Typology of the Lowlands

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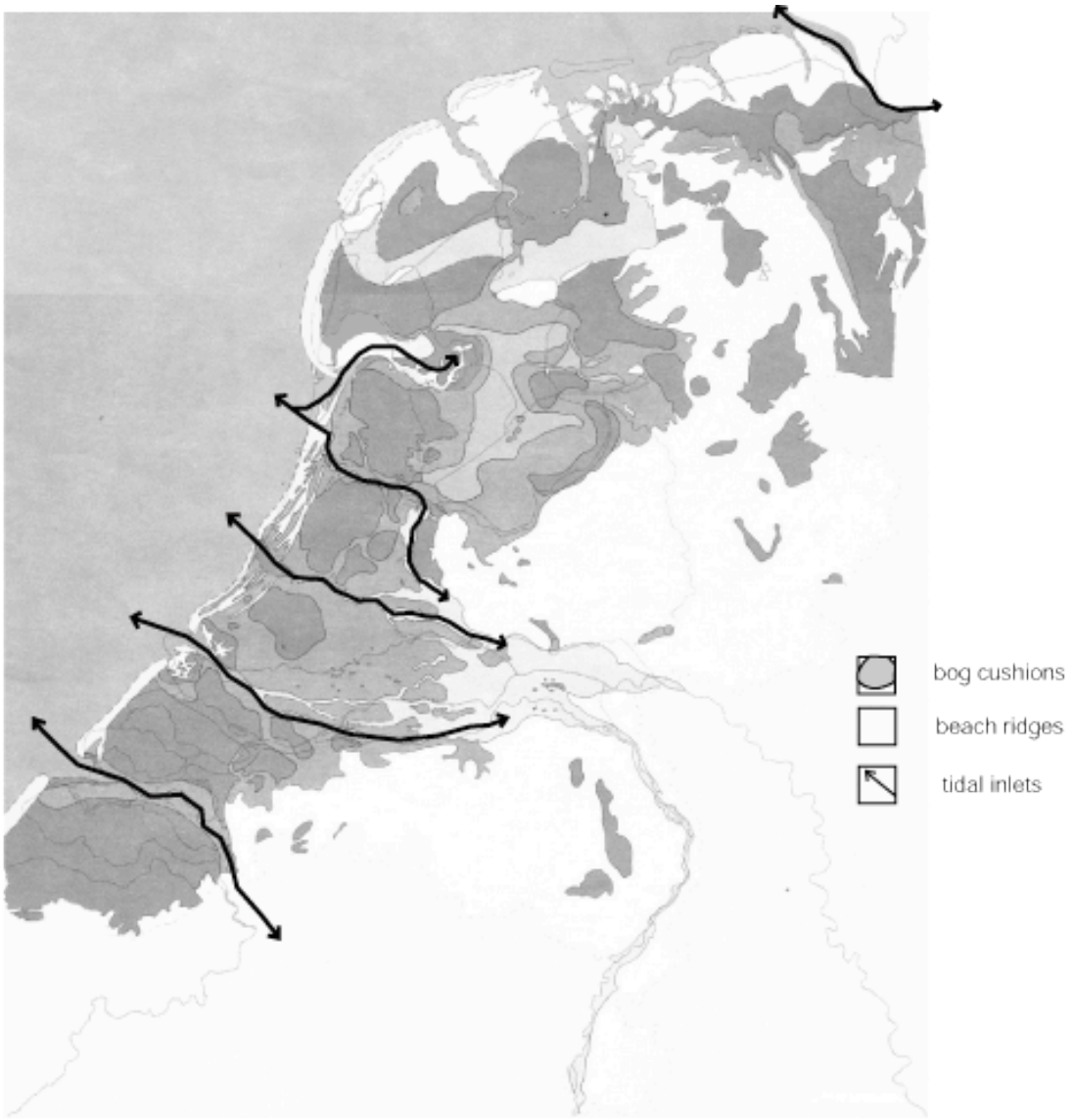
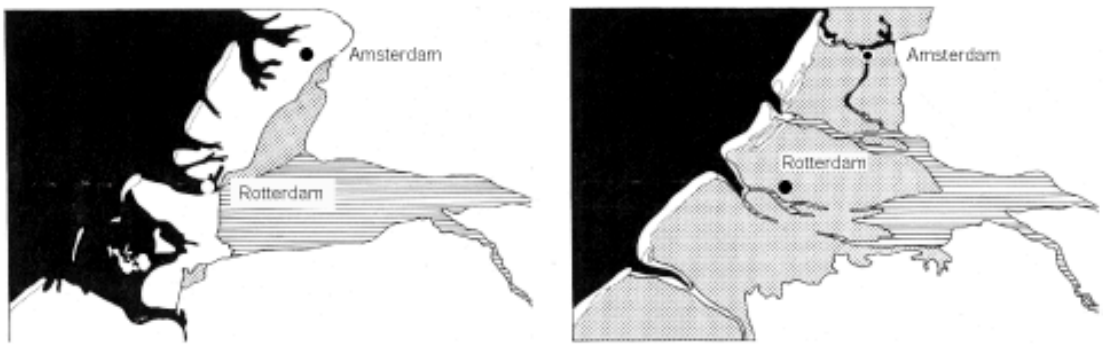


the form of the natural landscape
In the sheltered lagoon behind the beach ridges thick layers of bog are formed; tidal inlets traverse the bog



shifting relations between sea, rivers and bog created the landscape of the Delta

Introduction

The landscape

The term 'landscape' has been interpreted in various ways throughout the ages, depending on the cultural, scientific and social context of a given time. Hidden behind this lies the development of the understanding of nature, time and space.

.1 Topos and locus

The Italian poet Petrarch wrote that his *villetta* in France had two gardens, one dedicated to Apollo, who exemplified control and reason, and the other dedicated to Bacchus, who symbolized sensuality and instinct. This duality is fundamental to landscape architecture and can be related to various ideas on time and place.

The origins of the word *topos* are rooted in Greek mythology and refer to the natural landscape as the dwelling place of the gods. *Topos* is therefore a magical, or mythological, concept defined in the mythical landscape. It is labyrinthian and without scale: it has no geometric determinates. The Greek temple is the oldest, best-known architectonic form in which the *topos*, or site in the natural landscape, is linked to the *ieros odos*, or holy route. The concept of rational space represented an entirely new modality that left the labyrinthian concept still intact. What is more, the one presupposed the other. In the villa design, labyrinthian space was consciously positioned next to the rational space. At Villa Lante, from around 1560, the *bosco* and the ceremonial garden were roughly the same size and were of equal importance. In the 17th century the labyrinth was elbowed out of the garden by the Baroque explosion in the main bilateral axis, but; lived on in the magical tradition of the hydraulics and the playful games of the surrounding plantings. The early 18th-century English landscape garden revived the labyrinthian space and the *topos*. The origin of the term locus is rooted in the *templum*, the mythical cross of the founding of a town and the design matrix of Roman cultivation. The locus is geometrically determined: it is the point in the rationally ordered agricultural landscape from which distance is measured and to which time is related. When the Romans founded a new city, a priest was present to mark out the terrain. He drew two orthogonal lines with his staff, one towards the Pole Star and the other parallel to the sun's path. This ritual stamped the city as a holy place, which represented nature's order. In Paris such an axis stretches across the River Seine where it intersects the strategic north to south route. The junction creates a town plan facing in a westerly direction along the Seine, and includes the Louvre, the Tuileries and the Champs-Elysees, respectively. The city grew rapidly; its boundaries were continually being extended, which prompted the question of how it should be kept under control. At the behest of the Sun King the landscape architect Le Notre assembled the various urban fragments along the Seine into a geometric spatial axis measuring some kilometres long. Its positioning was such that the axis eliminated the route along the banks of the Seine and took over its function as a main formal component of the urban morphology.

.2 The Villa Urbana and the Villa Rustica

In his *Quattro libri* Palladio drew perfectly organized agricultural villas which were to function simultaneously as ideal dwellings. They were used as working farms in the fertile Po Plains and were strategically sited at the junctions of roads and flowing, water. This was practical, since during the reclamation of the Veneto in the r6th century the land was completely parcelled out, creating many such junctions. Positioned; in the centre of the farmlands, the villa was easily accessible to the landowner, enabling efficient management of his estate. Nevertheless, capital investment was really only transferred from Venice to the countryside because of the cultural and architectonic dimension Palladio was able to contribute to the process of reclamation.

In keeping with the flatness of the terrain and the Roman parcelling out of land, Palladio advised laying out the villa roads according to military road-building principles -broad, paved and straight so that it was possible to survey great distances. He also advised lining the roads with trees and building them slightly higher than the fields to allow for a view. The importance Palladio attached to having unrestricted views is largely evident in the way he sited the agricultural villas on the intersection of

these straight avenues. The avenue formed the axis of symmetry of the estate with the raised villa at the centre and the administrative offices and servants' quarters in the basement and side wings. While the avenue was a formal expression of the agricultural landscape, Palladio used the flight of steps, loggia, arcade and tympanum to present the *villa rustica* as also a *villa urbana.* He extracted classical architectonic elements from their military and sacramental context and placed them in a new environment. In this way a formal composition was fashioned, using selected functional elements of the farmland. By employing a Roman scheme, Palladio was able to lend a theatrical expression to the agricultural programme.

.3 THE FORMAL LAYERING OF THE LANDSCAPE

It is possible to analyze the landscape as a 'build-up" of various systems or types of cultivation, the one laid out over the other and interacting with each other over time, as the result of a series of functional and morphological transformations. Agricultural landscape is a result of alitivation processes carried out on the natural landscape. Likewise, the urban landscape is a result of civil engineering processes on both the natural and farming landscape. The historical layering and the merging of nature's (geo)morphogenic system, agrialiture's farming techniques and a city's civil engineering system comprise the Structure of the urban landscape.

Besides this structure, upon closer examination the landscape reveals layering in its form, which is shaped by the endemic flora and fauna; alitivation, water supplies, road networks, land enclosure, buildings and garden architecture. The form of the natural landscape reflects its geological history but does not have any formal determination. The form of the agricultural landscape is the result of colonizing the natural landscape via a cultivation grid. That layer, in which the form has been most consciously determined, can be termed the architectonic landscape. This is evident in the implied formal components of the alitivation grid or is made specific as an architectonic definition of lines, points and surfaces within this. The landscape form can be explained in terms of three imaginary layers: the 'natural' landscape, the 'agricultural' landscape and the 'architectonic' landscape, respectively.

This stratification is not harmonious. The 'substructure' is not endlessly mirrored in the surface nor is the substratum always reflected in the form; Instead it is linked to a change in the nature of the formal transformation. Generally, a distinction can be made between direct adaption of the natural topography, architectonic trans-formations and visual references. Topographical adaption is of a technical nature and, in a landscape architectonic sense, is one or two dimensional, while architectonic, transformations assume a three-dimensional, architectonically controlled form. i Visual references are associative and they relate to the age or the history of the site

2 The Dutch Lowlands

2.1 The stratification of the landscape

In an analytical sense the landscape can be seen as a stratification of various systems or types of adaptations, interacting with each other over time, as the result of a succession of functional and morphological transformations. The starting point was the *natural landscape*. The forces caused by the elements earth, water and wind determine the appearance of the landscape. The *cultural landscape* was formed by a series of cultivation processes carried out on the natural landscape. The *urban landscape* in its turn is the result of civil technical adaptations of the natural and the cultural landscape. The historical layering and spatial coherence of the (geo) morphogenetic system of nature, the cultivation techniques of agriculture and the city's civil engineering system comprise the structure of the urban landscape.

The landscape not only reflects this structure, but also a *formal* layering that includes nature, reclamation, water management, infrastructure, parcelling, buildings and garden architecture alike. The natural landscape has an appearance that reflects its geological history, but is not yet formally defined. The appearance of the cultural landscape has its origin in the colonisation of the natural landscape and its cultivation. Likewise, the urban landscape is a result of civil engineering processes on both the natural and the cultural landscape. The layer in which the form becomes explicit can be named the *architectonic landscape*. This exists in the implicit formal moments in the cultivation grid or explicit as an architectonic definition of lines, points and planes. The architectural quality of the landscape arises where the architectonic manipulation of the basic forms of the successive layers (the "genius loci") makes the landscape as an independent entity legible and transparent.

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2.2 The natural landscape: sea, rivers and marshlands

The rivers Rhine, Meuse, Scheldt and Eems created the delta of The Netherlands. After the Ice Age in combination with a transgression of the sea broad bands of river clay are deposited in the coastal area. This clay area is the base of the present coastline. After the breaking through of the Straits of Dover a ridge of dunes was built up along the coast. This was possible by the new pattern of streaming in the North Sea and the enormous amount of loose material delivered by the current. A further transgression of the sea caused a fresh water lagoon behind the dune ridge. This lagoon is gradually transformed into an enormous bog.

Three compositional actors influence the natural landscape: sea, rivers and the stagnating water of the bog lands. The influence of the sea alters from transgression to regression, so flooding the land and withdrawal of the sea from the land. The rivers have immediately an answer to these movements. Everywhere in the delta one of the three actors predominates during a short or a long period of time. For the present landscape is always one of these actors determining, because of the forms of the actor were the last for reclamation by man or the influences of the actor take a long time and are the most important for the area. All the movements of the coastline and the action of sea and rivers can be summarised in three phases.

Phase 1: Atlantic (4000 BC)
There was nearly no growing of bog during this period. The rivers were streaming on a large plain covering it with sediments. The first complete dune ridge was devastated by a transgression of the sea. The influence of the sea was further than Amsterdam and Rotterdam.

Phase 2: Middle and Late Boreal (2100-1250 BC)
During this period the growth of the bog was on its summit. The western part of The Netherlands was covered by bog. Only rivers crossed the bog land.

Phase 3: Middle Ages
Since The Middle Ages the influence from the sea and the rivers is strongly increased. A hand shape pattern of sedimentation is developed from the main channels of the rivers between Rotterdam and the IJ. South of Rotterdam the river mouths are transformed in large estuaries with marine sedimentation far inland as far as the Biesbosch.

Since the 5th century the dune the forward pushing sea breaks down ridges along the coastline. As a result the thick layers of peat behind the dunes were attacked and a slow transformation of the area into a tidal marsh (he Dutch Shallows) took place. Finally in the 12th century the Zuiderzee was formed by a transgression of the sea. The Flevomeer became a part of the Zuiderzee.

2.3 The cultural landscape: reclamation of the delta

2.3.1 Peat reclamations

After a decrease of the population since Roman Times the population started to grow again in the 7th century. The growth of the population caused a shortage of arable land and again land reclamation started not only in the clay and sand regions but also in the bog region. The first (rather primitive) reclamation took place in the coast district. There was a natural drainage possible by the influence of the sea. These old reclamations suffered later from transgression by the sea and many disappeared. During the heyday of the Middle Ages the need of arable land grew and the technical knowledge concerning land reclamation, drainage systems and keeping the groundwater level on level. Reclamations took place extensively. Regional rulers behaved as real landlords. The system of predials was important for the reclamations, but also free burghers started to reclaim the land since the 10th century.

The first peat reclamations were directly connected with the fields of the existing settlements. Digging ditches drained the bog. The pattern of the ditches was often rather randomly chosen. Since the 10th century the land reclamation took place on a large scale. Total new settlements with surrounding fields were founded. Some of these new settlements were affiliated with settlements situated on the sand. For example the population of Schoorl in North Holland founded Scharwoude (Schoorl-woude).

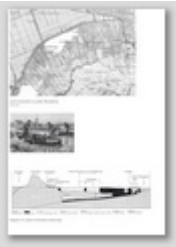
Fixed sizes for reclamation blocks did not exist, although there were many agreements or contracts. In the beginning the reclamation started with a natural waterway as a base, but later on also man-made ditches or canals were used as a base. Each participant or colonist was allotted a piece of land with a fixed width along the base. He got also the right to reclaim the land perpendicular to the base. The stretch of the reclamation was not fixed, but always (many times) longer then the width. This claim is named "het recht van de vrije optrek". The built up area was planned along the reclamation base. When the bog was reclaimed from different sides, the end of the different stretches was determined by the meeting of the different reclamations. The length of the stretches could range from very short hundred metres till many kilometres.

the "cope system" In the beginning of the 11th century a new method of organisation was introduced; called the "cope". The Nobility and the Church, who during that time had obtained the royal claims on the not cultivated regions, initiated this new method. They issued pieces of not reclaimed land to free burghers in exchange of long lease or "cijns". The agreement of long lease is named "cope". The method of reclamation is named "cope" reclamation. The greatest part of the Holland-Utrecht bog region was reclaimed and occupied in 300 year with the "cope" method. The majority of colonists came from Holland and Kennemerland. A part of the colonists came also from West Friesland, where the reclamation of the bog land started earlier. From there the colonists went to Germany and East Netherlands.

The “cope” reclamation was determined by a strongly changed society. It was the disintegration of the feudal society and the rise of the lower nobility in service of the higher nobility. The lower nobility served in the army of the landlord in exchange for land “tienden or tijnsen” and claims. In the same time a change of accent on agriculture into commerce took place. Payments in goods were replaced by payments with money. A group of independent farmers was born. They obtained a certain wealth by selling the surplus of their crops from the newly reclaimed land instead of providing the landlord his needs.

For the new “cope” settlements the exact measurements were determined, the reclamation base was determined and the direction of the drainage was regulated. The width and the length of the parcels were fixed in the agreement. Every colonist was allotted a stretch of land with a standard length between 1200 m and 1350 m and a standard width between 95 m and 115 m (6 voorling by 30 Rijnlandse roeden, a surface of 16 morgen land), divided by ditches, “slagen”. On the reclamation base of the parcels farmhouses were built. Long elongated settlements were developed.

2.3.2 Peat digging



During the Middle Ages wood was the most important fuel. On the dune ridges and in the bog lands there was wood in abundance until the 12th century. While the woodland decreased by the past land reclamations the demand of fuel increased by the growth of the population and the industry. The Romans used already limited amounts of dried peat – turf - as fuel. Afterwards turf was not used till the 14th century. During centuries peat or turf was the most important source for energy in The Netherlands. An important cornerstone for the economy during the Golden Age in The Netherlands was the fact that the land could cover its own demand of energy.

Not all the bog is suitable to provide peat. Sphagnum or bog moss is oligotrophic peat growing far from the rivers and totally dependant of rainwater. This peat is the most suitable for fuel. On the fertile soils along the rivers peat from wood develops. It contains not totally rotten rests of wood, clay and sand caused by inundation of the river. This wood peat is not used as fuel. In regions with wood peat like the "waarden" no peat reclamation took place.

Reclamation of peat for turf was done in two different ways. The reclamation started above the groundwater level, the so-called dry digging. When there was no peat left above the groundwater level wet digging or dredging took place underneath the water level.

The infrastructure of the agricultural settlements was the base for the peat reclamation. Before digging ditches were made to drain the bog land. The peat coming from these ditches was originally enough to cover the needs of fuel. As the population increased and the demand for fuel became more urgent, the superficial deposits of peat were exploited. The digging for peat was still restricted to the shallow layer of peat above the water table. The land was converted into arable land, mostly pastures.

Towards the end of the 15th century the development of the watermill enabled to lower the groundwater level, so more peat was available for use.

New developments in the peat industry were necessary because of the growing demand for fuel. Excavation of the peat underneath the water table was a following step in peat reclamation. The peat was dredged by a "baggerbeugel" out of the water and spread out on ridges, the "legakkers" or "zetwallen". These were small strips of land conserved for this purpose. The peat was dried and cut into pieces of "turf" during summertime in order to sell the turf as fuel for the next winter. This method of reclamation resulted in pattern of narrow strips of water (the "trekgaten") and land (the "legakkers"). The ridges were sometimes used as hay land or obligatory planted with alder. The existing settlements, the dikes and roads remained as land.

But the ridges were very weak, and sometimes disappeared completely under water. Since no crops could be gotten from the reclaimed land they were left as unwanted land and the few fertile lands that were left had to pay for all the expenses to keep the land dry. In the end this deep dredging for peat ruined the land. Wave erosion and illegal excavation destructed great areas of land and large lakes or "plassen" are the silent witnesses of these activities. The large water bodies formed a menace during storm for the surrounding dikes and settlements. The Haarlemmermeer once existing of several separated lakes grew during that period from 2600 ha to one vast lake of about 16000 ha. Many villages were inundated by the water and disappeared in the waves.

It was obvious that all kind of legislation was made to avoid the annoyance. The legislation was about the width of the ridges, the distance of the "trekgaten" from the settlements, dikes and roads etc…. And then there was a controversy between the cities and the inhabitants of the rural area. The cities needed the peat as fuel, so they pledged for freedom of dredging peat. Legislation was not of their interest.

A major part of Holland stayed useless for years with all the water behind the dunes and between the dikes. Only small parts of the land were inhabitable and agriculture was of no importance.

