Monuments on the horizon : the formation of the barrow landscape throughout the 3rd and the 2nd millennium BCE

Bourgeois, Q.P.J.

Author: Bourgeois, Quentin

Title: Monuments on the horizon : the formation of the barrow landscape throughout the 3rd and 2nd millennium BC

Date: 2013-01-10

Chapter 6

THE VISUAL CHARACTERISTICS OF A BARROW

6.1 Introduction

The previous Chapters dealt with the geographical and temporal scale of the barrow landscape. As I argued in Chapter 3, the practice of barrow construction lasted for at least two millennia in the Low Countries. The formation process of the barrow landscape resulted in elaborate and complex barrow groups within a single region, sometimes forming extensive dispersed groups and at other times long alignments. Each new barrow was carefully placed amongst many others and each created a visual marker within the landscape. Each added to a phenomenal landscape where the choice to build each new barrow specifically on *that* spot was carefully deliberated.

Explanations for the location of new barrows are abundant in the archaeological literature, although almost every theory has in common that a visual relation played a role in its placement. Indeed, few people would disagree that visibility is important in relation to burial monuments and it is arguably the most common explanation as to why a barrow was built in a specific place. Remarks of this nature were already made as early as the beginning of the 18th Century when Stukeley toured the Stonehenge area:

> *'I observe the barrows upon the Hakpen Hill and others are set with great art not upon the very highest part of the hills but upon so much of the declivity or edge as that they make app[earance] as above to those in the valley'* (quoted in Ashbee 1960, 18).

Even though the visual nature of a barrow is not disputed, different interpretations are given to the visual aspects. Three main positions can be distinguished. Firstly, and perhaps most commonly, it has been argued that barrows were meant to be seen, demarcating boundaries between territories (Field 1998, 316; Renfrew 1976; Woodward and Woodward 1996, 277). Implicit in this is that a barrow has to be highly visible in order for such a goal to be accomplished. A highly visible barrow would then indicate claims to land, ancestral presence and the final resting place of important deceased individuals (Hanks 2008, 271; Field 1998, 316; Last 2007, 5).

This aspect was highlighted during visits to the barrow groups described in Chapter 5. On the Ermelo heath field for example a small group of Neolithic barrows (barrows 356-358) are inconspicuous when approached from higher ground. They almost blend in with the background vegetation. But when approached from a specific angle, walking upslope from the lower lying river valley, at a certain point the barrows present themselves as majestic mounds cresting the horizon (Fig. 6.1). This deliberate positioning and increased visibility would then be interpreted as signalling territorial claims over land.

Secondly, the view from a barrow has also been argued to be important, once again explained in terms of territoriality and claims over specific areas (Lagerås 2002; Thrane 1998, 275). This position has sometimes been expanded upon with

Fig. 6.1: Three barrows on the Ermelo heath, excavated by Remouchamps. Each mound crests the horizon from this particular perspective.

a specific view from a barrow towards specific areas within the landscape, such as views of the sea (Cummings and Whittle 2004, 82), or of meaningful places (Woodward 2000, 140-142; Cummings and Whittle 2004, 84; Tilley 2004b, 185). The view from the barrow is then assumed to 'control' or 'dominate' the landscape (Tilley 2004b, 197).

Once again, walking on the Ermelo heath, it is not uncommon to see hikers standing on top of a barrow and overlooking the region. This would suggest that at least some barrows do have a commanding view of the surrounding landscape. Indeed when standing on top of specific barrows within that heath field, specific prominent landscape features can be easily distinguished. For example, the lower lying Leuvenumse stream valley was entirely visible from one of these high vantage points.

Thirdly, patterns of intervisibility between barrows and groups of barrows have been assumed to create networks of hierarchy or encompassing cosmological landscapes (Tilley 2004b, 197; Kristiansen and Larsson 2005, 355; Needham, *et al.* 2006, 72; Criado Boado and Villoch Vazquez 2000; Beck, *et al.* 2007, 838).

This can be illustrated with the same Ermelo example as above; the northern barrow alignment is almost completely invisible when overlooked from one of the (higher) cover sand ridges. But when walking down to the alignment and standing close to one of the easternmost barrows several other barrows become easily identifiable as the eye gets drawn into the alignment.[25] Similarly, when walking along the Epe-Niersen alignment, standing on top of specific barrows will immediately reveal the next barrow (group) on the alignment. In this way intervisibility in-between the burial mounds seems to have been actively manipulated in order to direct the traveller along the alignment, perhaps guiding him to important places.

The role of visibility thus pervades every aspect of explanations of the placement of new barrows. With each of these different interpretations of visibility a different ideological background determined the site location. Chronological differences may also have played a role: people building barrows during the Late Neolithic for example may not have concerned themselves with making them highly visible. Whereas people in the Bronze Age actively sought out highly visible locations for their burial monuments (as has been suggested for Denmark; *cf.* Kristiansen 1998, 288).

Whatever visual aspect was important to the people building the mound, the visual characteristics of a barrow are intrinsically linked with its specific location. The cresting of barrows on the horizon can only be achieved when building them exactly on the horizon as seen from a specific viewpoint. The ideal location for a good viewing platform must fulfil certain requirements, especially if the objective

25 A characteristic of barrow alignments already observed by Müller (1904).

is to have a good view of a specific place within the landscape (*cf.* Cummings and Whittle 2004, 84). The question of why a burial mound was built in a specific location is thus intimately linked to its visual relation with the wider landscape.

In this Chapter I will explore how a barrow structures and manipulates visual relations within the landscape. I will first discuss whether or not visibility mattered in Prehistory, followed by a discussion on how we should study visibility. In the second half of the Chapter I will develop a methodology using GIS and apply it to two case studies discussed in Chapter 5, Ermelo and Epe-Niersen. The purpose of the second half of the Chapter is to explore visibility patterns within these two case studies.

6.2 The importance of visibility in Prehistory

Most archaeological studies on visibility in relation to barrows rarely question whether visibility was intentional. For example Thrane mentions that '*anyone standing on a barrow will notice that he sees so much more from this vantage point than by staying at ground level*' (Thrane 1998, 275). This quote, and there are many others, implies intentionality in the placement and height of the barrow, a conception shared with the phenomenological approach (see below). It is certainly relevant to investigate what evidence there is that people in Prehistory manipulated visibility intentionally.

6.2.1 Monumental mounds

The strongest evidence for the role of visibility can be found in the monumentality of the burial mound itself. There are certainly indications that by building a mound, people in prehistory manipulated visibility and modified the inherent visual structure of the landscape (Llobera 2007b, 53). This is in evidence through the construction of the mound itself, but also through the post circles which were at times erected around some of them (see below). The overall visibility of that space is increased through the simple stacking of sods and the placing of posts around the mound. As I argued in Chapter 2, this transformed a locality into a meaningful place (see p.11).

Yet at the same time, as can be seen in Fig. 6.1, they also manipulated visibility by carefully determining where they constructed their mounds. Barrows sometimes crest the horizon, in such a way that they are 'sticking out'. This frequently reported quality (*e.g.* Field 1998, 315; Ogburn 2006, 407) ensures that the mounds were visible from long distances.

Multiple examples of this manipulation can be found, in all three case studies on the Veluwe barrows were placed on small hills or Pleistocene sand dunes. It may well be that this was done in order to increase their inherent visibility.

So, both the creation of a mound as well as its placement within the landscape strongly suggests that a view of the mound was important to the people building it.

6.2.2 Barrows as ritual platforms?

Our perception of a barrow is that of a round mound with gently sloping flanks. While this is certainly valid for many mounds, taphonomical processes and subsequent active modifications to the mound will have changed their shape. There are indications that some mounds were used as viewing platforms and indeed had a flat top from which rituals could be performed (*e.g.* Lawson 2007, 168; Thrane 1998, 275).

During large scale reconstruction projects in the Netherlands many barrows were reconstructed to what was thought to be their actual size and shape (*i.e.* a convex mound). At the Echoput on the ice-pushed ridges of the Veluwe for example, a large barrow was restored in this way (Fontijn, *et al.* 2011). Several cubic metres of white restoration sand were added on top of a large mound as it was thought that the barrow was heavily destroyed and its top had been recently flattened. The resulting reconstructed barrow now had a nice round shape.

In 2007, an excavation of the restored barrow took place and it was revealed that the barrow never had such a round shape, the (Iron Age) barrow was not destroyed and indeed had an intentionally created flat top (Van der Linde and Fontijn 2011, 40-41). From the top, not long after the barrow was constructed, a small pit was dug into the mound in which cremated remains were deposited. Next to it the remains of what may have been a pyre were discovered with immediately adjacent a posthole. Other examples of flat topped mounds also exist elsewhere (*e.g.* Van Giffen 1954).

There are several more other indications that suggest specific activities took place on the top of mounds. In the case of a number of Neolithic mounds (fragments of) beakers were deposited by people in Prehistory. A similar case can be made for at least a few barrows where large amounts of charcoal were found on top of the mound (*cf.* Holwerda 1908). All this suggests that some barrows were used as platforms on which rituals took place.

Both interpretations of the visual role these mounds played, appear equally valid. The monumentality of the mound itself as well as its position within the landscape certainly suggests an increased visibility was desired. The converse position of seeing *from* that mound may have been equally important. By elevating a specific place, they marked it out. Yet by creating an elevated place, they also created a vantage point. Regardless, both these interpretations provide us with an entry point into researching the visual effect of a burial mound.

6.3 Visibility studies within archaeology

Visibility within archaeology has been especially researched since the early 1990's and can be divided into two main positions; on the one hand phenomenological studies and on the other hand GIS-based approaches. Both have strong proponents although little dialogue has taken place between the two approaches (Lake 2007, 1; Barrett and Ko 2009, 276).[26]

6.3.1 Phenomenology and barrow landscapes

Phenomenology traces its origins to philosophy and involves the study of how we as humans experience and make sense of the material world (Brück 2005, 46; Tilley 2005, 201; Barrett and Ko 2009, 276). It aims to describe the world as it is experienced by humans as precise as possible (Tilley 2004a, 1) and involves all the senses (Tilley 2005, 202). Within archaeology the application of phenomenology is narrower and usually restricted to the way people experience and interact with the landscape (Barrett and Ko 2009, 276; Cummings and Whittle 2004, 8-9).[27] It is seen as a corporeal and sensuous encounter with the landscape (Tilley 1994,

26 Even though phenomenology has mostly focused on the Neolithic and megalithic monuments, the same principles are also applied to round barrows (*e.g.* Tilley 2004b).

27 For a recent overview and critique of phenomenology in all its aspects within archaeology see Brück 2005 or Barrett and Ko 2009.

11-14; Tilley 2004b, 185; Cummings and Whittle 2004, 8-9), although within archaeology it is primarily focused on seeing to the exclusion of most other senses (Cummings 2008, 286).

Central to the phenomenological approach stands the embodied experience. Walking through the landscape and experiencing the differences in visibility can only be appreciated through experiences firmly rooted on the ground. The changing vistas, the manipulation and interplay of visible and invisible places, and the entire structuring of the landscape with meaningful places are insights which cannot be gleaned from the classical two dimensional distribution maps. These maps represent a landscape from a viewpoint several km above the surface of the earth (the so-called outsiders view of the world; Cosgrove 1984). This detached viewpoint was not the viewpoint people in Prehistory had when encountering burial monuments on the ground (Bender 1999). These points of critique were initially raised to target Cartesian positivism and the role of (distribution) maps within archaeology (Thomas 1996) but have quickly developed into their own discourse (*e.g.* Tilley 1994).

In recent years the phenomenological approach within archaeology has become the centre of a polemical debate (Fleming 1999; 2005; 2006; Tilley 2004b; Brück 2005; Barrett and Ko 2009). The main critique is aimed at its methodology: modern observations ('participant observation', Tilley 2005, 203) are taken as evidence for past experiences. According to Tilley, '*the phenomenologist his or her body and the experience of this body is the essential research tool'* (Tilley 2005, 203) as '*all modern human beings [...] have the same kinds of bodies and perceive and experience the world in similar human ways at a basic biological level. This is what links past and present, me and you, us and the people who constructed an ancient monument or made a pot'* (Tilley 2005, 203). By walking through the landscape, and gathering knowledge about that landscape, one can come to a better understanding of how people in the past experienced the landscape as our own experiences provide a proxy for the past experiences (Tilley 1994, 73-75; Tilley 2004b, 185; Barrett and Ko 2009, 283).

This position towards the past landscape is highly problematic. Tilley's proposition that erosion of the past landscape was limited (Tilley 2004b, 202), can be considered at best a little naive. As Fleming has demonstrated on several occasions, the past landscape was significantly altered in most cases (Fleming 2006, 274). Rivers may have changed their course and coast-lines shifted (Wheatley and Gillings 2000, 5); vegetation was entirely different and may have obstructed significant views (Chapman and Gearey 2000); erosion and sedimentation over the past few thousand years may have obstructed or on the contrary enabled lines of sight which were not possible in the past. And all this without even mentioning the human impact on the landscape!

Returning to the case studies of Chapter 5, we know that the present day landscape of the Veluwe and the Southern Netherlands is entirely different from that of 4000 years ago. The large afforestations of the 19th and early 20th Century have completely modified visual relations within the landscape in such a way that participant observation is almost futile. Pine trees were almost absent in the region during Prehistory, while nowadays they dominate the vegetation. Heath landscapes are reduced to tiny preserved patches and probably do not equate to the heaths present during at least part of Prehistory (Doorenbosch in prep.). Many barrows are now located in re-forested environments (notably those in nature reserves, Fig. 6.2), while others are now located in partially or fully urbanized landscapes. Trying to establish visual relationships between barrows on the ground is almost impossible, and one can wonder if any results obtained in the phenomenologists fashion are not just misleading.

Fig. 6.2: The excavation of two barrows on the Veluwe. The modern vegetation surrounding these two mounds consists of oak and pine-trees. Pollen samples from underneath the barrows indicate that at the time of construction the mounds were surrounded by a vast heathland (Doorenbosch 2011).

A second line of critique is aimed at the rather casual way in which the phenomenological studies present their findings (*cf.* Brück 2005, 51-52; Fleming 2006; Barrett and Ko 2009, 276). Barrows are said to *'[…] have been 'fitted' into the local landscape so that a range of symbolic places could be referenced'* (Cummings and Whittle 2004, 87-88), although the way in which they reference is diverse and extremely flexible (Fleming 2005, 922-923). Views from the barrows themselves form the basis for this referencing, yet it is never clear from where this view should be established.

Additionally, and perhaps much more importantly, it is never questioned whether these relationships were intentional (DeBoer 2004, 200; Fleming 2005, 923). The extensive views available from certain barrows for example may be the unintended result of people building barrows on the higher parts of the landscape (Wheatley and Gillings 2002, 209).

Lagerås suggests for example that views of the sea, and then especially specific areas of the sea were important (Lagerås 2002, 186-188). Along a similar vein, Cummings and Whittle argue that in Wales, views of natural features were important. In particular views of mount Snowdon in Wales are considered as an important feature as one has a view of mount Snowdon from two thirds of all monuments (Cummings and Whittle 2004, 84).

Yet the question should rather be how *difficult* it is to achieve this view. It is not very hard to imagine that a view of mount Snowdon is easy to achieve if it represents the highest point in the entire research area. Equally with a view of the sea, if a monument is located on elevated terrain in close proximity of the sea, how hard is it to see the sea? Are there only select areas from where one can achieve this or is it almost impossible to *not* see the sea? That is not to say views of particular areas were not important, yet demonstrating a causal relationship between the monument and the area of interest is not so straightforward.

As a more general point of critique it can be said that the phenomenologist's observations are not verifiable or cannot be reproduced (*cf.* Fleming 1999) and therefore lose much of their scientific credibility.

It has also been suggested that the phenomenologist's source of knowledge, the archaeologists' encounter with past monuments, provides more insight into the views of the archaeologist himself than into the role of the monuments in the landscape (Brück 2005, 57; Chadwick 2004, 22). In a sense the application of phenomenology can be seen as a very individualistic practice which attempts to conflate the experiences of past people into one single encounter.

A more fundamental point of critique, which lies at the heart of the matter, is that the phenomenological approach as it has been used in archaeology implicitly assumes that the entire barrow landscape was pre-planned (Barrett and Ko 2009, 283). Tilley for example suggests barrows '*differentially reference the significance of these places metaphorically through a combination of their specific locations*' (Tilley 2004b, 185). He thus assumes that the entire barrow landscape must be seen as a single monument (Tilley 2004b, 198). But this in effect de-historicises the landscape and compresses the entire barrow landscape into a single logic (Garwood 2007, 44; Fleming 2006, 274; see Chapter 2).

The implications of these critiques can be demonstrated through the Ermelo case study and its northernmost alignment. The individual encounter with the alignment as described in the introduction certainly demonstrates how visibility was manipulated in such a way that standing at the beginning of the alignment allowed one to see almost the entire alignment from specific points. Yet as has been demonstrated in Chapter 5, this alignment consists of a first line of 6 Neolithic barrows which was expanded upon by 11 barrows more than a millennium later. The first alignment is more removed in time from the second alignment than we are from the Early Middle Ages!

Additionally the size of the Neolithic barrows was increased through time to such an extent that they are now significantly higher than they were originally. The height of most barrows at the time of excavation by Modderman was the result of a Bronze Age activity phase in which they refurbished most barrows in the region (see Chapter 5; Modderman 1954). Furthermore the initial destruction of the mounds through military activities and the subsequent restoration in the second half of the 20th Century dramatically changed the shape and form of these barrows.

Therefore, trying to establish visual relations in a modern day landscape between the barrows would result in grossly overstating the importance of the visual relations as intended by the first barrow builders.

Phenomenology is not without its merits though. The role of the senses and the experiencing of the landscape firmly rooted on the ground are concepts which certainly have had their impact on any further interpretations involving the role of barrows within the landscape (see Chapter 7). Nevertheless its methodology is fundamentally flawed and a different approach must be developed to overcome these flaws. If we attempt to research the visual relation within a barrow landscape, we need to reconstruct and visualise at least part of the barrow landscape several millennia ago. We should try to account for (most) of the changes through time or at least try to acknowledge their impact. An important tool which might help us to attain this goal is GIS.

6.3.2 GIS and viewshed maps

Roughly at the same time as the phenomenological discourse within archaeology developed, the use of GIS or *Geographical Information Systems* within archaeology boomed (Lock and Harris 2000). GIS is difficult to define and encompasses many disciplines (Wheatley and Gillings 2002, 9). In general GIS can be considered as *'computer systems whose main purpose is to store, manipulate and present information about geographic space'* (Wheatley and Gillings 2002, 9). However, this definition is not without its critique and concerns on the deterministic nature of GIS are well founded (Thomas 2004, 201; Conolly and Lake 2006, 9). In recent years many attempts have been made to alleviate these concerns (*e.g.* Wheatley and Gillings 2000; Llobera 2007b).

Most commonly visual relations are researched through some form of the viewshed map (Conolly and Lake 2006, 226-227), essentially a two-dimensional representation of what can be seen from a specific viewpoint. On the basis of a Digital Elevation Model (DEM) a line of sight is calculated from a specific viewpoint to each individual cell of the DEM.[28] If a direct line of sight is possible then a 1 is stored in the visible cell, if not a 0 is recorded (Fig. 6.3). This process is repeated for each individual cell and creates a binary map where each map cell is assigned the value of 0 or 1. A new viewshed can then be created for alternative viewpoints. Multiple viewshed maps can be summed to create what is called a cumulative viewshed (Wheatley 1995). Each individual cell then records how many viewpoints can see that specific cell. It is even possible, given enough computational power, to create a total viewshed where a viewshed map is calculated for each individual cell on the raster and which is then summed (Llobera 2003). Derivatives such as viewshed area and intervisibility can all be calculated with the viewshed map as the basis.

The technique is straightforward and relatively easy. Most GIS software packages contain basic functions which enable the user to create a viewshed map. From both a theoretical and a practical viewpoint many problems must be addressed before we can make use of viewshed maps.[29] Practical issues arise with the correct use of a DEM (Wheatley and Gillings 2000, 10), edge effects (Van Leusen 1999), the role of different types of algorithms and the binary nature of a viewshed with its reduction into in- and out-of-view maps (Llobera 2003, 29).

Theoretical problems arise with the focus on visualism (Wheatley and Gillings 2000, 13). Even though some other senses have been modelled within GIS (*e.g.* Mlekuz 2004), most studies researching burial monuments only investigate their visual aspect (Conolly and Lake 2006, 225; Llobera 2007b, 51-53). This focus on visualism is considered to be a particular Western approach (Bender 1999) and it is certainly true that focussing on visibility creates an impoverished surrogate for real life perception.

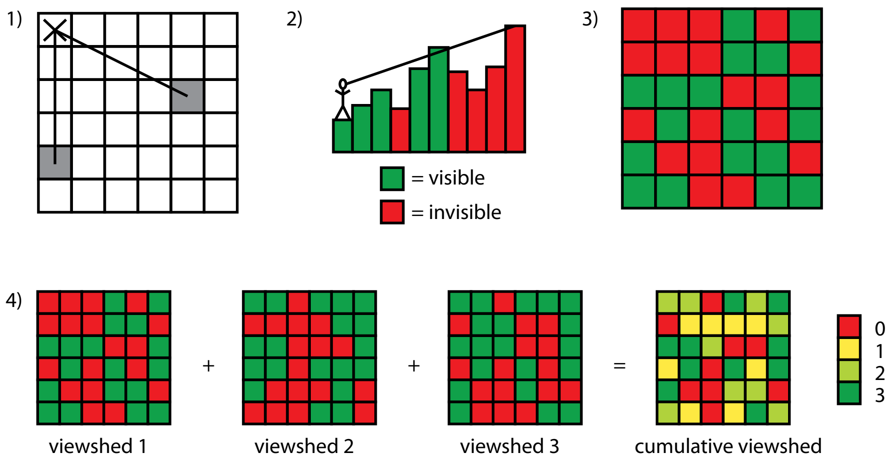


Fig. 6.3: The steps involved in the creation of a cumulative viewshed map. 1) A Line of sight is drawn from a viewpoint to each individual cell of the DEM; 2) If the target cell is visible a 1 is stored, if not a 0; 3) The end-result creates a map indicating which cells are visible from the viewpoint. 4) multiple viewshed maps are then summed creating a cumulative viewshed map.

28 Although viewsheds are also possible on a Triangulated Irregular Network (TIN) these are much less common (Wheatley and Gillings 2000, 10).

29 For an overview of the risks and problems associated with the use of viewsheds see Wheatly and Gillings 2000 and Van Leusen 1999.

That is not to say we should abandon researching visibility altogether (Llobera 2007b, 52). As has been noted by many authors, from the field of phenomenology (*e.g.* Tilley 2004b, 197; Cummings and Whittle 2004, 87) as well as GIS (Llobera 2007b, 57; Wheatley 1995, 174-175), barrows were used by people in the past to visually structure and modify space and to create or visualise meaningful places. This reason in and of itself is already enough justification for visibility to be researched. It must be realised, however, that this is only part of the entire experience which was lived by the people in the past (Van Leusen 1999, 220).

The critique on the role of the map put forward by the phenomenological approach has recently also been expanded to the use of GIS (Thomas 2004; Cummings and Whittle 2004, 22). It is argued that perception is reduced to a two dimensional sheet of paper. A simple viewshed map cannot be interpreted directly as a visible/invisible map. The simple binary representation does not account for errors inherent in the generation of a DEM (Wheatley and Gillings 2002, 209-210). Therefore it is possible that a place within the landscape which appears visible on the viewshed map is in reality not visible and vice versa (Cummings and Whittle 2004, 22). Furthermore the viewshed assumes perfect vision as well as perfect visibility. It does not account for poor eyesight, a gloomy rainy day or more fundamentally whether or not the object (in this case a burial monument) can be distinguished from the background (Wheatley and Gillings 2000, 6; Llobera 2003, 29). To overcome these problems the use of probabilistic, Higuchi and fuzzy viewsheds have been suggested (Wheatley and Gillings 2000; Wheatley 2004).

