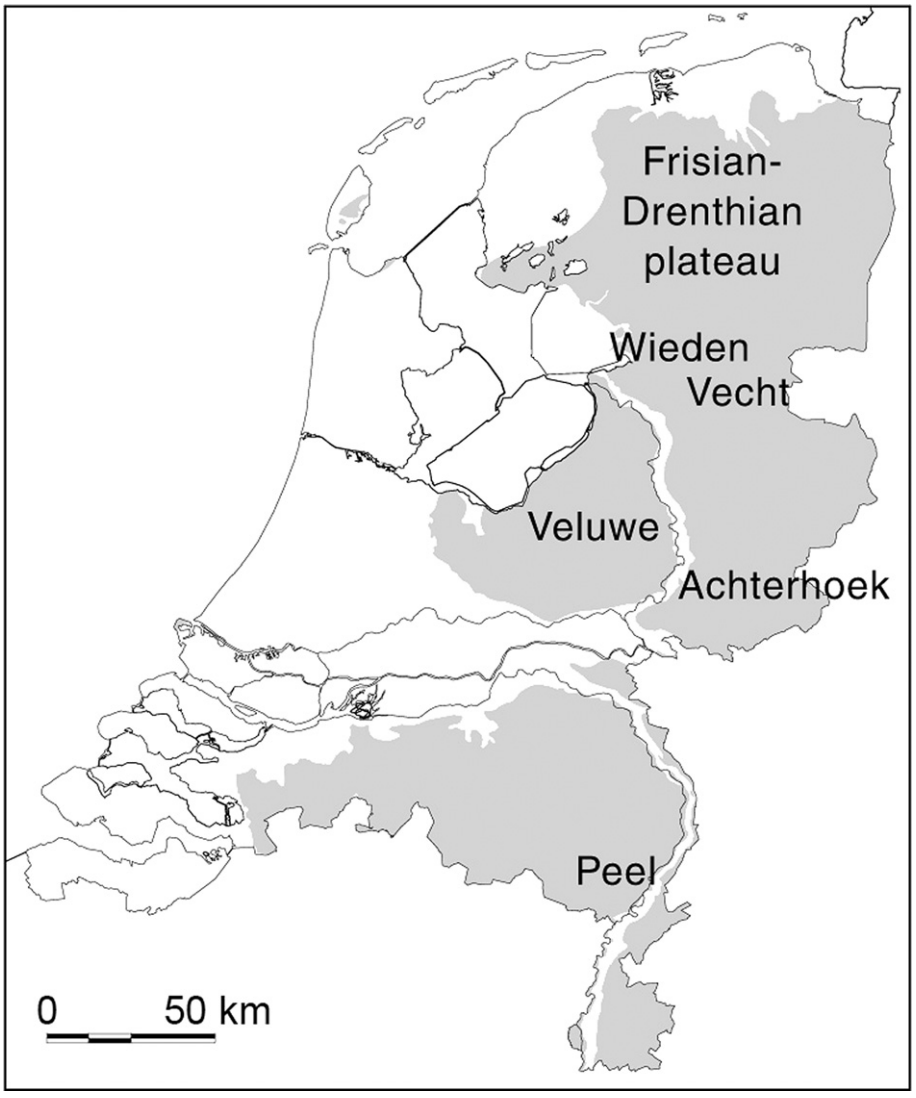

Fig. 1. The Pleistocene areas of the Netherlands (indicated in grey) and regions mentioned in the text.

covering it entirely, four foot deep. It is certain, I would think, that there no other grass or herb, has ever sprouted from the earth, except for broom, juniper and heather.' (Early 14th-century 'Roman van Heinric en Margriete van Limborch', X, 49–50; translated passage as cited in Heidinga, 1987, 131).

In the higher and drier parts of the Dutch sandy areas, an opposite development occurred. Here, deforestation and intensive agriculture ultimately led to substantial soil degradation as nutrients leached out, and especially from the Bronze Age onwards (after ca. 1500BC) heather vegetation expanded. Around the middle of the 19th century, over half of the eastern Netherlands was covered by stretches of virtually treeless heath and heather-grass vegetations typical of poor soils (*Stichting Wetenschappelijke Atlas van Nederland*/Scientific Atlas of the Netherlands Foundation, 1984; Demoed, 1987, 76–78). These barren landscapes were a direct result of intensive sheep farming between the 15th and the 18th-19th centuries (Spek, 2004) (Fig. 6).