The further development of the windmill and later the steam engine transformed the water wilderness in reclaimed lakes or polders with excellent fields for crops.

2.3.3 Coastal land reclamation

Coastal land reclamation can be divided in two ways. Sandbanks were formed in the sea and at the mouth of rivers. When these banks had risen high enough above sea level a dike was built around them and the new land could be occupied for living and especially for agriculture. This kind of land is called an "opwas". The movement of the sea in combination with sediment saturated water could also cause new land to emerge attached to existing land, called an "aanwas". These emerging mud-flats were first used as extensive pastureland.
When this emerged land was high enough above sea level also a dike was built around and connected with the existing land.

Land reclamation by building offensive dikes started since 1200 in the Frisian "Middelzee".
In the southern parts of The Netherlands in Zeeland reclamation was more to regain the by inundation lost land.

Those activities of land reclamation were not done under responsibility of the government but of private persons. The projects were so large in scale that no private person could afford to finance it on his own. So people joined themselves in "companies" or groups to accomplish the land reclamation. Those companies can be compared with the partnerships in the shipping. These partnerships were formed in order to make profit. An investment in land reclamation was seen as lucrative, but it was not without any risks. During the All Saints flood of 1570 many dikes along the coastline failed. Since the 19th century the risks diminished by the growing knowledge about the behaviour of the sea and technical improvements in dike building.

2.3.4 Reclamation of the lakes

The first reclaimed lakes were small and not very deep, experiments for the later, bigger reclamations. In 1533 the Achtermeer near Alkmaar felt dry. This lake measured only 35 ha. Afterwards another series of smaller projects followed in the same area, until in 1564 two big, but still not very deep lakes, the Egmondermeer (686 ha) and the Bergermeer (620 ha) were reclaimed.

In the 17th century fundamental changes took place. The financing of the reclamation was not longer done by one or several members of the nobility, but by well-to-do merchants. They formed partnerships just for the occasion of land reclamation. These partnerships resembled the "companies" for the commerce abroad, the commercial building of dikes and the peat reclamation. This change marks the transition from the Middle Ages to the new era. Secondly this form of co-operation could gather more risk bearing capital so that the reclamation of larger became possible. In 1612 the Beemster (7100 ha) was reclaimed. In 1622 followed the Purmer (2756 ha), in 1626 the Wijde Wormer (1620 ha), in 1630 the Heerhugowaard (3500 ha) and in 1635 the Schermer (4770 ha). Plans for the reclamation of the Haarlemmermeer were made more then once, but it was not possible to execute this project for time being. The technical, organisational and financial possibilities still needed developing. Smaller and middle size lakes were reclaimed meanwhile.

All the land reclamations had one large disadvantage: the enormous decrease of the bosom water[1]. Water annoyance during heavy rainfall was a direct consequence of this decrease of water reservoirs. The reservoirs were filled quicker than in former days. An obligation was made to take precaution against inundation. So in the project of the reclamation of the Schermer two discharge canals – one to the South and one to the North – had to be dug. This thread of inundation by shortage of enough water reservoirs prohibited also for a long time the reclamation of the Haarlemmermeer. On the other hand the Haarlemmermeer due to it's seize was a danger for the surrounding land.

We will find the oldest lake reclamations only in North Holland. Since the 17th century land reclamation took also place in South Holland and Friesland. The first and largest reclamation in Friesland was the Staverensche Noorder- en Zuidermeerpolder (436 ha) in 1620 on the initiative of the Noord-Hollanders. Nearly all the lakes in South Holland mostly originated by peat digging were reclaimed during the 18th century. Only after 1800 the lakes in Groningen, Overijssel and Utrecht were reclaimed.

The reclamation of the lakes in the peat-digging district caused often a special problem. The settlements dating from the middle Ages with the linear structure had still peat underneath and formed long narrow axes in the lakes. After reclamation these ribbon settlements arose 3-4 m above the new surface. Without taking special steps this bog land would set strongly and the foundations of the houses would rot away.

[1] Bosom water: system of reservoirs for superfluous polder water.

2.4 The urban landscape

The urbanisation of West Netherlands is fundamentally involved with the polder system of the coastal plain, primarily as a technical precondition. But the spatial characteristics of the area of peat polders and the reclaimed polder landscape are also treated, in different ways, in the pattern of the town, both regionally and locally.

development of the urban landscape The development of the mediaeval town originally took place in much the same way as elsewhere in Western Europe. Serfs freed themselves from their feudal state and formed communities of free citizens. Town charters gradually gave urban societies autonomy, with their own administration and jurisdiction, creating a nursery for democratic forms of government. For a long time the church remained the binding force until the role was taken over by the growing economy. Trade and industry were able to develop and a body of tradesmen began to exist alongside the guilds. Thus the seeds of modern commercial capitalism were sown in the mediaeval city, leading in the 17th century to the unprecedented prosperity of Holland's Golden Age.

But the pattern of distribution of Dutch towns differed considerably from that found in other countries. A 'network system' was developing here right from the outset, with open relationships, regional and even international, developing much earlier than relationships with neighbouring countries. Leiden, Haarlem and Alkmaar were favourably situated with respect to major waterways and the hinterland, and grew through trade and the exercise of crafts. The form and scale of the river and coastal landscape of the delta forced, as it were, the development of a network of more less similar towns, linked with one another by waterways. Since these waterways also formed the lifelines of the agrarian hinterland, the result was an intensive interchange with the man-made landscape of the lagoon.

the layered landscape of the Dutch town
Layout and design were determined by various factors, including natural physical geography, the state of civil engineering, social relationships, concepts of urban space and ideas about form derived from architecture. Urban design and architectural concepts have changed significantly over the course of history, while the underlying landscape has remained relatively constant. It follows that an analysis of urban form from the point of view of a landscape architect must be based on a reading of the layered landscape created by the urban pattern. Looked at in this way, urban transformations can be reduced to confrontations between the changing relationships between the natural landscape and the man-made landscape on the one hand, and the spatial organisation, physical structure and architectural and spatial components of the town on the other.

The tidal landscape of the delta and the archetypal peat bog with its streams were the factors which determined the position, the open ground and the extended profile of the Dutch polder towns with their controlled water systems.

The difference between for example the peat polders and the reclaimed land as separate hydrological units, determined in broad outline the urban configuration of North Holland. In a peat polder town the division of the bog into plots provided the matrix which supported both urban plot division and the form of open space. The continuity of the bog matrix was interrupted by the form and layout of reclaimed land. The rational plot division of the polders freed itself from the context of the bog, making it possible to project autonomous urban landscapes.

The basic form of the landscape was treated differently each time in the various elements of the town plan, so creating a montage of different fragments, whose dimensions, boundaries and

shape could be reduced to the original man-made landscape. This montage landscape is one of the features supporting the formal identity of the Dutch town.

2.5 The architectonic landscape: the Dutch villa

three levels The landscape architecture of the Dutch lowlands developed on several levels. The first level was that of the plot and the division of the estate, based on the two-dimensional grid provided by the man-made landscape. The peat matrix consisted of collections of long plots of reclaimed land; the grid of reclaimed land consisted of polder modules, approximately square, within which the model plot was located. Applying these different basic principles to the design of a villa led to different treatments and different results.

The second level was that of the villa landscape. As soon as a number of villas had been laid out close to one another they began to form an architectural unit, reacting to one another and affecting the spatial structure of the man-made landscape. In a deeper sense they could be said to have affected the shape of the natural landscape. In the case of the Wijkermeer it affected the curved row of dunes round the natural basin, in the case of the Beemster, the bottom of the lake.

At both plantation level and villa landscape level, it is possible to make a comparison with the schemes of composition used in landscape gardening, which had undergone substantial development in the 17th century. The estate and the 'polder room' can be compared with the private garden round a villa and the rational town plan of the Renaissance. The transformation of lines in the grid into an axis of symmetry or compositional line of sight can be seen as part of this development. The tunnel perspective of the avenues of polders is reminiscent of the formal systems of avenues in 17th-century French gardens. Almost everywhere one could find one treatment or another of the ring dike, combined with a view over the peat or the water. The drainage system provided for man-made land created a picturesque effect, with its locks, mill races and windmills and, later, pumping stations. This spatial relationship between the components of the polder landscape provided the basis for the scenography of the *architectural route* to the villa.

The third level was that of the Dutch delta as a whole. The combination of villas created architectural landscapes based on various different man-made landscapes with a wide range of different scales, ranges and compositions. The pattern of distribution of 17th century villas round the coastal landscape was directly related to the sand bars, the peat rivers, the man-made land and the network of waterways through the lagoon. In a more special sense they formed a regional unit; such was their *typological wealth* that together they displayed an architectural treatment of the morphology of the natural landscapes of the delta, demonstrating the architectural scope of urban terrain in the Dutch delta landscape.

genealogy of the villa The precursors of the villas were the mediaeval manors, whose background was feudal and agrarian. These manors were situated round the towns of Holland, at strategic points along important routes. A large number of manors appeared round Utrecht, a place which occupied an important position in the feudal system as a powerful diocese. In later times these manors were often converted into villas, and more manors quickly sprang up to join them. In this way sets of villas came into being, which could be thought of as forming a primitive type of villa landscape.

These Manors were by no means luxurious. Their gardens were modest in size and the features they contained were mainly agricultural, for example an orchard or kitchen garden. The herb garden or kitchen garden would be the only 'natural' feature.

The 17th century marked a high point in the history of the villa. Enormous economic growth, powered by the VOC, led to an increase in the number of villas and the expansion of estates already in

existence. People saw land as a safe investment for money earned from trade in tropical produce.

The 17th-century villas were located more particularly in areas of clay and peat, whose prosperous appearance provided a suitable setting for the character desired in a villa. The dominant type of landscape gardening was the formal garden, in which the 'nature' displayed was nature improved by man, productive landscape; nature that was untamed and unstructured was considered unfinished and objectionable. And of course these flat areas were suitable for laying out formal gardens and were easily accessible by canal boat, the most important means of transport available at the time.

A fresh revival in the Dutch economy, after the decline in the 18th century, took place in the 19th century. This was the beginning of industrialisation and the heyday of trade with the Dutch East Indies. This prosperity was in turn reflected in the villas. Many old villas were refurbished and extended and a further set of new estates was created.

There were a number of differences between the villas of the 17th century and those of the 19th century. The origin of these differences is to be found in a change in the style of landscape gardening, the new availability of cheap sandy soil and the increasing radius of activity of the town dweller. The dominant style of landscape gardening was an idealised natural landscape: a manufactured image of nature with varied woods, meadows and buildings located in rustic surroundings. This new style of landscape gardening required the different kind of countryside with more relief found in the sandy ground along the coast and on the Utrecht ridge. The arrival of the train and the tram (the horse tram) provided access to these areas from the town.

landscape typology of the villa The physical or geographical location of villas over the centuries suggests a distinction into four types, according to whether the estates were sited at the edge of urban ground, on the transition between polder land and sandy ground, on reclaimed land or on sandy ground or heath.[2] The factor linking these different types was their connection with the town. Access was generally by waterway, except for estates on sandy ground and heath, where access was by country road. Later on it became possible to connect with the town by tram or train, and the use of the tram meant more attention had to be paid to country roads.

urban territories The territory occupied by a town is directly connected with the position of the villa in its surroundings. A villa is an urban element, providing the town dweller with a way to escape the town and find recreation in the country.

In the 16th century urban terrain was still limited. Wars made areas outside towns dangerous. In the 17th century the amount of urban terrain increased steadily, so that in some cases towns began to touch one another. Villas spread out over the surrounding area. The terrain of Amsterdam, in particular, was considerable, and villas owned by Amsterdam merchants were to be found as far away as the town gates of Utrecht. By the 19th century even larger areas had become accessible and the terrain extended beyond the defined image of Holland. Terrains began to overlap and the boundary between different towns became blurred: the landscape of Holland became urban, a delta metropolis.

a Lowland Pantheon The rational villa can be seen as the effect of a process of landscape architecture on a particular plot or the projection of a rational plot on the natural landscape. This is where differences between peat bogs and reclaimed land become apparent, differences in both the articulation of the composition of the garden and its scenography.

The treatment of the plots of peat bog gave rise to a division into linked sections of garden located

[2] Bordes, B. in: Het Hollandse buitenplaatsenlandschap, geografie en ontwikkeling in de tijd; 2001

behind one another, perhaps founded on relational principles (in the case of Hofwijck, anthropomorphic principles). In the case of the polder villa, the basic principle was to divide up the plot so as to provide a square for the formal garden, an architectural reduction of the polder module.

Hofwijck and Huis te Werve, near Voorburg in South Holland (section 4.1), are examples of an architectural treatment of a plots of peat bog and together maintain the scale of a reclaimed peat landscape. They provided a model for a country house landscape transforming a man-made landscape of sand bars and wide beaches into an architectural system of gardens, avenues and stretches of meadow.

The villa landscape represents the lowlands' most complex architectonic organisation. A variety of different combinations were possible, depending on the type of landscape. On the sand bars south of Haarlem sets of estates were created which were linked diagonally with the lagoon and the dune landscape by a view or a system of avenues (or both) in the wide beach. Along the landward edge of the dunes, by the Wijkermeer (section 2.2), a regional landscape theatre was created, visually linking the landward edge of the dunes with Amsterdam. Along the Amstel and the Vecht sets were created with diagonal views across the water. Villas on reclaimed land formed a series along the avenues of polders, linked at the back by the drainage system.

The landscape types of the Dutch lowlands gave rise to a wealth of different villas. The combination of natural geomorphology and technique had a decisive effect on architectural differentiation. In this sense the Dutch villas were architectural 'observatories', keeping a close eye on the spatial quality of the delta landscape. Together they formed a 'Lowland Pantheon', within which the architectural wealth of the delta was portrayed and secured.

3 The coastal landscape

3.1 Mounds and marshes: the northern coast

Mijn lichaam is van klei en zand en veen.
Diepe kanalen trekken door mij heen.
Een waddenrijk ligt voor mijn kust te blinken.
Zeevogels zien het rijzen en verzinken.

Ed Hoornik

(My body consists of clay and sand and peat.
Deep canals cut through me.
An empire of shallow is glittering in front of my coast.
Sea birds see the changing of the tide)

North of West Friesland was a zoning from north to south of dunes shallows marshes and bog. In the early Middle Ages the influence of the sea increased and a large gap between Vlieland and Terschelling came into being. This gap changed the lake Almere into the Zuiderzee. Large quantities of bog land were swept away by the waves and the shallows and the marshes were enlarged.

3.1.1 The Dutch Shallows

The most important characteristic of the Shallows is their dynamics. Sometimes gullies and channels move several tenths of meters during a year. The tide in this landscape is the motor behind the movement. Near Den Helder the tide is only 1.5 meters, but in the Dollard the difference is more than 3 meters. The greater part of the surface of the Shallow Sea is covered with fine sand, but in near the coast and the tidal divide the surface is covered with clay. The tidal divide is the divide between two adjacent tidal channel systems where two different tidal streams meet.

The size of the Shallow islands is determined by the difference in height between ebb and flow. The larger the difference the less elongated the island is and the wider the tidal inlet is. The Dutch Shallow islands come to birth at a difference in height of the tide of 1-3 m. The islands change of place in two directions. There is erosion on the North sea side and a local accumulation on Shallow seaside. Above all on Texel and Vlieland the loss of land is great. In the second place there is a movement in eastern direction of the islands. As well as on Vlieland as on Ameland and on Schiermonnikoog settlements on the west side have disappeared in the sea, while on the eastern side of the islands accumulation takes place. One small island Rottumeroog will soon disappear by erosion on the west side, while no accumulation can take place on the east side because of the mouth of the German river Eems. The more westwards situated Rottemerplaat grows constantly. Another island is growing west of Den Helder; until now this island is not inhabited.

The islands exist of one or more beach ridges covered by dunes. On the lee side salt marches were growing. The western part of the salt marches on the islands is reclaimed and surrounded by dikes, while the eastern part of the salt marches is still open f to the sea. The western parts of the dunes on the islands are better developed than the eastern part due to the moving to the east of the whole island.

Texel is the largest island. The heart of the island consists of a sand and loam ridge, an ice pushed ridge dating from the Ice Ages with a highest elevation of 10 m above sea level. From the west part of the ice pushed ridge a barrier developed in sea in north-eastern direction. Later dunes grew on this barrier. The former island Eierland was in a direct line with the barrier and in the 17th century it was connected with Texel. On the lee side extended salt marches came to birth. These salt marches are reclaimed later.

Cultural landscape

In1924 the law of the re-allotment acquired the force. A total re-allotment took place by joining of parcels, digging of ditches and building of agricultural roads. In 1927 the first re-allotment took place on Ameland; 5000 small parcels of an average size of 7are were transformed in 500 parcels of an average size of 62 are.

The re-allotment in the polders of Ameland, Terschelling and Texel lead to an increase of scale and the agricultural activities became more intensive. While the small dairy industry could not compete with the large dairy industry on the mainland, the greatest part of the quantity of milk was brought on the mainland by boat or even by pipe line (Ameland).

The recent development of the recreation influenced strongly the Shallow Islands. Especially after 1950 the influence became very important.

Another transformation took place by way of nature development. Around 1900 State Forestry started to afforest the till then rather bare islands. The motive was to protect the dunes against moving and to

give shelter and to produce wood. This type of forestry evolved slowly into nature management.

3.1.2 The mound landscape

"There the ocean floods an immense land during day and night with two intervals, so that one can wonder one self during this eternal struggle in the cycle of nature if the soil belongs to the earth or to the sea. A miserable people is living there on high hills or rather on mounds erected by hand till from one's own experience known level of the highest tide and on these mounds they have built their huts. Seamen when the water covered the surroundings, but castaways when the water was withdrawn and they chased the fish that tried to fly together with the water." (Pliny the Elder in Historia Naturalis, 42 AD)

The first settlements were built by emigrants from Drente on the highest places on the banks of the marsh creeks. The banks were less wet than the centre of the marsh, because of a natural way of rising by sedimentation of coarse sand during high floods. Nevertheless these banks did not provide enough safety against flooding from the sea. For that reason the settlements were artificial raised by deposits of dung, household refuse and used and replaced building material. In a later period they were raised with marsh sods. On this way a kind of a "house podium" came into birth. Later these podia grew together so that the whole settlement was situated on one dwelling mound. Around the dwelling mound there were the marshes with fields on the highest places and pastureland and hay land on the lower and wetter parts of the land.

The land was regularly flooded before the building of the dikes. This is the reason that only the high enough situated fields were divided in small, elongated parcels separated by shallow ditches. The pasture and hay land, that suffered more of flooding, consisted probably of large complexes of land in common use.

The marshes were intersected by a widely furcated system of creeks. These creeks widened strongly in the direction of their mouth. The largest dwelling mounds were situated in the direct surroundings of the mouth of the creeks. In this way the fishing-boats could land nearby. Along the creeks paths were made. The winding course of the roads of today marks the old courses of the creeks.

The marshland was reclaimed from the embankments of the creeks. The natural course of the creeks and gullies were the exponents of the parcelling structure. Ditches connected the waterways with each other. On this way blocks of land were created, on which each could assert one's right of use. The soil was common property until the building of the dikes. The village dwelling mounds were abandoned for settling in the surrounding marshland, when the dikes proofed to be safe enough. The large blocks of land were divided in individual parcels.

3.1.3 Reclamation of land from the sea

the "Middelzee"

The first offensive building of dikes took place along the "Middelzee", around 1200. Step by step building a large amount of dikes reclaimed the sea-arm.

Around the year 800 flooding had ravaged the Frisian coast. Continually land was lost in the waves and in the end the "Middelzee" was enlarged till Bolsward. After some time sedimentation took place again and gradually the sea-arm became land again. People settled on the newly reclaimed land and founded Terra Nova or "Nijland" (new land) around 1230. The final stage for the time being was reached in 1503, when three gentlemen from Holland reclaimed "Het Bildt". The systematically parcelled land was leased to farmers from Holland. The drainage took place near a lock at Bildtzijl. In 1600 new land reclamation took place and the lock shifted towards the sea to the village "Nieuw Bildtzijl". The old dike became a "sleeping" or back-dike and on the flat slope houses or labourers were built[3].

The many dikes had not only to protect the land against flooding by the sea from the north but also for flooding by masses of natural drainage water of the higher situated bog lands in the south. In the 12th century dikes were also built for protection against this drainage water. The polders between the sea dikes and the other dikes are called "hemmen". This region is spontaneously cleared up and has an irregular parcelling in blocks. Old creeks and gullies function as boundaries between the parcels. On the contrary the reclaimed land within the dikes of the "Middelzee" is divided by a collective organised reclamation in a regular block parcelling.

the Bay of the "Dollard" In Groningen the bay of the "Dollard" was reclaimed from the sea polder after polder. Characteristic for these polders is the difference in height between each other. Each new is situated approximately 30 cm higher than the previous one. The surface of the "Reiderwolderpolder" (1874) is even situated 1 m higher than the "Stadspolder" dating from 1740, although the polders are adjacent. The decreasing of the bay by the land reclamation most probably causes the difference in height between the polders. During high tide the water of the sea was driven higher up and the sedimentation could become higher.