While the critique is certainly true for a simple viewshed map, the potential of cumulative and total viewshed maps is much greater. A total viewshed map is a map where for each cell of the DEM a viewshed has been created. Each individual viewshed is then summed to create a single map. Every cell within this map then records the value of how often it was visible from each other individual cell. The value stored in that cell can then be likened to the visual magnitude of that specific location (Llobera 2003).

A total viewshed map for example provides insight into the general potential visibility within a region.[30] As it is based on thousands of observations this equates to standing on almost every possible location within that landscape and recording what might be seen from that spot. A feat which is difficult, if not impossible, to achieve in the field.

The resulting map suggests locations within the landscape which may be highly visible (or not at all) and may therefore have been targeted by people to build their barrows. A 3D visualisation of such a map (Fig. 6.4) does not create a representation of the physical reality of the landscape but rather provides insight into the visual impact landscape features have on the viewer (Llobera 2003, 39). It visualises which locations may potentially stand out within a landscape, something which can not always be ascertained from a DEM.

GIS also has the potential to recreate fragments of the past landscape which have now disappeared. Notably prehistoric vegetation can be modelled onto the DEM (Gearey and Chapman 2006). The so-called 'tree problem' has been frequently noted in relation to visibility studies (Wheatley 1995, 182) although it has rarely been implemented in GIS studies. It is arguably very difficult to reconstruct prehistoric vegetation, let alone prehistoric vegetation at different times.

30 The same may be attained with a cumulative viewshed map on the basis of thousands of randomly created viewpoints. If enough viewpoints within a map are generated, the resulting map will approach the potential visibility within such a landscape (see below).

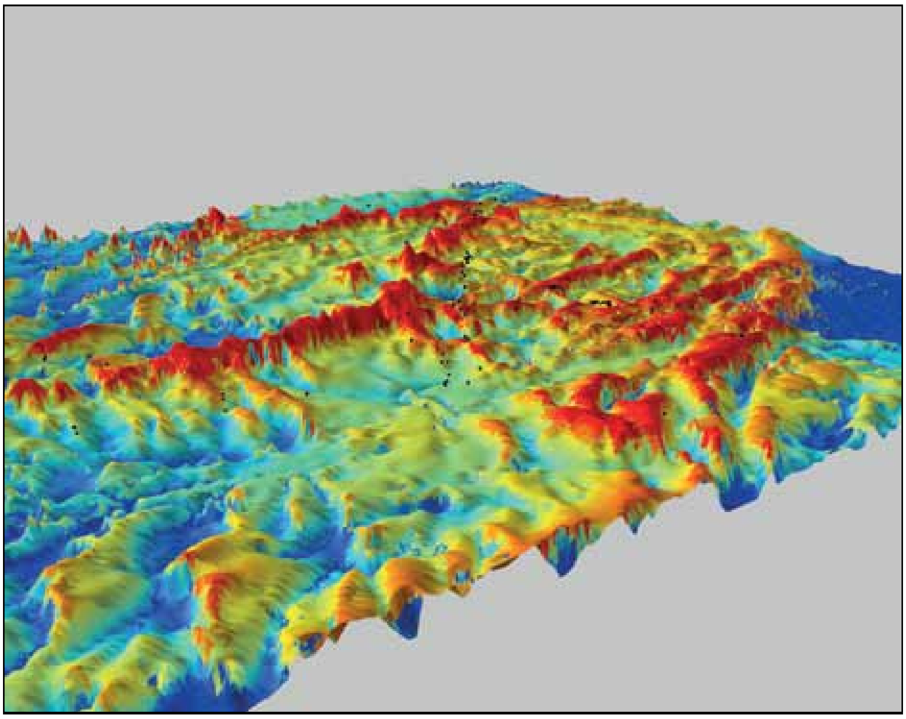


Fig. 6.4: A 3D representation of the visual structure of the landscape. The red areas indicate high visual prominence, the blue and yellow areas low visual prominence.

However, when enough proxies for the prehistoric vegetation are available a general model for the prehistoric vegetation can be created (Gearey and Chapman 2006; Bourgeois in press; see below).

GIS is a powerful tool and can certainly help in interpreting the choice of location for barrows within the landscape. Its potential to create different alternative representations of the same landscape, its potential to create derivative maps which go beyond a simple representation of the landscape and its potential to statistically test these results can be considered as valuable additions to the archaeologists' toolbox. Nevertheless it should be realised that with any use of GIS, a model is being created. This model should be considered for what it really is – only a model – and any results obtained from this model should be considered as probabilities to be researched further and substantiated by the archaeologist (*cf.* Wheatley 1995, 182-184).

An additional problem associated with the viewshed models and indeed with most GIS use, is that they generate static images and reduce temporally separate events to what has been called 'thin Cartesian slices' (Thomas 1996). In generalising barrow landscapes and conflating what is temporally separate, GIS based studies fall victim to the same pitfalls as mentioned for phenomenology.

6.3.3 Temporality and visibility

The role of time within barrow landscapes and indeed in every form of engagement with the landscape has already been addressed in Chapter 2. As with the study of barrow landscapes in general, the temporal aspect in relation to visibility studies is of fundamental importance (Wheatley and Gillings 2000, 8). There are two distinct ways in which the concept of temporality affects the study of visibility.

Firstly, as has already been mentioned before, we as archaeologists tend to reduce the complex interplay of diachronic events into one single seemingly synchronous layer. Compressing the entire barrow landscape into a single layer and then explaining the formation process from a single logic perspective is common in most approaches to barrow landscapes (see above and Chapter 2). Inherent to the limitations of archaeology and the lack of a fine chronology, this problem, in most cases, cannot be overcome.

The Epe-Niersen barrow alignment is a case in point. It came into existence through at least two thousand years of barrow construction. As has been shown in Chapter 5, the earliest barrows on the alignment date back to the early 3rd Millennium BC. But even the Late Neolithic A origins of the alignment already represent a reduction of multiple decisions and events separated through time. We do not know which of the six Late Neolithic A barrows came first. Were they all erected during a single large event, or was each built separately after several generations? What exactly are we studying then? What we, out of necessity, must conflate is actually the result of people making individual decisions to locate a new barrow on that exact spot (Wheatley and Gillings 2000, 8). The resulting pattern that we are studying are the '*sedimented activit[ies] of an entire community, over many generations*' (Ingold 1993, 167).

This implies that from a practical viewpoint we cannot study the choice for an individual site location of a barrow but only the result of dozens of such decisions. It is impossible to get behind the individual barrow narrative, instead we must confine ourselves to studying the repeated choices and the resulting distinguishable activity phases within the barrow landscape.

That these activity phases are idiosyncratic to each region is demonstrated by the different case studies. The Ermelo case study for example exhibits a complex phase of activity and barrow construction around 1500 cal BC, which cannot be identified at all in the Renkum or the Vaassen case studies. The Toterfout case study on the other hand demonstrates that if a (more) detailed chronology is available, (subtle) differences can be distinguished and studied.

A practical approach would therefore be to create a diachronous development of synchronous activity phases for each case study, each with their own idiosyncratic temporality. From an interpretative viewpoint these synchronous activity layers must be considered as the results of generation upon generation manipulating and changing these barrow landscapes. I will return to this discussion in Chapter 9.

The second aspect of temporality in relation to visibility studies is more subtle. The temporality of a landscape not only affects the entire landscape and its diachronous development but also the viewer. As Ingold noted, when walking from point A to B, it is not the distance which has an impact on the viewer. Rather moving through a landscape is accompanied by constantly changing vistas (Ingold 1993, 154) and it are these changing vistas which significantly impact the perception of and the dwelling within a landscape. The sequence of the encounters we have with the landscape determines how we perceive those encounters (Llobera 2005, 181-182).

The static viewshed maps do little to reflect the effect of walking along the alignment of the Vaassen case study for example. Some barrows will readily be visible irrespective from where one stands, while other burial monuments are revealed in a specific sequence when walking along the alignment.

Both these aspects of temporality must be addressed if we wish to bridge the gap between phenomenological approaches and GIS studies. Studies that approach the barrow landscape as a diachronous development are rare, from both the phenomenological and GIS approaches. Attempts at including movement into visibility studies have been equally limited (see however Bell and Lock 2000; Llobera 2000; Lock and Pouncett 2010; Eckardt, *et al.* 2009).

In my opinion it is only through the use of GIS that we can provide the tools to answer this question. The potential of GIS to eliminate modern and subsequently model past vegetation and investigate the impact of that vegetation on visibility is invaluable in this research. It is equally capable of addressing questions on intentionality and causality. Through the use of GIS, an archaeologist can, for example, investigate whether or not barrows were built on highly visible points.

Nevertheless uncritical use of GIS can quickly lead to misidentifications and to potentially misleading results (*cf.* Van Leusen 1999; Wheatley 1995, 180). To continue with the example, if a positive association is found between barrows and high visible points, it should be further investigated whether or not this may have a different cause, such as barrows being built on the highest points in the landscape.

6.4 Visualising prehistoric landscapes

Whether one approaches the visual role of the barrow from the perspective of phenomenology or GIS, the reconstruction of the past, and the visualisation of that past, plays an important role. Two problems stand central to this reconstruction and must first be dealt with before we can continue any further. Firstly, it is important to realise that the visible burial place is not the ruined and overgrown (and usually restored) monument as we now encounter it. Secondly, most barrows are no longer surrounded by the vegetation present at the time of its construction (Barrett 2004, 199). Both these points combined influence the visual character of the prehistoric landscape and must be taken into account to some extent.

If visibility was important, then it is worthwhile to investigate how we should visualize these barrow landscapes. Most archaeological studies involving burial monuments do little to consider their original forms, shapes and landscape setting. The present day barrow landscape is incomplete and ruined. The barrows are now the partial, collapsed, decayed and overgrown remnants of what was once overground architecture.

When investigating the visual elements of the prehistoric landscape, we must realize that many of those elements have now disappeared. Postholes recovered around many barrows in reality created elaborate wooden constructions. Visibility of those barrows at the moment of their construction will have been significantly higher than it is now. If visibility (in whatever form) was the desired outcome of a barrow we should first try to recreate how these burial monuments may have looked like when newly created.

6.4.1 Colourful mounds

As already mentioned in the introduction to this Chapter, barrows in present day landscapes sometimes seem to disappear and blend into the background. The vegetation growing on top of those barrows is similar to the vegetation growing around it, usually grasses or heather shrubs. But a burial monument, especially when freshly built, would have contrasted with the surrounding vegetation.

Firstly, large tracts of land were stripped of sods needed for the construction of the mound, destroying the top-soil. These tracts will initially have remained bare, and it is assumed that it took a long time before heath vegetation returned to its original density. Especially when the sods were cut deep enough, as they were in the Low Countries, the recovery would have taken at least 20 years (Doorenbosch 2011, 120). This means that tracts of stripped soil close to the mound, and perhaps surrounding the barrow, were coloured differently to the vegetation around it (Bender 1992, 747; Thrane 1998, 271).

Equally the mound itself had a different hue than the surrounding vegetation. In the construction of a mound the sods were usually stacked upside down. If the last layer of sods was also stacked upside down, the outer layer of the mound would have been made up of relatively brown soil mixed with the roots of heather shrubs and grasses. Different types of soil have different colours and there are some indications that people manipulated these different colours to create differently coloured segments (Holst, *et al.* 2004). For at least a few years, until vegetation grew back, the mound will have been easy to distinguish from the background.

In the Stonehenge area the same effect was achieved by covering the mounds with an outer layer of fresh chalk (Ashbee 1960, 45; Lawson 2007, 52). Instead of the gently sloping green hills we now see, we should visualise bright white or brown/orange coloured mounds, depending on the subsoil. And even when vegetation returned to the mounds and started to grow on top of it, the type of vegetation will initially have been entirely different from what surrounded it.

Irrespective of any other attempt to enhance the visibility of a barrow, this in itself would already have enhanced the contrast of a barrow against the natural background and will therefore have improved the long-distance visibility of a barrow (Llobera 2007b, 57-58). Whether or not this was intentional is secondary, the end-result will have been the same. A barrow, when freshly built, will have contrasted with the surrounding vegetation.

6.4.2 Post circles, ditches and palisaded ditches

While the mound is one element of the burial architecture, features surrounding the mound also form part of the monument as a whole. Although most of these features have disappeared through time, with the posts rotting away and the ditches filling up, at the moment of their creation these architectural features will have made a significant visual impact.

Post circles, common during the Bronze Age (see Chapter 3), represent the most obvious way to enhance the visibility of a mound (Lohof 1994, 111; Theunissen 1999, 101). And, as I argued in Chapter 5, distinct types of post circles were used to differentiate specific groups of barrows (notably in the Toterfout case, see p. 98).

In most cases the posts seem to have been fairly substantial (20 - 30 cm in diameter). While it is impossible to say how high the posts will have been, their maximum obtainable height was approximately 3 - 4 m.[31] Some postholes were dug so deep that they would have been capable of sustaining posts of up to 5 - 6 m in height (*e.g.* Tumulus 5 at Toterfout Halve Mijl; Glasbergen 1954a, 45). The resulting post circles would have had a clear visual impact on the landscape.

The post circles can be divided into two distinct groups (see Chapter 3). The first group of widely spaced post circles, may have had more elaborate architectural elements above the surface. Some of these post circles show a pairing of posts which suggests transverse baulks may have been placed on top of them (*e.g.* Tumulus 5 and 11 at the Toterfout cemetery). Several post circles also suggest entrances indicative of elaborate overground architecture (Glasbergen 1954b, 154). It may even be possible that the posts themselves were brightly coloured or decorated with woodcarvings.[32]

---

31 Based on the depth of the post-holes we can calculate the maximum height of a post before it would have no longer been able to support itself. Huijts (1992, 41) suggests that the depth of a posthole equates to 1/5 to 1/6th of the maximum length of a post. Of course in reality the post itself may have been lower in height, but it nevertheless suggests how high such a post *may* have been.

32 The actual posts surrounding the barrows have never been preserved, but drawing on parallells from water-logged conditions suggests that wood carvings were certainly not uncommon. At the small Bronze Age temple of Barger Oosterveld, the four corner posts were all decorated with cattle horns (Waterbolk and Van Zeist 1961), while in Danish bogs large wooden posts have been found, displaying anthropomorphic figurines (Glob 2004 [1965]).

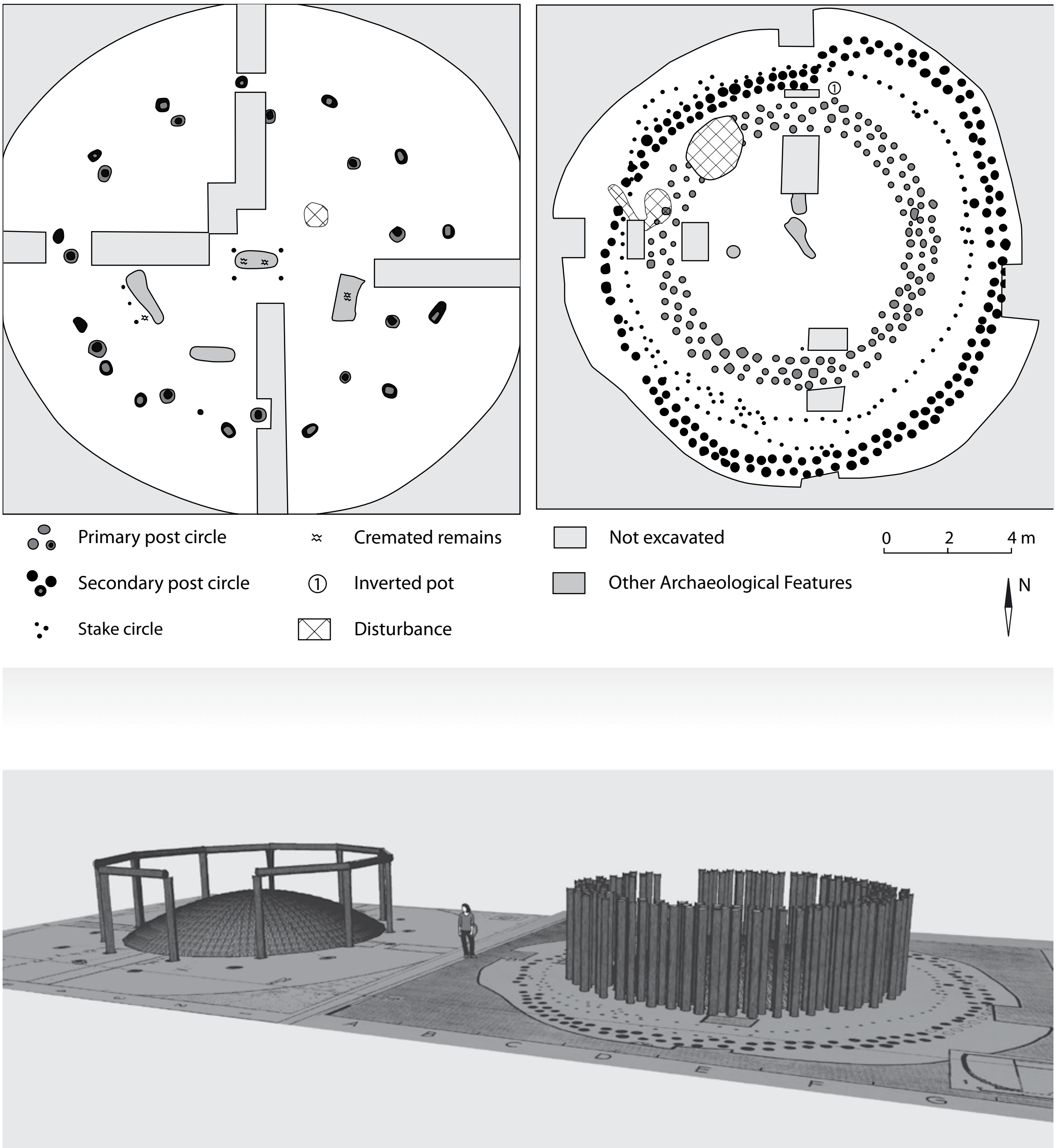
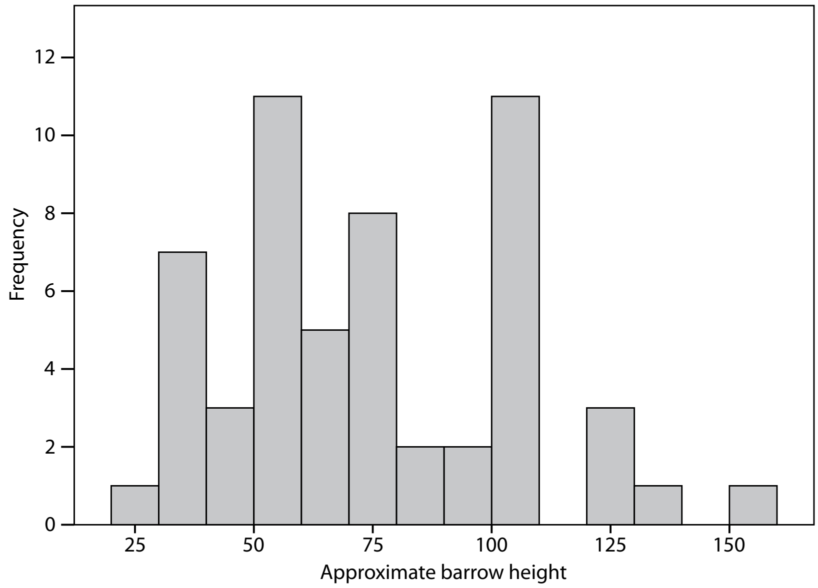


Fig. 6.5: Top: excavation plans of a widely and a closely set post circle; to the left Tumulus 5 of Toterfout Halve Mijl (redrawn after Glasbergen 1954a, Fig. 13); to the right Rechte Heide (redrawn after Glasbergen 1954b, Fig. 51). Bottom: a 3D reconstruction of the post circles on the basis of the primary post circles (created with Google Sketch-Up).

Conversely, the second group of closely spaced post circles would have obstructed visibility of the mound itself. This construction would have created a wooden cylinder that encircled the mound. These post circles will have created two visually distinct groups (Fig. 6.5; see Chapter 5). In some exceptional cases the entrances to post circles were extended to create long allées towards the centre of the barrow (*e.g.* Van Giffen 1949b; Wilhelmi 1986).

The outward visual impact of post circles will certainly not have been its only function. It has been suggested that the regularity in spacing indicates they were oriented to the cardinal points as well as the midwinter and midsummer solstices (Harsema 2001). The cordoning off of the burial space and the creation of a delimited space (perhaps even pre-mound construction) will have been equally important (Theunissen 1999, 92).

Fig. 6.6: *The approximate height of all Neolithic barrows upon excavation (where this could be reliably determined; N=55).*



Nevertheless, the resulting effect of the post circles left to decay in the landscape will also have been a visual one (*cf.* Gibson 1992; Theunissen 1999, 101; Lohof 1994, 111). The visual effect of a barrow would not have been that of a low gently sloping mound such as we can see today, but rather of elaborate wooden structures in varying degrees of decay.

Barrows surrounded by a ring ditch or a bank and ditch may not have shared this visual concern. The ditch delineated the burial monument and created a liminal space, but its long-range effect on visibility can be considered limited. At close range, however, the ring ditch did create the optical illusion of a bigger monument. A bank and ditch barrow will have achieved the same effect.

The material from the ditches was in some cases thrown on top of the mound, in other cases it was covered by sods. When the excavated material was thrown on top of the mound it will have created a differently coloured mound, increasing its contrast and thus its long-range visibility. The frequent re-digging of ditches and surrounding barrows with new ditches during the Bronze Age may have served the function to refurbish the mound and to increase its visibility.

Both types of surrounding features are typical for the Bronze Age (Theunissen 1999, 57-67; Bourgeois and Arnoldussen 2006; Bourgeois and Fontijn 2008; see Chapter 3). Late Neolithic mounds have a slightly different burial architecture. As in other regions in North-Western Europe (*e.g.* Lawson 2007, 158; Ashbee 1960, 148-149), Neolithic mounds in the Low Countries were usually not very prominent. While not necessarily small, most were relatively low and are rarely higher than 1 m (average of 70 cm; Fig. 6.6). The visual impact of the mound itself will have been limited.

Most barrows from this period are surrounded by palisaded ditches. Reliably identifying palisades within the ditches surrounding Neolithic barrows is only possible for the better documented excavations. Especially excavations undertaken before 1940 do not always allow the distinction between a 'normal' ditch and a palisaded ditch.