Soil degradation and agricultural exploitation, including overgrazing and the large-scale cutting of sods as fertilizer, caused sand to drift as early as the late prehistory, but the process intensified during the Middle Ages (Koster, 1978; Castel, 1991; Lascaris, 1999). This also happened in similar sandy landscapes in northern Germany and Poland (Castel, 1991; Hilgers, 2007). The frequent use of traffic routes, of which the international Hessian roads of the 17th and 18th century are good examples, also either triggered or at least intensified the drifting of sand (Sloet Baron, 1859; Heidinga, 1987, 229–232; Horsten, 2005) (Fig. 7). Increasingly, adjacent fields and settlements were threatened by encroaching driftsand, and around the middle of the 19th century sand drifts had become a common phenomenon, covering a total of ca. 80.000 ha of the Pleistocene sandy soils in the Netherlands (Koster, 1978, 17; Koomen et al., 2004, 159). Locally they had become very extensive, especially in the central Dutch Veluwe area where they covered more than 11.000 ha (*Statistiek der Veluwsche Zandverstuivingen*/Statistics of the Veluwe Driftsands. 1843, 508–514). There is conclusive evidence that driftsand contributed at least in part to the abandonment of settlements as early as the Middle Ages. The settlement of Kootwijk was deserted as early as the 10th century, probably as a result of increasing desiccation and encroaching driftsand (Heidinga, 1987). The settlement of *Lisiduna* (Oud Leusden) was relocated in the 13th century, probably for the same reasons (Van Doesburg, 2009, 192).

In the Pleistocene east of Netherlands, the earliest evidence for a reactivation of sand dunes by (probably) human activities dates to the Middle or Late Bronze Age (1800–800BC, van Beek, 2009, 499–503), but the vast majority of sand drifts are much younger. In the Veluwe area, there is clear evidence that driftsand occurred during the Early Middle Ages (Heidinga, 1987, 131–150), but most Veluwe sand drifts probably date after the 12th–13th centuries. The earliest historical sources that mention them date from the 14th century (Wartena, 1975, 33–34). In the province of Drenthe, the date of the earliest sand drifts is believed to be similar (Spek,