Not only between the polders, but also inside the polders differences of height exist. The polders have the highest elevation near the oldest dike caused by sedimentation of clay in relatively quiet water along the dike while more seaward less sedimentation took place. This internal height difference inside the polder was used for drainage in the direction of the younger dike. On the land side of the younger dike a collective ditch was made.

Each new reclamation required a new lock. The old drainage channel with the lock was extended in the new polder. The part of the channel between the old and the new lock was used as a reservoir for the superfluous polder-water. So it happened that a row of locks was built during the different land reclamations. The locks were not only there for drainage purposes, but were also used for

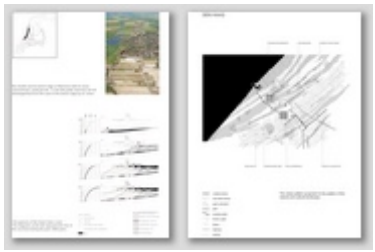
[3] A spatial segregation was built in this way: the farmers lived amidst their fields and pastures and the labourers along the dike.

transhipment of agricultural products. A harbour was built on the seaside of the dike and on the landside a settlement was built. The settlement disappeared when a new lock was built. Till the end of the 18th century the drainage was a natural system, afterwards windmills were built for drainage and later pumping installations.

the landscape of the young sea reclamation polders Ditches were built perpendicular on the sea dike by the farmers that lived along the dike on the landside. The distance between these ditches called “zwetsloten” was 500 m. between the ditches earthen walls were raised. The parcel between the wall and the ditch was divided in “meetjes”, smaller parcels by trenches. This system stimulates the sedimentation of clay. The vegetation on the higher grounds also helped the sedimentation. When the new sedimentation accretion was high and broad enough the land was reclaimed.

3.2 The beach ridges: the central coast

3.2.1 The beach ridges



Natural landscape

The development of the Dutch dunes takes place in the Holocene, the warmer period after the last Ice Age. The rising of the sea level started approximately 11000 years ago. In the North sea a tidal pattern was developed in which the flood stream coming from the Strait of Dover influenced strongly the coast along The Netherlands. Under influence of this stream a pattern of sandbanks and offshore bars were developed in southwest northeast direction. Also a sand transport northwards along the coast took place. The rather fast rising of the sea between 9000 and 5000 BC caused an accumulation and an erosion of beach ridges and a movement of large quantities of sand over the coastal plane eastwards. Between 5000 and 3000 BC the coast was formed; new beach ridges and bars were built up to the west of the former ones. The youngest ridge was always a fraction higher than the former. The rising of the sea level caused this. On the ridges dunes were developed. These dunes attained nowhere a great height. Instead the available sand was used for building up new bars and ridges outwards. Till Roman Times the coast was shifted approximately 10 kilometres in western direction.

Until the Middle Ages the southern past of the dune coastline was situated more to the west, a curve from the northeast to the southwest. In the year 1000 the coastline lay 1 kilometre west of The Hague and Scheveningen.

There were three large breaks in the coastline, when the Romans settled themselves in the western part of The Netherlands. These were the mouth of the Scheldt, the wide estuary of the Meuse and the Waal south of The Hague (the Romans called this mouth Helinium) and the mouth of the Old Rhine near Egmond. The North sea could be reached from the IJ by a small gap in the coastline.

Cultural landscape

The landscape was divided in the "Hout" (the Wood) on the old dune ridges, the open geests (sand flats in between the beach ridges) and the wilderness adjacent to the Wood. The wilderness consisted of bushes and mixed wood on the bog land's edges and wide open spaces covered with peat moss. The drainage of the bog land was to the east.

The first grounds were reclaimed in the early Middle Ages, starting with a small reclamation from an existing settlement on the inner rim the dunes. Since the sand could hardly keep any water, the surface had to be lowered till near the groundwater table. These soils are called "geests". At first the sand was used as a shield against the wind in the form of a small dike. Later the sand was used to raise marshy soils on other places. Canals were dug in order to transport the sand by boat. These canals served also as segregation for the parcels. This land is now used for the cultivation of bulbs and for glasshouse farming.

During the laying-out of the countryseats in the 16th and 17th century the beach ridges were re-afforested.

Architectonic landscape

the Hof te Bergen Some villas, at the interface between the sand bars and the polders, imposed a special architectonic form on the characteristic features which determined the shape of the landscape of sand bars and beaches, controlled by dams, dikes and reclaimed land. A striking example is provided by the Hof te Bergen, one of North Holland's most northerly villas, built in 1643 for Anthonis van Zurck, son of an Amsterdam merchant.

The ground plan consisted of a rectangular area; 1072 metres by 422 metres, running approximately north-south, across an east-west spur of the beach ridge, in a curve in the young dunes. Two main axes bordered by ridges mounted with drifted sand link this autonomous piece of reclaimed land with the surrounding countryside. Kijklaan (today's Sparrenlaan), ran south from the dunes in the north and in the south offering a view across the canal of the polders and reclaimed land of the Bergermeer. A perpendicular axis links the garden with the village of Bergen on one side and the sea on the other. The whole of the southern quadrant of the garden, containing the house and a grid of 4 x 4 squares, was planted with trees; further north were four open game reserves, bordered by avenues.

The southern part of the layout was surrounded by canals, fed by two partially dug streams through the dunes. The original lower reaches of one of these streams, the Westdorper Veersloot, which ran into the Bergermeer, served to provide drainage. A weir in the southern canal made it possible to regulate the level of water in the garden. The whole combination of fields, dikes, avenues and canals made up, as it were, a stamp impressing a monumental seal on man's conquest of nature.

the villa landscape of The Hague The urban territory of The Hague extends along the sand bars parallel to the coast. It is possible to distinguish two types of villa: those on the sand bar immediately behind the young dunes, and those on the sand bar adjoining the peat. The estates on the sand bar along the coast are reasonably sized and connected with the town by means of country roads running along the bar, the most important being the road from The Hague to Leiden. The estates beside the peat are smaller in scale by comparison with the villas to the west, being narrow and elongated. The principal connection with The Hague is by the Vliet barge canal.

In the 17th century urban terrain extended into the area between the Oude Rijn and Monster, with a second parallel zone between the Oude Rijn and Delft (peat villas). That terrain shrank in the 19th century: most of the villas in the peat disappeared, while those on the western sand bar actually increased in number. This bar was wider and higher than the one to the east, and so provided more scope for laying out estates in landscape style.

the Wijkermeer The Wijkermeer is the westernmost bulge in the outlet of the IJ, where it meets the sand bar near Beverwijk in the south-east and curves back north-eastwards. What was originally a meandering stream had developed into a large basin-shaped lake about three kilometres in diameter.

Even in the Middle Ages castles and fortresses were to be found along the strategic western edge of the lake. After the end of the Thirty Year War, many Amsterdam and Haarlem merchants and governors chose this northern section of Kennemerland to build their country houses, which started out as small villas but gradually became larger and richer.

At the end of the 18th century the villas fell into disrepair. As an economy measure Amsterdam patricians either disposed of their country houses or neglected to maintain them, resulting in the houses being demolished and the land divided into individual building plots. After 1813 trade boomed; country life was suddenly in favour again. Apart from those old country houses which still remained, Amsterdam patricians once again built substantial houses in Kennemerland, residences like neo-classical temples with columns, large windows and smooth stucco. The old gardens were cleared away

and turned into landscape gardens. All traces of the old houses were swept away. The only house to escape this was destructive change in taste was Beeckestein, where the new landscape garden lies *next to* the old rectangular garden.

The 17th and 18th century villas of Kennemerland almost always looked out over the Wijkermeer, so forming a coherent complex, an amphitheatre-like landscape, with the Wijkermeer as its stage. The contours of the dunes and the sand bars and indeed the most important north-south links curved away to the west of the head of the lake. The villas lay along the contours in a few layers, situated above and behind one another along the west bank of the lake. Their layouts included the streams through the dunes (in canalised form), emphasising the radial pattern of drainage into the Wijkermeer. Many of the gardens were laid out axially, along this radial structure, so providing many different views of the lake. Some of the gardens, like those of Akerendam, contained watchtowers or mounds of earth; sometimes, as at Westerveld, they were connected to nearby high points in the dunes.

The Wijkermeer formed the striking northern end of the landscape of villas in the '*zegepralent Kennemerlant*'. The villas could be reached by boat from Amsterdam. In this way the lake welded the whole surrounding countryside together with the dunes, windmills and steeples of Zaanland, Haarlem and Amsterdam. The complex formed as it were a landscape theatre, a setting for the topography of the lowlands. Its views blended the *genius loci* of the villa with the great landscape ensemble of sand bars and lagoon.

In 1876 work began on the North Sea Canal. The diking in of the Wijkermeer destroyed the architectural coherence of the landscape of villas with the lagoon. Many small independent villas, facing the lake, disappeared; larger complexes along the landward side of the dunes survived the changes. These villas continue to form a coherent set along the sand bars and the dunes. Sometimes their relationship with the dune landscape was reinforced by a constructed landscape, but their formal relationship with the lowland lakes and peat polders was at an end. The break was later made permanent by the construction of a railway line, motorways and urban expansion.

3.2.2 Sea arms

the Zijpe

The original sea arm the "Zijpe" was situated between two former Shallow islands "Callantsoog" and "Huisduinen" and the boulder clay of "Schagen" and "Wieringen". Since long were these islands and the boulder clay strongholds in the dynamic landscape of the coast. At the moment the "Zijpe" is bordered by a dune ridge in the west, the Shallow Sea in the north, a dike ("Omringdijk") in the east and in the south by the "Schoorlse" dike.

Natural landscape

Until the 10th century there was a large bog cushion in North Holland, dividing the natural water system. A predecessor of the "Marsdiep" and some other small rivers drained this bog cushion.
Between 1he 8th and 10th century the small rivers were transformed in wide sea arms by inundation caused by heavy storms. The seawater could invade the land very far. The bog reclamations were slowly inundated and transformed into a lagoon. In the 9th century the near Petten was broken through. The gap became the later Zijpe.
The Zijpe (sipe = gully) reached first Schagen and bow south later in time. The gap of the Zijpe silted several times up, but was opened again and again. The gap shifted slowly to the north. The marks of the last burst are still recognisable in the hook of the beach ridge in the polder de Zijpe with in a direct line of it Burghorn, the gap that marks the burst in Westfriese Omringdijk.
During storm floods in the second half of the 12th century the coast was broken up on two other places between Callantsoog and Huisduinen and between Huisduinen and Texel. The gaps Heersdiep and Marsdiep were then formed. Also two new Shallow Islands were formed, called 't Oge and Huisduinen. Wieringen broke away from Texel with which island it had been connected for thousands of years, and became an island. The whole region between the islands became Shallow Sea.
The Heersdiep had reached the largest width when the mouth of the Zijpe closed in the middle of the 14th century. The obstacle in the form of the island Wieringen caused on its turn the silting up of the Heersdiep and at the end of the 16th century only an insignificant creek was left over. The Marsdiep became after closing of two other gaps the deepest eroded gap of the three. In the 18th century it reached its form of today.
East of Bergen is the present day West Friesland, perpendicular on the coast. The Zijpe is the remnant of the original connection between the lake Almere and the North sea. The Zijpe is silted up. It forms nowadays a massive clay ridge that became a breaking point in the rather homogenous coastline of former days. The coastline was broken up in the Shallow Islands and the closed dune ridges south of Bergen. Until the Middle Ages the Zijpe was a part of the Shallow Sea in the north. The inundation, that connected the lake Almere with the north, broke up this former unity. From this time on the Zijpe developed itself on its own free from the Shallow Region.

Cultural landscape

The dune ridges between Camperduin and Callantsoog were always narrow and weak. During the Elizabeth flood of 1421 the dunes were broken up. The sea defence wall was permanently repaired, but shifted in the direction of the land. In the end all the original villages are disappeared. Between 1466 and 1500 the loss of land had a width of approximately 200 m. In the beginning of

the 16th century stone beach jetties were built. The formation of the water board Hondsbossche Zeewering in 1555 led to the construction of continuous sea defence wall. The land behind the wall was now protected and large surfaces of land could be reclaimed. By the construction of a wall of drift sand between Callantsoog and Huisduinen after the storm of 1610 the forming of dunes was helped forward. The North sea could no longer beat with full force on the Westfriese Omringdijk.

Since 1660 the Hondsbossche Zeewering is shifted 600 m in the direction of the land. Until 1792 the sea had free play of eroding the dunes from Camperduin to Petten and the sea dikes were retreated in the direction of the land. Only around 1860 dikes could be constructed heavy and large enough to resist the forces of the sea.

In 1597 the closure of the mouth of the Zijpe 96500 ha) was a fact after an earlier attempt in 1552-1553. The importance of the closure was especially the fact, that the seawater could no longer penetrate the land during north-western storms. The quality of the soil was disappointing. Nevertheless approval was given immediately for reclaiming the land east of the Zijpe. In 1611 the Wieringerwaard (1800 ha) was reclaimed.

The pattern of the parcels joins the natural morphology. The Zijpe has a broken or bended pattern; on the contrary the pattern of the Wieringerwaard has a folded pattern. The Anna Paulownapolder has an own but continuous pattern on both sides of a creek. The Oostpolder has the same pattern as the Zijpe. The parcelling of the Wieringermeer (reclaimed in the first half of the 20th century) falls apart in a number of bumping lath patterns, which are derived from the different original borders of the reclamation. So the form is projected from outside the reclamation on the land.

The parcelling of the Zijpe exists of two rectangles turned around a point halfway the polder. The axis passes along the middle of the beach plane and follows the bend of the Westfriese Omringdijk. At the north side the axis is directed on Hippolythushoef on Wieringen. During the first reclamation the Groote Sloot was situated in the axis of the reclamation. In the third reclamation the Groote Sloot followed more or less the creek along the Omringdijk. As an adaptation on the sharp bend in the creek is the Groote Sloot turned to the Lock in the mouth of the Sint Maartenszwin. By its asymmetrical place the Groote Sloot connects as a mediator the low lying clay soils with the higher sandy soils and the water outside the polder. The windmills were all situated in the lower eastern part and the Groote Sloot drained on the sea using the difference of height of the tide.

The Westland

Between Hook of Holland and The Hague is the dune ridge narrow and relatively low or is even missing. Behind this coastal area lies immediately the Westland with its tightly packed glasshouses. Originally the area had large differences in landscape in a rather small area, but with the fast growth of the horticulture in the 19th century the use of the soil changed enormously. Farmers specialised themselves in horticulture and on the previous fields and pastures glasshouses were built. The city of glass was built.

Natural landscape

The clay soils of the river Gantel – streaming from Delft along Wateringen to the sea – met along the line Monster Poeldijk in the sandy soils of the beach ridge. Until the damming of the Gantel a layer of clay was deposited around these tidal creeks with its numerous branches. The Gantel discharged itself into the estuary of the Meuse. The width of the estuary of the Meuse was in the neighbourhood of Monster approximately 10 km. The northern embankment of the estuary was more or less straight line between Maassluis and Monster. In the end of the total land reclamation this line was shifted considerable to the south.
The oldest bog layer (the base bog) covered also totally the Westland during the time that coast was situated more westwards and formed a closed dune ridge. Around the beginning of our era the level of the sea rose and the mouth of the Meuse became an estuary. A part of the dunes disappeared in the sea.
A thick layer of tidal sediments was laid down on the bog.
The Meuse was not silted up after the end of the transgression, so that a new layer could not grow in the Westland. As a matter of a fact the boundary between the Westland and the reclaimed central lakes of Zuid Holland formed the boundary of the bog.
Around the 3rd century the area was a shallow landscape of salt marshes around the tidal creek the Gantel. The salt marshes reached out till the hinterland of living bog land. Along the Meuse levees were deposited, that in the end closed the mouth of the Gantel together with a dam.

Cultural landscape

From the beach ridge and the embankment of the Meuse the area was colonised. Till that time the region was hardly inhabitable. It was low-lying area between the dunes on the west and south side and the bog on the east side. The area was the drainage basin for the land around it. But the drainage of the Westland was very poor so that it became a muddy and swampy plane with luxuriant growth of reed.
In 1134 a strong gale devastated the whole south-western part of The Netherlands. The dunes between Naaldwijk and Monster were destroyed, the Gantel changed in a tidal creek with a system of tributaries as the Lier, the Vlaarding and the Schie. The Gantel got a new mouth west of the original one. The Vliet became the most important drainage channel. And last but not least a layer of clay, the Westlandsdek, covered the bog. At first the inhabitants left the area. They reclaimed the bog land of the hinterland from need of land. In later days the lost Westland was regained by means of systematically reclamation. Two closed dikes (ringdijk) were built: in the west a dike from the former dunes along the "dune island" Naaldwijk to the west bank of the Lier and a horse shoe like dike from the east bank of the Lier to the west bank of the Schie. Afterwards the creek system of the Lier situated between these two dikes was dammed. In 1190 one closed dike connected the dunes with the Schie.
On the remnants of the beach ridge and on the higher elevated and dry creek levees some 50 villas were built during the 16th and 17th century.

Architectonic landscape

'Behalven eene ruime wildbaan, vogelgaarde en oranjehuis, zijn hier schoone dreeven en lustbosschen, die allen overeenkomstig met de vereischte grootheid van den aanleg deezer hoeve, de oogen door allerlei verschiet-gezigten, met vermaak aandoen.' (Tegenwoordige staat der Vereenigde Nederlanden, 1746)

Honselaarsdijk At the beginning of the 17th century Honselaarsdijk house, a mediaeval manor, came into the hands of Prince Frederik Hendrik, who had the dilapidated castle pulled down and replaced. He also enlarged his property with manors and pieces of land in the neighbouring communities of Wateringen, Naaldwijk and Monster, so that the park eventually lay in four different communities. The land consisted mostly of 'orchards, meadows and farmland' growing wheat, and was now transformed into woodland and gardens. The Prince arranged to have a gardener, Andre Mollet, come over from France to carry out this transformation. The ensemble consisted of three sections enclosing one another, each surrounded by a canal: a castle with a forecourt, a garden with an orchard, and a piece of woodland or game reserve with kitchen gardens and servants' quarters. The woodland consisted of square fields, with a menagerie and gaming house in the north-west corner. Inside the canal and in front of the house lay a rectangular forecourt, connected through a gateway with a bridge over the moat with a crescent shaped reception area for waiting carriages. The crescent was surrounded by a massive colonnade of trees.

In 1673 the Oranjesluis [sluice] was built in the Maasdijk [dike], allowing the brackish water of the Maas to flow along a canal to Honselaarsdijk and provide the lakes with fresh water. In 1814 the house, which by then had become completely rundown, was demolished.

3.3 Estuaries and islands: the southern coast

Natural landscape

The southwest part of The Netherlands, where now thick layers of marine clay are deposited, was covered with endless bog land in former days. Small and big rivers crossed this bog that was developed behind the protecting ridges of the dunes. In the early Middle Ages the bog land was replaced with salt marshes by a transgression of the sea. Low salt marshes consisting of heavy clay were situated between high-elevated sandy creek levees. These creeks were silted up with sand in a fast pace. A pattern of sandy levees with silted up sandy creeks was formed. The salt marshes in between were set.

Cultural landscape

The first settlements were situated on the beach ridges. Since 7th century man also invaded the salt marshes. First the marshes were used for extensive stock farming. Small dwelling mounds – stel or stelberg - were built with in the centre of it a drinking pit for cattle. In the pit rainwater was gained and kept. The Hollestellenpolder on Zuid-Beveland was a salt marsh with a drinking pit or "holle stelle" (hollow mound) before the building of dikes in the first half of the 15th century. During the 11th and 12th century dwelling mounds were built. On the dwelling mounds farmhouses were built in a circle along a ring road with the backside of the farmhouse turned to the open land. Since the beginning of the 12th century the dikes became higher. From the side of the Haringvliet and the Meuse the sea penetrated the area and devastated the weak bog salt marshes. More creeks were formed that attacked the bog marshes.

During the Middle Ages the authority in the delta was hold by a number of noblemen. They cared among other things for the construction and maintenance of the dikes. The present islands Voorne, Goeree and Overflakkee belonged to the manor of Voorne. The largely not cultivated and reclaimed land was under supervision of the landlords or their bailiffs. They managed to interest colonist from Friesland, Vlaanderen and other regions for reclamation projects in the delta. This colonist had to surrender one tenth of their land to their landlord and they were obliged to contribute to the maintenance of the sea dikes.