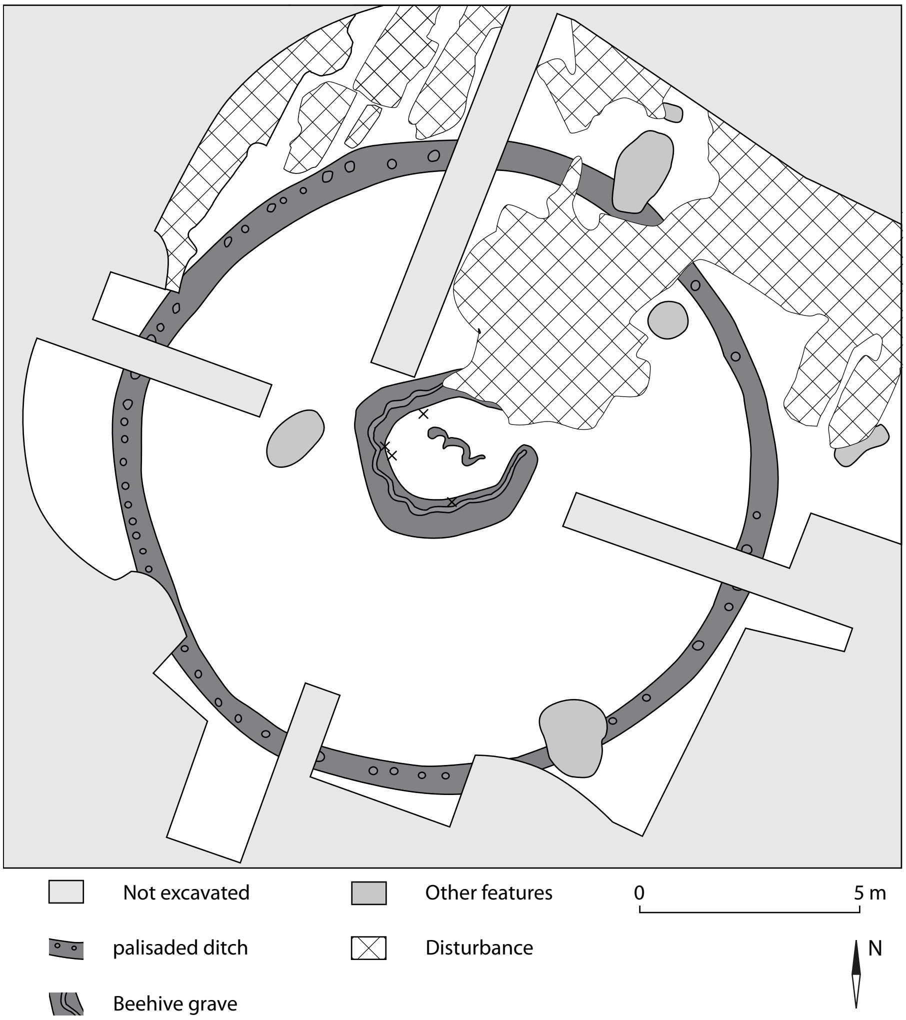


Fig. 6.7: The excavation plan of the Putten barrow (redrawn after Van Giffen et al. *1971, Fig. 2).*

Nevertheless almost every ditch surrounding a Neolithic barrow can be considered palisaded (Lanting 2007/2008, 62),[33] even if no traces of posts were recognised. Where sections of these ditches are available, a double filling can generally be identified in the ditch, which should be interpreted as the remains of an organic construction placed in the ditch and left to decay. A barrow excavated by Bursch at Maarsbergen makes a good example (barrow nr. 276). While the original excavation plan does not depict any posts within the ditch, sections of that ditch display several distinct post-shadows visible within the fill of the ditch (Lanting and Van der Waals 1971b, 118).

There is, especially in Dutch literature, considerable debate as to the function of these palisaded ditches (*cf.* Modderman 1984; Lanting 2007/2008, 62-63; for a similar discussion on Bohemian and Moravian Neolithic barrows see Turek 2006). Much of the debate and confusion stems from the fact that palisaded ditches appear both close around the grave and at, or slightly under, the foot of the mound. Both have been interpreted as having the same function (Lanting 2007/2008, 62).

Since some of these ditches appear to have been covered by a mound, they are interpreted as being temporary and are considered to have been removed prior to the building of the mound (Lanting and Van der Waals 1976, 43; Drenth and

33 To my knowledge only two or three Neolithic barrows have a 'normal' ditch. At the Hunerberg the ditches documented are V-shaped in profile and do not show any trace of posts (Louwe Kooijmans 1973).

Lohof 2005, 440; Lanting 2007/2008, 62). If we follow this interpretation, all palisaded ditches documented in the Low Countries, should be viewed as temporary screens demarcating the site of the future barrow.

Several aspects of this interpretation are difficult to reconcile with the evidence however. On the one hand some palisaded ditches form an integral part of the grave pit. Finds were placed right up to the edge of the palisaded ditch and the entire area it enclosed was deepened. On the other hand some ditches do not relate to the burial pit at all, but rather are associated with the edge of the mound. The division into two groups is supported by the fact that in several cases a palisaded ditch around the grave is found together with a palisaded ditch around the foot of the mound (*e.g.* Lanting and Van der Waals 1971b; Van Giffen, *et al.* 1971; Fig. 6.7) suggesting that both ditches served a different function.

Together with my colleague K. Wentink, I set out to understand the relation of these ditches with the mound and how to reconstruct them. We started with an inventory of all ditches found underneath or in association with Neolithic barrows (Appendix D). For each ditch, we tried to ascertain its stratigraphical relation to the mound, especially noting whether it was covered by the mound or whether it was placed at the foot of it.

A total of 113 Neolithic barrows are associated with ditches. The stratigraphical relation between the barrow and the ditch could not be determined in 77 cases.

Fifteen of these ditches were certainly covered by the mound and all are without question part of the burial chamber, later covered by the mound. While I would argue that the term 'beehive' is perhaps not entirely in line with how these burial chambers should be reconstructed, I nevertheless would suggest to keep this now common-place term. As these chambers are subsequently covered by the barrow I will not discuss them here any further. For an extensive discussion of these graves I refer to my colleague (Wentink in prep.).

Twenty-one ditches were situated at the foot of the mound and were not or only partly covered by the foot of the mound. These must be considered as palisaded ditches encircling the mound. They are common during both the Late Neolithic A and B (see Chapter 3). The way in which these palisaded ditches are reconstructed is of great relevance to the visibility of the burial mound. As stated above, most if not all of these ditches were palisaded. The documented depth of these trenches (an average of 72,5 cm; Table 6.1) and the width of the observed traces of posts suggest we are dealing with substantial beams. Their maximum height may have been as much as 4 to 5m[34] with an average diameter of roughly 15 – 30 cm. The posts are usually closely set within the ditch leaving little space in-between the posts (*e.g.* Harenermolen, Van Giffen 1930; Bennekom Tumulus I, Van Giffen 1954). The posts decayed *in situ* and created a wooden screen enclosing the burial.

In most cases the burial mound was constructed within this wooden screen and in several instances the mound itself was constricted by the wooden palisade (Modderman 1984, 62; *contra* Lanting 2007/2008, 62). This is supported by the fact that when sods have been recognised in Neolithic mounds, they always appear inside the confines of the ditch and never outside of it (*e.g.* Hijszeler 1945). The parts of the mound which are found to be covering and sometimes extending beyond the ditch can be considered slope wash. The subsequent decay of the posts would allow the mound to settle outwards. The colluvial deposits to the sides of the mound would then gradually cover over the ditch.

This process can be observed in several profiles (Fig. 6.8). This is supported by the fact that the distance from the foot of the mound to the ditch is in almost every case less than 1 metre (Fig. 6.9). In well documented profiles this colluvial

34 Once again based on the formula by Huijts (1992, 41); see note 31.

Sitename	Barrow ID	Distance barrowfoot to surrounding structure	Diameter of the barrow	Diameter of the surrounding feature	Height of the mound	Depth of the surrounding feature	Remarks
Heerde Koerberg Heuvel 2	392	100	425	350	25	50	.
Hijken Hooghalen Tumulus 17	472	150	1100	550	75	90	.
Ermelose Heide heuvel III	326	80	760	600	80	90	.
Maarsbergen heuvel 1	276	125	900	700	60	65	in drawing the posts appear to run through the mound body.
Nutterveld Tumulus II	4410	100	1000	710	60	35	8m sod core untill center of ditch, outside ditch lighter colour sand.
Harenermolen	456	50	980	720	90	65	51 posts (15-20 cm diameter), ditch fill contained a BB sherd.
Holten Tumulus IV	4011	85	1050	725	100	55	.
Oosterwolde Galgenberg	558	50	.	750	.	.	4 posts visible in ditch (diam posts 10-25 cm)
Lunteren 'De Vlooienpol'	4038	.	.	750	.	.	6 posts visible (diameter 25 cm)
Vaassen Heuvel 3	275	.	.	750	30	75	.
Swalmen bosheide Heuvel 1	48	.	.	750		125	.
Niersen Galgenberg G4	635	.	.	775			.
Exloo doppelkreisgrabenhugel	556	25	1000	800	75	75	17 posts visible, originally about 50-60
Hilversumsche heide heuvel 7	297	150	1000	800	.	65	.
Vaassen Heuvel 1	273		1300	850	100	75	.
Schipborg heuvel d	496	100	1300	900		75	.
Ermelo Groevenbeekse Heide	301	0		900	50	50	.
Meerlo Tumulus I	145	0	900	900	50	80	Foot of mound slopes into ditch
Eext visplas/pingoruïne	521	100	1350	1050	125	25	52 posts visible with ca. 6 to 7 missing. Approx. 50 cm inbetween posts (diameter 20-30 cm)
Bennekom Quadenoord heuvel 1	322	0	1300	1300	100	100	65 posts visible with approx. 20 missing. All posts approx. 30 cm in diameter with 10 cm inbetween each post
Putten	409	0	1500	1400	100	110	42 posts visible with approx. 40 missing. All posts approx. 20-30 cm in diameter spaced around 20-30 cm from one another.

Table 6.1: Palisaded ditches surrounding Neolithic mounds; (values in cm). The references to these monuments can be found in the database (Appendix A).

deposit outside of the ditch is differently coloured and textured than the mound on the inside of the ditch and in some cases a steep slope outwards is also indicated (*e.g.* Van Giffen 1954).

Modderman's suggestion of cylindrical mounds (1982, 62) would thus be in line with the evidence as we observe it. There are however barrows which seem to defy this classification and where it is difficult to distinguish between palisaded ditches and burial structures.[35] Palisaded mounds are not restricted to the Low Countries (see Turek 2006 for several central European examples and Hübner 2005 for Danish ones). It has also been suggested for a Neolithic barrow in England, where the excavators reconstructed the original form of the mound as a drum-shaped monument (Lawson 2007, 168).

The exact shape and form of a Neolithic mound will remain difficult to reconstruct. In some cases we see that the mound within the palisaded ditch was relatively flat as opposed to the more convex mounds of the Bronze Age (*e.g.* Van Giffen 1954). Two different reconstructions are depicted in Fig. 6.10. As with the post circles of the Bronze Age, any overground reconstruction is pure conjecture. The palisade may have been brightly coloured or not, it may have been 1,5 m or

35 Notably Hijken Hijkerveld Tumulus 17 (Van der Veen and Lanting 1991).

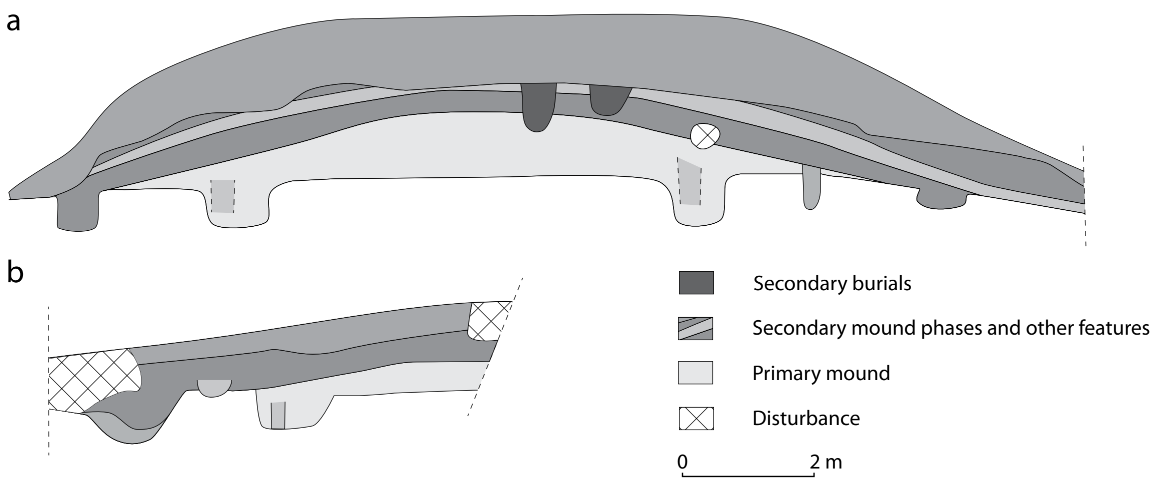


Fig. 6.8: Profiles of two Neolithic mounds surrounded by palisaded ditches. Note the traces of the posts at the edge of the primary mounds. The top profile (a) is from the Harenermolen barrow (Van Giffen 1930, T.33); the bottom profile (b) from Bennekom Quadenoord (Van Giffen 1954, pl.II).

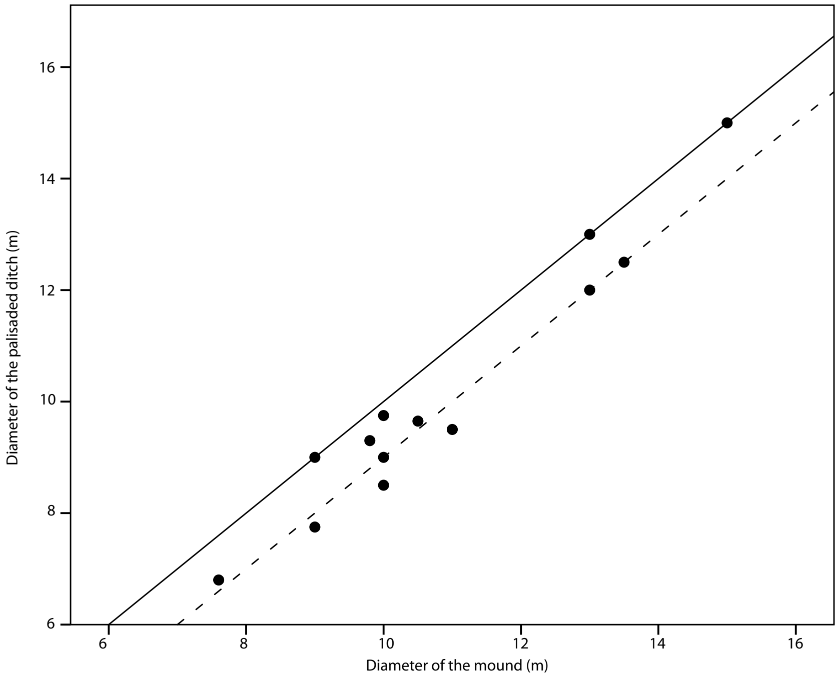


Fig. 6.9: A scatterplot of the relation between the palisaded ditch and the foot of the mound. In most cases the palisaded ditch is located at the edge of the mound (solid black line) or within 1 m of it (interrupted line).

3 m high, the posts may have been decorated or something may have been placed on the top of (some of) the posts. Whatever the case may be, the form and shape of a Neolithic mound was decidedly different than the relative low mounds we see today. With their surrounding palisades we must rather reconstruct them as cylindrical monuments (*cf.* Modderman 1984, 58).

The original function and meaning of Bronze Age post circles and Neolithic palisaded ditches may be difficult to reconstruct, but the effect they achieved was similar. In both cases they significantly altered the visibility of a small low mound and created clearly distinguishable man-made constructions. The impact on wider visibility within the landscape of those specific points was significantly increased, albeit only temporarily. Perhaps what may also be important is the interplay between barrows with a low visibility signature, such as those surrounded by ditches or no features, in contrast to barrows with a high visibility signature, such as those surrounded by palisades or post circles. Observing a barrow group still in

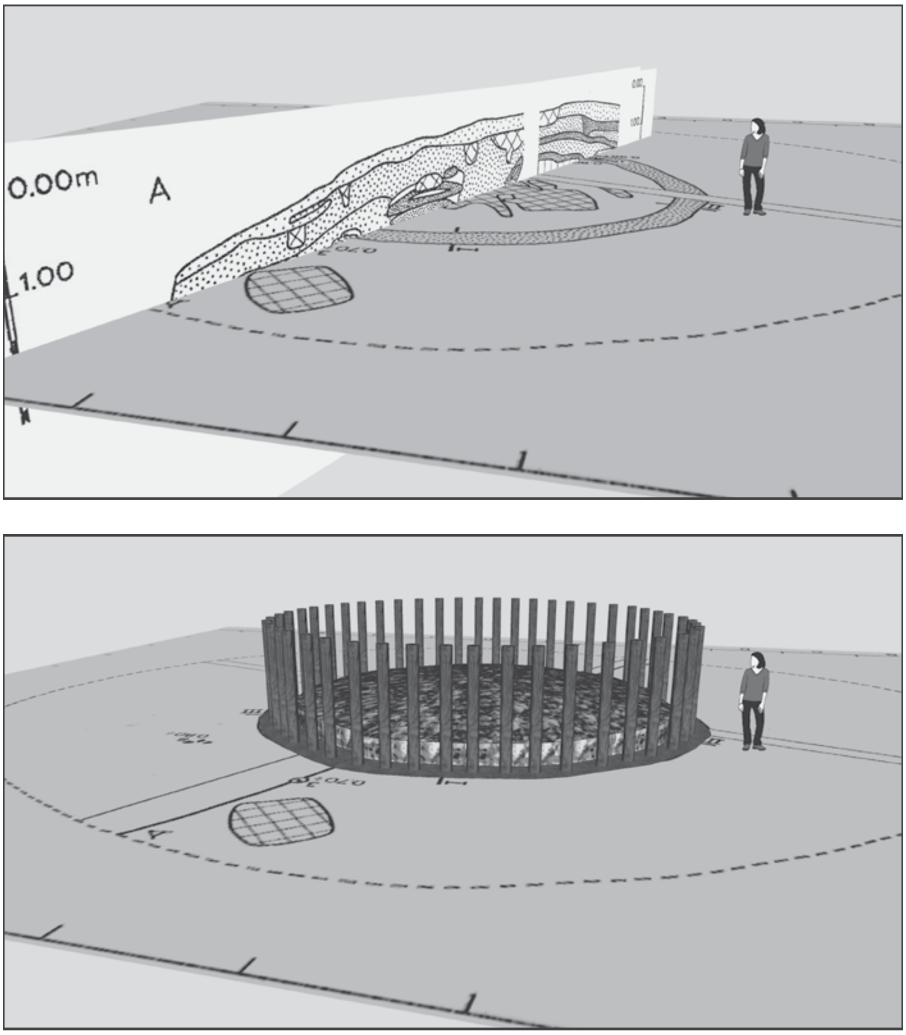


Fig. 6.10: A 3D reconstruction of the palisaded ditch surrounding a primary mound at Maarsbergen (Lanting and Van der Waals 1971b, Fig. 13a and b; courtesy of the National Museum of Antiquities (RMO)).

use would have revealed barrows in varying degree of decay, from newly finished mounds surrounded by fresh post circles to almost completely ruined and decayed post circles encircling a completely overgrown mound.

6.4.3 Vegetation reconstructions

Visualising and reconstructing prehistoric barrow landscapes would be incomplete without attempting to reconstruct (part of) the vegetation (Chapman and Gearey 2000). When trying to research visibility patterns, standing on top of a hill or barrow trying to look towards a specific point, it is important to realise what type of vegetation would have been standing between the observer and the target. A small copse of trees, rightly positioned, can already block any possible line of sight and lead to false conclusions. Both the role of modern-day vegetation and the role of prehistoric vegetation has to be taken into account.

Modern-day vegetation on the Veluwe is significantly different from what was present in the past. While some burial mounds are now located in heath fields, most are located in very small clearings within modern planned forests. Three quarters of the Epe-Niersen alignment is now located in a pine-forest planted by prince Hendrik in the early 20th Century (Bleumink and Neefjes 2010, 150-154). Trying to establish visual relationships in the field between monuments on this alignment would be impossible as the evergreen trees enclose almost every individual barrow on all sides.

Fortunately the modern-day vegetation can be removed within a GIS. The DEM which often forms the basis for visibility studies is effectively stripped of any vegetation (Wheatley and Gillings 2002, 6). This surface is sometimes referred to as a *'bare earth surface or barren landscape'* (Tschan, *et al.* 2000, 29). These DEMs offer views unimpeded by modern vegetation and (most) buildings.

While it is fortunate that modern day vegetation can be removed, it does not take into account the prehistoric vegetation. Viewshed studies carried out on these bare earth surfaces are much more likely to overstate the importance of visibility than studies that do account for vegetation (Tschan, *et al.* 2000, 34-35). From the early advent of viewshed studies, this so-called tree-problem has been acknowledged (*e.g.* Wheatley 1995, 182), although it has rarely been dealt with.

The first step which must be taken in order to visualise past barrow landscapes is reconstructing what type of vegetation surrounded these barrows in Prehistory. It is admittedly difficult to model where an individual tree would have been standing and the lack of solid vegetation proxies limits the possibilities and extent of reconstructions. And when these proxies are present, it is often difficult to say where exactly the pollen-producing vegetation would have been located (Gearey and Chapman 2006, 171) or what the extent of it would have been (Cummings and Whittle 2003, 268).

Fortunately for the Low Countries we have quite a lot of information on past vegetation. The case studies presented in Chapter 5 all have multiple barrows that were sampled for pollen remains, allowing us to reconstruct the vegetation (development) around the barrows in relative detail. Those mounds were all built on heaths, and indeed all barrows sampled for pollen in the entire Low Countries indicate the presence of heathland (118 out of 119; Casparie and Groenman-Van Waateringe 1980; Groenman-Van Waateringe 2005; Doorenbosch in prep.).

From these vegetation proxies we can certainly suggest that almost every barrow was built in an open heath/grass field (Doorenbosch in prep.) which appears to have been managed and kept as heathland for millennia to follow (*cf.* Doorenbosch 2011). Even the earliest barrows on the Veluwe were built in open heath fields (Casparie and Groenman-Van Waateringe 1980). The heath itself is composed of grasses and heather plants, which will have had a limited impact on visibility.

Next to this open vegetation, all pollen spectra indicate that alder fen woodland as well as a mixed oak forest was present close by. The impact this vegetation will have had on visibility was much more profound than the low shrubs of heath and grasses. Both zones would have presented visual barriers which will have made visibility of the landscape behind it difficult although not necessarily impossible (Chapman and Gearey 2000; Cummings and Whittle 2004, 22).

So in Prehistory, people standing close by a barrow would have been standing in a heath interspersed with grasses. Low shrubs of heather and patches of grass and the occasional birch tree would make up the immediate environment of the barrow.

In the lower lying river valleys and bogs, dense vegetation of alder and willow trees was present. The height of this vegetation was substantially higher, with the alder trees reaching altitudes of 15 to 20 m (Stortelder, *et al.* 1999, 189-210). Dense vegetation, low shrubs and reeds, would have impeded any view through this area.

The third component in the pollen spectra is a mixed oak forest, which surrounded the heath on all sides. The oak and lime trees would in general have reached heights of 20 to 40 m while the edges of the forest were rimmed with hazel trees and shrubs (Van der Meijden 2005, 405). While it may have been possible to view through the trees (Cummings and Whittle 2003, 260; Llobera 2007a), the hazel trees on the edge of the forest represented dense vegetation and undergrowth, with visibility unlikely to have ranged far beyond the edge of the forest. Even in winter, the massed tree-trunks would still block visibility beyond more than 50 m (Fleming 2005, 926). This mixed oak forest will have formed a significant visual barrier and would have blocked most if not all views beyond it.

Admittedly generalizing, this reconstruction of the vegetation surrounding a barrow is nevertheless valid for almost the entire Prehistory from 3000 BC onward (Casparie and Groenman-Van Waateringe 1980; Doorenbosch in prep.). The size of the heath will have increased gradually through time (although in some cases perhaps also decreased?), but the composition of the vegetation remained the same. The heaths were permanently managed (Doorenbosch 2011), either through burning, sod cutting or grazing. Once established the heaths never disappeared throughout the 3rd and 2nd Millenium BC (Doorenbosch in prep.), remaining a staple part of the landscape in the Low Countries. We should thus visualise the barrows in an open heathland with at a distance the forest edge.

More problematic is the exact size of the heaths. Estimates vary from a few hundred metres to more than a kilometre in diameter (Doorenbosch in prep.). This may have varied from burial mound to burial mound or through time (De Kort 2007), although how this should be translated in the actual extent of the heath is difficult to quantify.

If we assume a radius of 500 m, the resulting open heathland will increase dramatically. Conversely a radius of just 100 m will reduce the heathlands to small patches within a vast forest. In either case, with a radius of 500, 250 or 100 m, the burial mounds will have been enclosed on all sides by the forest edge. Especially in a relatively flat landscape as in the Low Countries visibility will have been severely restricted beyond anything more than a few hundred metres (*cf.* Doorenbosch in prep.).

The visual impact of the vegetation on a barrow landscape can therefore be considered significant. The effect of the mixed oak forest on the observer will have created a sense of visual enclosure (Llobera 2005, 187), with the burial mounds forming important visual foci on the small heaths (Bourgeois in press). Emerging onto a heath, the burial mounds will almost immediately have been located at a distance relatively close to the observer (Llobera 2007b, 58). Their visual impact, especially when the mounds were freshly built with the posts still standing, will have been very high, yet their long-distance visibility can be questioned. Views extending beyond anything than a few hundred metres will have been especially difficult.