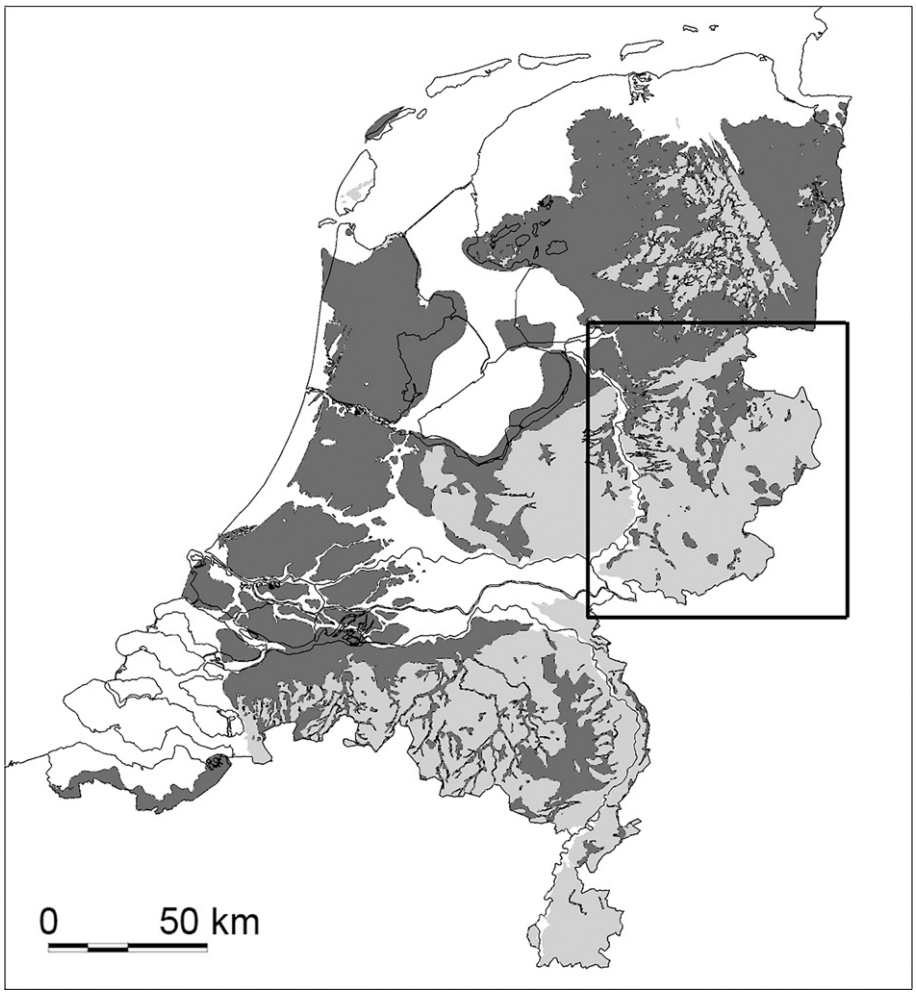

Fig. 2. Maximum expansion of mires and bogs (indicated in dark grey) in the Netherlands, AD800 (after Vos, 2009); Light grey = Pleistocene areas; Fig. 3 in rectangle.

2004, 174). Along the river Vecht, the earliest records date from the 16th century (Bruins, 1981), but there is conclusive archaeological evidence that the process of drifting sand began before the 11–12th centuries (Groenewoudt, 2009, 154).

Sand drifts were certainly more common than modern soil maps suggest. Many former sand drifts are now hidden underneath thick agricultural layers, the so-called *Plaggen Soils* (Pape, 1970), that essentially formed during the post-medieval period (Spek, 2004, 965). Various authors believe that in addition to human action, climate was also an important factor in the origin and expansion of sand drifts (Heidinga, 1987, 131–150; Koomen et al., 2004).

From the 16th century onwards, attempts were made to fix or at least control sand drifts. However, the expansion of the larger ones only came to a halt during the late 19th-and early 20th centuries, when the government introduced large-scale measures to that purpose. The conversion of heath and other degraded land into good farmland only became possible after the introduction of artificial fertilizers, also in the late 19th century.

To summarize, during prehistory, and increasingly from the Middle Ages onwards, the processes of drowning and desertification strongly influenced the Dutch landscape. Rising groundwater levels led to an expansion of wetlands and stimulated the formation of peat, which increasingly encroached upon agricultural land. At the same time, high and dry areas suffered from soil exhaustion and wind erosion. Large stretches of land became increasingly 'marginalised'. Of course, the term 'marginality' is highly subjective when applied to landscapes (Svensson and Gardiner, 2009). What is seen as marginal not only depends on the environmental but also on the cultural context, i.e. the mode of existence and the preferences of a specific group of people. Landscape 'marginality' can be approached in at least four different ways: economic, geographical, social and cognitive (Groenewoudt, 2009, 149–150). In addition, the definition of marginality varies with time. In this paper, marginality refers to biological and agricultural productivity. Insofar as the changes described above occurred quickly enough for people to have been keenly aware of them, they were likely to be perceived as negative. However, the agricultural system adapted to the changing environmental conditions and gradually grew to depend on the availability of vast stretches of poor soils, mostly as common land. Others, however, regarded those same areas as a regrettable waste of space, and indeed literally as waste lands. The existence side by side of these two opposite views slowed down the partitioning and reclamation of common land up to until the middle of the 19th century.

The attitude towards raised bogs was the first to change, and the new attitude seems to have been widely shared. The realisation that these 'worthless' bogs could offer a solution to an acute shortage of fuel after ca. 1600 greatly contributed to their rehabilitation, at least