The process of building dikes and land reclamation was less steady and without problems than in the bog land. Between 1200 and 1450 the farmers in the polders suffered from heavy western storms and a rising of the sea level. The water entered the deep in the hinterland by the tidal creeks. Polders became water again and the tidal inlets became wide and deep. At the end of the Middle Ages land reclamation could start again once more. The sea transformed the delta into an estuary. Only a small number was left and not attacked by the sea. From these polders new land was reclaimed from the tidal salt marshes. The old bog kernels developed into the Islands of Zuid Holland and Zeeland.

The steaming in the tidal inlets undermined many sea dikes in Zeeland. As a reaction the inhabitants built more inland reserve dikes. The building material for the dike was taken away from the land between the two dikes. As a matter of fact this area - inlaag – was given away to the sea. After a burst in the original sea dike the reserve dike became the new sea dike. In this way many hundreds of hectares of land were given up including some settlements. The last reserve dike was built in 1954.

the islands of Zuid Holland The islands Voorne and Putten are separated from each other by the winding gully of the Bernisse. On the island Voorne the transition from the small and shut parcels of the coastal zone to the wide-open polders in the south can be recognised clearly. The young dunes form a closed brim on the northwest crest of Voorne. More inland the soils overblown with fine sand and the just dug out sands (zanderijen) are situated. These soils will change into bog land and clay polders in the east. The south-eastern part is much later reclaimed than the northwest. In the southeast the bog land is covered with clay from the gullies some centuries longer. A thick layer of clay is deposited there. The land reclamation in this part of the island was on a larger scale and more rational.

The landscape of the Hoekse Waard is more homogenous. There is a difference between the old reclamation used as pasture land. The ditches are based on the old creek system and the parcels are small and elongated. The more recent reclaimed land is used for arable farming; the parcels are large and have the form of blocks. Here the structure is determined by the heavily with trees planted dikes. The oldest settlement of the Hoekse Waard is Strijen that dates from 992. Before the St Elizabeth flood it was situated east of the Keizersdijk in the Grote Waard; after the flood it was rebuilt west of the dike.

Nearly all the villages were situated along open water. Often a new canal was made during new land reclamation in order that the old village kept an open water connection with the sea. The village Poortugaal on the island IJsselmonde threatened to loose the open waterway to the sea as a result of new land reclamation. But here the village is moved several times in order to keep the harbour.

the first land reclamations on the islands of Zuid Holland The first polders reclaimed by dikes were in fact isolated bog islands on the north side of Voorne and Putten. This bog contained a small amount of salt deposited by floods with salt seawater. On the surface of these islands was a thin layer of clay. In the 12th and 13th century were these islands like Veckhoek, Zwartewaal, Rijswaard and Abbenbroek surrounded by a dike. In some parts of these islands the saline bog is dug out from under the layer of clay. This is called moernering. Nowadays this land is pastureland for the land is to wet for any crop. These first polders had a round form. They were also called ringpolders. The polders are comparable with the first salt marsh polders of Goeree-Overflakkee and in the Hoekse Waard. On the sea side of the dike were deep tidal gullies and scarcely overgrown muddy flats that felt dry during low tide. When the sedimentation on the salt marshes had attained such a height, that they stayed dry during high tide, than the land was reclaimed. This reclamation was directly connected with the first dikes around the bog islands. After each new land reclamation the dikes of the former reclamation stayed behind without any function of protection against the water. Sometimes these old dikes were levelled and sometimes they were used as a base for a new ribbon development. Only the seaside of the dike was used for the new settlement, because the slope was flat and longer. In tidal gullies dams were built in order that the stretch behind the dam could silt up. Some polders on Voorne-Putten have more the long elongated form of the gullies like polder the Strype and not the characteristic form of a peel like on the other islands of Zeeland and Zuid Holland. Once the Strype was an important waterway to Brielle. The island Putten was originally made up of five ringpolders, the polders Biert, Geervliet, Spijkenisse, Brabant and Vriesland. The polders together were called the Ring of Putten. The area that was around these polders was reclaimed later; this polder is called Simonshaven.

The eastern part of the Hoekse Waard was reclaimed and had the Keizersdijk between Puttershoek en Strijen as sea dike. The western part consisted of salt marshes with some isolated reclaimed higher parts. This area was not reclaimed, because it was very opportune to make salt from the saline bog underneath the thin layer of clay. In 1270 the Groote Waard was reclaimed by an enclosing dike around a number of smaller polders. The eastern part of the Hoekse Ward was also a part of the Groote Waard. The river the Meuse was dammed and diverted to the more north situated Nieuwe Maas for a better management of the water level in the Groote Waard .The control of the dam was rather random as was that of the enclosing dike.

flooding During the St. Elizabeth flood in 1421 the polder the Hoekse Waard was totally inundated. Only the Sint Anthonypolder and The Keizersdijk were saved. The islands Voorne and Putten were save during this flood, but during other heavy storms it was also flooded. The soil stayed for years unfertile by the inundation with salt water. The Zwijndrechtse Waard surrounded by the wide rivers of the Waal and the Devel was inundated in 1322. Ten years later the Waard was again reclaimed; the Waal and the Devel were dammed in the same time. The Zwijndrechtse Waard together with the Riederwaard was inundated again in 1374. The dikes of the Zwijndrechtse Waard were quick repaired, but in the inundated Riederwaard the gully Koedood was widened up and changed in a broad tidal stream. Only in 1580 the Koedood was dammed and the Riederwaard was reclaimed again. During the St Elizabeth flood a part of the island IJsselmonde was also inundated. The mouth of the Meuse moved southwards. The branch of the Meuse along Rotterdam and Vlaardingen obtained less water because of this diversion.

Only the river Rhine used this waterway as a way out to the sea. The amount of water decreased and so did the stream velocity of the water in the river. This caused a silting up of the originally broad waterway and the island Rozenburg came into being. At the end only two small streams were left together with some islands.

land reclamation after the inundation In the old inundated polders with a bog soil or bog covered with a thin layer of clay came into being large tidal gullies. The water could enter the hinterland very far. The bog and clay over the bog was eroded. From that period date the Koedood on IJsselmonde and the Hollands Diep. A large part of the islands of Zuid Holland was covered with rather thick layers of sandy clay and clay: sea deposits along the coast and river deposits on the side of the back lands. In between these sediments there is a transition of freshwater sediments to saltwater sediments. From the 15th till the 17th century many salt marshes were reclaimed. The islands got their today appearances during that time.

In the 16th century the drainage became worse by the rising of the sea level and the setting of the soil. The introduction of the windmill was also here a relief. Water basins were made temporal water storage. The Brielse Gracht, the Vierambachtenboezem and the Spuiboezem date from this early period.

the Hoekse Waard The greater part of the polders in the Hoekse Waard was reclaimed again after the St Elizabeth flood (1421). The first was the Oudeland van Strijen situated next to the saved Anthonypolder. About 1500 the whole area around the Oude Maas was reclaimed. This Oudeland exists of a thick layer of bog covered by a thin layer of clay.

The Hoekse Waard has several nucleuses around which land reclamation took place. Examples are the Sint Anthonypolder in the east and the polders Oud-Heinenoord, Oude Korendijk and Oud-Piershill in the west. In the 16th century the salt marshes around these polder islands ware reclaimed; a connection was made between the west and the east part of the Hoekse Waard. In these younger polders a thicker layer of marine clay could be deposited on the bog. The original tidal gullies are filled up with sand. Setting of the polder soil caused

an inversion of the original relief of higher clay on bog soils and in the lower soils in the gullies. Nowadays the gullies form small ridges in the landscape. In 1939 the last polder – the Albertpolder – along the Hollands Diep was reclaimed.

IJsselmonde From the 15th till the 17th century new polders were reclaimed with the old nucleus of IJsselmonde as a point of departure. The tidal gullies became smaller and thus the stream velocity in the gullies increased. Sedimentation of sand and clay became more difficult and so the later reclamation got the form of elongated peels.

the Dunes The western winds formed along the coast low dunes from the marine sand deposits. The sand was also blown over the fields and pastures behind the dunes. In order to protect the land against the drift-sand the farmers built dikes. Against these dikes new higher dunes were formed.

The large transformations in the landscape started by the inundation during World War II. Low lying polders were inundated for military reasons. As a reaction on the large catastrophe of the inundation in 1953 In Zeeland, Zuid Holland and the western part of Noord Brabant the Delta works were developed in order to protect the people living in that region and to shorten the length of the sea dikes. By realising the Delta works no tidal movement was felt any longer in the quiet water of the Oosterschelde, Grevelingen and Haringvliet behind the dikes and no longer salt marshes were formed by the sea.

Architectonic landscape

Walcheren One of the earliest examples of post-war businesslike landscape architecture was born from pure need. The German occupation forces had inundated the island towards the end of World War II in 1944 in order to slow down the advances of the allied troops. The long time exposure to the salt water of the soil was disastrous for the quality of it. It was soon obvious after the war that it was not possible to bring the land back in the old state. Only measures in the direction of renewal could probably help.

The parcels on Walcheren were very small. The most important agricultural, but also landscape architectonic spatial intervention was an enormous enlargement of scale. Not only the parcels were enlarged but also the network of linear vegetation elements in the landscape was strongly thinned. The densely network of hawthorn hedges from former days was perished by the inundation. The choice was made not to replant the hedges, but to plant trees along the roads. By doing so a total inversion of the landscape was attained. In the pre-war situation roads without trees crossed through fields, that were densely planted all around and now the roads became green tunnels in an open landscape. The thinning of the planting was partly a result of modern agricultural demands, but it was also an esthetical choice. Less, but thicker vegetation had a strong visual effect in the eyes of the designers. This effect was a modern landscape worthy.

The new planting follows the lines of the old landscape, because the roads kept the historic trace on the levees of the creeks as far as possible. The patterns hidden underneath the landscape are pronounced by the enlargement of scale and by the thicker plantation along lines.

In the north-eastern part of the island deep tidal creeks have been come into being by the force of the sea that had freely ravaged the land more than year. After the closure of the dike near Veere these creek system stayed behind. Landscape architect Nico de Jonge took advantage of this total new landscape by designing a number of geometrical wood elements in between and around the creeks. In the end the wood became smaller than was designed and was confined on the sandy washovers in the direct surrounding of the creeks. The clay soil was reserved for agriculture. The fixed wood parcels and the capricious formed creeks give a strong contrast between natural and cultural forms. Later after the closure of the Veerse Gat as a part of the Delta Works, the same design of fixed wood parcels as a contrast to the meandering Veerse Gat was used.

3.4 The Zuiderzeepolders

'Toen d'aarde bloot kwam, druipend van het water,
was het een scheppingsdag, waarop Gods hand
de stromen scheidde van het slijm'rig land,
dat rilde van verwachting. Verlatener

dan ooit lag Schokland, walvis op het strand.
De lip lubt om't gebit der palissade,
harpoenen in de rug, bomen ter kade,
de flanken aangevreten en ontmand.

En uitgeloerde boeren, strak de monden,
trekken met paard en ploegschaar in de stand
de voren tot een waaier door de gronden,

delvend het wrak uit zavel en uit zand,
waar eens de golven tegen 't leven stonden
van ploegers met de helmstok in de hand.
(Jan H. de Groot, 1980)

Natural landscape

The Zuiderzee was a part of the Dutch Shallow Sea; two times a day the salt water of the sea entered the Zuiderzee by the Shallow Sea. There was a strong stream and congestion of the water in the narrow between Enkhuizen and Stavoren. More south the influence of the sea became less. The supply of fresh water by the rivers the Zwarte Water, the IJssel, the Eem and the Utrechtse Vecht caused a gradual change in the Zuiderzee from fresh water to salt water.

Cultural landscape

In 1866 the association of the Zuiderzee was founded. This was a joint venture set up by influential private persons, six provinces, twenty-five local authorities and sixty-four water boards. The decision to start the Zuiderzee Works in order to reclaim the Zuiderzee was laid down in the Law of the 14th of June in 1918 still during World War I. The basic plan was made Cornelis Lely, although Hendric Stevin lanced a similar plan two and a half century earlier. The plan was called: "Hoe het ghewelt en het vergif der Noortsee uytten Verenigt Nederland te verdrijven sy". The new plan of Stevin proposed a lake of fresh water in the central part of The Netherlands. All the tidal inlets between the Shallow Islands from Noord Holland to Ameland should be dammed and a dike should be built from Ameland to the coast of Friesland. The Buiten-IJ should also be dammed and a canal with sea locks should be constructed between Amsterdam and the North sea on the place where nowadays the Noordzeekanaal is situated.
The plan of Lely proposed a dam with a length of 30 km, which should close the Zuiderzee. As the years passed the closed part of the sea should became a freshwater reservoir, because the river IJssel would bring fresh water in it.

This fresh water reservoir, the IJsselmeer, was very important for the surrounding regions, which suffered from salination from early days. The food shortage during World War I made the reclamation of 225.000 ha very attractive. But the danger of inundation was more decisive. The Zuiderzee was an inland sea of 400.000 ha with an open connection with the North sea and one could imagine the danger. The flood of 1916 that caused large inundation especially around the Zuiderzee was an important reason for damming the sea.

The closing of the Zuiderzee shortened the coast with almost 300 km. Closing the gap, the Vlieter, in 1932, ended the building of the dam. In contrast with earlier reclamation the whole work – the reclamation, the layout and the design - was planned by the government.
Before starting the extensive project an extra number of De Amsterdammer was edited in 1918,

in which several specialists on the field of the Zuiderzee works wrote about parts of the project. Jac. P. Thijsse dealt with the aesthetics of the polder parcelling in an article. He wrote:*"We hope, that the parcelling of the new polders not will be done in a system of blocks and that the soil will not be exploited till the last quadrate meter for earning money. The quarter of a million of people that will live here in the future need something more than a substantial standard of live but should also be protected against boredom and one-sidedness. These polders should become beautiful and let us say amusing. In one-way or another villages should grow and that should not be made impossible".* Thijsse showed the weakness of the project. The plan anticipated in not more than the agrarian exploitation of the polders, which were determined by the fertility the sea bottom.

Wieringermeer The first reclamation was the Wieringermeer between 1927 and 1929. So the polder was reclaimed for the closure of the Afsluitdijk. The dike was to be built in water, which was still influenced by the tide. The dike should be as high and massive that it could resist storm floods. In 1941 the opening up and the colonisation of the 20.000 ha of the new land was completed. In 1945 the dike was blown up on two places; the Wieringermeer was flooded and after the World War II the dikes had to be repaired. The Wieringermeer wad not only on the field of design a function of a specimen for the following generation of IJsselmeerpolders, but it had also a laboratory function in other respects. The start of the land reclamation was in a period, in which the social sciences got a status equivalent to the technical sciences and asserted their influence. The new polders were considered as new regions for colonisation and they were in that way an ideal experiment for social planning.

Noordoostpolder The reclamation of the Noordoostpolder took place between 1936 and 1940. The land became dry in 1942, but the layout took the next 20 years. The islands Schokland and Urk became a part of the polder. Yet during the war the designs for the central town Emmeloord and the first villages were made. Also a landscape design for the whole polder – for the first time under the name landscape design – was made for the polder as a total. Characteristic for the Noordoostpoder are sheds of concrete panel-work. The sheds were built up of prefabricated parts. These parts were developed on an industrial way as an answer on the scarcity of labour and traditional building material from just after the war.

Oostelijk and Zuidelijk Flevoland The polders were reclaimed between 1950 and 1968. It soon appears that by draining water from the new Noordoostpolder the groundwater level in the "old land" dropped notable. For that reason the plan of Lely for the reclamation of the Flevopolders was changed. It was decided to keep open water between the old land - the Veluwe and the Gooi - and the new polders. So edge lakes –randmeren - were formed. The ideas about agriculture were also changed: a parcel of 300x800 m had the ideal measurements for the Noordoostpolder , but for the Flevoland the parcels were enlarged till 450x1000 m. The growing of leisure time and in connection with it the greater demand for recreation grounds changed also the program for the polder. Zuidelijk Flevoland situated near the Randstad consists 25% woodland and 50 % agriculture land, while in the Noordoostpolder still 87% of the surface was occupied by agriculture land.

The last polder the Markermeer with 60.000 ha should become the largest polder of all the five IJsselmeerpolders, but the plan was abandoned.

The reclamation of the land took place in open water. So they started with the building of a ring dike with some open gaps to place pumping-engines. It took several years to build the ring dike. Afterwards the polder was drained in nine months. The extended mud flats were sowed with reed. After a short time the land could be entered. Each year a part of the reed land was cleared. In the water saturated and impermeable soil trenches were dug with a distance of each ranging from 12-24 m. The water was brought to the ditches and canals by these trenches. After enough ripening of the soil in

3-4 years the trenches were replaced by field-drains. On this way large flat parcels were obtained.

geometry The first design for the Wieringermeer dates from 1870 and is made up of a network of quadrangles with a central village on the crossing of the principle canals, just as was done in the Beemster. Only the measurements were larger. The executed design does not resemble the layout of the Beemster, but was parcelled from the edges led by pure hydraulic reasons. The irregular form of the ring dike caused different parcel patterns that met each other in the polder. Instead of along the brims diagonal angles and oblique parcels are found in the middle of the polder. The number of angle distortions in the parcel pattern gives a surprisingly varied image.

As ordering for the Noordoostpolder a principle structure was chosen, that on scale levels the space would articulate on a simple, but strongly marked way. Two crossed axes formed by wood parcels should divide the polder in four quadrants. Those quadrants on their turn should be divided in smaller spaces by windscreens of trees or rows of trees. In the direction of the ring dike the compartments became smaller in order to give the brim of the polder a more closed image. In consideration of pure production technique only the geometrical pattern without the trees, that had to form the spatial layer, is used in the end. The result is a regular pattern of radial roads and canals. The course of the ring dike shows long straight parts connected with each other by short twists and bends. In Oostelijk Flevoland the polder tradition of rectilinear layouts was radical broken with. The pattern of the Flevopolders is irregular composed of slightly bended roads, canals and dikes. It was no longer a radial layout; the central position of Dronten is mostly neglected.

In the design of the Dutch polders is an obvious process of development. The 17th century Beemster has an almost pure orthogonal grid. The Haarlemmermeer had only a one-sided symmetry around the principle canal, but the orthogonal plan was kept. In the Noordoostpolder the rectangles disappeared and the straight lines lost their continuous character. Oostelijk Flevoland obtained an irregular pattern of slightly bended roads, canals and dikes.

Architectonic landscape

Of all the projects only the Afsluitdijk had an architectonic content. The dike contains two complexes of locks that were built in the sea in large trenches surrounded by temporary dikes. After the finishing the locks the pits were flooded by removal of the dike. By way of the locks the IJsselmeer can be drained in the sea twice a day. The buildings for the mechanism of the drain locks and the pumping-engines Lely and Leemans are outstanding pronouncements of the enormous scale and complexity of the project. The bright white and sculpturally designed volumes of the pumping-engines and locks form a dramatic contrast with the polder and the dike.

3.5 Recent transformations in the coastal landscape

the Delta works As in 1953 a large number of dikes broke through as a result form heavy storms from sea together with spring tide, large compartments of the dikes broke down. These compartments were often old and worn-out, too narrow and often too low. After the heavy storms the landscape developed in centuries was turned into one mud and sand plane. In the flood 1835 men died. To prevent such a disaster in future the Delta plan was proposed; all the tidal inlets were to be closed except the most southerly, which should stay open for the harbour of Antwerpen.
First the Brielse Maas was dammed followed by the Veerse Gat and the Zandkreek south of Noord Beveland. By doing so a water sport area was created without tidal movements. The closure was done by pontoons, based on the idea of pontoons used by the allied landing in France in 1944. The large inlets of the Grevelingen, the Oosterschelde and the Haringvliet required more research. It seemed that there was too little knowledge about the influence of the tide on the sand flats and of the movements of the sandbanks by cutting of the tidal streams. The longest discussions were about the closure of the Oosterschelde. The enormous influence of a total closure on the environment became more and more obvious; weighing of these interests against those of protection led to a change in the Delta wet in 1976. The Oosterschelde was closed by a water permeable dam.

4 The river landscape

The river landscape

'Denkend aan Holland zie ik brede rivieren
Traag door oneindig laagland gaan.' (Marsman)

(Thinking of Holland I see wide rivers
move slowly through endless lowlands.)

Natural landscape

The river plain shows ripples, elongated levees that accompany the river on both sides, with low-lying back lands behind them. Fossil higher levees articulate these back lands. This zoning is an arrangement parallel to the river, related and referring to the river. The character and the proportions of levees and back lands differ between the upstream and downstream part of the Dutch Delta. In the east of The Netherlands, where there is no tidal influence, the rivers have wide outer marshes, wide sandy levees and clay back lands. In the West of The Netherlands and at the mouth of the IJssel the levees are narrow, built up by clay and behind them are extended bog back lands. Nowadays high dikes reinforce the levees.