It is only in specific cases that we can be fairly certain that larger heath fields were in existence. Especially with the alignments on the Veluwe, we can argue for the existence of bigger heaths. If we assent that all barrows on the alignment of Epe-Niersen were built within a heath field, each individual heath links up to form one elongated stretch of heath enclosing the entire alignment (Fig. 6.11).

These relatively large heathlands must already be reconstructed for the earliest phase of barrow construction. As was argued in Chapter 5, most burial mounds on the alignments were already constructed in the Late Neolithic A. If we reconstruct even moderate heaths (250 m in radius) around each individual barrow, they link up to create a minimum of several square kilometres of heathland around each alignment. It is only in these regions that we, with a certain measure of certainty, can substantiate long-distance views (Bourgeois in press).

6.4.4 Combining the elements: an impression

Having set the stage we can now attempt to combine the different elements into a reconstruction of the barrow landscape roughly 4500 years ago. Once again walking up to the Neolithic barrows of the Ermelo barrow group, the experience we try to recreate now starts to become entirely different. Walking up from the boggy

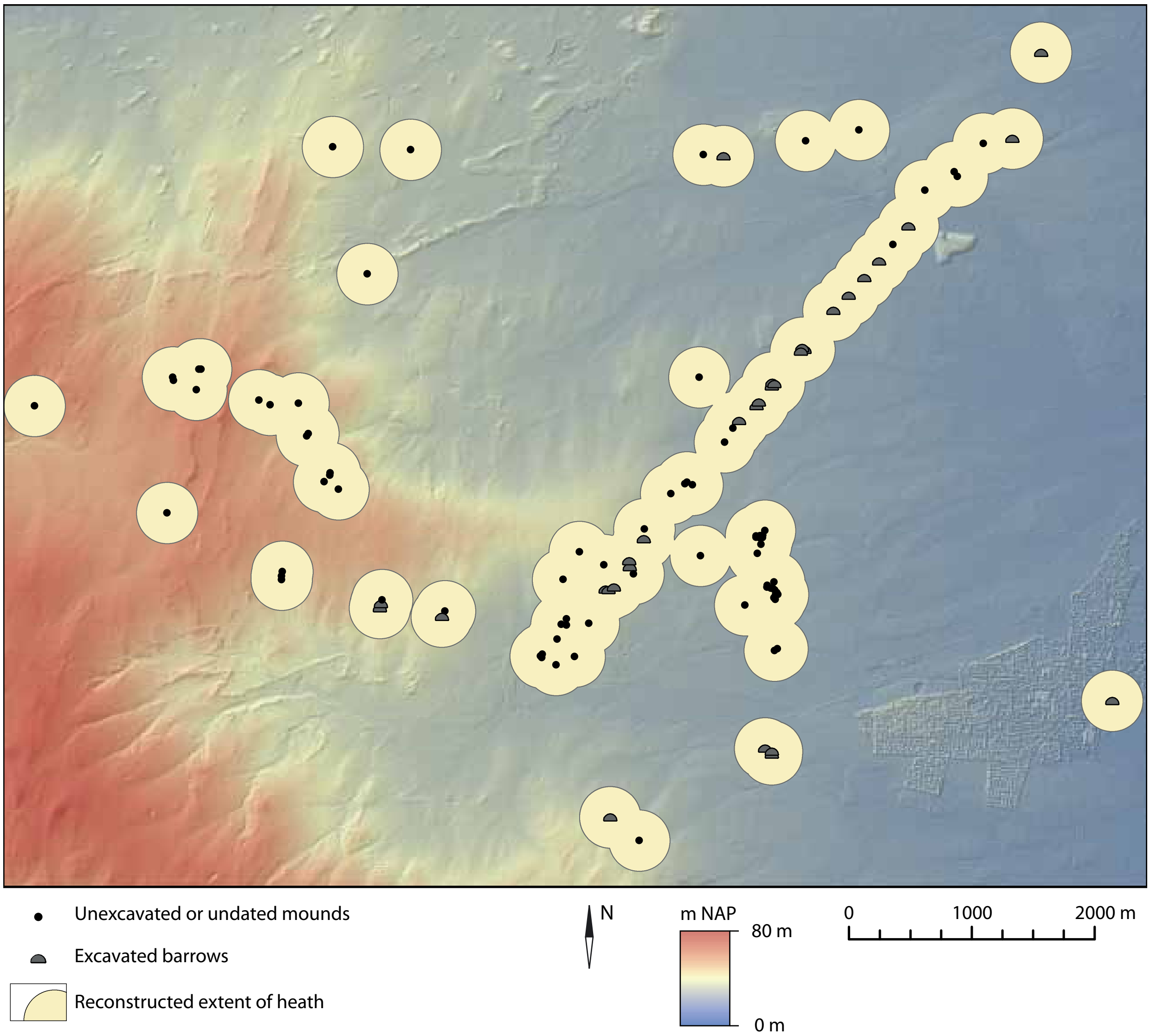


Fig. 6.11: A reconstruction of the size of the heath on the basis of the distribution of the barrows.

river valley with its alder brook forests we emerge onto a heath. On the horizon we see three wooden palisades enclosing small burial mounds. Two of the mounds are surrounded by the half decayed wooden posts, while the third mound, recently constructed is enclosed by a freshly built palisade. Moving closer to the mounds reveals more palisaded burial monuments, built in line with the first three, further off in the distance, with one built right on top of a hillock. The burial mounds are built in a long stretch of heath field enclosed by a mixed oak forest on all sides.

If we were to approach the same group from the same direction a millennium later we would see two large mounds, freshly refurbished and a barely perceptible low mound right next to these. The colour of the two large mounds contrasts with the surrounding vegetation and with the overgrown smaller low mound. Moving towards these two barrows a long line of barrows would come into view. Most barrows were either recently erected or refurbished, and the strips of barren soil close to these mounds are still clearly visible. To the north and south of the alignment, a few hundred metres out from the barrows, the forest encircles the heath.

This impression and the attempt to recreate the barrow landscape demonstrates how differently we must visualise these landscapes. But even more so it shows how limited an experience in the modern day landscape would be. It is imperative to research the past landscape through a reconstruction of all its constituent elements. While for some elements this is easier, such as the form of the mound, for others this is much more difficult. For example, the impression presented above is now notably devoid of people. The human presence in the landscape, through settlements, is now almost impossible to reconstruct as a result of an archaeological bias.

6.5 Researching visibility patterns

Let us return to the question at the heart of this Chapter. How does a barrow structure and manipulate visual relations within the landscape? As I argued in the introduction to this Chapter, the role of visibility permeates all explanations concerning the choice of location for a barrow. Yet how we should interpret and understand the role and specific articulation of visibility varies significantly. Using the case studies of Ermelo and Epe-Niersen I will explore what visual relations these barrows had with the rest of the landscape.

Now of course each type of visual relation is articulated differently. In essence we must break down the question central to this Chapter into five sub-questions and develop a methodology for each of these:

1. Was a view *from* a barrow important? And a view of towards what parts of the landscape?
2. Was a barrow meant to be seen (and from what distance)? And does a barrow have a higher increased visual signature than its immediate surroundings?
3. Which barrows are in view of which other mounds? And does the position of each barrow create networks of intervisibility?
4. Were barrows built on locations of high visibility? And did they manipulate this in order to increase the visibility of the barrows (*i.e.* cresting a hill)?
5. Was visibility manipulated in such a way as to reveal a sequence of views?

These questions reflect the differing opinions outlined in the introduction to this Chapter. Within a GIS environment these different positions can be explored and a methodology can be developed for each. Below I will first outline the technical details and constraints followed by a reconstruction of the vegetation on the DEM. Then I will discuss a methodology for each question, followed by its application to the Ermelo and Epe-Niersen case studies.

6.5.1 The visibility analyses: some technical details and constraints

The visibility analyses described below all use a viewshed or a Line of Sight (LOS) as a basis. All viewsheds and LOS have been calculated using ArcGIS 10 and the Viewshed, Skyline or LOS tool within its 3D analyst extension.

All observers used for the viewpoint have been given an observer height of 1,7 m, reflecting the assumed average height of people in Prehistory. In cases where the visibility of the barrow itself was important, the observed target height has been increased by 0,5 m. This will result in the target barrows being 0,5 m higher, reflecting a freshly constructed barrow. All viewsheds were calculated using earth curvature.

All viewsheds were calculated on the basis of a Digital Elevation Model (DEM). All DEM's were created using an *Inverse Distance Weighing* (IDW) interpolation from Lidar-imagery (the *Actueel Hoogtebestand Nederland*, AHN). The raw data (though with the vegetation already filtered out) of the AHN was used and there is at least one point every 5 x 5 m with a standard deviation of 15 cm on the elevation value (Van Heerd, *et al.* 2000).

The IDW allows for an as accurate representation of the actual observations as possible and ensures that the small scale variability of the landscape is represented in the DEM (Conolly and Lake 2006, 94-97). The interpolation was created using ArcGIS and the IDW tool of the 3D analyst module.

There are several important limitations and constraints which need to be addressed prior to the viewshed analyses. Firstly, the importance of the quality of the DEM. Secondly, the edge-effect within viewshed studies. Thirdly, we need to determine the distance at which a barrow can still be seen

The quality of the DEM is of primary importance to viewshed analyses (Wheatley and Gillings 2000, 9-10). The resolution of the DEM used in this research is 5 x 5 m. This means that the raster is made up of 5 by 5 m wide cells with a single elevation value. The real landscape is of course much more variable. This means that any results obtained from the DEM should be considered as probable results based upon that *model* of the landscape.

In specific cases the so-called edge effect can also have a significant influence on the validity of viewshed studies (Van Leusen 1999, 218-219; Van Leusen 2002, Chapter 16). Cells located towards the edge of the DEM have increasingly low values as the viewpoints which are outside of the boundaries of the DEM are not included in the analysis. If the target research area is 10 x 10 km and viewsheds have a radius of 2 km, only the inner 8 x 8 km area will have values which are correct.

In order to compensate for this, the DEM was increased in size, not only to include the research area, but also to extend beyond it by one time the extent of the viewshed. In practical terms, this means that the DEM, and the area in which random points are located is extended by 2 km beyond the boundary of the research area (Fig. 6.12).

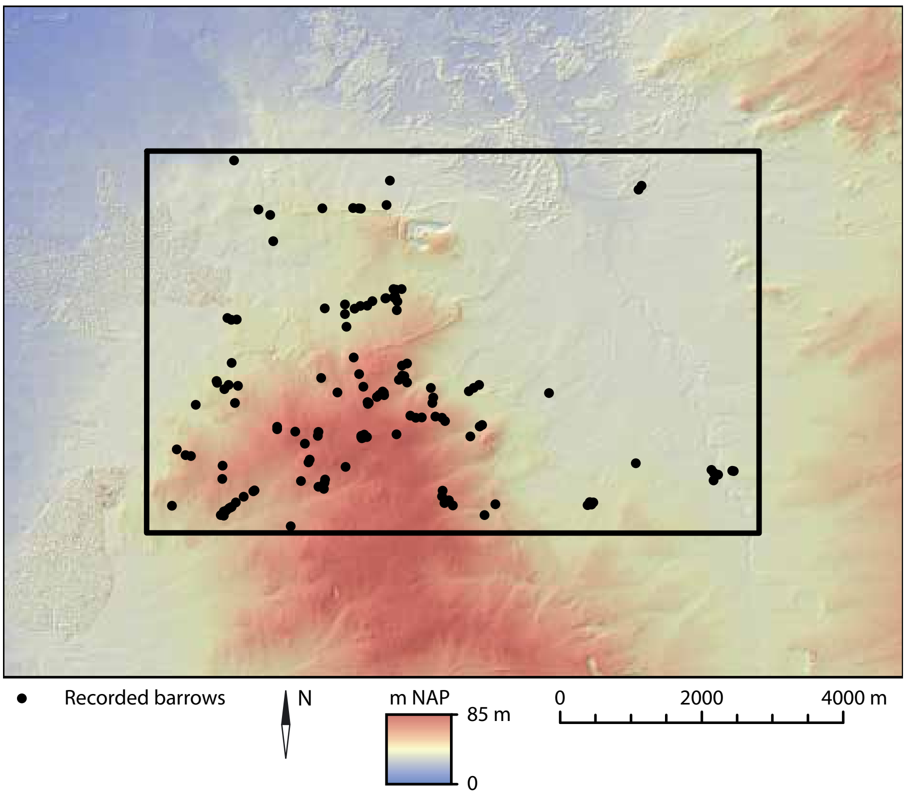


Fig. 6.12: The extent of the DEM, accounting for the edge-effect. Here, an additional 2 km buffer is included in the viewshed analyses.

Fig. 6.13: Photograph of several mounds on the Ermelo heath. The photograph was taken from the top of barrow 327. Visible in the photograph are: a) barrow 330; b) barrow 331; c) barrow 325; d) barrow 326; e) either barrow 332 or 333. Several of the barrows in between barrows 330 and 325 were not visible (i.e. barrows 337-339). The distance between the point where the photograph was taken and the furthest barrow is just under 700 m. Both barrows 325 and 326 remained visible over longer distances. For an overview of all barrows mentioned see Fig. 5.19 and Fig. 5.23.

Once the DEM is constructed, viewshed maps can be generated. From a viewshed map individual values for each burial mound can be obtained, indicating their visual exposure, area of view etc.

Within a GIS environment, we can restrict how far we should be looking. Yet we should be aware that the extent of the viewshed radius significantly influences what locations are emphasised (Ogburn 2006, 405). If the viewshed radius is unconstrained, it will reinforce the visual magnitude of high locations such as hilltops (Van Leusen 2002). On the other hand if a small viewshed radius is chosen, local elevation differences will be accentuated. A similar process is described by Llobera on topographical prominence (Llobera 2001).

Central to this problem is the question at what distance we can still resolve a burial mound. Is it of much use to create a viewshed with a radius extending beyond multiple kilometres if it is impossible to distinguish the target under study (Van Leusen 1999, 220)?

Personal experience on several heath fields suggests that the burial mounds will not have been clearly visible beyond more than a kilometre. Even with (reconstructed) post circles it is very hard to distinguish the individual burial mound, and only at specific positions were they clearly visible.

To get an estimation of these distances, I visited several heathfields and determined at which point I could still see individual mounds. On a relatively flat stretch of heath called the *Rechte heide*, to the south of the town of Tilburg, lies an alignment of seven mounds. After having been excavated by Van Giffen all of them were fully reconstructed (complete with post-circles; see Fig. 2.1; Van Giffen 1937a). Yet I could only distinguish a few of the barrows when just over one kilometre away, and even then with great difficulty. Similar tests in the Ermelo-heath field suggest the same approximate distances (Fig. 6.13).

This suggests that long-distance visibility patterns which can be generated through viewshed analysis should be evaluated carefully. The visibility of a burial mound will only rarely extend beyond a kilometre. It is only in specific cases where the visibility of the individual mound is increased that longer viewing distances can be supported. In the case of false-cresting, the contrast of the burial mound offset against the horizon will enable the mound to be perceived from greater distances than if it were located at the foot of a hill.

In cases where the view *of* a mound is important, I constrained the viewshed radius to a maximum of 2 km. This represents the extreme maximum range at which a burial mound may still have been visible. Beyond this distance, a barrow will no longer be distinguishable from the background (modified after Llobera 2007b, 57-58).[36]

Values obtained for archaeological features are however, meaningless if they are not compared with expected values. These can be obtained from a random sample within the same area. Such a sample can be constructed using a Monte Carlo technique (Conolly and Lake 2006, 161-162). With this technique multiple sets of n randomly located points are created, where n is the number of points under study (for example the number of barrows in the region) and the number of sets determines the confidence level (in this study 99 sets have been used, with a confidence level of 0,01).

The background sample can then be compared with the values obtained from the barrows. The hypothesis is proven to be correct if the values of barrows are significantly higher than the values of random points. The significance is tested with a Kolmogorov-Smirnov (or K-S) test (Wheatley 1995, 173-174; Wheatley and Gillings 2002, 215; Conolly and Lake 2006, 130-133) commonly available with most statistics software.

The technical limitations of the visibility analysis are not limited to the technicalities of the GIS used. The DEM used in these studies is a representation of the modern day landscape. These modern landscapes also include modern features such as highways, urban centres and raised causeways for highways or railroads. These modern features are then included into the DEM and will severely impact the results of the visibility studies.

For some areas this impact is much more severe than others. The Renkum research area for example is less suited to visibility research because of the close proximity of the urban centre to the barrows as well as the impact of raised levees of highways and railroads crossing the research area. Any patterns of intervisibility or visual magnitude of specific points will be severely limited by these features. The visibility studies discussed in this Chapter will mainly focus on the Ermelo barrow groups and the Epe-Niersen alignment as these research areas are less influenced by modern-day features.

6.5.2 Modelling vegetation within a GIS

Before we attempt to construct methodologies and interpret the results we must first address a problem touched upon before: the impact of vegetation on visibility. While running the danger of generalising, it can nevertheless be said that barrows in the Low Countries were built in heathland, while at the same time wooded areas were in abundance nearby.

Not incorporating these trees in visibility studies would render any obtained results almost meaningless or at least difficult to substantiate (Bourgeois in press). We must therefore model the vegetation within a GIS environment (*cf.* Llobera 2007a).

As I argued above, three vegetation units can be identified within the pollen record underneath barrows. These are heathland, alder carr and mixed oak forest. I made three assumptions prior to modelling these vegetation units onto the DEM.

36 Note that these estimates are for barrows of on average 15 m in diameter and 1,5 to 2 m high, the average Dutch barrow.

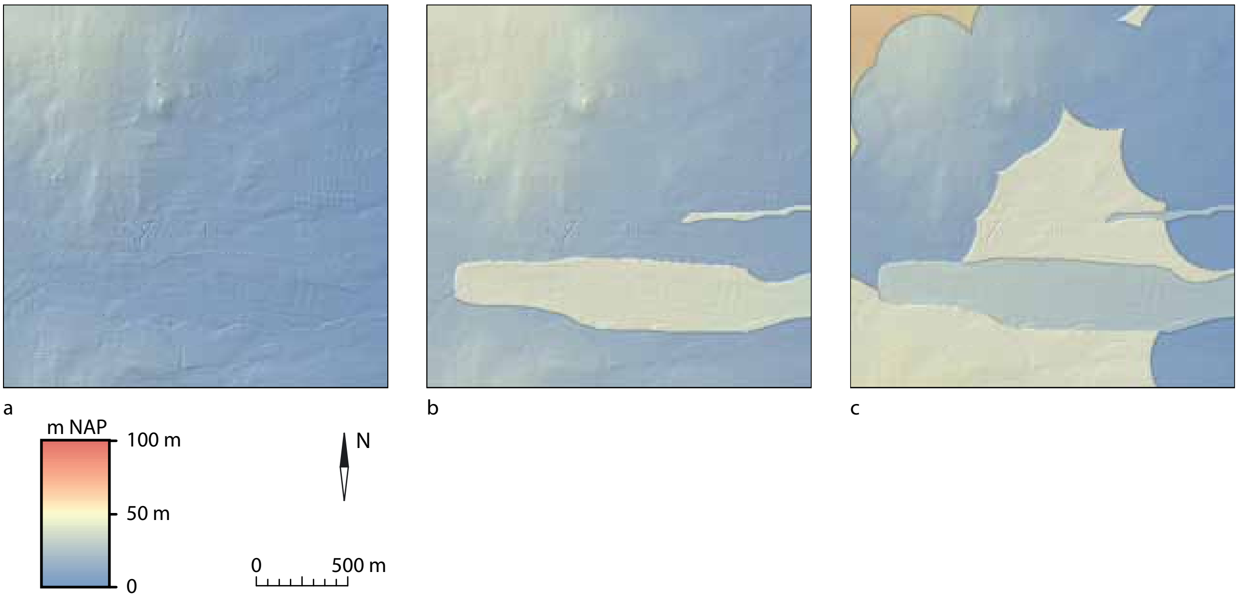


Fig. 6.14: a) a bare earth DEM; b) DEM with alder brooks modelled; c) DEM with both alder brooks and a mixed oak forest.

The first assumption is that all barrows were located in heathland of moderate size. On the basis of preliminary work by my colleague M. Doorenbosch (see Doorenbosch in prep.), I have assumed the heaths to have a radius of on average 250 m around each individual barrow.

Another major element of the vegetation record are alder trees. Found in all pollen records, these alder trees represent alder carr in the lower-lying stream valleys or areas with high ground-water tables. Two sources have been used to model the alder carr on the DEM. On the one hand areas with high ground-water (within 20 - 40 cm or less) were selected from the modern ground-water tables. However, modern use of ground-water combined with the canalisation of the many small stream valleys running of the Veluwe have significantly lowered the ground water (*e.g.* Eilander, *et al.* 1982, 31). The Militaire Topografische Kaarten of 1830-1850 were used to compensate for this and the swamps and boggy areas indicated on those maps have been added to the high-ground water areas. The assumption is that both sources reflect the general extent and location of the alder carr in Prehistory.

The third element of the vegetation was a combination of oak, lime, hazel, beech and to a lesser extent pine and fir trees. The percentages of these trees remain relatively constant throughout Prehistory although they decrease somewhat in the Bronze Age (Doorenbosch in prep.). The assumption is that the pollen of all these trees represent an extensive mixed oak forest which constituted a major part of the landscape and covered large parts of the Veluwe.[37]

These three vegetation units were then modelled onto a DEM. As mentioned above, a DEM represents the surface of the earth without any vegetation, a so-called barren landscape (Tschan, *et al.* 2000, 29). The original DEM was thus modified to account for the presence of the alder carr and the mixed oak forest (*cf.* Tschan, *et al.* 2000; Chapman 2000; Gearey and Chapman 2006).

Surrounding each individual barrow a buffer was created with a radius of 250 m. The elevation values within this 250 m radius were kept at the original elevation values with the exception of areas covered in alder carr. The elevation values

37 I acknowledge that an individual oak tree, isolated on an extensive heath may equally produce large quantities of oak pollen (*cf.* Cummings and Whittle 2003, 259). Nevertheless the combination of all these different types of trees suggest a more extensive tree cover rather than individual isolated trees.

of areas which represent the alder carr were then increased by 15 metres, representing its average height (Stortelder, *et al.* 1999, 189-210). Beyond the extent of these open places and not covered by alder trees the DEM was increased in altitude by 30 m, representing the average height of mature oak trees (Van der Meijden 2005, 405). The resulting Vegetation DEM creates distinct blocks of vegetation with different altitudes (Fig. 6.14).

Now of course the vegetation model as presented here is artificial and will only partially reflect the actual vegetation cover in Prehistory. First and foremost, the perfectly round heathfields surrounding the barrows are obviously artificial and do not reflect the complex mosaic of vegetation. At the same time it is very difficult to extrapolate the vegetation beyond the extent of the barrows and the model only represents the vegetation in close proximity of these mounds.[38]

Second, the vegetation reconstructions are notably devoid of settlements, an archaeological bias typical for the Late Neolithic (Whittle 1996, 227; Drenth, *et al.* 2008) and the Middle Bronze Age A (Arnoldussen and Fontijn 2007).

6.5.3 To see …

Methodology

The first question that will be dealt with involves the view available from a barrow. As posited by multiple authors, the view available from a barrow would be the prime motivation for the construction of a barrow on a specific place. Was this the case in the Ermelo and Epe-Niersen area?

It is relatively straightforward to demonstrate that a barrow has a wider view than other points in the landscape. By simply elevating a certain location one already obtains a better view of its surroundings. It is not even necessary to argue this through a GIS. Of course we are left with a question of causality; is the wide view an unwanted consequence of the mound or is it the desired outcome (DeBoer 2004, 200)?

I would argue that it is better to rephrase the question and ask what one was meant to look at. It has been frequently argued that from a barrow one could view specific (natural) places within the landscape (*e.g.* Tilley 2004b; Thrane 1998; Cummings and Whittle 2004). This can be tested within a GIS.