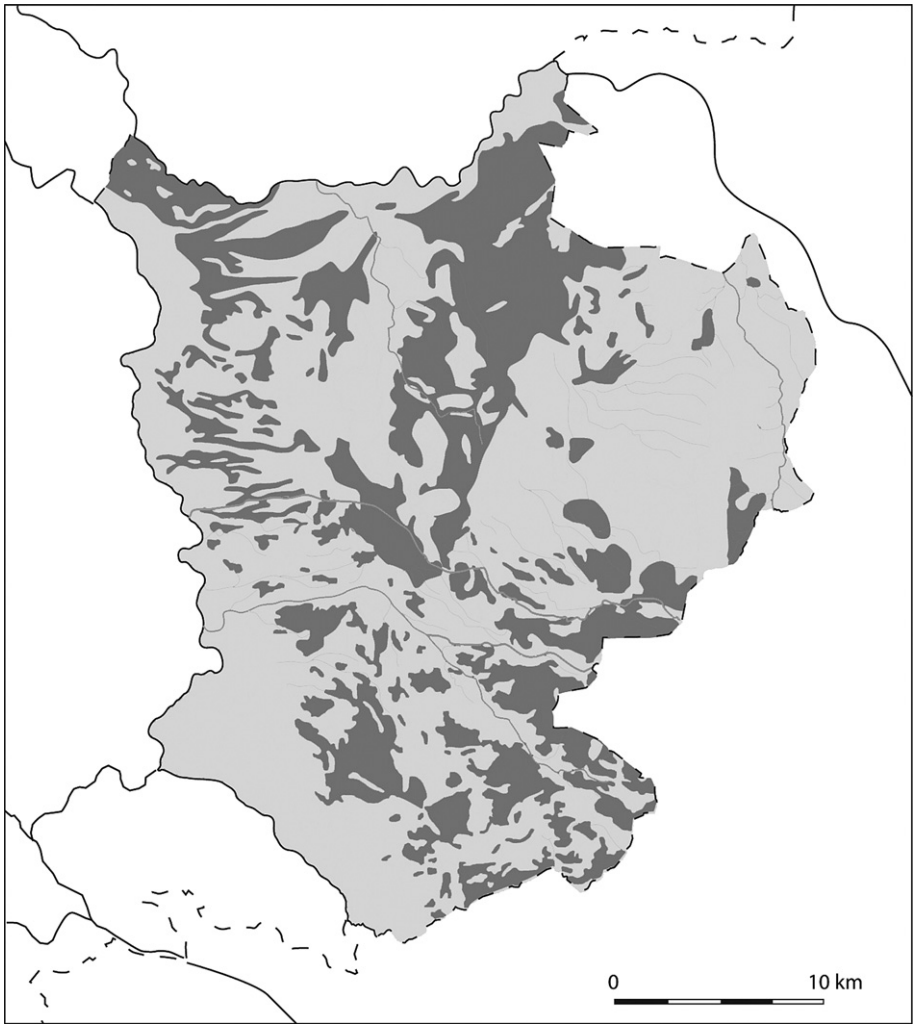

Fig. 3. Former mires and bogs in the eastern Netherlands (after de Rooij, 2006; van Beek, 2009); Legend as in Fig. 2.

Fig. 4. New lakes like 'the Wieden' being created by the cutting and dredging of peat. 'the 'Wieden' came into being between the 16th and early 20th centuries (topographical map 1850, scale 1: 25.000, original field registration).

economically. As the German scholar F. Arends wrote in 1818: *"The bogs…..are God's most generous gift to a nation that has no wood"* (cited by Westerhoff, 1936).

4. A reverse development

Illustrative for the changing and often conflicting ways in which people perceive their environment is a development that in the Netherlands gained momentum since the late 1980's (van der Windt, 1995). Shortly after the sand drifts had finally been brought under control, 'waste' land had at last been reclaimed, many lakes had been drained and filled in, and groundwater tables had been artificially lowered to enable intensive agriculture nearly everywhere, a remarkable and actually reverse process began to manifest itself: a process starting with the re-valuation of waste lands. It merged with the already ongoing transformation of the Dutch countryside from a merely agricultural space into a multifunctional one, space where society pursues growing ambitions towards (among other things) landscape and nature. It had also became increasingly clear that the large-scale lowering of groundwater tables has substantial negative side effects as well, that are made worse by the accelerating rate of groundwater extraction made necessary by an increase in drinking water consumption. During the increasingly hot and dry summers of the last decades, desiccation caused by draining agricultural land (too) deeply resulted in considerable economical damage as well as damage to forests and nature. Drastic action was necessary to counteract these problems and to improve groundwater management.

Pursuing increasingly 'green' ambitions has already led to the mechanical removal of the cultivation layer from thousands of hectares of farmland, in order to restore ecosystems that are bound to poor or wet soils. Elsewhere, agricultural land is being inundated in order to re-create marshland, 'wet nature'. Furthermore, thousands of hectares of forest have been or will soon be cleared in an attempt to revitalise and expand the few remaining active sand drifts, which are now being regarded as precious nature reserves, or in order to clear heath land that has become overgrown by trees (e.g. Bal et al., 2002; Koomen and Maas, 2009; Reijnen et al., 2010). Once more 'drowning' and 'desertification' occur on a substantial scale, but this time they are deliberate and human-made. Reliable over-all figures concerning the total surface area that is involved are not available (for the general trend, see Planbureau voor de leefomgeving 2009), probably because the background of these activities widely varies and a multitude of actors is in charge. That such measures can be carried out, by various authorities, nature preservation organisations and water boards, shows that they are being widely supported, both by the political elite and by society at large. They are, however, not uncontested. The ongoing and passionate debate about the future of the coastal Hedwigepolder (reclaimed 1904–1907; Renes, 2009) clearly illustrates the ingrained Dutch reluctance to give back land to the sea for whatever reason. Serious conflicts broke out in several places between local residents and the authorities concerning the conversion of agricultural land