The natural river is characterised by a broad shallow gully with elongated sandbanks and islands in the direction of the stream. On the higher scale the form is characterised as linear, continuous and fluent. On a lower scale bends, direction, repetition and rhythm transform the form continuously. The form of the river and of that the islands are complementary to one another. The twisting of the river is unique for every section of the river in the delta. Close to the mouth the river has an almost linear course and ends in a hooked or sharp bend under influence of the tidal stream. The central course of the river has mostly a twisting form. On stretches with sandy subsoil the meanders of the river have large amplitude.

The Netherlands as a delta From the origin to the mouth the dimensions of a river grow. As a total a river is a hierarchical system; a main stream with branches of different degrees. The rivers in the lowlands form the last stadium in the course from well to sea in which the eroded material from the upper zone is deposited. Whereas in the mountains and the hills branching of a river is almost impossible because of the narrow valley floor, on a plain the river has more freedom in seeking its own way. The branches in a delta are more or less of the same size. Parataxis instead of hierarchy becomes the main characteristic of the system. This aspect of equal river branches is a form characteristic of the lowlands.

a network of rivers Typical for a delta is the plain, built up by the rivers. That is the reason that the rivers can change their course so easy within the boundaries of the higher grounds. The triangular shape of the delta is connected to the branching of the rivers. The rivers do not only split in this area, but they also reunite. The branches of Rhine and Meuse are strongly braided especially close to the mouth. There is no obvious hierarchy of main stream and secondary streams in this network of braided rivers; it is better to speak of parataxis. Moreover the hierarchy of wide and small river branches has changed time and again.

Specific places in the river pattern in the delta are those where river branches split or reunite. Just as specific are the places where watercourses of a lower order, such as brooks and bog streams, flow together with the main river. There is an obvious difference in orientation between those streams, that flow more or less perpendicular and from a higher level to the river, and the dug watercourses (weteringen), that are situated parallel to the river and flow into the river as far downstream as possible.

the plain as an empire of islands A network of river branches divides up the plain into large ”islands” by bifurcation and flowing together. The Dutch river landscape seems to be an empire of islands: an empire in which the width of the islands surpasses that of the river. River and island function as the fundamental (and complementary) building blocks of the river landscape.

the plain and the edge The higher grounds create a more or less distinguished edge, framing the plain and supporting the main direction of the river. The edges of the plain are the context; in this case the ice pushed ridges or frontal moraine of the Veluwe, the Utrechtse Heuvelrug and the Rijk van Nijmegen and the sand soils of Salland and Brabant. River and river plain are connected to the higher grounds by brooks and brook valleys. Each of the river branches in the delta has its own characteristic place: the Waal as the broad central river, the Meuse “rubbing” against the sand soils of Brabant, the Nederrijn en Vecht “scraping” against the Veluwe and the Utrechtse Heuvelrug and the IJssel framed between higher soils. The most striking edges, such as the ice pushed ridges of the Utrechtse Heuvelrug , the Veluwe and the Rijk van Nijmegen, function as a natural balcony, from which one can oversee the river and its surroundings in one panoramic view.

ruffles in the plain The river plain shows ruffles: elongated natural levees that accompany the course, and low-lying back lands behind them. This morphology of the river plain changes at each high tide under influence of erosion and especially of sedimentation. The sedimentation, which is so important for all lowland rivers, takes place on all low parts in the river region.

The differentiation in levees and back lands is caused by the selection of the material during sedimentation. The morphological dynamics become stronger as the velocity increases because heavier sediment can then be transported. The stream velocity decreases in proportion to the distance to the main current. This caused a sorting of sediment from coarse and heavy to fine and light.

The finest sediment fraction of silt and clay would sink down on the lowest places, the back lands, in between the streams. Here the heaviest clay soils are found; they are poorly drained and often, especially in the western part of the river area, covered by peat.

In the natural river landscape the lower embankment zones between river and levee were most frequently inundated. The levees suffered the least severe and the least frequent of inundation because of their higher position. And the back lands behind the levees stayed wet after inundation for a long time, so that is why here that peat developed.

The stream character of the river changed into a meandering streambed with wide curves and twists. The outer or concave bank was eroded while sedimentation took place on the convex or inner bank. By this process of erosion and sedimentation the curves became larger and move downstream. The sedimentation made the riverbed and its levees raise higher and higher. Sometimes the river would make a shortcut and leave an unused curve behind. The left curve would overgrow with plants and after some time be only perceptible as a fully overgrown ridge in the landscape.

the dynamics of a meander A natural lowland river is subjected to a continuous process of changes by erosion and sedimentation: the morphological dynamics. Every stretch of the lowland river has a specific form varying from straight, slightly meandering to strong meandering. The meander or bend depends on the size of the wave length, the amplitude and change in direction of the river. The form of the river evolves by shifting the bend forward and enlarging the bend sideways or by cutting off the bend.

Each (water) course tends to waving: so do rivers, but also gulf streams in the ocean and streams in the air. The archetype of the curving, dynamic stream form is the meander.[4] About origin and development of meanders various hypothesis exist. Differences in stream velocity and differences in subsoil in connection with erosion and sedimentation are important for the development of a meander.

In an originally straight river sand bars can develop on both sides at regular intervals. A slightly oscillating pattern develops, enforced by secondary streams. Erosion and sedimentation cause an asymmetrical cross-section. The alternation of bends gives the stream a stabile character.

the metamorphosis During high discharges of water the river landscape experiences a metamorphosis. In a natural river the water level rises during high discharges and the river widens sideways crawling up against the heights of the landscape. The pattern of the relief of the river plane determines the sideways expansion during the high water. The form of the plain changes gradually but unceasingly caused by increase and decrease of the discharge.

The winter bed of a natural lowland river is many times wider than the summer bed. The low embankment zones, the lower natural levees and often also the back lands are inundated; only the highest parts of the levees are safe against the water. High water discharges enlarge the perceptibility of the river by the enormous surfaces of water. On the other hand the differences in the form of the river are diminished, because the sharp and faint bends are covered by the broad surface of water.

The image of the river during low water is less spectacular. The water lowers and fills only the lowest parts of the river channel. During the lowering of the water level more and more sandbanks and bars become visible; the contours of the river change gradually but continuous. The wind gets free play on the river sand and river dunes can come into being.

the back land The back lands of a natural river exist of elongated levees on both sides of the river and elongated back lands behind the levees. Sometimes the back lands are divided by fossil river streams or stream ridges; former streambeds with their levees, visible as ridges in the lower land. The stream ridges are a remembrance of the earlier dynamic periods of shifting rivers.

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[4] The name for this type of bending, dynamic stream form originates from the river *Meander* (Büyük Menderes) in Turkey.

Cultural landscape

The cultural transformation of the natural river landscape is characterised by two technical processes. On the one hand the drainage and the parcelling of the agricultural land and on the other the building of dikes for protection from flooding. Both processes are related to the creation of solid and marked boundaries, while in earlier times only changeable and often gradual transitions existed.

The stretch of land between the dikes is so wide, that it comprises not only the river but also a floodplain. The levees and the back lands, which lay behind the dikes, were no longer under the influence of the river except in times of inundation. Stream ridges and left river branches stayed behind as congealed forms of the streaming water of a river. Sedimentation could only take place on the flood plains next the river. This led to a rising of the high water bed of the river and the flood plain. The sedimentation on the floodplain was helped along by planting the higher parts and damming the secondary gullies on the floodplain. The secondary gullies of the wilder river system in the floodplain became also congealed forms of the river. The fixed and sharp limits of dikes and embankments replaced the changeable and gradual transitions of the natural river system and shaped their own topography.

parcelling of the plane Reclamation of the river plain led to two different types of parcelling: reclamation of the levees and that of the back lands. Downstream, where the back lands become boggier, the parcelling changes into the peat reclamation with their regular parcelling of very long and narrow strips. At the mouth of the river, where the influence of the sea dominates, are the young marine clay polders with the regular strip or block parcelling.

The pattern of the parcellation is characterised by the orientation and the changes in direction of the whole pattern, and by the dimensions and the form of the individual parcels. The pattern is related to the zoning of levees, back lands and outer marshes, corresponding with the time of reclamation and the agricultural use. The orientation of the parcelling is mostly perpendicular to the main direction of the river, or to the dikes, roads or waterways ,that are more or less parallel to the river. On the natural levees the orientation of the parcelling is less regular and less uniform than in the back lands. A parcelling parallel to the river also occurs in the outer marshes. At sharp bends in the river course the pattern of parcellation also changes direction. Moreover changes of direction occur in places where an old levee crosses the back lands, on the transition of the landside and the outside of the dikes or on the boundary of two water drainage entities. Fan shaped and wedge-shaped patterns can result from these changes in direction.

The parcelling of the natural levees and the back lands is not uniform. The highest levees are the oldest inhabited parts of the river area and they have a parcelling of blocks of which the form and orientation is adapted to the irregular relief of the levee. The younger parcels of the lower levees and in the back lands are arranged in more regular parallel strips. In the course of time blocks and wide strips are sometimes divided in narrow strips by inheritance. On the other hand narrow strips in the back lands are joined to broad strips of land on behalf of the "*ruilverkaveling*"[5] in the 20th century. Under the same act the drainage of the back lands is improved. As a result the differences in measurement between levees and swamps become less obvious.

The parcelling in the floodplain or the outer marshes differs strongly from the parcelling of the back lands. Remnants of riverbeds, embankments and ditches parallel to the river dominate the image. Here the boundaries of the parcels are cleared in order to obtain a better river management. The new parcels are large, irregular and even amorphous. In the youngest parts of the river plain there is no parcelling at all.

[5] Ruilverkaveling: land consolidation act

the plain in compartments The building of dikes comprises the subdividing of space, the tracing and marking of the new boundary - always as a reaction to the original landscape form. The introduction of the dike as a sharp boundary has an enormous impact on topography, space and image of the river landscape.

On the scale of the lowland river the dike, like the river, follows the lower parts of The Netherlands, avoiding the higher parts such as the ice ridge of the Veluwe, Montferland and the Rijk van Nijmegen. The existing ripples in the plain, the elongated natural levees, are the base for the linked dikes in the river plain. The dikes transformed the fluent transition between the winter bed of the river and the levee into a sharp edge.

The dike divides the plain into two types of compartments: the wet floodplain between river and dike and the artificially drained compartment inside the dikes (the ”waarden” or polders). The dynamic of the river is concentrated in the floodplain for the hydrological as well as for the morphological aspects.

Sedimentation in the floodplain (originally the lowest place of a river system) and setting of the soil in the back lands caused an inversion of the landscape: the winter bed of the river became higher than the back lands. The empire of islands characterizing a natural lowland river changes gradually into a range of embanked pits.

The dike as a boundary sharpens the contrast between the floodplain and the back lands, along with natural and anthropogenic processes that gave them each their own patterns and images. The boundary enhances these differences. The salient line of the dike is above all an important intervention of landscape architecture: the dikes make the river delta legible as a coherent landscape.

canalising The variety in the curves of the river led to different interventions in the management of the river. Meanders were cut off or a canal as a by-pass was built. When the curves are not that strong, an intervention as mentioned above is seldom necessary; sometimes the curves are even further diminished by private land reclamation. In the straight stretches the form of the river remained unaltered.

Urban landscape

the condensed plain Most of the river landscape is condensed with built-up areas, but there are large differences in concentration and pattern of these built-up areas. The differences trace partly back to the strategies that counted at the time of settlement. In the first place a high and so a dry place was recognizable as a factor for settlement. On elevated places at a short distance of the river towns and large village are situated. These places are the ice pushed ridges of Nijmegen and Arnhem, the river terraces of Maastricht and the higher sandy soils along the right embankment of the IJssel. In other parts broad natural levees and in the downstream area the dikes are the obvious kernels for the built-up areas. A second factor for settlement in the river landscape is the junction of two rivers. On the junction of a river with a tributary, brook or bog stream towns and larger villages like Dordrecht, Rotterdam, Tiel, Gorinchem, Roermond, Deventer and Zutphen are situated.

These two factors together give an image of a concentration of built-up areas along the river embankments in contrast with a relatively empty back land. A long regular row of villages alternated with a town is the familiar image along a river. The condensation of the natural levees enhances the natural zoning parallel to the river; buildings in the back lands blur the zoning. The natural asymmetry of river branches like the Nederrijn and he IJssel is enhanced by the dense built-up areas along the highest embankment.

a network of roads The river plain is traversed in all directions by a network of highways and railroads. The pattern of this national infrastructure is characterized by two directions. On one hand there are roads parallel to the river in the relatively empty back lands ; on the other hand there are roads perpendicular to the river. The perpendicular crossings over the river determine the direction. The direction of the large rivers is made legible by the pattern of highways and railroads.

the fortified plain There were not only interventions in the Delta in the fight against the water, but also in the fight against human enemies. Since the Late Middle Ages strongholds were built on strategic places. They are mostly characterized by a mansion surrounded by a moat. The mansion is round or rectangular with one or more towers functioning as a landmark in the plain.

Relatively many castles are situated in the river area. The water was important for the defence: it was used to fill the moats. During the Middle Ages a castle also had a political and economical function and the rivers were strategic places for toll collection and the supply of goods.

The next step in the defence landscape of the rivers was the building of fortified cities. Like the castles they were built at strategic places: the junction with a brook, secondary river or bog streams. At first moats and walls with gates and turrets were sufficient for defending, but from the 16th century onward the walls were replaced by vast earthen ramparts. The polygonal ramparts with bastions jutting out and defensive islands in the moats gave the defensive towns a more and more striking appearance. In the 19th century in many towns the ramparts were (partly) destroyed and transformed into a hilly promenade around the city centre.

The last step in the fortified plain was the construction of the ‘Hollandse Waterlinie’ (Dutch Water Line) and the ‘Nieuwe Hollandse Waterlinie’ (New Dutch Water Line), straight through the river plain. A Water Line is a series of fortifications supporting one another. In times of threat the defence line was strengthened by inundating the areas in between. Between the IJsselmeer and Utrecht the line is parallel to the River Vecht and from Utrecht downward it is perpendicular to the rivers. At the intersections of river and Waterlinie existing fortified towns were strengthened and new forts arose.

Utrecht Utrecht was built at the site where the Romans built a border post 2000 years ago, where the Kromme Rijn divides into the Utrechtse Vecht

and the Oude Rijn. Here the trade on water to and from Germany, Amsterdam and England joined.

The city is situated on the northern edge of the river landscape. At the north the peat landscape begins and at the north east the sand of the Veluwe. The city is for the greater part limited to the narrow strips of river clay. The first urban activities outside the walled centre followed the three rivers and the canal Vaartse Rijn that connects to the river Lek in the south. The railways follow the course of the rivers at a short distance. They are the industrial alternative for the natural waterways. The narrow zone of river clay is transformed into a condensed bundle of infrastructure in combination with estates.

Nowadays this most important traffic junction of The Netherlands is surrounded by a net of highways, canals and railways following the direction of the rivers at a short distance. The built-up areas of Utrecht are enclosed by the infrastructure lines, causing the city to develop in distinctive rings. Every extension is enclosed and cut off from the other areas. In order to overcome this problem a network of connections perpendicular to the main directions is made at a lower scale.

Utrecht is a central point in the Hollandse Waterlinie. The peat areas are the inundation fields for the defence line. At the east of the city is a compact series of fortifications. A condition for the defence was that no building was allowed in the shooting range of the defence line. As a result the line is a sharp border and emphasises the natural border between peat and river clay. After World War II the line lost its function. Part of the dike is transformed into the ring road. Parallel to it the A 27 forms the new city border.

Oog in Al is a former estate at the canalised river Leidsche Rijn. The villa looked over the canal back to the city centre. Nowadays the estate is part of the Kanaleneiland, enclosed by the residential area Oog in Al that was designed by Berlage in 1920.

After World War II the residential area Tuindorp was made in the peat area. The street pattern is characteristic, reminiscent to the long lines of the peat landscape. Contrary to similar developments of around 1900, in which the pattern is literally copied, Tuindorp is a homogeneous neighbourhood, planned according to the garden city adage.

Architectonic landscape

the villa landscape of Utrecht Utrecht is located like a spider at the centre of a web of structure lines, rural and urban, each strikingly different from the rest, which found their expression in different landscapes of villas.

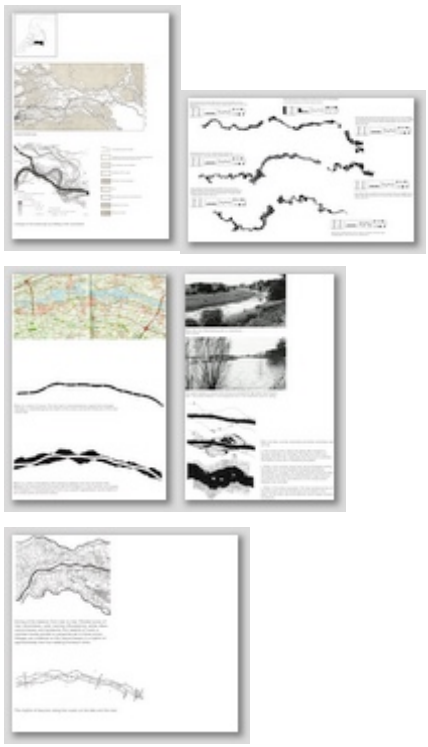
The oldest such landscapes lay along the waterways, at strategic points, particularly on the levees of the Kromme Rijn and Lek rivers. The villas were originally border castles and fortresses on the reclaimed land between the area ruled by the counts of Holland and Gelre and the bishop of Utrecht.

By the 17th century there had been a substantial increase in the number of villas along the roads and waterways leading away from towns. Four different landscapes of villa came into being. Country houses were built to the west of Utrecht along the Vleutense Rijn and the Leidsche Rijn similar to those along the Vliet near Den Haag and along the waterways near Amsterdam. To the south a landscape of villas was created along the Vaartsche Rijn, near the town, in which the country houses combined industrial activity with recreation. The 16th-century manors along the Langbroekerwetering were extended to form a landscape of villas, in the middle of the polder, with a watercourse as a reclamation base. Finally, a series of villas was created at the edge of the Utrecht ridge, along the road from Utrecht to Arnhem.

By the 19th century a landscape of villas, the Utrechtse Lustwarande, had been created along the Utrecht ridge, in the transitional area between the fertile land by the rivers and sandy ground, whereas the villas to the west and south of Utrecht had largely disappeared. The axis along which this development took place was provided by the road from Utrecht to Arnhem, along which ran a tram taking the town dweller to his villa. The role played by the horse tram there was comparable with the role played by the canal boat in the west of the country. The country houses on the Lustwarande covered almost the entire ridge with large stretches of woodland.

Over the centuries the urban terrain shifted from the Kromme Rijn via the Langbroeker Wetering on to the Utrecht ridge, a development which continues to this day in the upper-class suburban landscape on and around the ridge. In the 16th century the position of a manor was determined by the location of the infrastructure, which at the time meant the major rivers. In the 17th century country houses were built in the fertile polder land as an expression of prosperity and industry, and in the 19th century on the hilly wooded sandy ground, as a representation of idealised nature. The popularity of the castles and small manors along the waterways leading to the villas on sandy ground was accompanied by an increase in scale.

4.1 The central river landscape



The central river landscape forms a narrow ribbon in east west direction in the middle of The Netherlands. The south side of this ribbon is formed by the riverbed Meuse and the north side by the riverbeds of Rhine and Lek. The ribbon is bordered by the hills of Utrecht and the Veluwe in the north and the sand area of Brabant in the south.

The Midden Waal can be regarded as prototype of the Dutch lowland river because of the symmetrical position in the central river region, the weak winding river form and the closed dikes.

Natural landscape

The great rivers did not always stream to the west. Originally they streamed to the north in the wide plain of the delta. During the Pleistocene the lowering temperature caused an expansion of the Scandinavian glaciers. 200,000 years ago these glaciers reached the north German plains and occupied the valleys of the rivers. The glacier tongue pushed the frozen sediment forwards, forming the range of hills of Utrecht and the Veluwe and the hilly country near Nijmegen. The glaciers and the hills forced the rivers to find themselves a way to the west. The riverbed became more permanent at the end of the glacial period by the eroding work of the huge quantity of melting water that streamed through the bed.

After the ice ages Rhine and Meuse were braiding rivers for a long time: the water streamed towards the sea across a slightly inclining slope without a real riverbed. The sediment load of the rivers was very high during that time. And little by little with the decline of the amount of sediment transported by the river they found their way to the sea by forming their own riverbed between natural levees. These elongated levees consist of sandy and well drained clay soils (*zavel*), rich and good bearing soils, remaining dry during high water. These natural levees were occupied by the first colonists in the region approximately 5,000 years ago.