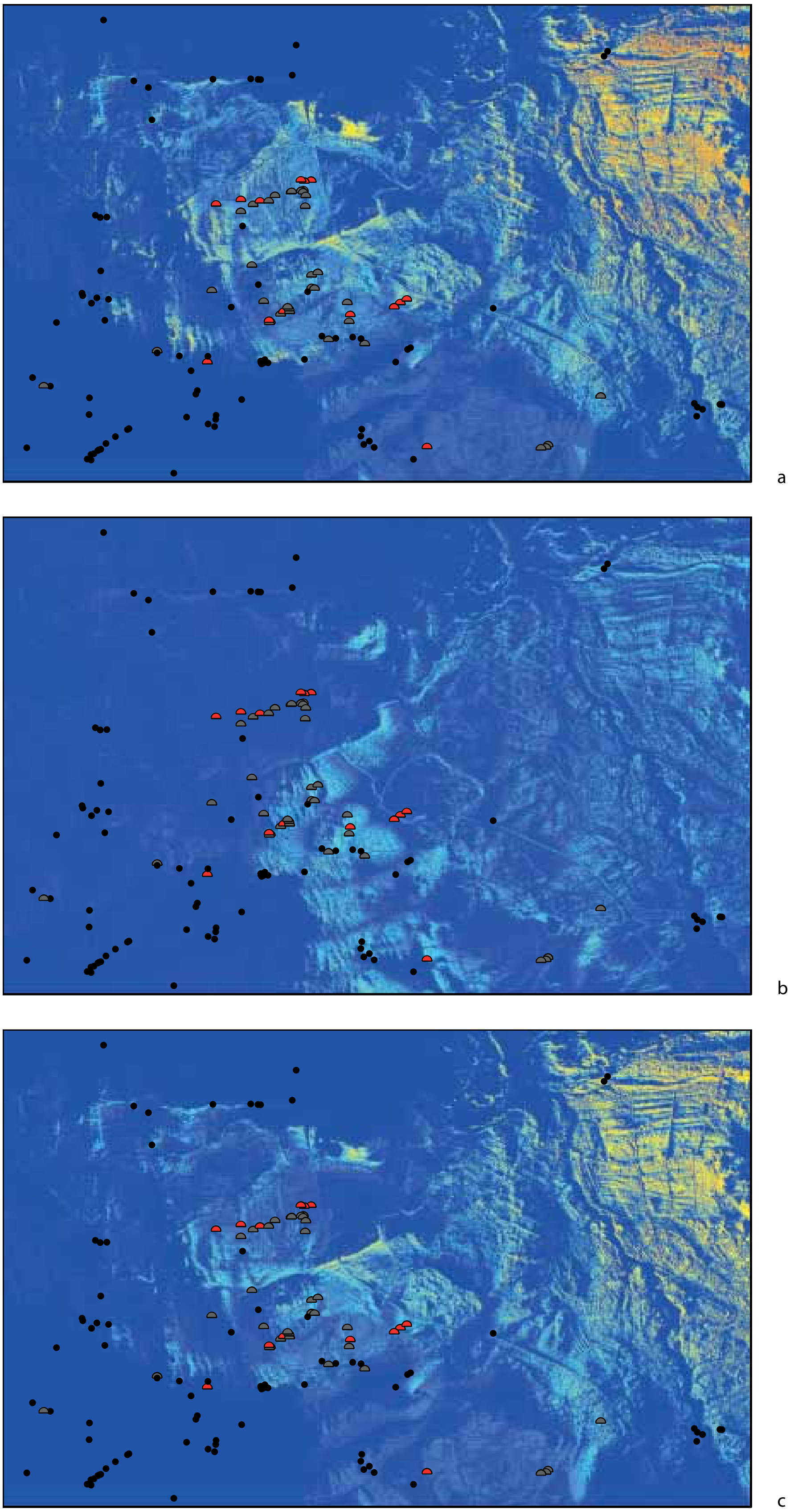
The vistas available from barrows can be offset against a background sample drawn from the entire research area. A cumulative viewshed from barrows would then highlight which areas are in view from the mounds (Fig. 6.15a). This can then be compared with the average cumulative viewshed created on the basis of a randomized set of samples (Fig. 6.15b). Differences between the two would suggest a preferential view of specific areas from the barrows.

Yet the method described above suffers from the fact that barrows are sometimes located in close proximity of one another. Their grouping together ensures that many of them have views towards the same points. These similar views will be reinforced in the cumulative viewshed and therefore introduce a bias.

If we take the northern alignment at Ermelo as an example, all 6 Late Neolithic A burial mounds are located in the same local environment. A comparison between points randomly placed within the entire research area versus the barrows, will automatically yield differences as the close proximity of the mounds will reinforce common areas of visibility.

---

38 I would like to emphasise that the only purpose of this vegetation model is to investigate its impact on visibility and does *not* represent the actual vegetation cover at that time, particularly not beyond the extent of the barrow distribution!



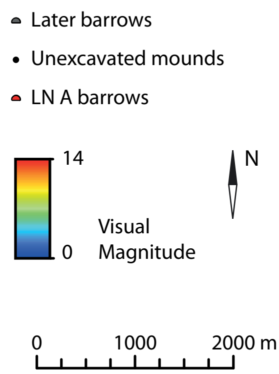


Fig. 6.15: a) A cumulative viewshed map with 14 Late Neolithic A barrows as viewpoints in the Ermelo region; b) Average cumulative viewshed on the basis of 99 sets of 14 randomly located points; c) Average cumulative viewshed on the basis of 99 restricted sets of 14 randomly located points.

Yet it may well be that local elevation differences may significantly change what may be visible from certain locations. Therefore it may be possible that each individual barrow was 'fitted just so' in the landscape as to enable certain views (Cummings and Whittle 2004, 88). To investigate this, we can restrict the random sample to an area close around the burial mounds (Fig. 6.15c). Randomly placed points in close proximity of the burial mounds will have the same general background as the burial mounds do. Here too a comparison of both can then highlight the areas which are preferentially in view of the burial mounds and not influenced by the local environment.

Ermelo

Firstly a cumulative viewshed map was created with the Late Neolithic A barrows as a starting point (Fig. 6.15a). In this way, we can explore what views were available from the two largely contemporaneous groups of burial mounds located in the centre of the map. The map indicates how the *Leuvenumse* stream valley was frequently in view from the burial monuments. Especially an area in the centre right of the map shows the highest values and it can be said that from almost every burial mound one had a view of that area.

Now comparing this map with the unrestricted background population (Fig. 6.15b), it becomes obvious that almost every randomly located point within the entire region has a good view of this stream valley. This is not surprising as it is the lowest point in the landscape and good visibility of this area is easily achieved. The conclusion drawn from the previous map should thus be seen in the light of this background population. Apparently it is not very difficult to achieve high visibility of the stream valley and it can then be questioned whether a view towards this stream valley was intentional.

The third map supports this conclusion (Fig. 6.15c). While there are several differences between the first two maps (a and b), the differences between the first map (a) and the third map (c) are negligible. There is, on the basis of these maps, no reason to assume that burial mounds were positioned *just so* in order to enable specific views.

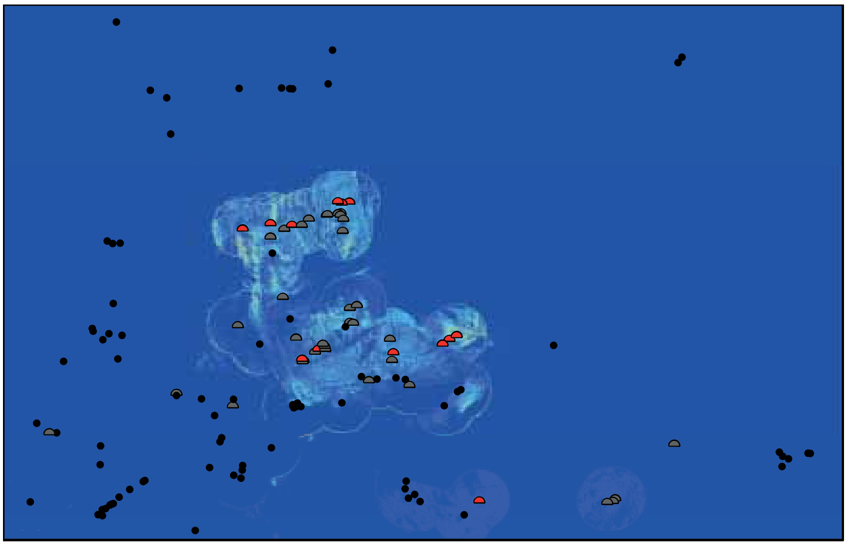
Rather, the views they have are views available from any randomly located point within the research area, and especially to any point surrounding the burial mounds. This does not imply that specific views may not have been meaningful. It may well be that a view of the stream valley was important, yet it cannot be proven on the basis of these maps.

The same exercise was repeated on a DEM including vegetation, although only with a restricted random sample for obvious reasons (Fig. 6.16a and b). Once again the differences between both maps are negligible, and both barrows and random points have views of the same places. The second conclusion we can draw, is that if we include vegetation, views of anything beyond the reconstructed heathlands are impossible. The trees around the heathfields effectively form barriers beyond which most of the landscape was hidden.

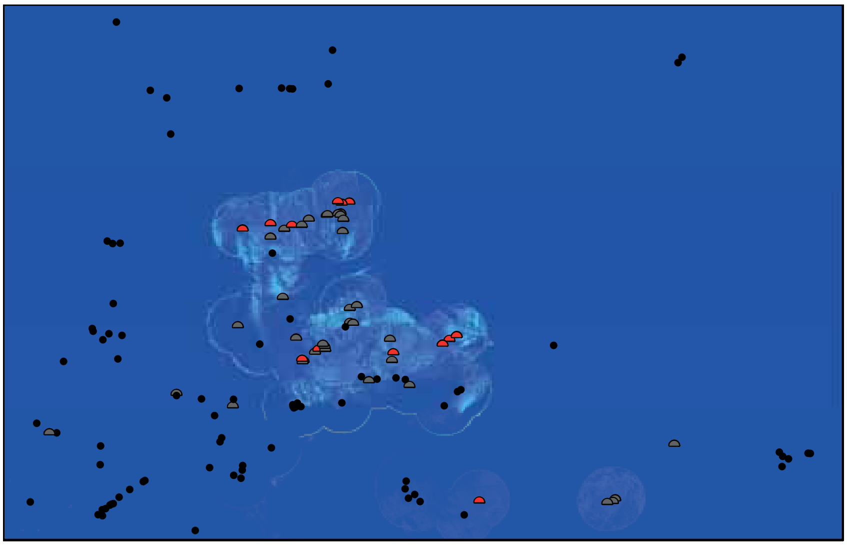
The maps of later periods are not included here. They only reiterate the same viewshed-patterns as the Late Neolithic A mounds, since they are located in proximity of these.

Epe-Niersen

The same approach was used with Epe-Niersen. The differences between the first two maps (Fig. 6.17a and b), suggests that all barrows have a good view of the area around the alignment. There are certainly significant differences between the



a



b

Fig. 6.16: a) A cumulative viewshed map on a vegetation DEM with 14 Late Neolithic A barrows as viewpoints in the Ermelo region; b) Average cumulative viewshed map on a vegetation DEM on the basis of 99 sets of 14 randomly located points as viewpoints.

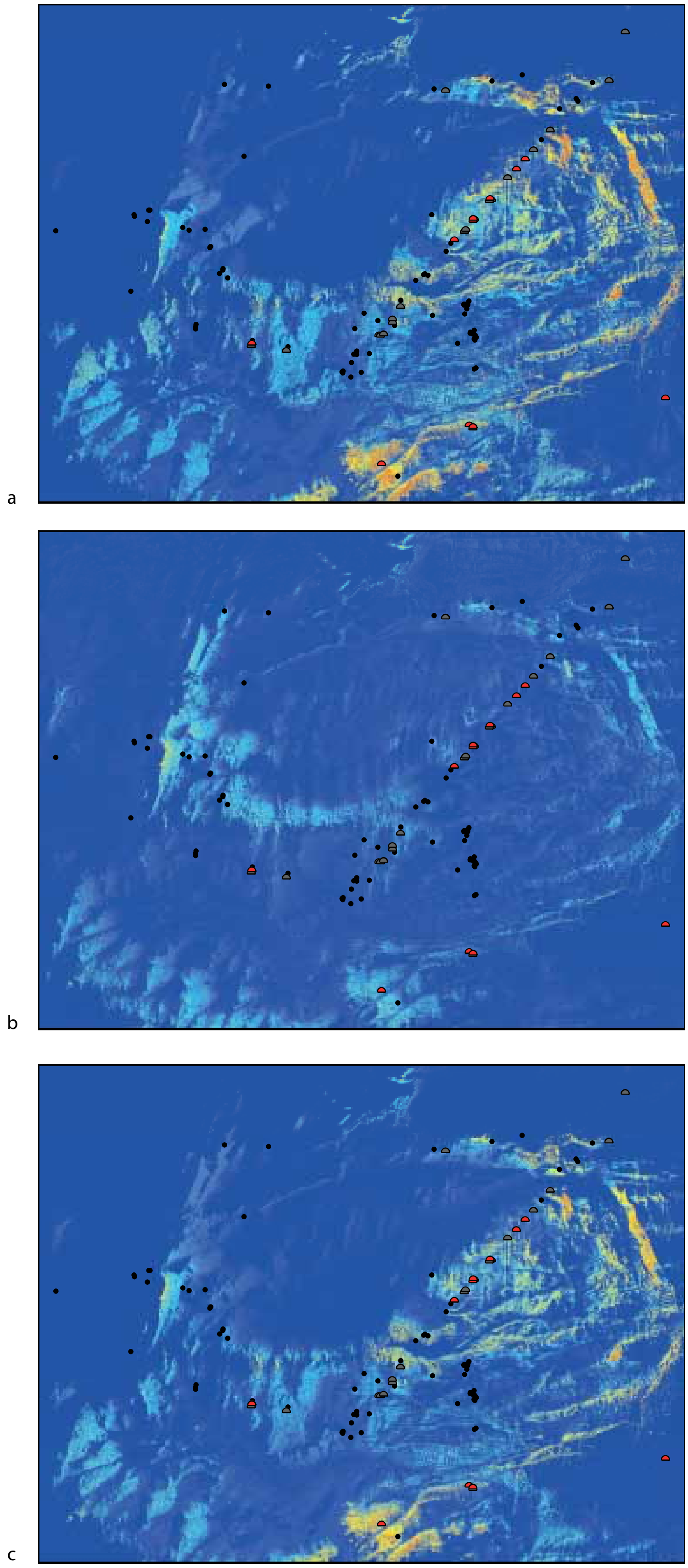
two maps. Yet the comparison with a restricted background sample (Fig. 6.17c), once again suggests that this is more likely a consequence of the mounds on the alignment being located on a gently sloping plain.

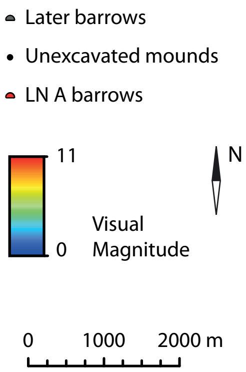
The differences between the two maps created on a vegetation DEM are negligible (Fig. 6.18a and b). Interestingly, the area of the alignment has consistent high values throughout all sets of maps.

Interpretation

Summarizing, a view from a barrow within both regions may well have been important, yet substantiating this position is very difficult and dependant on many unknown variables. There is no evidence that barrows have a better view of specific areas within the region as opposed to randomly located points. Especially the restricted random samples have almost identical cumulative viewshed maps. That is not to say that a view from one of the Ermelo or Epe-Niersen mounds may not have been important, or that views of specific parts of the landscape may not have been meaningful, yet it cannot be proven on the basis of these maps.

Fig. 6.17: a) A cumulative viewshed map on a bare earth DEM with 11 Late Neolithic A barrows as viewpoints in the Epe-Niersen region; b) Average cumulative viewshed map on a bare earth DEM on the basis of 99 sets of 11 randomly located points as viewpoints; c) Average cumulative viewshed map on a bare earth DEM on the basis of 99 restricted sets of 11 randomly located points.





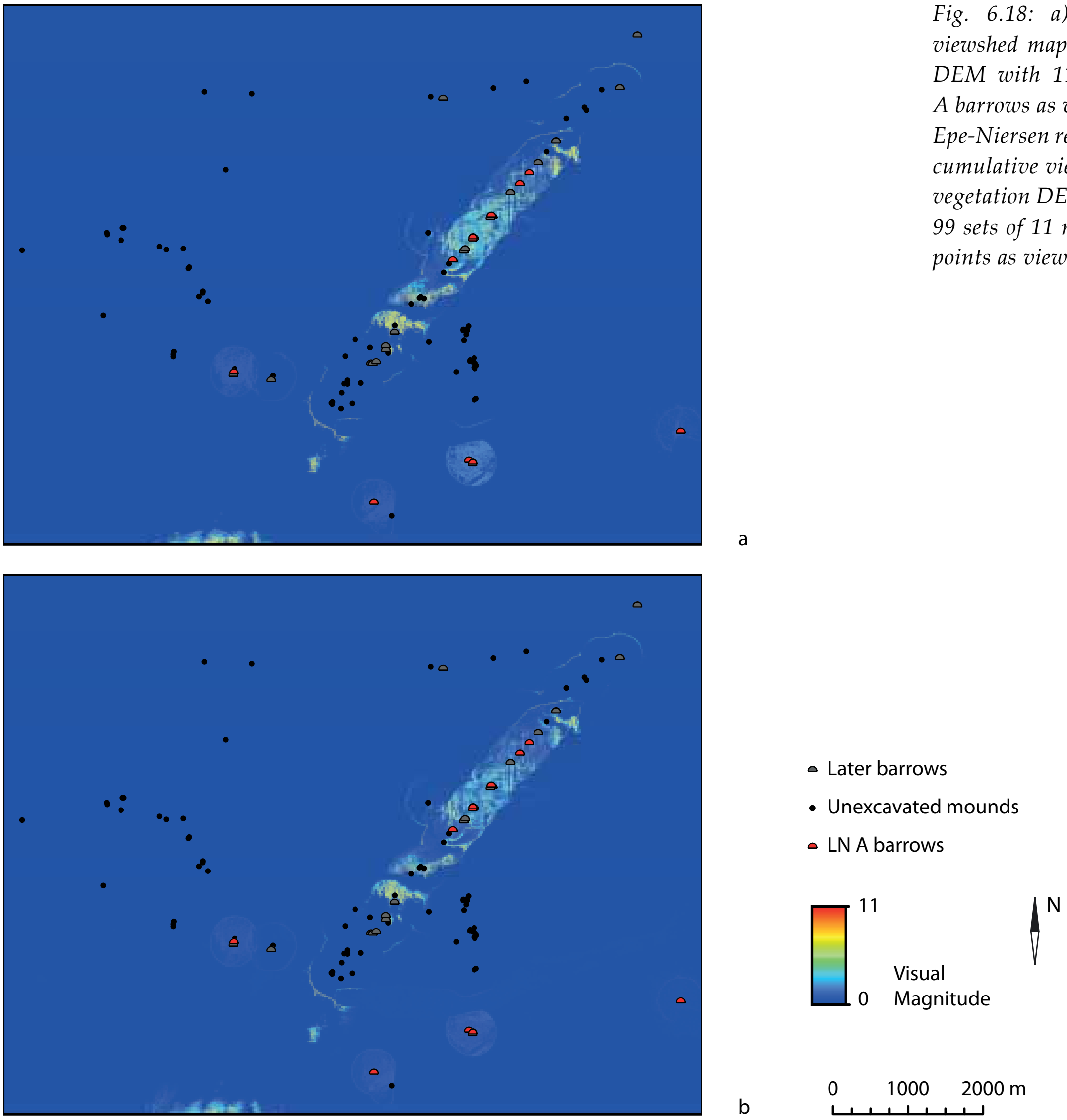


Fig. 6.18: a) A cumulative viewshed map on a vegetation DEM with 11 Late Neolithic A barrows as viewpoints in the Epe-Niersen region; b) Average cumulative viewshed map on a vegetation DEM on the basis of 99 sets of 11 randomly located points as viewpoints.

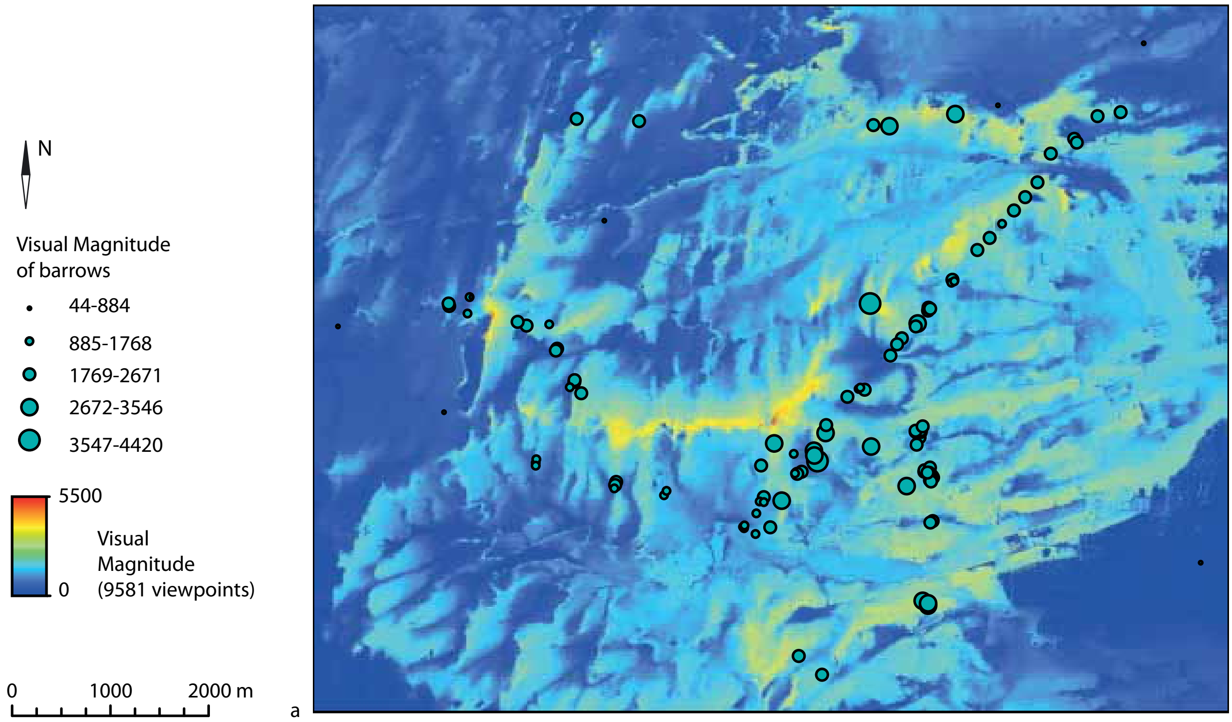
6.5.4 … or to be seen

Methodology

The converse position towards burial mounds has also been suggested. Was a barrow meant to be seen? Does a barrow have a higher increased visual signature? As a first step we could create a map indicating which points are highly visible and which are not. In theory this can be visualised in a total viewshed map (Llobera, *et al.* 2010). In such a map a viewshed is calculated from each individual point or cell of the map. All individual viewsheds are then summed into a single map. The resulting map then displays the visual magnitude of each individual cell (Llobera 2003).

Creating such a map demands high computational resources however and takes weeks if not months to generate (Llobera, *et al.* 2010). If we take into account that the Epe-Niersen and Ermelo DEM's have respectively 7.8 and 6 million cells, and that a conventional computer needs 2 to 3 seconds per individual viewshed, we would need several hundreds of days to generate such a map.