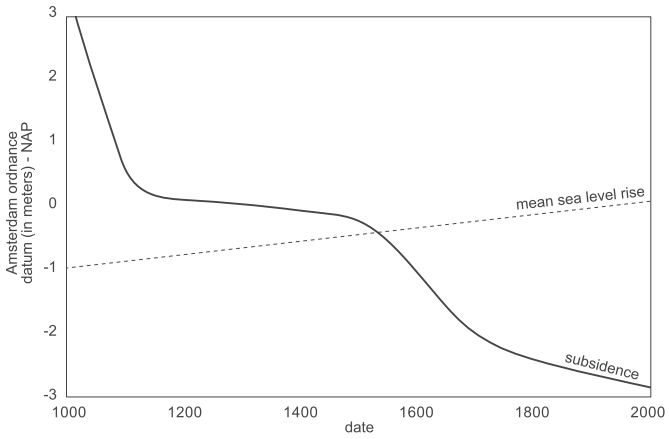

Fig. 5. Sea level rise and subsidence in western Netherlands peat areas over the last 1000 years (after de Bont, 2008, Fig. 68. Simplified version).

Fig. 6. As a result of ongoing soil exhaustion between the 15th and 19th centuries open heath land became the dominant type of vegetation in much of the sandy, Pleistocene parts of the Netherlands (photo: Veluwe area, Central Netherlands).

into 'wet nature', one example being the 19th Century Horstermeerpolder where residents 'declared their independence' from the Netherlands, in protest against the deliberate inundation of land. This is landscape as social reality *in optima forma*. In recent years debate between supporters and opponents of creating 'new nature' on a large scale is becoming increasingly passionate. Political support (and financing) is no longer something obvious.

The creation of so-called 'new nature' increasingly has an important secondary - and sometimes primary - objective: solving problems caused not by a water shortage, but by an excess of water. Along the North Sea sea levels have been and will be rising (e.g. Vink et al., 2007; Van de Plassche et al., 2010), within the last century probably accelerated by the consequences of climate change (Parry et al. (eds.) 2007). Increasing discharge peaks in the main rivers and torrential rainfall are equal threats. To cope with these challenges, water basins and other water storage facilities are being created on a large scale, preferably in places were sand and gravel extraction not only make hydrological and ecological sense, but are also economically viable, and perhaps even profitable. Along the main rivers, an estimated 20.000 ha of land have already been converted into depressions or water basins, or will be so in the near future. The main programme coordinating these activities is called '*Ruimte voor de Rivieren*' ('Make way for the Rivers'). In other areas, water and wetlands are being reintroduced into the landscape, replacing the numerous lakes and bogs that had disappeared there only recently. Many people regard the digging and dredging that accompanies this as an unacceptable infringement on the landscape. From a historical point of view, however, what is happening now is merely another expression of the highly flexible and adaptive ways in which the inhabitants of coastal countries and wetlands have since prehistoric times (e.g. Bazelmans et al., 1999; Gerrets, 2010) dealt with the effects of water. In her inaugural lecture (2010, VU University Amsterdam) professor Petra van Dam described this flexible-response way of live as 'amphibious'. It expresses itself physically in the building of dwelling mounds and dikes, and the construction of drainage systems. A topical example (2011), also of the growing social necessity to reach creative compromises, is the rebuilding of farms on new dwelling mounds in the Overdiepse polder near the town of Den Bosch. To prevent the town from being flooded the polder had been designated for temporary water storage during incidental flood events. The polder however will keep its agrarian function.

Moreover, from a perspective of landscape history, the current developments are not only logical but also sensible and in many ways an enrichment of the present situation. Current measures involve the reintroduction of exciting characteristics of past landscapes: water will once again visually dominate a landscape that is an intricate mosaic of land and water, wet and dry. Organically shaped landscapes, that had all but disappeared, will exist once more; landscapes characterised by curved lines instead of straight ones, and fuzzy borders instead of sharply defined ones. Variations in relief, now largely erased by levelling, will become visible again, and there will be room for natural processes such as erosion, albeit under strictly defined and controlled conditions.