The winding of the river can be dissected in a series of bends. On the scale of a river stretch one can recognize a global river form in that series of bends. The form is related to the geomorphologic processes belonging to that river stretch. The section of the Midden Waal has a weak winding river form, with the sinusoidal curves moving down the stream.

Cultural landscape

The river Rhine is the most important of the river courses in The Netherlands. The character of the Rhine is that of a mixed river system fed by melt water from the glaciers and the snow cover in spring, summer and early autumn and with rain water all year round. As a consequence the Rhine has always enough water to navigate throughout the year. On the contrary the river Meuse is only fed by rain water and totally dependent of the season with most of the precipitation. In dry periods – mostly during the summer- the river shrinks to a small stream. The Rhine is split up in the delta in three branches. The most important branch during Roman Times was the Kromme Rijn. Later the mouth of the Kromme Rijn is renamed Old Rhine. The river system Rhine, Kromme Rijn and Old Rhine formed the northern border of the Roman Empire.

Important places along the Rhine during Roman Times were Wijk bij Duurstede (Dorestad) and Katwijk. In later time strongholds were built along the river like Arnhem, Lobith, Utrecht and Leiden. The higher natural levees along the river were brought into cultivation for crops and fruit. Settlements were founded at the outer curves of the rivers since here the river was deep due to the erosion and it was easy to build a harbour.

dikes Since the year 1000 dikes were built for defence against flooding. The first dikes were built only locally on the lower parts of the embankments to protect villages and croplands against flooding. Also dikes were built perpendicular to the river in order to divert the water running over the flood plain during the high water season. Such dikes are named "zijwenden". Gradually one closed dike was created from this incomplete system. Around 1100 the dikes stretched already along large parts of the rivers. After 1200 co-ordination was started for dike building and two centuries later a closed system of dikes along the rivers was completed The area inside the dikes is compartmentalized in order to decrease the risk of flooding. For this aim the old "*zijwenden*" were often used.

The dikes made it possible that low lying and wet back lands could be drained by larger and smaller watercourses. Nearly everywhere the back lands were divided in large plots that were subdivided in elongated parcels. Because of regular high water tables the back lands stayed in use for pasturing and haying.

The dike can be regarded as a first technical manipulation of the form of the river, a reflection of the meanders of the river dating from the dike building (1100-1300). The dike transformed the gradual zoning parallel to the river into a sharply defined zoning. On the scale of the river section the dike is seldom straight, just like the river itself. The dike is projected on the riverside of the elevated parts, where the high parts of the wide embankments were already occupied. In the region of the lower rivers, where the embankments were narrow, rather low and still uninhabited, the dike connected the highest parts.

Because of the dikes the original embankments no longer fall under the direct influence of the river. River embankments and abandoned riverbeds remain behind as frozen stream forms. The channel itself gets less space and when the river attempts to change its course, it will collide with the dike.

Sedimentation is restricted to the area outside of the dikes, resulting in a rising of the high water bed of the river. Gradually river forelands are made. By planting the new "midden waarden" (middle forelands) and damming up the secondary channels man accelerated the process of sedimentation. By building summer quays around the forelands sedimentation there is restricted only to periods of flooding. Thus the river foreland receives a sharp boundary as well.

The morphological dynamic is driven back furthermore by the regulation of the rivers since 1850. The form of the channel is fixed: groynes limit the width of the channel and consequently increase its depth. Locally steep embankments are replaced by paved banks. Secondary channels are dammed, sharp curves are shortened; the remnants of both are found as frozen river forms. The fast streaming river carries away most of the sediment and deposits it near the sea in the deepened harbours of Rotterdam or in the Haringvliet.

All these civil works diminish the morphological dynamic. The changeability, the reach and the variety of forms of the channel are restrained. Sedimentation is concentrated in an increasingly smaller area. Only the frozen river forms refer to the former dynamics.

the limited hinterland The low lying back lands were drained by ditches that divided the land into large blocks, subdivided into narrow parcels. Despite the drainage system the peat and heavy clay soils stayed rather wet, and could only be used for meadows and hay lands.

The pattern of the parcels still refers to the river. Along the course of the Midden Waal the pattern is strongly simplified caused by the land consolidations that took place in the Land van Maas en Waal since the fifties. The rough pattern still shows the presence of the river, because the outlines are oriented parallel or perpendicular to the main direction of the river. The individual parcels are rectangular and rather large causing a relatively coarse pattern. The river levees are characterized by a pattern with a less clear direction. The pattern is finer and more irregular.

river forelands A result of the building of dikes are the river forelands, the stretch of land between the summer dike and winter dike. Along the course of the Midden Waal the forelands became gradually wider by fixing the islands of the river. The river forelands along the embanked Waal are a transformation of the islands in the natural lowland river.

The two long stretches of land outside the dike can be seen as divided in a series of river forelands. This is because the outside curve of the river nearly touches the dike at regular intervals: at that point one foreland passes into the next. A double series of forelands is recognizable on the scale of the river course, similar in form and dimension.

The form of the foreland is related to the morphological processes of streaming water and to the technical interventions that caused the building of the dike and the forelands. The river forelands of the Midden Waal course have a winding contour on the side of the dike, while they have a nearly straight contour on the side of the river caused by levelling through digging soil outside the dike.

In addition the curves of the Waal moved forwards, which is typical for a slightly winding river form. This forward moving causes a difference in phase between the curve of the space between the dikes (the winter channel) and the curves of the river (the summer channel).This difference is so large that the outside curves of the river touch the inside curves of the dike. These points of contact between river and dike are obvious and striking. On these points of contact is a "*schaardijk*": a dike with no foreland.

The series of forelands is complementary to the series of bends in which the form of the river is divided. The repetition of the curves together with the forelands and the rhythm of the inflection points together with the contact points can be especially clearly recognized on the scale of the river course.

At high discharge the river fills the total surface between the two dikes. The river compensates the limited expansion possibilities in the width by expanding in height. At high water the level of the river will be much higher than that of a natural river (without dikes). This is also caused by the drainage and sewer system stream upwards that results in an accelerated discharge. The high water wave will only slightly smooth down because of the reduced resistance in the high water channel of the river.

Sedimentation is concentrated in the area outside the dikes, what leads to a stronger rising of the high water channel. Gradually river forelands grow, by which man gives a hand to sedimentation by planting the middle lands and damming secondary channels. The articulated foreland can be seen as a transformation of the island in the river.

The river forelands along the course of the Midden Waal are the result of land reclamations outside the dike. In the Stiftsche Waard this is still visible in the zoning of channels or marshy depressions and higher situated plates in the topography. The oldest part is situated along the dike, the youngest part is even outside the dike (Variksche Plaat). The main current in this course of the river tends to move downstream and collides with the dike; as a result the plates are shifted downstream. The articulation of the river foreland provides information about the orientation of the channel. During the regulation the river is reduced to one fixed main channel. The secondary channels are dammed and the existing islands are connected with the river foreland.

summer and winter bed The metamorphosis of the river with a main dike and a summer embankment is concentrated as well in time as in space. Concentration in space: the contours of the water surface are limited by summer embankments and dikes that mark sharply the two possible water levels of the river. Concentration in time: the transition from summer channel into winter channel is sudden and the metamorphosis is not fluent but in stages.

The form of the stream during high water is determined by the dikes. When the river forelands are embanked as well, then the river will have only two levels: the summer channel and the winter channel, and their transition is sudden. In a short time the river adopts a new contour by opening of the inlet. The role of the summer embankment as a sharp boundary is than taken over by the main dike.

The appearance of the hydrological dynamics is changed because of the boundary and the compartments. The contrast between high water level and low water level as well as the contrast between water and land is sharpened. Just like in the natural and unembanked situation high discharges enlarge the visibility of the river in the landscape. High discharges will weaken the differences in the river form: sharper and weaker curves merge in one broad stream. The contrast between the land inside the dike and the water outside the dike is strongest during high water. At low discharges a canalized river does not show a real different image from a natural river. The normalization however changes the course. The river defence becomes visible at low discharges. The croynes will be exposed, the sand between the croynes will dry out and dunes will be formed by the wind.

In the case of the embanked Waal the winter channel is much wider than the summer channel; this causes strongly different landscape images. In form of the channel it is remarkable that the summer channel is almost straight, while the winter channel is winding strongly. The situation of the Neder Rijn is just the other way round.

Urban landscape

The natural rhythm of the river is subtly reflected in its urban colonisation. The inflection points in the river and the contact points between river and dike have the same rhythm. But the ferries that around 1850 took care of all the transport across the river had a rhythm twice as fast; they were linked to the contact points between river and dike on both sides of the river. Many of those ferries are closed now, but their location is still recognizable on dike ramps, ferry roads and houses.

The villages are situated at a distance of about one hour by feet from each other. So they have their own rhythm in between that of the ferries and that of the contact points or inflection points. Every foreland near a village has a brick oven, sometimes still in operation, sometimes marked by the deserted oven with a high chimney and sometimes only recognizable by a raised area.

The last rhythm of the urban landscape is that of the longitudinal harbours and shipyards, situated at every contact point along the course of the Midden Waal.

A second layer if urban and infrastructural elements are those not connected with the rhythm of the river bends, but related to a higher scale. Striking urban beacons like the water fronts of the larger cities along the river and the urban balconies (Nijmegen on the ice pushed ridge), bridges at crossings with railroads and high ways, sluice complexes at the crossings of waterways, and extra high electricity pylons belong to this category. The bridges are often replaced by marked tunnel entrances in the river area downstream. Along the dammed parts of Meuse and Neder Rijn rows of barrages and sluices complete the image. All these beacons enhance the orientation and the identity of the river landscape.

villages along the river The colonization of the natural levees along the course of the Midden Waal is reflected in a long series of villages on a rather regular distance of about three kilometres from each other. Two strategically positioned fortresses developed into cities with a waterfront. Those cities are Nijmegen situated on an ice pushed ridge and Tiel at the neck of land between the rivers Waal and Linge. In the back lands some spread buildings are found after the time of the land consolidations. The network of roads is oriented parallel or perpendicular to the river, the levees or the dikes.

The villages along the course of the Midden Waal are situated on the levee behind the dike. Churches and their towers, that mark the centre of the village, are often situated on the levee. The villages themselves lie hidden behind the dike, but they still have some relationship with the river. The only roads from the dikes into the river foreland for example lead to the (former) ferries, the small local harbours or the brick ovens. The relationship between the patterns on both sides of the dike is the strongest when the roads perpendicular to the dikes more or less continue their course in the river forelands. The spacious grid of the road structure of the villages along the river contrasts strongly with the compact lay out of the fortresses. Compare the elongated structure of Wamel situated on the narrow levee with the former fortified town of Tiel.

relief in the embankment zone Apart from the summer bed and the winter bed of the river the incidence of local risings and depressions determine the character of the embankment zone. At high water level they read as islands or water filled holes. Places with a natural accumulation of sediment like sandbanks in the river, natural levees and river dunes in the foreland belong to these local high grounds. Sometimes local heights were raised further to dwelling mounds for a farmhouse, a ferry house or a brick oven. On nearly every foreland along the course of the Midden Waal a brick oven is built on such a dwelling mound.

The digging of harbours produced also grooves in the embankment. Along the course of the Midden Waal a harbour or shipyard is situated on nearly every contact point between river and dike.

5 The peat landscape

5.1 The peat

Natural landscape

The development of vegetation cover started in the lagoon behind the beach barrier dating from 3000 BC. The growth of plants in a lagoon starts with reed when the plants are still dependent on eutrophe[6] water from the sea and the rivers. A layer of plant remains is left in the water. This residue will become peat by an incomplete oxidation. Plant remains will fill up the lagoon and the growth of plants becomes dependent of oligotrophe[7] rainwater. Than the dominant plant is bog moss or sphagnum. It will be obvious that no flooding from the sea or the river will take place then. The bog can become a meters thick pillow high above the level of the sea and the rivers. The surplus of rainwater is drained form the bog by small streams.

Along the rivers the bogs are more eutrophe with a vegetation of trees, reed and sedge. Here you will find also depositions of clay. Even along the small bog streams there is sedimentation of clay during high water of the rivers or the sea.

In the end one continuous peat area along the coast behind the beach barrier was formed from Flanders in Belgium till far in North West Germany. Rivers as the Scheldt, the Meuse, the Rhine with its contributors, the Eems and the Weser crossed this area. In The Netherlands this peat area is called the Hollandveen[8].

At the end of the Middle Ages occupation of this peat area took place in The Netherlands. The occupation started with drainage of the bog. And so an area that was above sea level in former days changed in an area below sea level nowadays.

Cultural landscape

The Hollandveen has been brought under cultivation since the 8th century. In the 10th century the land reclamation was done on massive scale. New villages were founded. Sometimes these villages were derived from villages on the sand district.

The first agriculture took place on the thin clay layers along the small streams in the bog land in Friesland and Groningen. The massive reclamation of the bog later on was caused by an extreme drought during the 10th century. On the sand soils in the eastern parts of the country the harvests failed and the fields changed in sand drifts. So a movement in the direction to the west took place and the bog land was invaded for reclamation.

Reclamation was a communal task. The principle of reclamation was the same nearly everywhere. A small stream or a canal (wetering) served as a base for reclamation. The width of the plots (hoeven) is fixed. The colonist had the right of the land behind his hoeve. So very deep plots could be developed. When the plots became too deep new settlements were founded with a new reclamation base.

First the vegetation was burned and ditches were dug. These ditches served as property boundaries and as drainage system to carry the surplus of water from the bog into a natural waterway. The material form the ditches was used to raise the plots. The ditches were normally cut parallel to each other in a herringbone system.

Digging ditches perpendicular to the contour lines reclaimed thick bog cushions. So a fan shaped occupation form developed. Specimens of these parcelling are in the neighbourhood of Mijdrecht and the "Ronde Hoep".

The right of land reclamation behind the hoeve was without limitations in the beginning. But as soon as

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[6] Eutrophe: soil or water rich on nutrients for plants

[7] Oligotrophe: soil of water with a lack of nutrients for plants

[8] Veen is in Dutch peat or bog

the government became interested in the occupation and the reclamation of the land regulations were made. Not only was the width of the plot fixed but also the depth. The issue of the land became a contract the so-called “cope”. The systematic reclamation is called ”cope” reclamation. The whole peat district of Holland and Utrecht is parcelled following the “cope” system.

Urban landscape

Amsterdam as a polder town The town on the dam Amsterdam came into being around 1200 on the spot where the river Amstel flowed into the IJ. The peat bog to the south of the IJ was reclaimed in the middle ages. In the 13th century the reclaimed and so bedded-down bog was protected from water by constructing dikes and damming the mouths of the rivers. The seawall along the IJ curved inland by the Amstel where the peat river was closed off by a dam from the open water of the IJ. The dam in the Amstel transformed the river mouth into a harbour basin. The dam became the nucleus round which the city crystallised. This was the place where goods were trans-shipped from seagoing vessels to inland vessels. The drainage function of the Amstel was taken over by two new waterways running parallel to the river connecting the inner Amstel to the IJ via sluices in the dike. The town on the water, formerly wide open to the tidal channels of the lagoon, became a *polder town* with a controlled water regime.

The first building took place where the line of the dike curved inwards along the mouth of the Amstel. On this spot the pattern of reclamation was set by the comb-shaped structure of the drainage sluices perpendicular to the main direction of the river, linked at the far end by a straight “achterwetering”. Immediately along the Amstel the plots of peat bog curved to follow the bends in the river. In the middle ages the town gradually spread out over the low-lying strips of land between the Amstel and the waterways dug out parallel to it, so transforming the plots of peat bog into a system of lanes and streets running perpendicular to the water structure. Trade, warehousing and transport developed along the water, while houses, shops and workshops developed along the secondary network of streets.

The town's polder system was based on the natural movement of the water. The laying of dams and dikes determined the shape of the town, which was fitted into spaces in the peat polder. The estuary, the peat polder and the town on the dam formed a single organic whole. The town on the dam was limited in size, but strategically located relative to the potentially rich hinterland.

The town of canals In the Golden Age Amsterdam became an international trading town with a population that grew from 30,000 in 1570 to 130,000 in 1635. This necessitated larger, properly organised town planning, one of the main requirements being good access by water. In a short space of time therefore a regular pattern of three main canals was dug round the old town. Rich merchants - and their warehouses - became established along the new canals. Besides serving shipping and trading, the canals also played a role in the town's drainage system.

The system of canals made Amsterdam an independent polder, able to regulate the water level in the town. The tidal movement of the IJ was used to flush out the canals. To ensure that the town was not flooded Amsterdam required the Hoogheemraadschap Amstelland [Amstel District Polder Board] to keep the level of water in the drainage pool below a specified maximum.

The capacity of the drainage pool around the 17th-century town was considerably reduced by the reclamation of a number of large lakes, such as the Bijlmermeer (1627) and Watergraafsmeer (1628). In consequence in a short space of time about 20 small peat polders were constructed, each with its own quays and drainage.

Two different models of urban layout can be recognised in the belt defined by Amsterdam's canals, Daniel Speckle's radial fortress town and

Simon Stevin's orthogonal trading town. Both layouts were distorted by the fold round the mouth and the natural curvature of the bend in the Amstel. The rectangular blocks of buildings were 'draped' like a fan round the bend in the Amstel and the centre of the old town. A system of canals with architecturally developed bends connected these different blocks.

This rational ground plan did away with existing plots of peat bog particularly in the western and southern sections of the canal belt, but locally the plots were retained in the town's street plan, as in the Jordaan, where the direction followed by the plan coincided with the plots of peat bog. The plan was adjusted at the edges and the ends, the most striking adjustment being at the eastern end where the main direction of the plan was turned halfway round and a 'connecting piece' (later the Plantage) was laid on top of the 13th-century sea wall, running into the natural bank of the IJ and the islands laid out in the IJ. In the Jordaan (from the French 'Jardin'), a reception area for people who had been forced to make way for the laying of the canal belt, little was done beyond widening a few ditches between individual plots on the canals and laying some side streets.

What determined the character of the 17th-century town was that a model urban scheme was projected on to the surface of the ground as if it was a *tabula rasa*, like a piece of reclaimed land. The model plan for Dutch reclaimed land can also be recognised in the town of canals, complete with its road down the middle and central ditch. The rational block of polders was transformed into a rational block of buildings with access by road and water.

In 1682 the town made the large piece of land in front of the Muiderpoort [gate] at the eastern end of the canal belt, still unbuilt on and difficult to sell, available for the construction of allotments and a new botanical garden, thus creating public green space, like a polder plantation in the town.
In 'Beschreibung der Stadt Amsterdam' (1664) Philip van Zesen described the interchangeability of town and polder as follows: *'auf diese drei graften schauen wir izund (around), mit bestürzung, als in ein irdisches Paradies, als in einen grossen lustwald, mit so langen geraden wasserströmen durchzogen, und mit so langen geraden reinen überaus reinlich und herlich ausgeschmückter heuser, die zu weilen als kleine lustschlösser liegen, geziehret, auch unter den grühnen beumen und längst den ströhmen hin mit so langen fuß- und fahrwegen versehen, daß kein auge das ende darvon erblikken kan'.*

The well thought-out ground plan of the canal town broke through the plots of peat bog division. The building blocks provided by the reclaimed landscape took on an urban form in which the system of canals gave a new scale to the connection of the town with the water of the lagoon and the IJ.

polder town In the 19th century industrialisation and technical inventions like the steam engine, railways and canals gave a new impetus to urbanism. In the 19th-century town the new infrastructure, the track followed by the railway ring and the reclamation of land in the IJ, determined the shape of the large parcels of urban land on which building took place, like the Spaarndammerbuurt, Amsterdam West, Amsterdam South, Amsterdam East and the Central Station. The Singelwetering, laid out on the model of the transformation into a park of the Haarlem ramparts, formed a piece of landscape architecture at the transition between the canal town and the new town streets in the peat. From 1842 onwards public gardens were laid out along the last defensive dike. Here, as from a ring dike, a scenic view could be obtained over the neighbouring peat polders, though this view quite soon had to make way for urban expansion.

The highlight in the beautification of the town was the General Expansion Plan for the part of Amsterdam outside the Singelgracht [canal] prepared by J.G. van Niftrik, the town engineer, in 1866. This plan proposed a circumferential expansion of the town along the Singelgracht, containing a series of parks, squares and public gardens. The town council found this plan too ambitious; the expansion plan prepared by Kalff in

1875 was much more economical with green space and public space.

In Kalff's expansion plan the existing plots of peat bog division was adopted by blocks of buildings and streets which still ended randomly on the side furthest from the town centre, giving no clear picture of the edge of a town. The pattern shows relationships, almost down to plot level, between the shape of the town and the underlying landscape, with blocks of buildings as a 'literal' translation of the landscape of reclaimed peat bog. Apart from the pattern of streets, the relationship with the peat polder can be recognised from the town parks left in the town like empty bog plots. The pattern of building left empty blocks, occupied by Sarphati park, Ooster park and Vondel park, reminiscent of the rectangular plots of peat bog of the former polder landscape. Inside these parks the Dutch landscape of bogs was converted by landscape architecture into an urban natural idyll on the model of the English public garden.