As a work-around we can create a cumulative viewshed map based on an Monte Carlo sampling of cells or viewpoints (Llobera 2006, 150). The resulting map then approaches the values of the total viewshed map with a high degree of



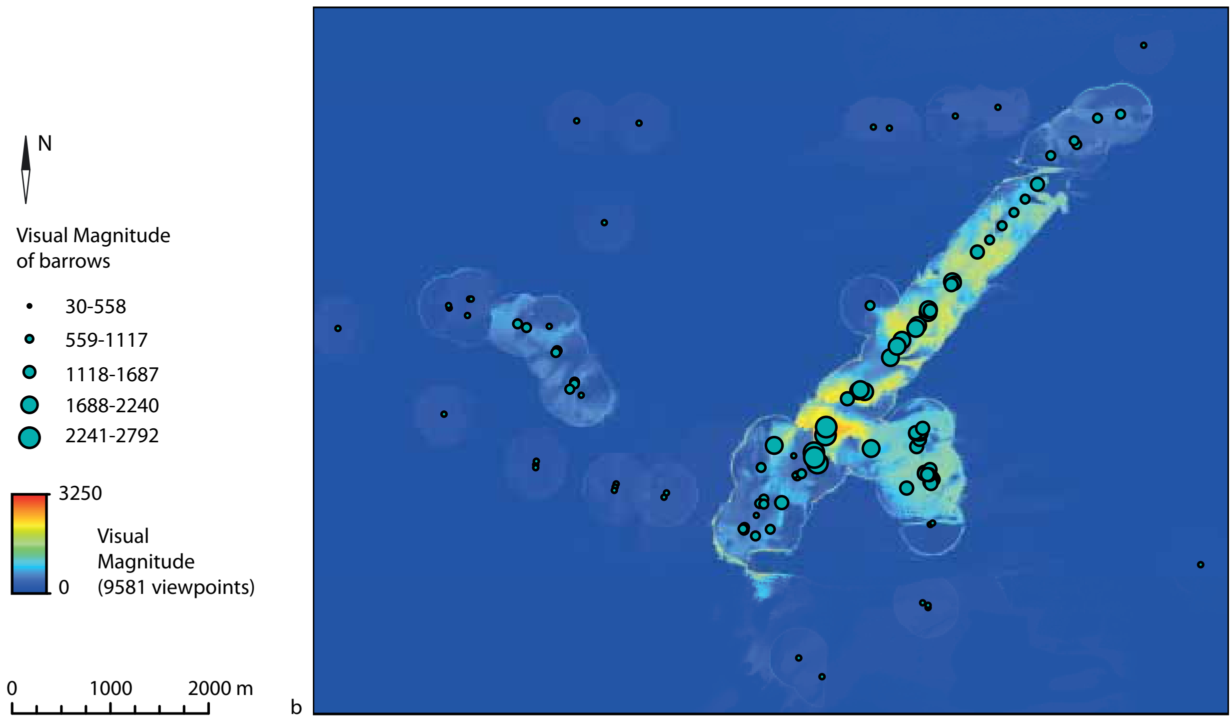


Fig. 6.19: a) Cumulative viewshed map on the basis of 10890 randomly located points on a bare earth DEM at Epe-Niersen; b) Cumulative viewshed map on the basis of 10890 randomly located points on a vegetation DEM. The size of the symbol for each barrow represents its visual magnitude.

confidence and indicates the visual magnitude of each individual cell in the map (Llobera 2003). The following step is then to compare the visual magnitude of barrows against the visual magnitude of a random sample of points.

Two maps were created for both case studies. On the one hand a map without vegetation cover, and on the other a map accounting for vegetation. Both maps are used to create a cumulative viewshed map on the basis of randomly located points. The resulting visual prominence maps then display how visible each individual cell is.

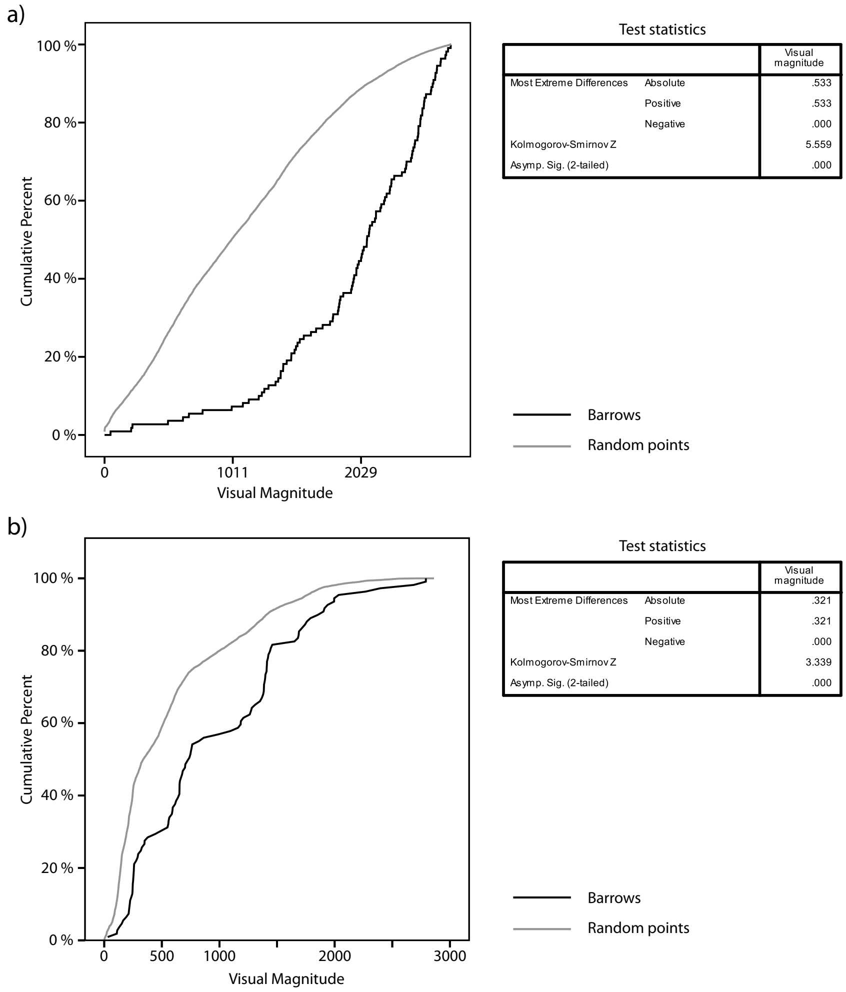


Fig. 6.20: a) Cumulative percentage comparing the visual magnitude of 10890 random points versus barrows on a bare earth DEM at Epe-Niersen. The K-S statistics suggests that barrows have a significantly higher visual magnitude than the random points. b) Cumulative percentage comparing the visual magnitude of 10890 random points versus barrows on a vegetation DEM. The K-S statistic suggests that barrows have a significantly higher visual magnitude than the random points.

Epe-Niersen

The visual prominence map of Epe-Niersen (Fig. 6.19a) indicates that the entire alignment is in an area of high visibility. Equally the burial mounds of the Celtic Field and three Neolithic barrows (273 – 275) close to the town of Vaassen are in areas of high visibility. A comparison of visual prominence between randomly located points and the burial mounds displays a significant difference between both sets (Fig. 6.20a).

The second map, accounting for vegetation, is entirely different (Fig. 6.19b). A comparison of visual prominence between randomly located points and the burial mounds still displays a significant difference between both sets, although the difference is slightly less pronounced (Fig. 6.20b). The major shift however is in which burial mounds are now highly visible. Whereas in the previous map, the burial mounds located in the Celtic Field of Vaassen and the three Neolithic mounds were visually the most prominent, this has shifted to a few specific burial mounds on the southern end of the alignment (notably 635, 636 and 4700).

Ermelo

The first visual prominence map (Fig. 6.21a) of the Ermelo region suggests that the most visually prominent points in the landscape are within the stream valley of the *Leuvenumse beek*. A few burial mounds located on elevated areas also have high values of visual prominence, but the highest values can be found in the stream valley.

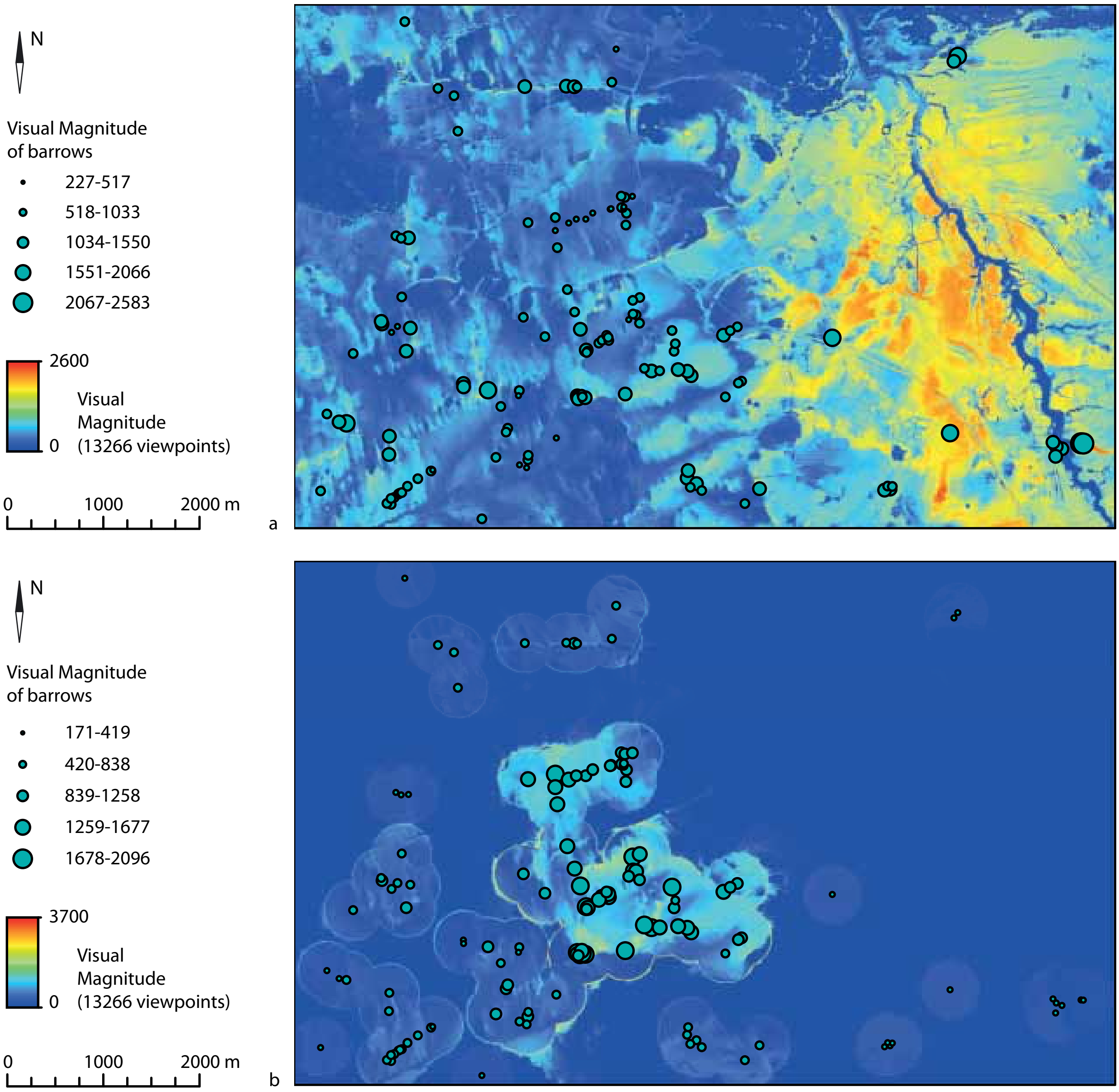
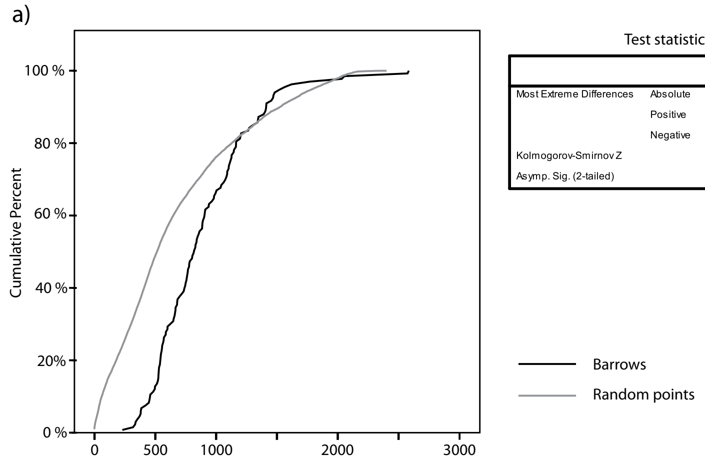


Fig. 6.21: a) Cumulative viewshed map on the basis of 13266 randomly located points on a bare earth DEM at Ermelo; b) Cumulative viewshed map on the basis of 13266 randomly located points on a vegetation DEM. The size of the symbol for each barrow represents its visual magnitude. The bigger the symbol the greater its visual magnitude.

A K-S test indicates that burial mounds have significantly higher values than randomly located points, although this difference is most notable in the lower half of the graph (Fig. 6.22a). This suggests that although burial mounds were not built in areas of very low visibility, they were not necessarily built in areas of very high visibility either.

The second visual prominence map (Fig. 6.21b) accounts for vegetation. The differences between both maps are striking. Where previously only a few burial mounds in the stream valley and on a few prominent points had high visibility values, the reverse now seems to be true. Especially the burial mounds on the *Ermelose Heide* in the centre of the map have high visual prominence. The difference in visual prominence between randomly located points and barrows is still significant (Fig. 6.22b), although the graph now indicates a marked difference between randomly located points and burial mounds. A K-S test of both distributions once again suggests barrows have a significantly higher visual prominence than randomly located points.

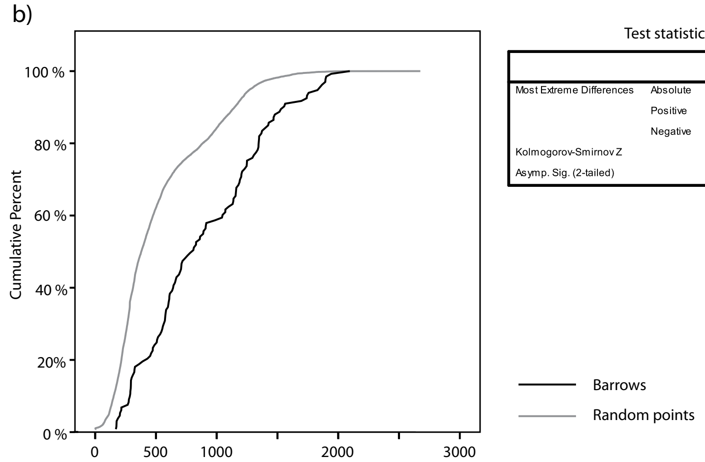
a)



Test statistics

		Visual Magnitude
Most Extreme Differences	Absolute	.370
	Positive	.370
	Negative	-.049
Kolmogorov-Smirnov Z		4.244
Asymp. Sig. (2-tailed)		.000

b)



Test statistics

		Visual Magnitude
Most Extreme Differences	Absolute	.389
	Positive	.389
	Negative	.000
Kolmogorov-Smirnov Z		4.465
Asymp. Sig. (2-tailed)		.000

Fig. 6.22: a) Cumulative percentage comparing the visual magnitude of 13266 random points versus barrows on a bare earth DEM at Ermelo. The K-S statistics suggests that barrows have a significantly higher visual magnitude than the random points. b) Cumulative percentage comparing the visual magnitude of 13266 random points versus barrows on a vegetation DEM. The K-S statistic suggests that barrows have a significantly higher visual magnitude than the random points.

Interpretation

Both case studies display similar results. There are three points which can be made. Firstly, barrows are consistently better visible than randomly located points. This conclusion is perhaps not the most significant result from these studies. Rather it is to be expected as the construction of the mound already suggests this to be the case.

Secondly, barrows are consistently the highest visible points on the reconstructed heathlands throughout both vegetation DEM's. This suggests that when standing within a small heath field, a barrow represented a highly conspicuous site and immediately stood out from its surroundings (Fig. 6.23). But also, that long-distance visibility of these mounds becomes increasingly unfeasible.

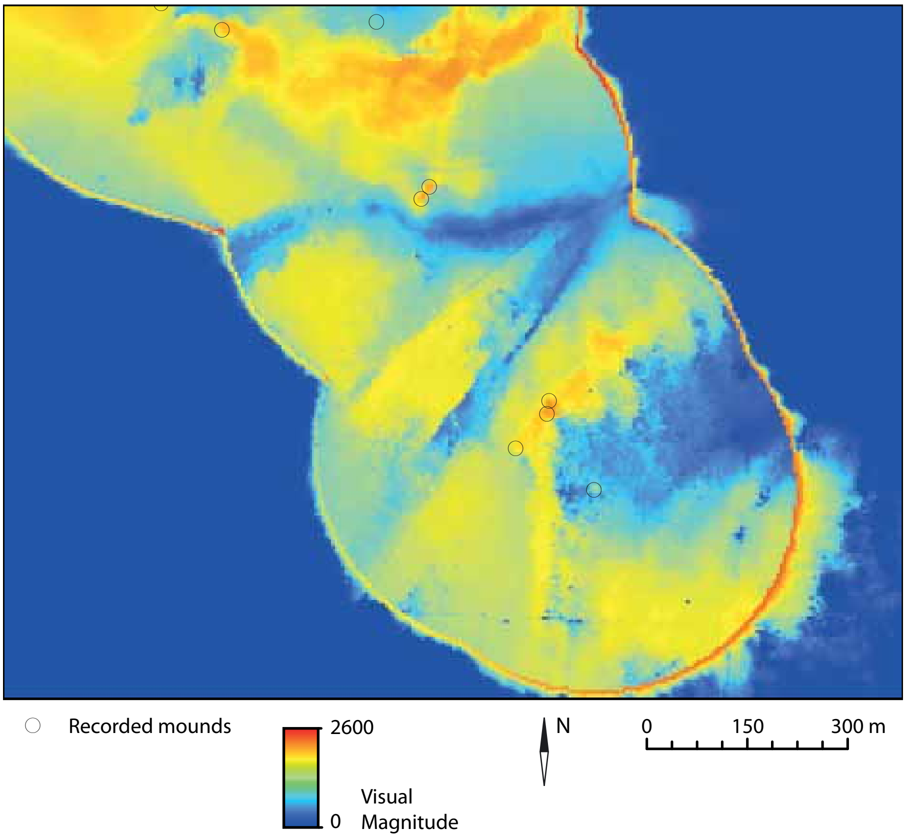
Thirdly, it is important to note that not all barrows are equally well visible. Strong differences exist between barrows, and this appears to be irrespective of their dating (Fig. 6.24). Rather, the values hint at a visual hierarchy, with some mounds taking up very prominent positions and others not.

6.5.5 To see each other?

Methodology

Does the position of each barrow create networks of intervisibility? Which barrows are capable of seeing which other mounds?

Fig. 6.23: Detail of the Cumulative viewshed map on a vegetation DEM. Note how several mounds (open circles) form the points with the highest visual magnitude.



The hierarchy observed above already suggests there was a difference in terms of visibility between mounds. It may well be that these highly visible mounds formed nodes in a network, linking parts of the landscape with one another.

A technique to investigate intervisibility has been suggested for long barrows in southern England (Wheatley 1995). The principle outlined by Wheatley does not differ much from the technique in the previous paragraphs. It involves the creation of a cumulative viewshed map on the basis of the location of the barrows. If a viewshed is constructed from each burial mound, and subsequently all these viewshed maps are summed, a map is created representing how often a cell can be seen from the location of each barrow. If barrows have significantly higher values than a set of random samples, then it can be suggested that barrows were built in locations enabling intervisibility.

A problem presents itself when the technique outlined above is applied to Late Neolithic and Bronze Age burial mounds. Generally speaking these were built in close proximity of one another forming distinct groups (in contrast to the relatively isolated long barrows which Wheatley researched, Wheatley 1995). Intervisibility between closely grouped barrows will automatically be a given and high intervisibility values will easily be achieved, potentially distorting the results and the subsequent interpretation.

An alternative approach might then be to investigate the intervisibility patterns between groups of burial mounds (Llobera 2007b), although this has the added problem of defining these groups. As I argued in Chapter 2, it is very difficult to define groups within the barrow landscape. With the alignments as an example, where does one group end and the other begin? Arbitrary group definitions as proposed by Llobera (Llobera 2007b, 55) are difficult to substantiate on archaeological grounds.

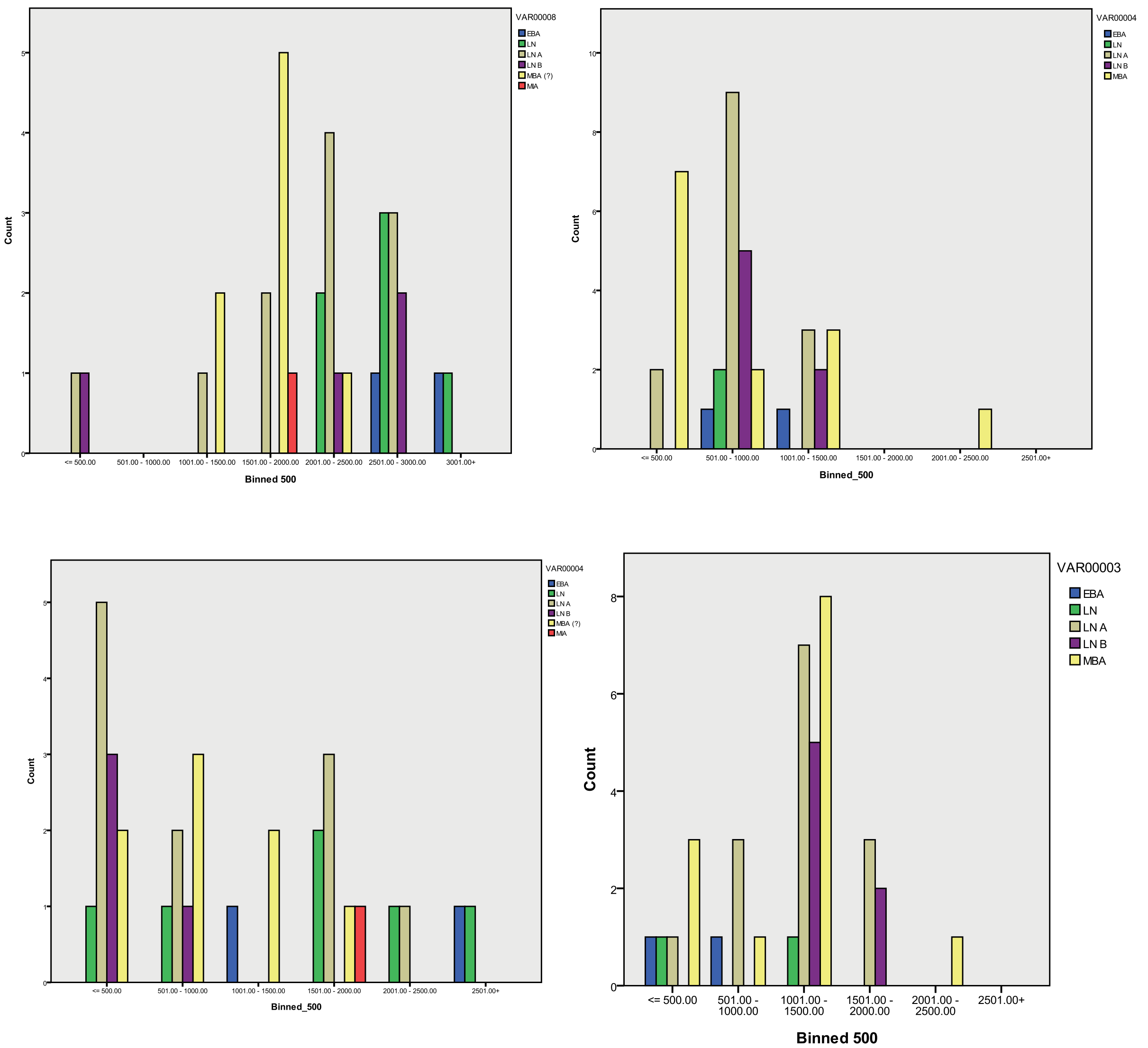


Fig. 6.24: Visual magnitude per phase. a) Bare earth DEM Epe-Niersen; b) Bare earth DEM Ermelo; c) Vegetation DEM Epe-Niersen; d) Vegetation DEM Ermelo.