In general, the scale on which such landscape modifications are carried out has a great impact on their appreciation by the public, regardless of their specific character, largely because smaller modifications blend in more easily with the existing landscapes people are familiar with (Fig. 8).

5. Guiding future developments

(Micro) regional and municipal administrative levels offer the best opportunities to influence processes of change, and to contribute effectively to the formation of the landscape of the future. There are several reasons for this: 1. Micro regions and municipalities form the optimal scale for research into landscape biographies; 2. At these levels, local involvement, expertise and support can most easily be drawn upon; 3. During the last few years, many of the discretionary powers with regard to spatial planning have been delegated to the municipalities.

Linking so-called 'Landscape Development Plans' and research guided by the 'landscape biography' concept has been proven to be an effective strategy (Baas et al., 2011). This can be illustrated by discussing in more detail a section of the 'Achterhoek' region in the east of the Netherlands, an area that is rapidly being transformed from a predominantly agricultural area into the multifunctional eastern rim of the western Dutch 'Delta metropolis'. Currently the area is also increasingly becoming a transit zone between Rotterdam harbour and the growing markets in the east, especially in Eastern Europe. These developments are accompanied by major changes which in turn have important effects upon the landscape. There is a growing demand for recreational and housing facilities, water management offers multiple challenges, and agriculture is undergoing rapid changes as well. Creating a national ecological network (*Ecologische Hoofd Structuur: EHS*)(Ministerie LNV, 1990, Jongeneel et al., 2008) to maintain biodiversity involves nature

Fig. 7. Sand Drift 'De Pollen' (Veluwe area). The nearby Kootwijkerzand is the largest of the few remaining active inland sand drifts in north-western Europe (Photo Elly Waterman, 2005).

development as well as the designation of several National Landscapes. Furthermore, there are plans for the development of 'new country estates'.

The interdisciplinary Eastern Netherlands Project of Wageningen University and the RCE was initiated to study in-depth, and for the first time, the landscape history of the area and to generate ideas and tools that will help to keep its past survive in a rapidly changing environment (Beek and Keunen, 2006; van Beek et al., 2008). The participants in this project included municipalities, counties, water boards and nature conservation organisations. The new expertise generated by the Eastern Netherlands Project is now being applied to processes such as the drafting of new Landscape Development Plans (LDPs) and will subsequently take shape in actual projects. For the LDP encompassing the municipalities of Bronckhorst, Lochem and Zutphen (Ziel and Baarslag, 2008) this process has already been initiated through local workshops. The results of these indicated that there is much local interest in the – unexpected - degree to which the landscape appeared to have been dynamic, and in the previously unknown 'chronological layers' in its history. Knowledge of these forgotten landscapes of the past provides unforeseen and challenging opportunities to shape the landscape of the future. Raising awareness and making use of past landscapes can also facilitate transformation processes, by helping to communicate the incontestable fact that landscapes constantly and inevitably change. There is a widespread misconception, even amongst administrators and landscape designers, that the landscape of the good old days was 'ancient and unchanging; the myth of the timeless landscape' (Spek, 2004, 18–22). This image of a small-scale, 'traditional', 'Arcadian' landscape (which in fact was a –(partial) reality only from ca. 1850 to ca. 1950) is still virtually the only point of reference used whenever new projects that involve landscapes are being designed, in contrast to the evolution in landscape change that took place over the last millennium.

6. An example: using the past landscape of '*Berlewalde*'

The forgotten medieval wilderness of *Berlewalde*, for instance, is potentially a powerful source of inspiration to give shape to new local developments within the context of an LDP (Fig. 5). *Berlewalde* (the name is a *pars pro toto*) once covered much of the low-lying and formerly marshy centre of the Achterhoek region (Groenewoudt et al. 2007; Groenewoudt and Keunen, 2008; van Beek, 2009, 490–493, Keunen, in preparation). Nowadays this area is predominantly pasture, used intensively for cattle breeding and milk production. The landscape is flat, parcelled out in large sections, and open. It formed after the vast, virtually treeless commons of the 17–18th century had been partitioned (19th century) and subsequently re-allotted and settled (20th century).