The collection of plots of peat bog over which the Vondel park was draped extended from the old town to the Kostverlorenvaart [canal]. The lower lying 'pit shape' of the park, too expensive to raise, was reminiscent of the former polder landscape. The layout, with its 'flat' relief and its partly hidden winding water garden reminds one of a different lowland feature, the duck trap. The collection of plots of peat bog can be recognised from the lines of sight, the length and the parallel location of the paths and water gardens. The length of the plot of peat bog is made more dramatic by the meandering nature of the flow, emphasised by bridges and colonnades of trees, which make the true length difficult to estimate. The Vondel park created a feeling of distance from the town of industry and work and provided the villas on the south side with an unrestricted view. The park replaced the private garden. The same could be said of the Sarphati park, laid out in 1883, though the motives for creating this park in a working class neighbourhood were mainly social and hygienic.

The unity of the plot division meant that in principle the 19th century industrial town had an open relationship with the surrounding man-made landscape, with no marked boundary.

Berlage's design ended the direct relationship with the plot pattern of the peat polders. He treated the long plots of the peaty landscape in a different, more picturesque way, projecting on to them a system of wide avenues and canals with bends and forks. This system established the main direction of the peat polder, and the whole street plan was oriented to follow it. The straight stretches in the avenues and canals had more or less the same length as those in the canal belt (300 to 800 metres) though the bends were less acute making the resulting form not geometrically polygonal, but elongated and meandering, like a peat river.

Increasing traffic density played an important part in Berlage's expansion plans. In the system of main routes with bends laid out among the peat polders in Amsterdam South, the relationship with the surrounding landscape was marked by infrastructural buildings: a station to the south and the Berlage bridge over the Amstel to the east. The long lines of the composition established a relationship with the peat polder as a large landscape area. The avenues and canals marked special spots in the area of peat, such as the old estuary by Sloterdijk, the Sloterdie by Bos- en Lommerplein [square] and the branching of Watergraafsmeer on the Amstel by the Berlage bridge. In this respect the design anticipated the 1934 General Expansion Plan.

Architectonic landscape

Hofwijck and Huis te Werve The spatial treatment of the plot division of the bog was founded on the interplay between the form of the reclamation matrix and natural geographic features, like bends in the river and humps in the bog, which forced the plot division to bend, deviate or even go round. The adjusted plot division mediated between the natural lowland and the shape of the reclaimed land, so making the land orderly and rational. At the same time it embraced random features, such as groups of trees and farms, enriching the rational spatial arrangement with picturesque elements.

The architectural significance of the strip-shaped *peat bog plot*, the module of the reclamation matrix, lies in the length and limited width, which gives the piece of bog spatial depth. The parallel lines of ditches refer to the horizon, with repeated strips to either side. The formal characteristics of this flexible mathematical arrangement, coordination, extent and spatial depth, can be recognised most clearly in the villas in the peaty landscape and on the edges of the sand bars, where these features of the landscape are treated architecturally.[4]

Constantijn Huygens' Hofwijck pleasure garden (1639-1642), just outside Voorburg, was the most important example. Besides being a poet, Huygens was also secretary to stadtholder Frederik Hendrik, whose villas in Honselersdijk (1620) and Rijswijk (1630) had layouts based on classic principles of symmetry and harmonic proportions. Prince Maurits was the first to use this mathematical type of garden layout, in the Buitenhof (1620) in The Hague. Hofwijck was one peat bog parcel wide and extended about 400 metres across the innermost sand bar, from the Vliet to the peat in between the beach ridges.

In his poem 'Hofwijck' Huygens compares the ground plan of the garden to a human figure, consisting of a head (the house on a square island), a trunk (the square upper garden, ringed by a canal) and an underbody (the long narrow lower garden). Research has shown that the human figure projected on the ground plan of the complex, proportioned in the way prescribed by Vitruvius, was elongated, following set rules, to enable it to fit into the long plot.[5]

The proportions of the garden, increasing towards the rear, coupled with long avenues and moats, reinforced the effect of depth, rather like the perspective effect produced by the beds in a French baroque garden. From the top of the hill in the middle of the lower garden it was possible to view the whole internal system and relate it to its landscape context.

From a map of Hofwijck and De Werve, a nobleman's property near Voorburg, it is possible to see how the two gardens were connected to the peat bogs by a system of avenues. Along the peat bog plots a number of longitudinal avenues and canals, running in parallel, provided a connection between Hofwijck and the Huis te Werve and the Haagse Bos on the next sand bar on the western horizon. The views at the points where the narrow, extended diagonal composition was intersected by waterways or roads on narrow sand bars, were enlivened by modest architectural accents, such as a gateway, a hill or a stretch of water, marking points where the natural geomorphology was intersected by the peat bog plots.[6]

In a competition concerning the design of new woods in The Netherlands Olthof and Oerlemans make the following contribution.

the sorrow of Belgium Analogue to the “cope” system with a reclamation base used in the 17th century for the layout of the countryseat Heemstede Olthof and Oerlemans propose to use the Amsterdam-Rijn canal as a modern reclamation base for new functions in the landscape that transforms gradually in an urban landscape. The countryseat was the expression of agrarian land reclamation of the wild bog land in former days. The new design for a wood symbolizes the transformation from an agrarian pattern to an urban landscape. The relics of the formal garden lake and

lanes and house are well integrated in the layout of the new woodland. Olthof and Oerlemans used in their design the cultural historical qualities of the "cope" landscape.

the villa landscape of Amsterdam In the 17th century the urban area of Amsterdam expanded enormously. The town's takeover of the bog area was achieved by digging canals and digging out peat rivers. Settlements - and villas - developed along the rivers, polders and beach ridges.

A first set of villas was created along the Vecht, running on into a further set along the Amstel and the Angstel. To a very limited extent villas were also set up along the canals, for example between Amsterdam and Haarlem. A second set of country houses or pleasure gardens was located in Kennemerland, forming a landscape theatre round the Wijkermeer. A third set of villas or polder villas was located on reclaimed land, Beemster and Watergraafsmeer in particular, which were easily accessible by canal and had fertile clay soil (see section 4.2). A special position was occupied by the landscape of villas by 's Gravenland, on the site of a former sandpit.

5.2 The "droogmakerijen"[9].

'De meeuw die vroeger over water vloog,
Verwondert zich; hier viel de aarde droog.
Vergane schepen rusten in mijn koren.
Ik ben nieuw land; ik ben maar pas geboren.' (Ed Hoornik)

(The seagull that once flew above the water
is surprised; here soil was born from water
Wrecked ships lay down in my cornfields.
I am new land; I am newly born)

After 1500 a strong growth of the population and a rise in the standard of life took place. The prosperity was caused by the discovery of new land and the increasing commerce due to these discoveries. At the same time the need of agrarian soil around the fast growing towns in Holland became necessary. The combination of the fast growing capital and the technical knowledge made it possible to start more difficult projects than the former land reclamation on the bog. New land was reclaimed from lakes with the help of newly improved windmills. Undermining of the embankments in the peat district caused the lakes.

The system of reclamation was simple. Around a lake a canal was dug. This canal is called a ringvaart[10]. With the soil form the canal a dike was built between the lake and the ringvaart. With the help of windmills water was pumped from the lake to the ringvaart. The ringvaart had a connection with open water like a river or the sea in order to lower the water level in the canal. After reclamation a drainage system and parcelling was made.

The natural landscape.

Since the 9th century the large bogs of Holland have been cultivated. By cultivating the growth of the bog stopped and the surface of the land became lower and the natural drainage stagnated. This caused a substantial annoyance of water. The embankments along the small streams and the small lakes broke down by the erosion of wind and water. The floods during the 12th century demolished great parts of the cultivated land. In the neighbourhood of Amsterdam the IJ was created. Between the former lake Almere and the inlet near Egmond. The water penetrated the central peat district everywhere. The lakes were enlarged by the action of the waves in NE direction.

In the end the whole peat district was connected to the sea through the many enlarged peat streams, the IJ and the Almere. The Almere became larger and larger and the connection with the North Sea became wider. The tidal movement was felt everywhere in the pet district.

The Cultural landscape

Since the Middle Ages Sea dikes were built on places that were exposed most to the sea. Dikes surrounded parts of the not flooded land in the lagoon behind the dune ridge during the 13th century in order to prevent further destruction. The most important parts were Schermereiland and the Zeevang in the North of Holland and Waterland and the Zaanstreek North of Amsterdam. The dikes were connected with the most important sea dikes. An important improvement was achieved by closing the bog streams that were in open connection with the sea by way of dams. These dams became the transhipment places and here settlements like Amsterdam, Edam and Volendam were built. Damming up decreased the flooding risk and kept the salt seawater outside. The whole water system behind the dikes got one level and became the boezem[11] for the later polder system.

The first reclaimed lakes were tryouts. They were small and shallow. In 1533 the 35 ha great Achtermeer South of Alkmaar was reclaimed. In the same surroundings other small projects followed. In

[9] droogmakerij is a reclaimed lake or a reclaimed part of the sea.

[10] Ringvaart : a canal round a polder on which the polder drained the surplus of water; de ringvaart itself was a part of the boezem or had a connection with the boezem and so with a river or the sea

[11] Boezem: system of reservoirs for superfluous polder water.

1564 two bigger projects were started to be reclaimed the Egmondermeer and the Bergermeer. The Count of Egmond and the Lord of Brederode undertook the project.

In the 17th century a fundamental change took place. Well to do merchants and entrepreneurs financed and took care of the reclamation. They formed a company for the occasion a so-called "company" like the companies for commercial trade over sea, the dike building and the commercial peat digging companies. More capital could be gathered for the reclamation and the projects became greater.

In 1612 the Beemster (7100 ha) was reclaimed. Later followed the Purmer (2756 ha) in 1622, the Wijde Wormer (1620 ha) in 1626, the Heerhugowaard (3500 ha) and in 1635 the Schermer. Plans to reclaim the 18.100 ha great Haarlemmermeer were already made in the 17th and 18th century, but this project was too great and too complicated from a technical, financial and organising point of view.

All this from water reclaimed land caused a substantial decrease of the surface of the Boezem. High water levels outside the embanked area caused a quicker filling with water of the boezem in comparison with earlier times. The result was flooding. This was the reason that since the reclamation of the Schermer it was necessary to construct two drainage canals one to the North and one to the South. For a long time this was the reason for not starting with the reclamation of the Haarlemmermeer although the lakes were a threat to their surroundings. The parcels between the lakes (existing of peat) were exposed to the wind and the waves and were partly washed away. The water surface became greater and less under control.
An important technical condition for the reclamation of the Hollandse Meren was a water system that could relieve the disadvantages for the surrounding area. The capacity of the boezem, the drainage system and the control of the water level were the most important keys.

In the beginning peat reclamation districts had a natural drainage system. Later caused by the combination of drainage and oxidation the surface of the peat set. The cultivated peat district changed into a polder system. The drainage system could keep up with the speed of the setting of the peat thanks to the technical development of the windmills and the development and keeping up of the boezem.

On the other hand the windmill technique was crucial for land reclamation from the water. A step-by-step development of drainage through a row of windmills parallel or next to each other improved the drainage possibility largely. The windmills became also less dependent on the direction of the wind because of the possibility of turning the wings in the right direction for the wind. It gave much trouble to reclaim the land from the water. This reclamation should be done in a short period of time. Many windmills were necessary to obtain the reclamation. Later those mills were used for just the up keeping of the drainage. The surplus of mills were broken down and transferred to other places, where they were necessary.

the system of polders and boezems The three elements of the drainage system are the polder with its network of canals and ditches, the boezem including the ringvaart and the open water river or sea. The polder drains on the ringvaart through a row of windmills.
Nowadays an electric machine does the pumping. The boezem is a closed system in relation to the polders and the open water. The boezem itself drains in its turn on the open water by means of an own pumping system.
The open water is that part of the canals and rivers that has an open connection with the sea.

prototype of the Dutch polder system:
The Beemster Merchants from Amsterdam organised the reclamation of the Beemster. It was a real commercial investment. In 1607 the reclamation started with a survey of the lake itself -

its form, its surface and its depths - and the surrounding topography as exactly as possible. This survey was mapped. With the help of the map the specifications for the reclamation were made in 1608. The most important parts of the specifications were the proposed layout and the form of the ringvaart, the height and the width of the (ring) dike and the place and the construction of the windmills. In 1609 the lake fell dry, but already in the next year the dike broke down at Kwadijk during a storm and the Beemster was flooded. In January 1611 the lake was frozen. Five surveyors went on the ice to gather information for a new map. This was the definite survey for the perfect map "de perfecte caerte". The second effort for land reclamation was a success and in 1612 the Beemster was finally dry.

On the basis of the "perfecte caerte" a layout was drawn comprising 4 roads in lengthwise direction and 4 roads in width wise direction together with 5 canals in both directions. ("4 weghen inde lengte ende 4 weghen in de breedte met 5 togten inde lengte en 5 inde breedte"). The Middenweg or middle road was the middle line from North to South. This line matched more or less the longest linear measure of the polder. This made it possible to continue the rational parcelling system as far as desirable.

The drainage system of the new polder was divided in 4 separate (inner) polders. The original relief of the lake made this division necessary. The 4 inner polders had their own water level. The parcels are 900 m long and
180 m wide. The dimension is based on the parcels of the peat district. Five parcels composed a block of 900m by 900m. The polder measure was the ideal square of 1800m by 1800m derived from the 900m by 900m block. The measure of the square is based on an architectonic ideal and differs from the pure technical measures of the older polders.

The direction of the parcels should correspond with the directions of the embankments of the former lake as far as possible. In this way the amount of not complete rectangular parcels was limited. The polder was adapted for agriculture especially for crops.

Urban landscape

Amsterdam as a reclamation town The town grew so large that apart from the IJ polders a number of other pieces of reclaimed land came to fall within the town's sphere of influence. The town had a number of different ways of incorporating urban fragments. Buikslotermeerpolder and Watergraafsmeer were totally annexed. In the case of Watergraafsmeer this took place in stages; when the construction of the IJ tunnel was complete Buikslotermeerpolder rapidly became completely built-up with high-rise buildings and motorways. The IJ polders form an unbroken area along the North Sea canal, containing harbours and industry. In Amsterdam West the Slotermeer polder was first used as a sandpit, then put back under water and given a new function as a lake for urban recreation. The construction of the Amsterdamse Bos turned the Rietwijkerpolder into an area of wooded parkland.

The 1934 General Expansion Plan for Amsterdam (A.U.P.) contained a comprehensive new plan for the town, in which the notion of a continuous town was forced to give way to that of a segmented town with radial zones of green space. The location of the wedges of green space was mainly determined by the natural water structure in the surrounding landscape, its rivers, peat streams and rings of dikes, such as the IJ, the Zaan, the eastern edge of the Haarlemmermeer, the Amstel, the Gaasp and the Vecht. The urban green space at the edge of the built-up area mediated between the town and the man-made landscape, connected it functionally through the recreational activity of the town dweller and separated it visually into different units. Striking urban transformations in the A.U.P., in which reclaimed land played a part, included the Westelijke Tuinsteden (Western suburbs), Amsterdamse Bos and Watergraafsmeer.

the Westelijke Tuinsteden and Sloterplas The Westelijke Tuinsteden [western suburbs] lie in three quadrants of the town (Slotermeer, Osdorp and Slotervaart) grouped round Sloterplas. Slotermeer, a peat lake, is the expanded headwater of a peat river which used to run into the IJ. The lake was drained and the reclaimed land prepared for agricultural use. The bends in the polder's Middenweg [middle road] reflected the curvature of the banks of the former lake. Two thirds of the polder was converted into a sandpit; the lake itself was converted back into a lake for urban recreation. The ins and outs of the banks still correspond to the natural flow pattern; orthogonal elements dovetail into the urban landscape.

The lake lies in the middle of the expanding town like an internal panorama, a 'void' containing a stretch of water, planted banks and a hill providing a view. An 'urban route' connects the old town with the lake. The end of the route, at the north-eastern end of the lake, is marked by a boulevard and a restaurant. Slotermeer and Osdorp are linked visually by a view over the lake. The main orientations of the two quadrants of the town intersect on the lake's longitudinal axis. At the north-east end of the lake the difference in orientation is taken up by high flats with a diagonal view over the lake.

the Watergraafsmeer Watergraafsmeer lies at the edge of the 19th-century town and provides a diagonal link between the Amstel and the Buiten-IJ. The urbanisation of Watergraafsmeer took place in stages. The design was decisively affected by the A.U.P.

In 1843 the railway to Utrecht was laid along the western edge of the Meer, with industry along its outer edge, and in 1874 a railway line to Hilversum, with a large marshalling yard, was laid out and through the polder on the eastern side. Amsterdam bought a piece of land by the old Rozenburg villa for the construction of the Nieuwe Oosterbegraafplaats [New Eastern Cemetery](1892), while Frankendael changed from a place of recreation into a wholesale nursery. The buildings of Amsterdam East approached the north side and began to run over the edge of the reclaimed land.

Watergraafsmeer was annexed by Amsterdam in 1921. Shortly afterwards, Betondorp (1923) and

Linnaeushof (1928), running along Middenweg opposite Frankendael, were built in the south-west corner of the Meer. Each of these building projects occupied about one polder block. In 1924 the bridge between Amsterdam-East and the Meer was replaced by a wide stone bridge and Middenweg was widened.

According to the 1939 Watergraafsmeer Expansion Plan, part of the General Expansion Plan for Amsterdam, Watergraafsmeer was to be used for working-class housing, with three new garden villages, Amsteldorp, Frankendael and Middenmeer. Amsteldorp is situated on the site of the former windmills on the Amstel, and is surrounded by urban green space. The garden village of Frankendael lies in the middle of the reclaimed land and occupies one of the four polder blocks in the central rectangle. The urban plot division reflects the plot division of the polders. The same is true of the garden village of Middenmeer, which also occupies about one polder block. Watergraafsmeer was then connected to the regional infrastructure. At the western edge of the reclaimed land came Amstel station, with a view over the low-lying polder. The nearby Prins Bernhardplein [square] became an important link with the centre of Amsterdam and Amsterdam South. A wide urban motorway on a dike through the polder, crossing local roads on viaducts, connected the polder with the Gooi [a suburb of Amsterdam].

About half of Watergraafsmeer was zoned as public green space, with a number of sports facilities each extending over whole polder blocks, for example Middenmeer (with its Jaap Eden skating rink), Voorland and Drieburg with allotments along its edges. Juliana park, with its allotments, provided a green setting for people arriving in Amsterdam via Amstel station. This was later joined by Prins Bernhard park and the Darwin public gardens, the size of a farm plot. In the eastern section of the polder, now cut off by the railway between Amsterdam and Hilversum, came the Watergraafsmeer Science Centre, now the Amsterdam Science Park.

All these measures had the effect of integrating Watergraafsmeer into Amsterdam. The existing polder structure provided a foundation for an urban expansion whose open spatial structure could be seen as a transformation of the polder plot division. The reclaimed land became functionally rooted as an entity within the urban network.

The plan, which covered the whole area of reclaimed land, was fitted into the main lines of the polder plot division, creating a neutral pattern of adjoining, evenly matched, urban units. In the garden villages country houses and villas became 'socialised'. Low-rise buildings, an orthogonal urban plot division and long straight streets remained tied to the polders and the polder grid. Large areas of urban green space turned the polder into a modern urban pleasure garden.

Bijlmermeer Around 1965 the whole of Bijlmermeer was raised and built up. The large-scale town plan, applied to the whole polder area at once, still largely retains its original orientation, but the boundaries of the reclaimed land were erased. In principle the areas of green space between the bent building strips still match the dimensions of the former reclaimed land (2 to 3 kilometres). On the east edge lies Bijlmerweide, a transitional area leading to the Weespertrekvaart and the peat polders. The Bijlmer park connects this huge polder town with Gaasperplas.

reclamation and city form The extent of the urbanisation of reclaimed land in North Holland has varied considerably, each time with a different configuration. If suburbanisation is ignored, a few areas of reclaimed land, such as Wogmeer, are still mainly man-made landscape. Other areas, on the other hand, like Bijlmermeer and Watergraafsmeer, have been completely absorbed into the urban landscape. Today we find two opposed extremes. Haarlemmermeer polder lies within the sphere of influence of different towns, an 'urban field' subject to regional forces. This position at the focus of a developing urban landscape is diametrically opposed to that of an area of reclaimed land which has become a nature reserve, like Naardermeer. But

even there urban transformation has in fact taken place: the natural image, expressed by the designation nature reserve, is an urban projection. In between lie the areas of reclaimed land on the periphery, still consisting wholly or partially of man-made landscape, each providing its own view over the pattern of urbanisation.