While the techniques as proposed by Wheatley and by Llobera are interesting in their own right, they do not offer insight in how specific burial mounds relate to one another. If we wish to investigate patterns of lineage, kinship and hierarchy, we should be more interested in which burial mound can see which other mound.

This can effectively be researched by a simple LOS inspection, the basic component of every viewshed map. A LOS from each burial mound towards every other burial mound gives us insight in which burial mounds can be seen from each individual mound (Woodward 2000, 132-139). The resulting positive LOS then create a network of the intervisibility patterns available within a region. Additionally we can visualise how many LOS each individual burial mound has and which mounds form focal points and nodes in the network.

As with the previous studies, vegetation will of course impede long-distance visibility and both the vegetation DEM and the bare earth DEM have been used as a basis for the study.

Ermelo

The first intervisibility network was applied to the excavated burial mounds of the Ermelo heath. For each different phase a new network was generated (Fig. 6.25).

The differences in intervisibility patterns between the phases are not very large. Almost all mounds of the northern alignment can see one another, as can all the mounds of the southern group. This intervisibility pattern is a consequence of the local topography. The northern group is placed on a gently sloping plain, with no topographical elements impeding visibility. The barrows of the southern group are placed on both flanks of a dry-valley and here too intervisibility is easily achieved. Intervisibility between the barrows of each group therefore seems to be a topographical given.

The same patterns are achieved on the DEM with vegetation, the northern alignment maintains intervisibility, as does the southern group (Fig. 6.26).

What is more interesting to see, however, is how some barrows take up a more prominent position and interconnect both groups. Especially one mound (barrow 354), possibly constructed in the Late Neolithic A, has a line of sight to all mounds of the southern group, as well as to several of the northern alignment. Especially mound 329 located on a small hillock should have been noticeable from this barrow. Tests in the modern day heath field prove this to be the case, although the burial mounds to either side of it, and not located on the hillock, were undistinguishable from this vantage point. Another barrow (342), possibly constructed in the Middle Bronze Age achieves similar values.

Of course the networks created on the basis of the excavated burial mounds leave out almost two thirds of the burial mounds in the region. A visual network on the basis of every burial mound gives us insight in the total visual network of the region.

While some of the excavated burial mounds take up highly visible positions, they do not occupy the 'best' positions. The highest values of intervisibility and indeed visibility within the entire region are taken up by an unexcavated group of burial mounds on one of the highest points in the region. A group of at least seven unexcavated burial mounds (barrows nr. 4618 to 4624) can be seen from almost every barrow within the landscape, just as an isolated unexcavated mound some 400 metres to the east of it (barrow nr. 4686). These burial mounds have visual links with every barrow group in the region and take up a prime position in the visual network of the area.

These burial mounds continue to take up this prime position after creating a visual network on the vegetation DEM, with views extending as far as the northern alignment. Here too, the burial mound located on a hillock can be seen even though it is located at a distance of just under 2 km. Conversely those same burial mounds are presumed to be visible from the barrow on the alignment. As these burial mounds remain unexcavated it is impossible to say how these mounds must be fitted in the sequence.

Epe-Niersen

A visual network has been generated for both the Late Neolithic A and B and on both a bare earth DEM as well as a vegetation DEM (Fig. 6.27 and 6.28).

The patterns in the intervisibility network reflect the alignment itself. All barrows on the alignment are intervisible of one another, as well as of older mounds. If vegetation is not included, several mounds further off can be seen as well. After we account for vegetation, intervisibility patterns become restricted to the alignment itself or barrows in close proximity.

If we include the unexcavated barrows in the analysis, this pattern is only reinforced. The majority of the barrows along the alignment are intervisible. Yet here too, several mounds take up an interesting position.

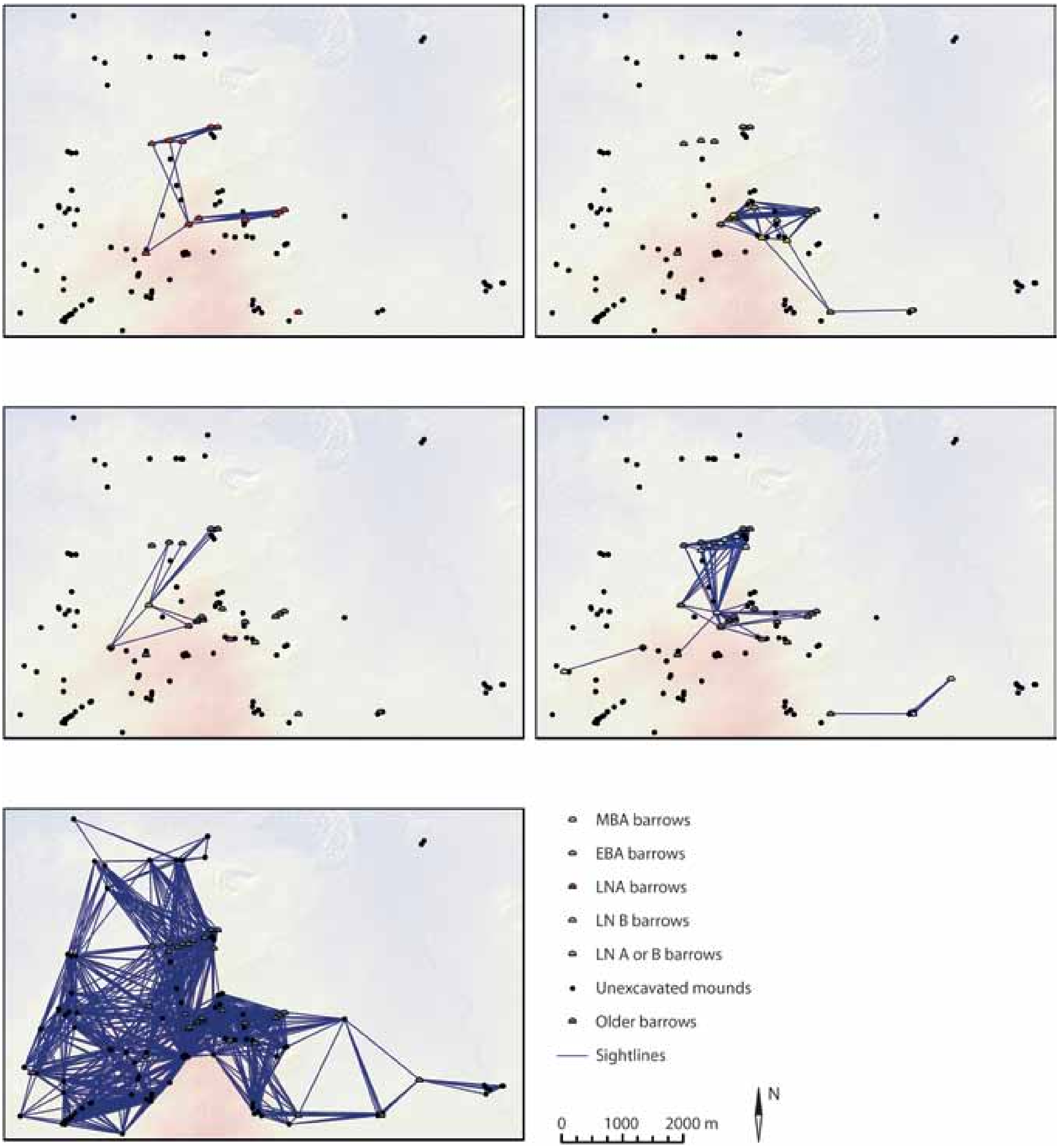


Fig. 6.25: Visual network between burial mounds in the Ermelo region. Each line represents a positive Line of Sight created on a bare earth DEM.

Firstly, three mounds on the *Galgenberg* (nos. 635, 636 and 4700) have LOS connecting mounds from both parts of the alignment with one-another. The hill on which these mounds are located impedes intervisibility between the northern and southern part. Yet these mounds form a visual bridge between both parts of the alignment.

Secondly, two mounds *not* located on the alignment (no. 4762 and 4764; one placed on top of a small hillock, the other higher up a ridge overlooking the alignment), are consistently in view from barrows on the alignment and vice-versa. Both barrows are unexcavated and their chronological relation to the alignment remains unknown. It is interesting, however, to see how both barrows, while physically not on the alignment, do appear to be visually related to it.

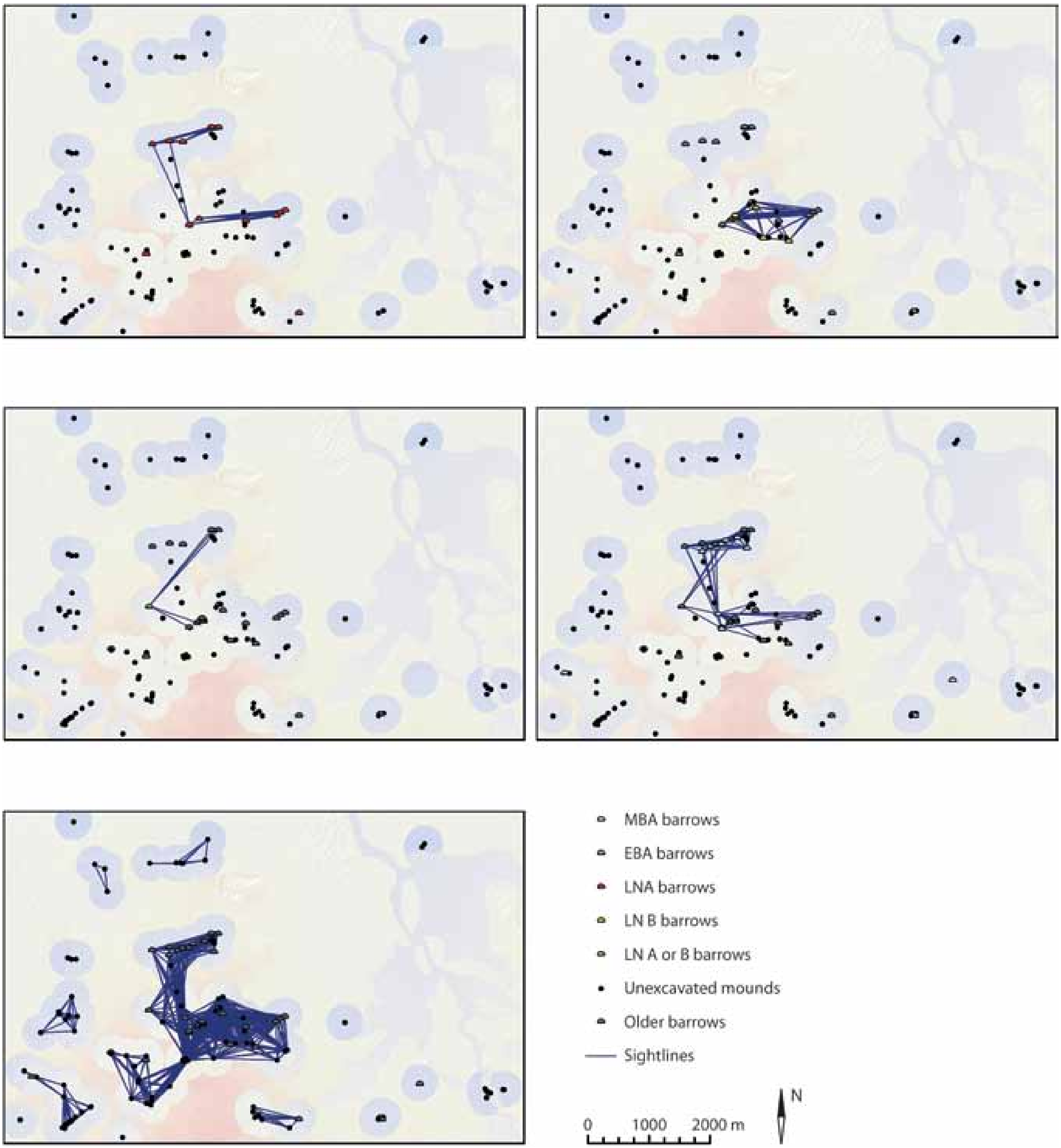
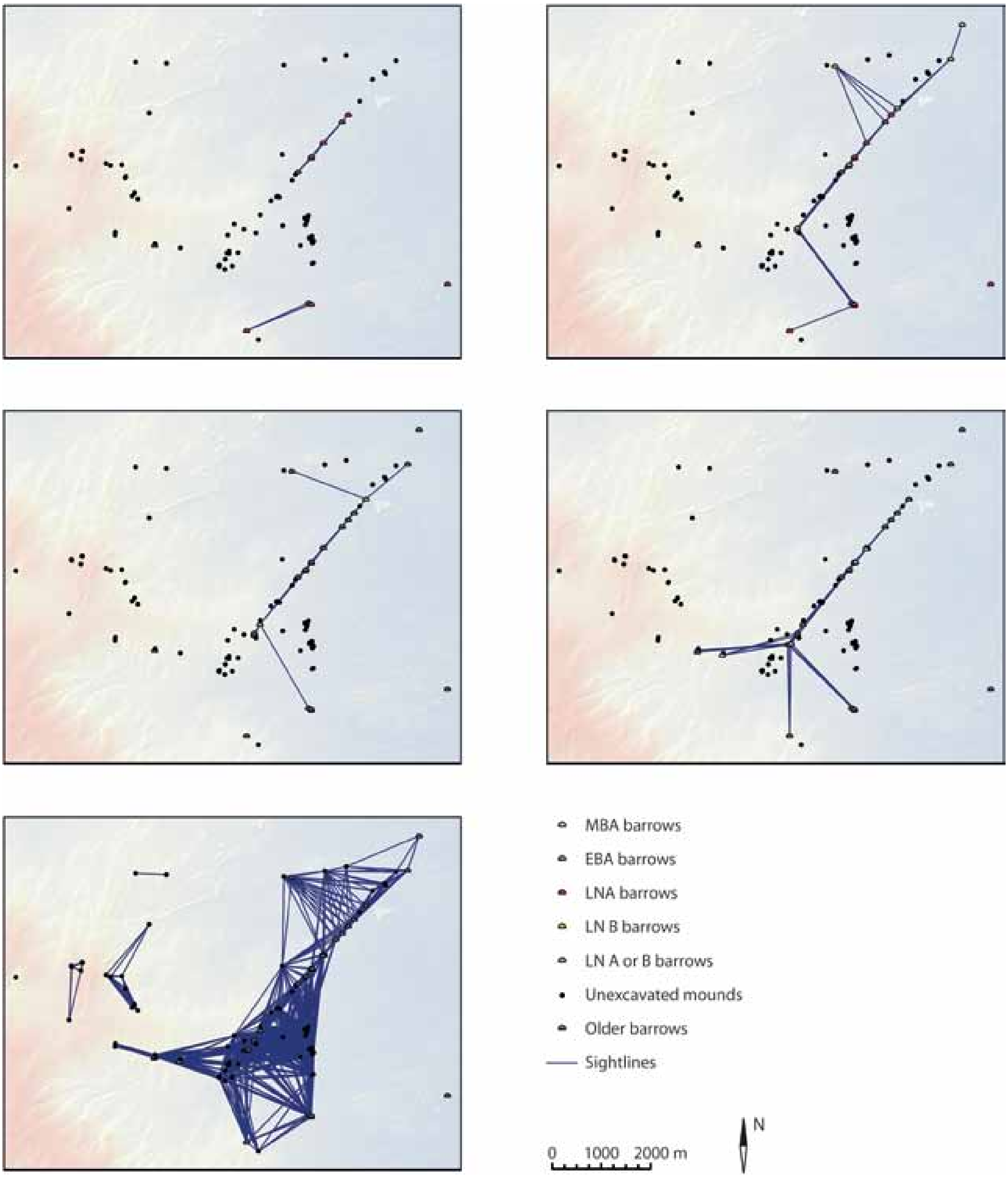


Fig. 6.26: Visual network between burial mounds in the Ermelo region. Each line represents a positive Line of Sight created on a vegetation DEM.

Interpretation

I would argue that the intervisibility patterns in-between most of the mounds is a consequence of the topography as well as the close proximity of the mounds to one-another. Intervisibility between most of the mounds is not very difficult to achieve within the dry-valleys or on gently sloping plains.

Yet at the same time, several mounds appear to connect several barrow groups to one another. They provide a bridge from one group to another. Especially in the Epe-Niersen case, the position of a few barrows, on top of a small hillock, connects two parts of the alignment which would otherwise not have been intervisible. Barrows to the north of this hillock cannot see barrows to the south and vice versa, yet they all can see the three barrows on that hillock.



Now of course 'seeing' within a GIS environment is not seeing in a real-life environment, and some of these Lines of Sight extend over more than a kilometre. Were these barrows then perhaps placed on the horizon in order to improve their visual signature? This question is of particular relevance to the alignments. When standing on a mound, can one see all the mounds on the alignment or only the next one in line?

Fig. 6.27: Visual network between burial mounds in the Epe-Niersen region. Each line represents a positive Line of Sight created on a bare earth DEM.

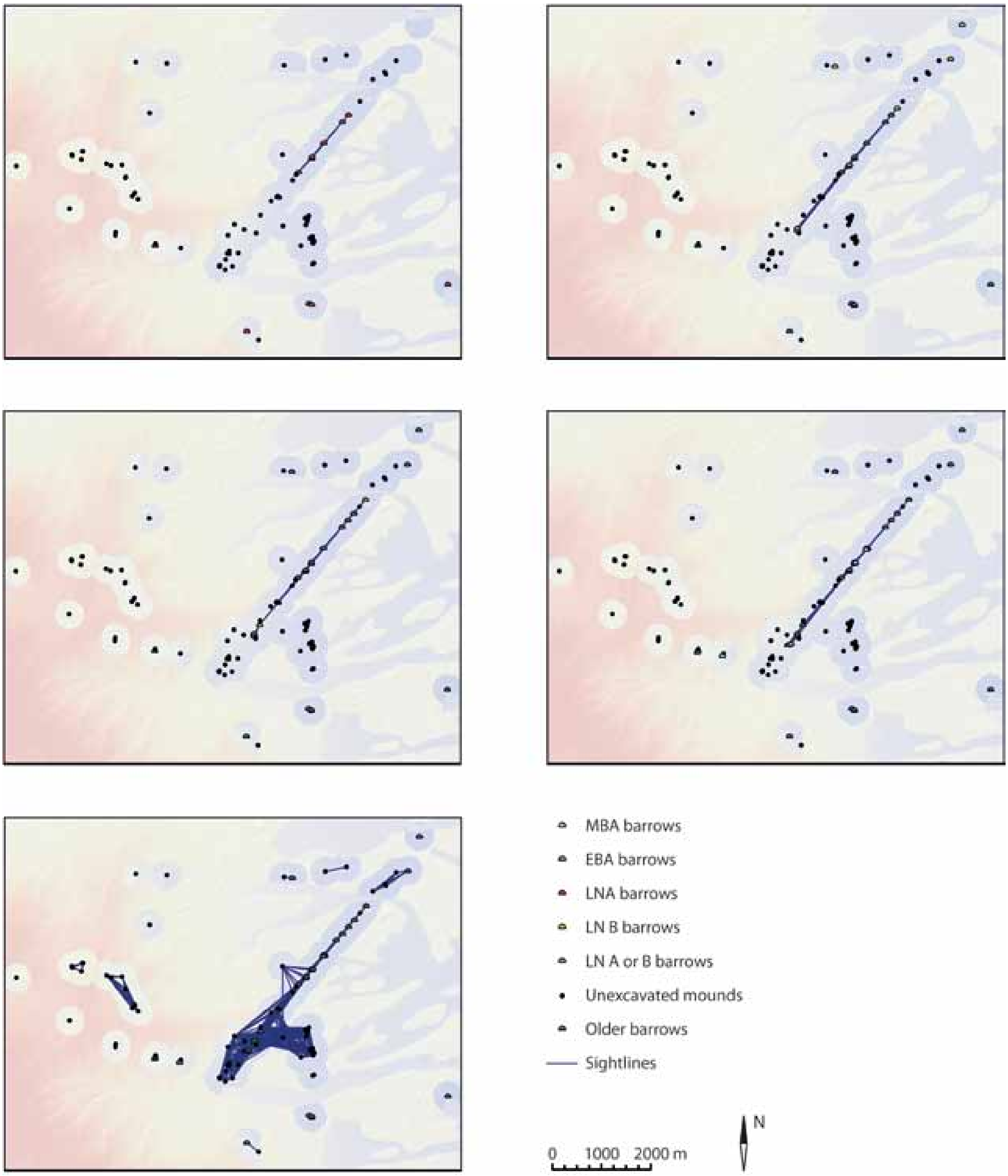


Fig. 6.28: Visual network between burial mounds in the Epe-Niersen region. Each line represents a positive Line of Sight created on a vegetation DEM.

6.5.6 Cresting the horizon

Methodology

With the previous two methods, we have established that most barrows have high visibility values on the viewshed maps. The question that remains however is whether or not these barrows were visible over long distances. This can be dependent on two qualities. Firstly, the contrast of the mounds with their surroundings. As I have argued above, the visibility of a mound may be increased through the colour of the mound or any post circles around it. Secondly, by positioning a mound in such a way that it 'crests' the horizon when seen from a certain perspective.

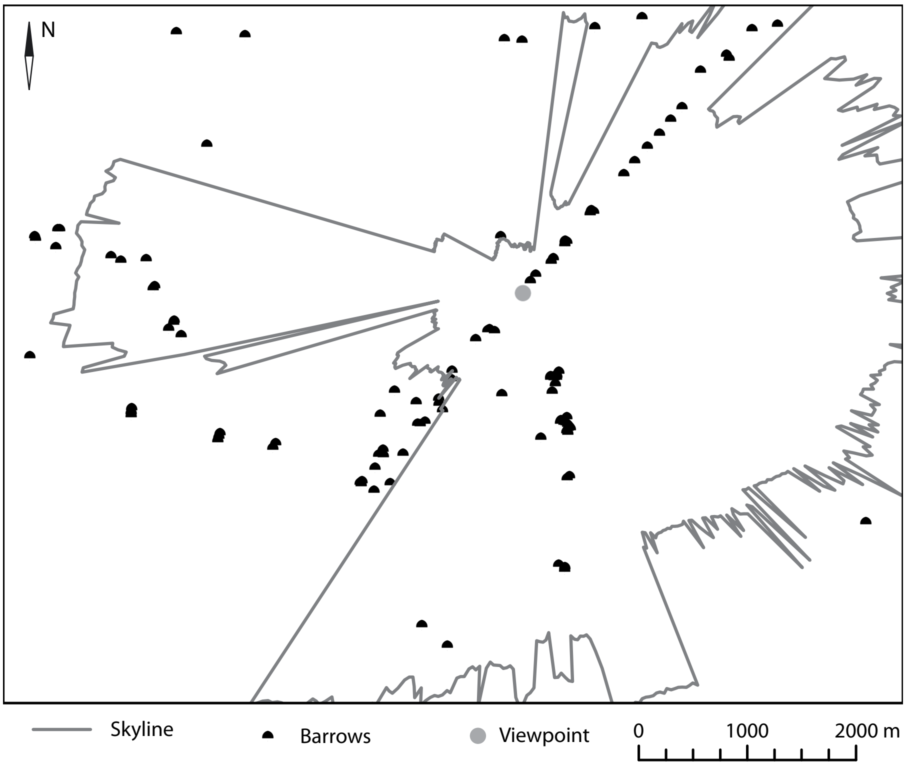


Fig. 6.29: A skyline from a single viewpoint in the Epe-Niersen region. Note how the skyline becomes increasingly coarser (and thus less accurate) the further away from the viewpoint.

Cresting is a quality frequently reported of many burial mounds (Field 1998, 315; Ogburn 2006, 407). In essence, these mounds are placed in such a way that they are visually topping a hill (see Fig. 6.1). As this is dependent on the viewpoint, this need not necessarily be the highest point of a hill. Especially ridges are ideally suited to enable this.

Within a GIS environment it is possible to demonstrate whether or not a burial mound is indeed cresting or false-cresting a hill. Through the creation of a skyline or horizon line, this quality can be visualised on the map. A skyline can be created by generating multiple LOS from the viewpoint incrementally along the azimuth (Fig. 6.29). Each last visual point along the LOS is then connected to its neighbour creating a continuous line representing the horizon or skyline.