Until well into the Middle Ages, however, the area looked radically different. Then it was a sparsely populated landscape covered by a mosaic of raised bog, marshes, dense woodland (predominantly alder carr), wood pasture (*Hudewald*), coppice, shrubs and patches of semi-natural grassland. Surface water was present as small streams and pools but also - periodically - in the form of submerged land. Habitation was for a long time restricted to a few isolated sandy ridges and to the banks of the river Berkel that runs through the area from east to west. *Berlewalde* initially had a spectacular fauna: brown bear, elk, red deer, roe deer, wild boar, wolf, beaver, common crane etc. Historical sources up until ca. AD1500 even mention the herding of 'forest horses' and 'wild horses.' The area was being reclaimed from the 13th century onwards. The last scraps of woodland, along streams, disappeared in the 17th–18th centuries although some may have survived longer. Sand drifts existed on some of the rare stretches of raised ground, such as at Zelhem – 't Zand ('The Sands') where a high bank protected fields against drift sand.

Berlewalde has the potential to become an attractive new historical reference point, a source of inspiration for the realisation of current policies concerning water management and nature conservation, and certainly for the development of recreation and tourism and the establishment of so-called 'new country estates'. What is listed below is merely meant to give an impression of how varying these possibilities are. General ideas that may me used to guide spatial planning and landscape design alternate with more practical and easily applicable plans.

Fig. 8. '*De Doorbraak*' ('The Breakthrough'), a brand-new eventually 13 km long canal carefully designed as a natural stream. Its main purpose is to solve the increasing water problems of the nearby town of Almelo (province of Overijssel). As a stream it is completely a-historical. It is historically authentic, however, in the sense that its construction fits in a long tradition of water management. Because of its limited size and linear shape the project could be realized while respecting the morphology and scale of the existing physical-geographical landscape (Photo District Water Board '*Regge en Dinkel*', 2008).

1. In a combined effort spatial planning, landscape architecture and nature development could try to create a deliberate contrast (polarity) between the highly domesticated and planned modern landscape and the older, more chaotic and mysterious *Berlewalde* wilderness;
2. With its physical characteristics (mosaic) and 'morphological language' (curved lines, fuzzy borders) *Berlewalde* could become an authentic and inspiring frame of reference for nature conservation, nature development and water management (Fig. 9);
3. This 'morphological language' (see above) and its accompanying diverse and park-like landscape particularly evoke the 18th-century English landscape garden (Hunt, 1992; Liard, 1999), which could be used as a soundly historical reference point for the creation of 'new country estates';
4. To counteract depopulation of peripheral regions like the 'Achterhoek' concepts like *Berlewalde* could be used in 'regional branding': persistently promoting the areas name, uniqueness and attractiveness. Local support would be essential and should not be taken for granted. Local preferences and ambitions may be very different from those of urban-based authorities (e.g., Svensson, 2009);
5. *Berlewalde* would provide an ideal environment for more adventurous kinds of recreational activities, such as GPS-guided tours, trekking, horseback riding tours and survival experiences;
6. *Berlewalde*'s original structure and forms of land use are in part still recognisable in field names (ter Laak, 2005). This 'landscape language' could be drawn upon to make the current landscape easier to 'read' and to experience. Obsolete names could be reintroduced (Furwalde, Steenerewalt, Synwede etc.).
7. Disappeared but historically known woods and forests could be replanted, taking their original characteristics (structure, species, forms of management) into account and using locally indigenous species, many of which are still fairly common in the area but have become rare nationally (Maes and Rövekamp, 2002). This would also counteract imminent loss of genetic diversity (Maes, 2002);
8. In areas that were only brought fully under cultivation less than a century ago, it may still be possible to use the landscape's own 'green memory' of soil seed banks (Thompson et al., 1997) by facilitating the spontaneous regeneration of former species and vegetation types;
9. The reintroduction of semi-wild horses would fit in well with the ongoing 'horsification' of the Dutch countryside (as a result of a rapidly rising number on non-agrarian residents the number of horses held for recreational purposes has exploded). '*Wildpferde*' ('wild horses') like the ones that formerly roamed *Berlewalde* have survived in de Merfelder Bruch nature reserve near Dülmen (Germany), where they are a major tourist attraction (see e.g. www.wildpferde.de). These animals could also contribute in a historically authentic way to a grazing regime that would support nature management;
10. As woodland biodiversity partly depends on a certain degree of dynamics and disturbance (Grime, 2001; Paillet et al., 2010), resuming traditional coppicing and other historical forms of woodland management is expected to have a positive effect on the biodiversity (now declining) and 'experience value' of woodland and hedges;
11. The reintroduction of charcoal burning (terminated in 1906) could become a new tourist attraction and create an additional regional specialty ('*Berlewalde* charcoal') as well as help to make coppicing economically viable again;
12. The profitability of woodland management could also be increased by stimulating the use of locally produced wood in modern CO_2-neutral heating systems (INTERREG-Projekt-Energiequelle-Wallhecke; see www.stokenopstreekhout.nl)