Architectonic landscape

The grid of reclaimed land consists of polder modules, roughly square in shape, within which lies the ideal plot. Taking this ideal plot as the starting point, a type of villa came into being on reclaimed land with an individual Dutch character characteristic of the reclamation of the lowlands, the so-called plantation [*plantage*]. This plantation consisted of a country house with orchards, avenues, areas of woodland, gardens (both kitchen and ornamental) and stretches of water, grouped as independent components orthogonal to and within a closed composition. The whole could really best be described as a double, or *intensified*, man-made landscape.

When more villas were constructed close to one another they began to form an architectural combination. Their reaction to one another affected the spatial structure of the man-made landscape, in the case of reclaimed land the polder rooms, the avenues and the border between the reclaimed land and the peat bog landscape. Together they formed a special kind of avenue composition in the polders. In a more profound sense they affected the form of the natural landscape.

Vredenburgh The plantation gave the man-made landscape of the Beemster a specific architectonic expression. The garden repeated, on a smaller scale, a number of the same features relating to the planning and layout of man-made landscape which applied, on a large scale, to the polder.

In 1637 Frederick Alewijn, a prosperous Amsterdam merchant, inherited a piece of ground in the Beemster on the Zuiderweg, near Purmerend. The site was 188 metres wide (approximately the width of a Beemster plot) and 226 metres long. Alewijn had the impractical division of the site into three plots -probably after his own design - redivided into two plots of unequal size. The plot on Zuiderweg - lying along the approach route - was doubled to form a single plot, which meant that the manor owned by Frederick's father came to lie in the middle of the west side, opposite the plot. The two parts were surrounded by a canal, leaving open two islands, 130 x 100 metres and 143 x 60 metres respectively, and by a dike planted with four rows of elms to protect the estate from the wind. The wide western section of the dike, which formed the main entrance to the complex, was planted with five rows of elms because of the prevailing west wind. In 1639 Alewijn commissioned Philip Vingboons and Pieter Post, leading architects of the day, to prepare plans for a country house and the arrangement of the two islands.

In Post's 1642 plan, as executed, the house was placed away from the centre of the large island and turned 90° to face south. A bridge connected the courtyard and the great avenue with the larger island, which contained the main square, planted with limes, the house, an ornamental garden and an orchard of fruit trees with a raised 'sitplaets' [place to sit]. The smaller island accommodated a plantation of oaks, a cherry orchard and a kitchen garden.

Ideal design elements such as squares, golden sections and series of absolute numbers were used to create a relationship with the dimensions of the farm plot, so creating oddly shaped remnants in the garden which expressed the tension between ideal architectonic order and the plot division produced by land development.

The square-shaped main square formed the central element in the geometrical arrangement of the plantation, a shape referring both to the *polder square* and to the squares for the designed settlements on the reclaimed land. The square connected the house and the gardens with one another.

the landscape of villas: the Beemster
Vredenburgh formed part of a landscape of country houses in the south-east corner of the Beemster along Volgerweg. This area was situated near Purmerend and connected with the barge canal to Amsterdam. Like the farmhouses, the country houses lay along the avenues of polders. The local plot division was subdivided and intensified so

creating a complex structure based on the modular division of the polder area.

The scenography of the approach to Vredenburgh was *diagonal,* a mannerist treatment of the grid of the polder module. People coming from Purmerend along Zuiderweg, which was planted like an avenue, could see Vredenburgh through the rows of trees, with the front elevation of the country house to the south. Arrived at the entrance gate - by which stage one would in fact have already passed the house - the route turned 90° to the western edge of the plantation, beyond which the empty polder country could dimly be seen at the northern end of the avenue leading to the house.[10]

In the opening of the gate on the polder avenue was a high entrance bridge so that the visitor gained just sufficient height to enable him to cast a sideways glance at the garden. After quite a journey along an avenue planted with four rows of elms the visitor finally reached the courtyard. After yet another 90° turn the route led over the access bridge, whose piers corresponded optically, following the *stanze concept*, with the innermost pilasters of the covered 'sitplaets' at the end of the orchard. In this way architectural methods were used to make the visitor conscious of the length of the large island. After that the visitor set foot on the main square, from which the house could be seen at an angle of 90° on the left.

Finally the visitor reached, along a double path, steps from which could be seen the main square, the ornamental garden and, immediately to the right, the avenue leading to the house. Thus it was possible to reside, in the company of other prosperous individuals, both *in* and *outside* the polder.

the landscape of villas: Watergraafsmeer The proximity of the town meant the creation in Watergraafsmeer of a special kind of landscape of gardens and villas, comparable with the 17th-century pleasure gardens round London, like Southwark's Vauxhall, south of the Thames. In this area of reclaimed land the plantation was also a *public* country house for the town, designed for pleasure and entertainment and less than an hour's walk from the town.

Elms and limes were planted along Middenweg and Kruisweg as far back as the first reclamation. Pollarded elms are also stood along Schagerlaan. In the 17th and 18th centuries many newly rich merchant governors built country houses in Watergraafsmeer. By 1730 there were 227 such houses. The largest villas were constructed along Middenweg, Kruisweg and the Ringdijk. Some of the pleasure gardens were open to the public. In the middle of these park-like gardens, at the intersection between Middenweg and Kruisweg, lay a croquet lawn, fitted into a farm plot, with pollarded trees on both sides, where it was possible to play the popular game of croquet with a wooden hammer and a ball.

For economic reasons most of these country houses were demolished at the beginning of the 19th century. Only Rozenburg, Voorland and Frankendael still remained. By the 20th century Rozenburg had been forced to make way for an extension to the new Oosterbegraafplaats on Middenweg, and Voorland for the building of the Ajax stadium (1934). Frankendael is the last remaining villa in the Meer and indeed in the whole of Amsterdam. The names of the Middenmeer and Voorland sports parks still remind us of the country houses which formerly stood there.

The spatial properties of reclaimed land were partly responsible for the fact that Watergraafsmeer played such an important role as a piece of countryside for the town. The basin shape, surrounded by a horizon comprising a ring dike and a ring canal, made people feel that they were really outside the town. In each individual villa this feeling of being outside was reinforced architecturally. The complex of gardens and villas transformed the agrarian reclaimed land into a landscape of parks, a country retreat for the town.

Typology of reclaimed land

Areas of reclaimed land in North Holland together take up an area of 61,980 hectares [153,153 acres], forming a more or less coherent mosaic of fields. The configuration of this mosaic broadly reflects its geogenesis: the natural interplay of water, wind and current, different in each area and each piece of reclaimed land. Comparative study reveals the geomorphologic background of the different areas of reclaimed land. Though they have a number of common characteristics there are also striking differences. It is possible to distinguish forms by the way they were shaped: *current-shapes, sheet-shapes, wind-shapes, leftover shapes, strandvlaktevormen, peat digging fragments, "dieën", current-fragments, break-shapes and seepage-shapes.*

When the dammed-up Zijpe bay was diked in (section 2.2.2) the dominant factors were the way the mudflats were shaped by currents and shoals. This is not true reclaimed land, since it already consisted of uncovered sand flats before the diking took place. The flow lines were determined by a system of streams running roughly south-west on both sides of Wieringen. The form of the embankment, which lies in the former channel of the bay, was a *current-shape*, while the *sheet-shaped* reclamation to the east was an uncovered piece of the Waddenzee.

West Friesland is a former bay, silted up to form a massive ridge, a barrier between the coastal mudflats and the enclosed coastal sand bars. Pieces of reclaimed land nestle in the bends of the ridge in the lower-lying salt and reed marshes. These are mainly *leftover shapes*.

Around the Beemster and the Haarlemmermeer, most reclamations are *wind-forms*, the natural formation of ground in a reclaimed area. These reclamations are mostly drained in their entirety, which means that their edges follow the natural shape of the lake. The prevailing south-westerly wind has produced a basic shape which is elongated (elliptical) and runs south-west. Purmer and Wijde Wormer can be considered 'pure' wind-forms; Beemster and Schermer compound forms, where currents have also played their part.

The lakes in Waterland came into being as the result of breakthroughs from the Almere flowing in from both sides of Marken and forming a fan-shaped pattern. These *'dieën'* subsequently fanned out further, so that the form of reclaimed land was determined partly by current, partly by wind.

The IJ polders reflect the meandering form of the river, so they have *current-shapes*, with some *break-shapes* because of dike breaks.

In the Ronde Venen (Amstelland) it is still possible to recognise the shape of the original cushions of peat. The lakes produced by the removal of peat had the same outline as the original peat polders, fragments of the peat cushions.

The Naardermeer and the Horstermeer, to the east of the Vecht, are distinguished by their *seepage form*, caused by water seeping from the higher-lying sandy ground of the Utrecht ridge.

5.3 Peat digging

Since 1666 the lakes in South Holland were reclaimed. Digging peat for fuel formed these lakes. The quality of the peat defined the lakes that later were reclaimed. The quality of the bog for peat digging was the best far away from the bog rivers with their embankments rich in clay on the high bog cushions. So an image was created of bog streams with embankments (the higher land) high above the surrounding dug out peat lakes that were for the greater part reclaimed. Old villages from before the peat-digging period are situated on small-elongated remains of the original bog along the bog streams or between the reclaimed lakes.

The natural landscape

The original landscape is that of thick layers of bog drained by small bog streams, like the Amstel, the Rotte and the Schie.
The bog consists mostly of oligotrophe sphagnum on the higher parts and eutrophe bog of wood along the small rivers.

The cultural landscape

The demand for fuel became urgent in the last decades of the sixteenth century. The peat was not only required for domestic use but also for a wide variety of industry. It is the beginning of the industrialisation of Holland. Large quantities of peat were consumed by breweries and bakeries, potteries, brick works and lime burning for cement, production of salt and in train oil-cookeries, dye-industry and metal industry.

Peat from the ditches dug for the cultivation and the drainage of the peat district were until the end of the 15th century sufficient. The growing towns and the industry caused the greater demand of peat. Extra peat had to be delivered. First the peat above the groundwater level was used. Later due to the improvement of the draining power of the windmills the groundwater level was considerably lowered and a thicker layer of peat could be dug. The left over land was not used again for agricultural purposes. The abandoned excavations were no longer drained and so they filled with water. These water filled excavations became a threat to the surrounding land and dikes. Great extensions of the lakes took then place. The former four lakes between Haarlem, Leiden and Amsterdam formed one vast lake the Haarlemmermeer through erosion of the small parts of land between those smaller lakes during storms.

The development of peat digging went on. People were no longer dependent on the groundwater table. The possibility was there to dredge up "under water" peat and let the peat dry on small-elongated pieces of land (legakkers). The result of dry compact pieces of peat could then be used for fuel.

The description of the process is very simple, but what are the consequences of this mass production of fuel for the landscape? Deep under water dredging enlarged the quantity of peat needed for fuel, but it widely destroyed the surface of the land. Roads and villages were still situated on the original surface (the higher land). Lakes developed by the activities of man. And those lakes on itself were a threat of flooding the surrounding land. Undermining its embankments enlarged them.

Regulations were made in order to mitigate the worse consequences of the dredging. Digging and dredging peat was only allowed in long strips. Long elongated strips of land of a minimum width separated those water strips from each other. Wherever possible the strips of land had to be planted with trees. The new lakes were reclaimed in the following centuries. At the end of the 19th century most of the lakes were reclaimed and in use for agriculture. Some lakes where the soil consists of sand and where there is an upward percolation is were never reclaimed. Some of these lakes are situated west of the Utrechtse Heuvelrug (Loosdrechtse and Maarseveense plassen).

The lakes made by peat digging and dredging were also used as a defence line during the war against Spain from 1568 till 1648. Extra land was inundated

to obtain a better water defence line. This defence is called the Hollandse Waterlinie. The water defence line is also used during later wars in the 17th and 18th century against France and Germany. The total waterline was kept operational until World War II.

In short nearly the total surface of Holland was either flooded or inundated towards the middle of the 17th century. Reclamation after inundation was not always possible. For example in 1635 an interdiction of peat dredging was proclaimed for the surroundings of the city of Gouda in a radius of 3 kilometres around the city to diminish the threat of the water.
Maps dating from this period do not exist because of different reasons such as cost and impossibility of mapping, but also to hide the illegal dredging activities.

5.4 Recent transformations in the Peat landscape

Westpolder

An example of a landscape transformation in the peat district is the design by buro H+N+S for the Westpolder in Noord Brabant.

The office researched the possible use of sand, clay or peat pits as a tool for development of nature. The Westpolder, a polder with upward percolation west of Breda was used as an example.

The polder is situated in a zone between the high sand soils in the south and the low clay soils in the north. In this polder there should be a natural upward percolation, but through the drainage of this polder the percolation was no longer perceptible in nature. The designer hoped to reintroduce percolation by superficial digging.
The design consists of three elements:

- The basic pattern of the digging and dredging
- Three reclamation axes
- The natural processes

The design should connect architectonic interventions (3 reclamation axes) with natural processes the dynamic of wind, water and vegetation.

In the design an area of 410 ha is dredged. By doing so three lakes are developed. The lakes will have an upward percolation. The pattern of the dredging follows approximately the direction of the first reclamation. The differences between the lakes are caused by measurements and orientation in respective to the main wind direction. Just because of this pattern of lakes there is a tendency of a gradual development in three different ways.
The central part consists of narrow, shallow lakes (50m wide and 3m deep) north south oriented. All processes of overgrowing the lakes by bog plants can take place and by doing so transform the water into land. These processes will determine the image. The western part consists of lakes with a midsize (100m wide and 5m deep) perpendicular to the main wind direction. The action of wind and waves can move the strips of land between the lakes. On the lee side growth of bog plants will take place. So the land will increase at the lee side and decrease and even be destroyed at the windward side. The northern part - a fan of large lakes (150 metres wide and 5 metres deep) - is more or less oriented in the main wind direction. The wind has here all the freedom of erosion in the northern part. In the southern part sedimentation and growth of vegetation will take place.

basic form The edges of the three different parts of the lakes will follow the existing roads and waterways as far as possible. The pattern of the western part will follow the direction of the parcels. The parcel direction in the central part is less obvious and regular; the choice of the north south direction is more determined by contrast in orientation. The fan in the northern part varies distinctly from the two other parallel forms of parcelling. The Leursche haven determined as well the original as the designed pattern. The "reclamation axes" are striking new or renewed lines in the landscape. The reclamation axis in the western and central part is designed as a rectangular form. The northern part is different from the other parts with a twisting waterway and a hook on the direction of parcelling.

The interaction between incidence and architectonic intervention, between twisting and direct lines is well pronounced in the design of the north-eastern edge along the Leursche haven. The curve of the waterway is reflected in the fan form of the dredged lakes. The strong notching of the reclamation axis contrasts with the fading of rectilinear lines.

spatial form The reclamation axes are rigidly planted with poplars as a strong contrast to the more spontaneous development of vegetation in other parts of the area. In the deep parts of the lakes parallel to the axes where vegetation cannot take place the wideness of the landscape and the view are maintained. The shallow parts of the lakes transform by filling with vegetation in the end into

woodland. A more closed situation like a small fringe of little chambers arises along the reclamation axes

image In the design the rigid lath of dredging referring the original culture the accidental processes of wind, waves and vegetation transform the landscape. The reclamation axes form an extra contrast by not changing their architectonic form, while there are no dynamics processes along these.

program Different parts of the program determine the form. Pattern, measurements and orientation of the lakes are connected with dredging, nature development and landscape architecture. The lakes are caused by the technique of shallow sand dredging. The elongated form of the lakes causes the length of the embankments. This fact is favourable for a good nature development. The differences in pattern, measurements and orientation are related to the genius loci and are at the same time responsible for variation in natural processes and new contrasts and variation the landscape.

6 Typologies

6.1 Coastal typology

6.2 River typology

The rivers of the Dutch lowlands differ not only from one river to another, but also and more importantly from one stretch to another. For example the upper reaches of the Rhine and the Waal show more similarities than the upper and lower reaches of the Rhine. Not surprisingly the typology described below can also be used to describe stretches of river. A stretch of river is a linear section of a river which taken as a whole has specific formal characteristics and a specific dynamic distinguishing it from adjoining sections of river.

Upper river and lower river

The most important distinction is that between the central branches of a river (upper rivers) and stretches near the estuary which are also influenced by the sea (lower rivers).

levees and basins The fall and morphological dynamic are greater in the area of the upper river than in the area of the lower river. For this reason more and coarser sediment is deposited along the central branches of the river than near the estuary, creating differences in the character and proportions of levees and basins. Along central river branches in East Holland we encounter wide sandy levees and clayey basins. In West Holland and by the IJssel estuary we find narrow clayey levees and vast peaty basins. The variation in width of the levees distinguishes the urban colonisation of the river landscape. The building pattern (older buildings) can be recognised as a treatment of the natural pattern. The wide levees in the east developed a scattered, irregular pattern and more diffuse visual relationships, while the narrow levees in the west developed a regular linear pattern emphasising the dikes and their relationships with one another.

minor bed and major bed Upper rivers are characterised by a substantial variation in water level caused by high and low drainage. Not surprisingly the major bed is much wider than the minor bed. In lower rivers the hydrological dynamic is much less, because wider channels are cut by the action of the tides, and because the water has already almost reached the sea and so no longer requires temporary storage. This fact is emphasised by the closeness of the main dikes to one another, the very narrow water meadows and the wide waterway. In lower rivers the width of the major bed is hardly different from that of the minor bed and there is no spectacular metamorphosis at high water or low water as there is in upper rivers. The large-scale extraction of clay and sand from the wide water meadows along the upper rivers gives the water meadow irregular contours, with gaps and hollows.

Amongst the upper rivers a distinction can be made first between the Maas and the Rijn and then between their branches, the Maas, the Waal, the lower Rhine and the IJssel. This is a distinction between parallel stretches. Amongst the lower rivers the distinction between rivers and branches is less clear; at the estuary differences between branches become blurred and the rivers become interwoven with one another.

stretches of river - twisting, winding and straight

The extent to which stretches of river bend is enormously variable. A clear variation in this extent can be observed between upstream stretches and stretches further downstream, and in a few cases even in parallel stretches. It is possible to distinguish forms of river which are straight, weakly and strongly winding, twisting and curved.

form of river The most common form of river is weakly winding, in which the bends follow a sine curve which tends to travel downstream (before the minor bed is established). This form of river is typical of the central river area and connects the straight stretches of river at the estuary with the twisting stretches of river found further upstream. A variant of the weakly winding form of river is the strongly winding form, found in the upper Rhine and the upper waters of the Waal. In both forms dead river arms show where the river used to run. The straight form of river is also found quite frequently in The Netherlands. This form is typical of lower rivers, where the tide compensates for the river's tendency to bend. Because the channel hardly moves, any islets within it are stable. Finally there is the twisting form, which mainly accursed where the river flows through lighter ground which is more easily reshaped. The twisting form most closely approaches the typical meandering form in which in principle the direction of flow turns at least 180° between one end of a bend and the other. The twisting form is found in the upper waters of the IJssel. A strongly meandering river usually tends to travel sideways, creating so-called point bars. A variant of this is the curved form, which occurs along upstream sections of the Maas. One difference from the twisting form is that the sideways travel of the river is limited and the level of the water meadows is substantially raised by sedimentation.

dike form The curvature of a dike often reflects the curvature of the river at the time of diking, but can vary considerably relative to the curvature of the present minor bed. In principle there are four extremes. The most frequent situation is the one in which both dike and river are curved (or straight). A straight river between curved dikes can be found along sections of the Waal, which were straightened by (ill-considered) technical operations. The opposite, a curved river between straight dikes, occurs in places where the river has eroded away a lateral moraine; the weak course of the lateral moraine seems to be reflected in the dike on the other side of the river.

The form of the river influences not only the form of the dike but also the siting of the points of contact or tangents between river and dike. With meandering forms, which tend to travel sideways, a long tangent with the dike often occurs in the outside curve of the river. With winding forms, which travel downstream, a point of contact or short tangent generally occurs between river and dike. The places at which the points of contact between river and dike occur depend on possible phase differences between the sine curves followed by the space between the dikes (the major bed) and by the river (the minor bed).

Delta mouth and estuary mouth

Stretches of lower river may be distinguished by the ratio between the influences exerted on their development and present form by the river and the sea. Obviously the influence of the sea is greater towards the mouth; but there are also differences between parallel stretches of river. The influence of the river in the mouth area finds indirect expression in the formation of a delta that is first swampy, later boggy. The influence of the sea finds expression, for example, in the deposit of marine clay in the delta, the formation of a widened river mouth (estuary) and the reach of the tide.[12]

6.3 Polder typology

[12] Broadly speaking, the boundary of the tidal area lies by Schoonhoven (Lek), Werkendam (Merwede) and Keizersveer (Bergse Maas). Upstream the influence of the river is dominant, downstream the influence of the tide.

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