7. Concluding remarks

Within a European context the Netherlands are rather exceptional. The countries regional tectonic, coastal, and deltaic position with respect to large River systems creates a unique geological

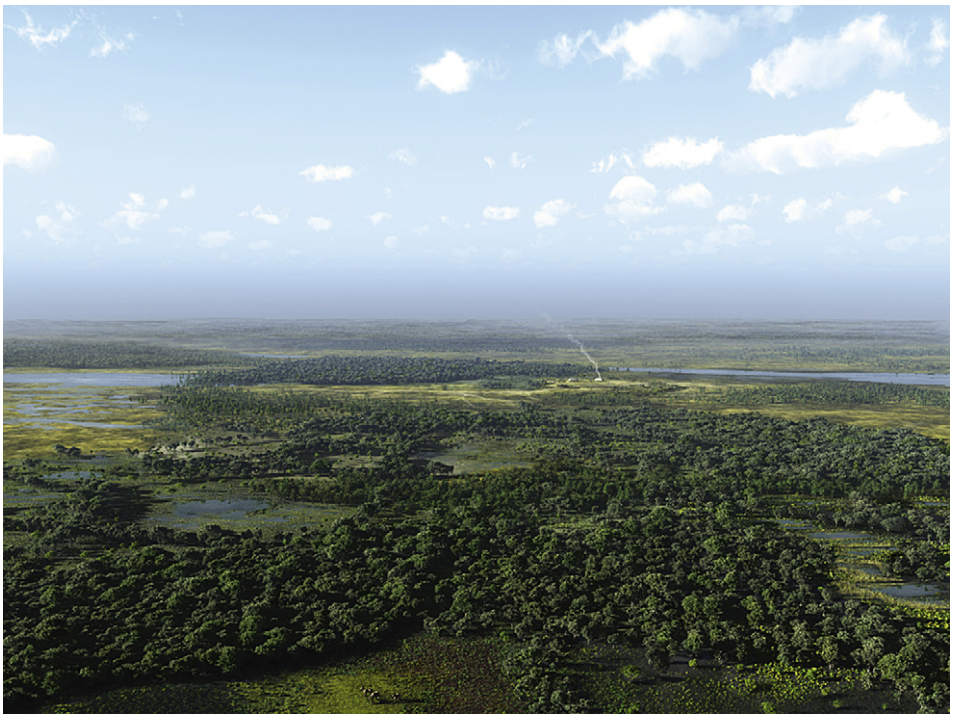

Fig. 9. A 'new' historical reference point: the medieval *Berlewalde* wilderness which covered most of the low-lying centre of the Achterhoek region in the eastern Netherlands (artist impression Mikko Kriek, BCL *Archaeological Support*).

setting (Borger et al., 2011). As a result the low-lying country is very vulnerable to flooding both by the sea and rivers. The major part of the surface consists of clastic deposits (predominantly sand and clay) and peat. Shallow bedrock is restricted to very small inland areas in the far south and east. Because of these conditions the Netherlands have also undergone dramatic changes as a result of both erosion and sedimentation, caused not only by water but also wind.

Water management has a long history. There is growing evidence of water management including the building of dikes from the Roman period onwards, or even earlier (Bazelmans et al., 1999; De Ridder, 2005) and it is hardly surprising that Water Boards originate from the Netherlands and have operated here on a far larger scale than anywhere else (Raadschelders and Toonen [eds.] 1993).

Understanding the processes behind landscape change is of vital importance, also to the management of historical landscapes. To illustrate this, two processes were discussed which for millennia played a major role in the shaping of the Dutch landscape: 'drowning' and 'desertification'. The first of these processes, 'drowning', is also highly relevant to one of today's most pressing topics: how to cope with the consequences of climate change (rising water levels and increasing discharge peaks in rivers and streams). Long-term studies of landscape formation processes and the associated landscape dynamics can provide essential contributions to the formulation of historically acceptable solutions to current challenges and problems, and to the dissociation of processes of policy making, planning and decision from current fashions. Linking the so-called 'Landscape Development Plans' to research based on the concept of 'landscape biography' proves to be an effective strategy to achieve this. Insight into the long-term history of people and landscapes can effectively inspire and shape future developments, especially on a regional and local level.

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