The increment and thus resolution of the skyline can be manipulated to create coarser or more detailed skylines. Additionally the increment between each individual LOS means that the skyline becomes coarser the further away from the viewpoint. For example an increment of one degree between each LOS means that at 100 m from the viewpoint the distance between each individual LOS is 1.7 m, at one km it is 17.5 m, while at 2 km it is already 35 m. In this research an increment of half a degree has been used in order to provide enough detail at the 2 km range.

It should also be realized that the extent of the skyline is influenced by the extent of the DEM. If high elevation values are present beyond the extent of the DEM, it may well be that these would have formed the actual skyline, but they will not be included in the model.

It is therefore more useful to consider the skyline as a near-horizon rather than the actual horizon. Whether or not far off in the distance other elements of the landscape will form the actual horizon is perhaps a moot point. If a burial mound is located on the near-horizon it will still stand out from the surrounding landscape, whether or not in the far distance a tree-line or a distant hill will form the actual horizon.

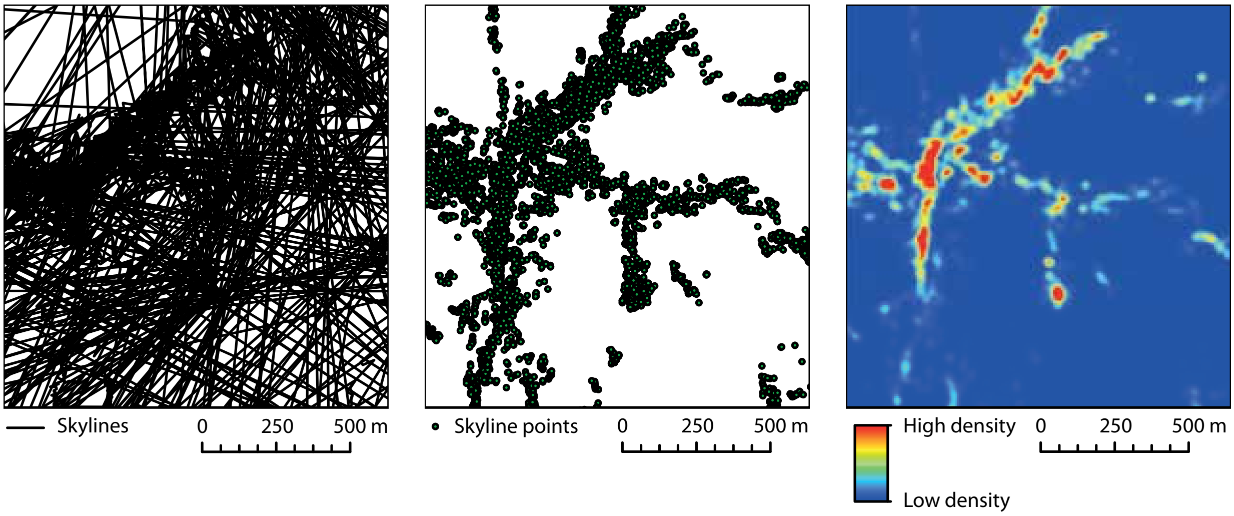


Fig. 6.30: The steps involved in the creation of a skyline density map. Firstly skylines are created on the basis of randomly located points. Secondly, the skylines are broken up in their blocking points. And thirdly a Kernel Density map is created on the basis of these skyline points.

It is for the same reason that I have not created a skyline map on a vegetation DEM. Any skyline map will create a horizon on the edge of the (artificial) forest. The local topography on this heathfield will not be included as the highest elevation values are provided by the 'trees' encircling the heath fields. Yet as I argued above, a ridge within the heathfield will still provide the same cresting effect, with or without a treeline behind it.

Visualising multiple skylines on an individual map and interpreting them is difficult. The multitude of criss-crossing lines does not provide a clear map (Fig. 6.30). A work around would then be to use the last visual point on each individual LOS (the starting point for a section of the skyline) and create a kernel density map on the basis of these points. Calculating the point density at each given cell then displaying in one map the areas which are frequently located on a skyline (a skyline density map). This map can then be used for further analysis and is able to answer which burial mounds are frequently located on the horizon.

Epe-Niersen

The skyline map of the Epe-Niersen region was created on a bare earth DEM (Fig. 6.31). The wide-ranging skylines are not impeded by vegetation and they represent what must be considered as the maximum potential skylines. Most burial mounds are not located in areas with high skyline values. In the centre of the map, we find a large East-West ridge with consistently high skyline values, yet with no barrows built on it.

Equally the burial mounds on the alignment are rarely located on a horizon. This lends weight to the assumption that most of these burial mounds were not intended to be seen from afar. They were probably only visible from within a few hundred metres, and the long-distance visibility of these mounds can certainly be questioned.

The low skyline values of the burial mounds on the alignment contrast sharply with the values of a few burial mounds on the southern end of the alignment. Here several burial mounds crest the small hill of the *Galgenberg* and together they are located on the cells with the highest skyline values within the map.

Ermelo

The skyline map for Ermelo (Fig. 6.32), once again without vegetation, displays similar results as in the Niersen-Epe alignment. Most of the burial mounds of the northern alignment are not located in areas with high skyline values. Only the eastern end of the alignment is skylined, and a detailed inspection of the direction

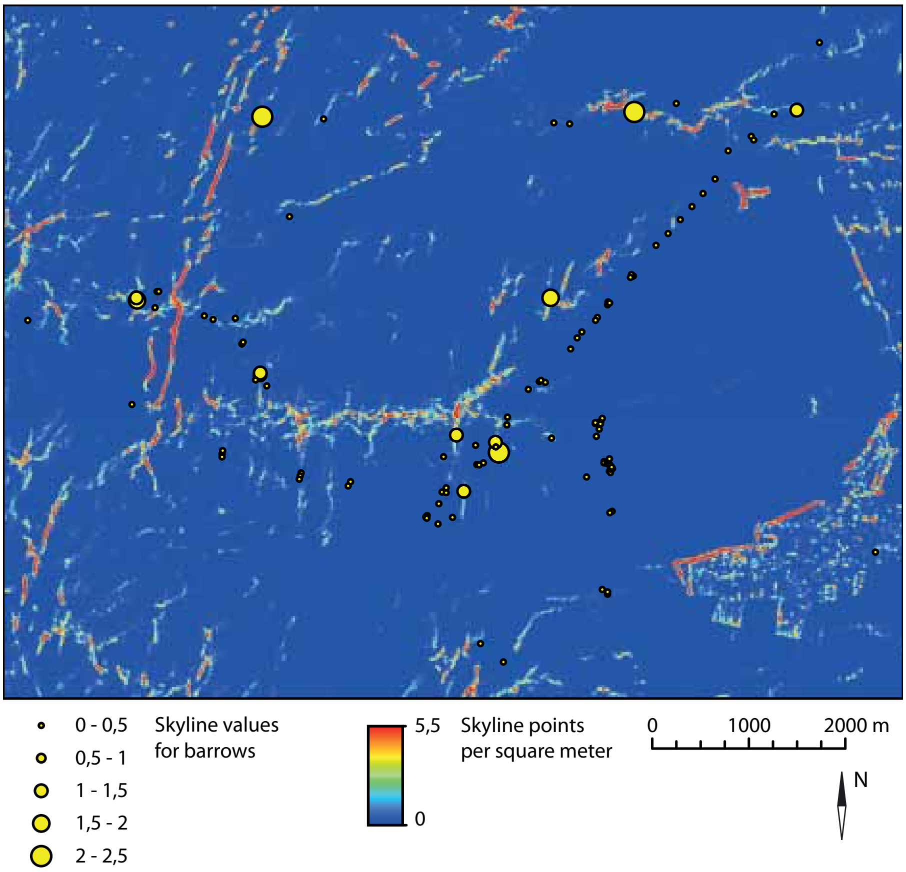


Fig. 6.31: The skyline density map for the Epe-Niersen research area. The size of the symbols represents the skyline density at that location. The bigger the symbol, the greater the skyline density.

of the skylines reveals that they all originate to the east of the alignment.[39] This suggests that when the alignment is approached from the east, this group of burial mounds will be clearly skylined with the rest of the alignment invisible behind it. The values for the other barrows on the alignment are extremely low and indicates they were not meant to be seen from far away. Only one burial mound of the alignment (nr. 329) located on a small hillock, has high skyline values.

Similarly to the northern alignment, most burial mounds of the southern group are not located in areas with high skyline values. However, here too a few burial mounds seem to take up extremely well-visible areas. Two burial mounds excavated by Modderman take up very prominent positions (barrows nr. 342 and 354) and are almost always cresting the horizon when approached from the east. Equally high skyline values are obtained for a group of seven unexcavated burial mounds a few hundred metres to the south of these (barrows nr. 4618 to 4624) as well as a barrow 600 m to the south-east (barrow nr. 4686).

Interpretation

The second analysis demonstrates that almost every burial mound had a high visual magnitude, yet the skyline analysis also reveals that not all barrows will have been equally well visible. The contrast between burial mounds becomes clear when differences in the values between them are explored. Some are almost never located on a skyline, while others crest almost every horizon. These differences hint at a hierarchy amongst burial mounds.

39 The values for the burial mounds are slightly lower than what they would have been in prehistory. This is caused by the presence of the N302 motorway, blocking part of the skylines from the east.

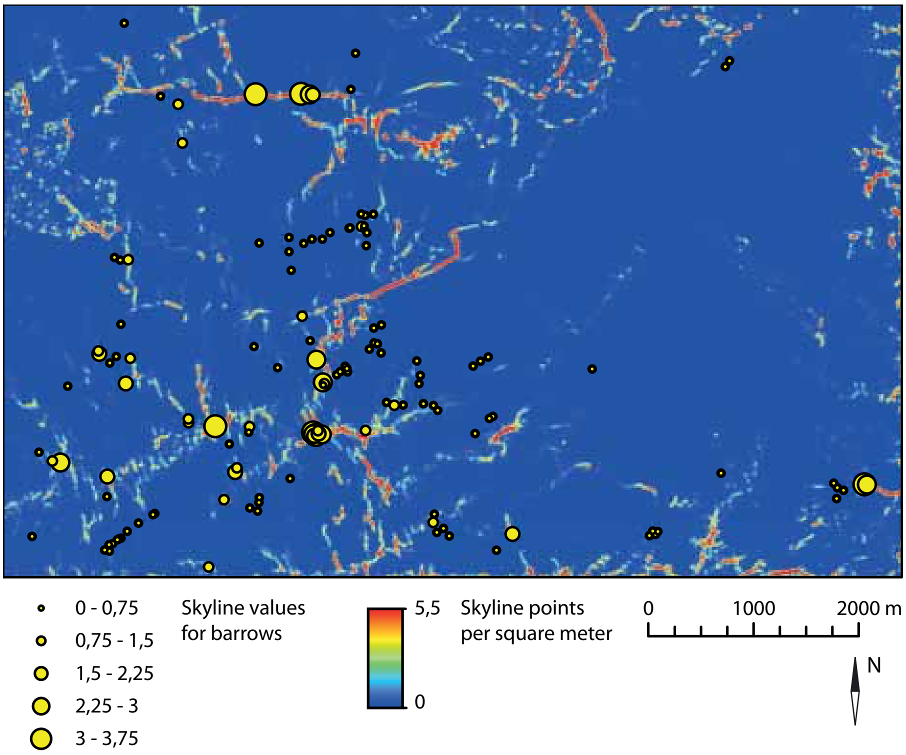


Fig. 6.32: The skyline density map for the Ermelo research area. The size of the symbols represents the skyline density at that location. The bigger the symbol, the greater the skyline density.

6.5.7 Moving along the alignments

Methodology

The viewsheds and their derivatives I presented above are static representations. They do not reveal the changing vistas people experienced when moving through these landscapes and how they encountered different monuments at different times. Therefore, it is interesting to investigate how visibility changes when walking along an alignment. As I stated in the introduction to this Chapter, standing on a mound of the Ermelo alignment, reveals a succession of mounds.

I will not discuss the role of movement along an alignment here (that is a discussion I reserve for Chapter 8), yet I would argue that it is worthwhile to investigate how visibility was manipulated along that axis. Several barrows on the alignments take up prominent positions throughout the methods I presented above. These mounds had a high visual magnitude and they connected fragments of the alignment to one another.

To investigate this manipulation, a skyline density map can be created along a single axis (see above). The axis can be any axis of choice, although here the axes were determined by the alignments themselves. A single point was placed every 5 m along the entire length of each alignment and a skyline generated for each point. All skylines were then broken down into their constituent points and a point density map was created for each. The resulting skyline density maps have been used below. Here, only the results pertaining to the alignments have been discussed.

Epe-Niersen

A skyline density map was created on the basis of a bare earth DEM (Fig. 6.33). Two groups of barrows can be identified. The first group of barrows is (almost) never located on a skyline. This is true for the majority of the mounds and it suggests most barrows were not visible from very far away.

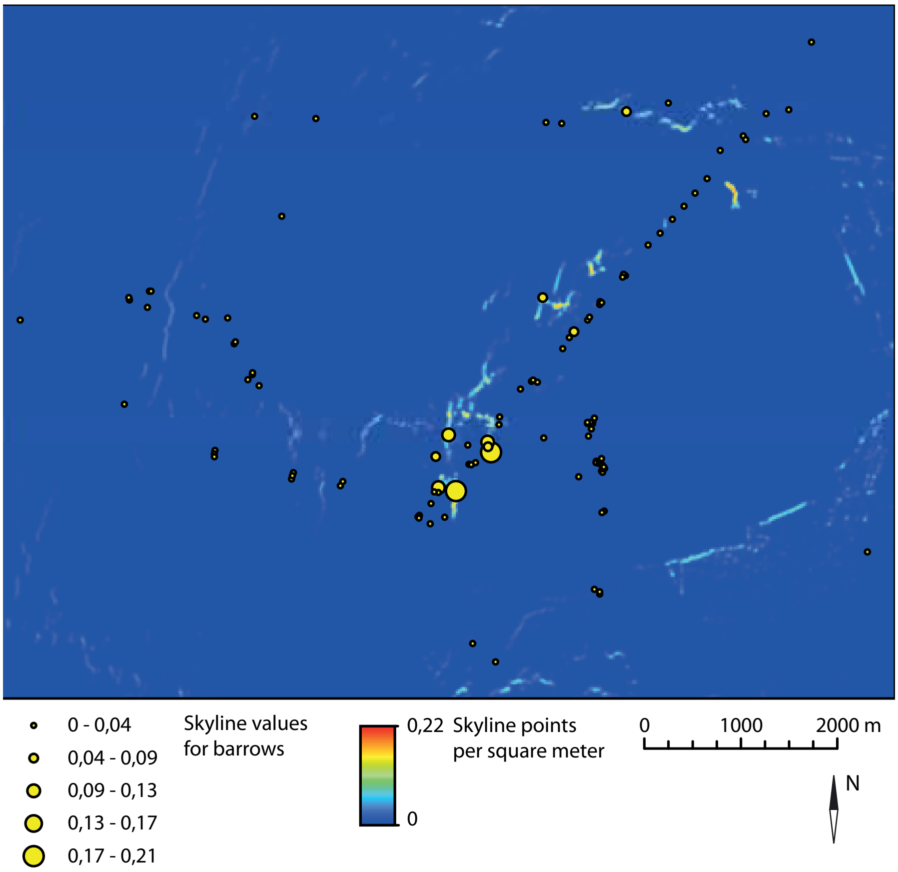


Fig. 6.33: Skyline density map on the basis of random points placed along the axis of the main alignment in the Epe-Niersen research area. Once again, the size of the symbols represents the skyline density at that location. The bigger the symbol, the greater the skyline density.

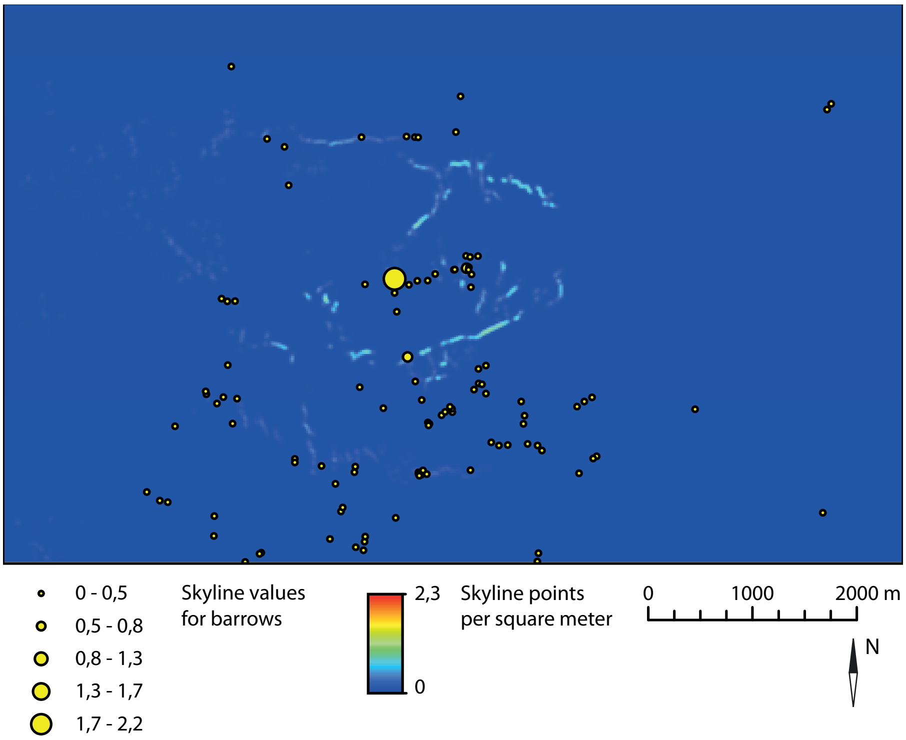
The second group on the other hand, consists of several mounds that are located on almost every skyline. A prime example being the three barrows on the *Galgenberg*. These three barrows were already mentioned before as forming a visual bridge between the two parts of the alignment (see above). The skyline density maps demonstrate that when walking along the alignment, these mounds are consistently on the skyline. Their position ensures they will have been visible from far away, guiding people along the alignment.

At the same time, several mounds, *not* on the alignment are consistently skylined when walking along it (nos. 4762 and 4764). I already pointed out these two mounds in the intervisibility section (see p.150).

The high skyline values illustrate that these two mounds will have been visible from a great distance when walking along the alignment. They were placed 'just so' as to be located on the horizon when walking along the alignment.

If we inspect individual skylines along the alignment, the following sequence can be reconstructed. Firstly, when emerging at the northern tip of the alignment, the view is drawn towards the *Galgenberg* hillock (perhaps aided by the forest edge encircling the heath around the alignment?). When walking towards it, this hillock remains in view and remains part of the horizon, together with the barrows cresting it. The other barrows of the alignment will not be immediately visible. Standing on top of one mound will only reveal the next one in the line, and perhaps the one after that. The rest of the alignment is gradually encountered when walking towards the hill. At the same time from the perspective of a person walking along the alignment, a single barrow to the west remains in view on the horizon, accompanying him as it were.

Fig. 6.34: *Skyline density map on the basis of random points placed along the axis of the northern alignment in the Ermelo research area. Once again, the size of the symbols represents the skyline density at that location. The bigger the symbol, the greater the skyline density.*



Ermelo

The skyline density map for the Ermelo alignment is similar to the Epe-Niersen map (Fig. 6.34). Indeed, most barrows are not frequently located on a skyline. Yet here too, one barrow takes up a very prominent position (nr. 329). It is located on a small hillock, and is always located on the horizon when walking along the alignment.

Examining several individual skylines also reveals a sequence in which this mound becomes visible. The first skylines originate in a lower lying area to the east of the alignment. The three easternmost mounds are placed on the horizon from that perspective (barrows 324 – 326). Approaching these barrows and standing next to these mounds will reveal the hillock located further off in the distance. Walking towards that point will then reveal a succession of less conspicuous mounds along the alignment.

Interpretation

The results from both the alignments are consistent with one another. Two points can be made, reiterating the previous analyses. On the one hand, most barrows will not have been visible from more than a few hundred meters. On the other, some barrows can, on the contrary, be seen from far away and are consistently visible on the horizon when walking along the alignment.

The sequences of skylines also reveal how those barrows remained in view throughout the entire length of the alignment. And it was through walking towards these points that the less conspicuous mounds along the path were revealed.

6.6 Interpreting the results

6.6.1 All barrows are equal …

The monumentality of the mounds themselves already suggests that people in Prehistory had a desire to create a visual place. This desire is also reflected in the construction of post circles around many of these burial mounds. The results of the second analysis support this and demonstrate that a burial mound creates a place which is more visible than its immediate surroundings.

Whether on a barren DEM, or in a forested landscape, barrows have a significantly higher visual magnitude than randomly located points. This intrinsic quality is shared by all burial monuments. It is therefore relatively safe to conclude that a barrow was meant to be seen, although this conclusion is perhaps not that surprising.

Whether or not visual links with other parts of the landscape (*i.e.* views from a barrow) played a further role is perhaps a different point. The research in this Chapter does not provide any evidence for preferential visual connections within the case studies. That is not to say these may not have been important at certain points in time. Conclusive proof of these visual links is, however, not provided in this research.

6.6.2 … but some are more equal than others

The underwhelming conclusion that burial mounds were meant to be seen is perhaps not the most revealing result of this Chapter, nor does it indicate that burial mounds were meant to be seen from afar. Tests in the field suggest that most mounds would be invisible beyond more than one or two kilometres. The visual impact of most mounds would therefore be limited to within a few hundred metres.

However, skyline and intervisibility analyses demonstrate how some burial mounds did receive pride of place, whilst others did not. These mounds will have been visible from much further away than other burial mounds as they occupied visually prominent points. This variation does not appear to be related to chronological phases. Contemporaneous burial mounds display extreme differences in the visual exposure depending on the positions in which they are located. Some burial mounds were built in such a way as to crest the horizon from specific positions while others were not, with some barrows forming nodes in a network, interconnecting parts of the landscape.

Especially in the case of the alignments, visibility was manipulated in order to reveal a succession of monuments. At the same time, some barrows were always visible, no matter where one stood on the alignment. This difference hints at a visual hierarchy amongst the burial mounds and demonstrates that the placement of each was carefully negotiated creating complex barrow landscapes.

6.6.3 Barrow landscapes and cosmological landscapes

It is almost impossible to understand a barrow group through an analysis of the individual burial mound. Rather it is the interplay between each individual mound and their intrinsic qualities that creates the entire barrow landscape. The differences between (almost) contemporaneous barrows reflect the conscious choices of people building these mounds, with some obtaining prime positions where others did not.

It is therefore imperative to study each burial mound within its wider landscape context and is perhaps a justification of the term barrow landscape. This barrow landscape is a relational landscape, where each burial mound is connected in some way with all previously existing structures.

The question we must ask ourselves now is what these barrow landscapes represent. The viewshed studies presented here are very mechanical. They involve looking at a specific place but not how we must interpret these views. Should we define these visual hierarchies in terms of kinship or lineage, with pride of place reserved for the politically powerful? Or conversely were these wholly cosmological landscapes, where mythical ancestors took up the most prominent positions.

In order to comprehend these barrow landscapes we need to understand two different processes. On the one hand the development of barrow groups, through the constant modifications and additions to the pre-existing barrow landscape. As we saw in Chapter 5, these processes are fundamentally historical in nature and have their own temporality. The Bronze Age reuse of Neolithic landscapes occurred on a massive scale, yet why is this? This will be the focus of Chapter 7.

On the other hand, we need to understand how a barrow landscape arose in the first place? Unravelling the barrow landscape to its bare origins reveals careful planning and placement of multiple barrows in a landscape at that time still devoid of burial monuments (Fontijn 2011; Whittle 1996, 227-228).

For example, with the long alignments of the Late Neolithic A, the initial phase of barrow construction already involves multiple burial mounds laid out almost simultaneously. Differences between burial mounds were already made explicit from the onset. What are the origins of these complex barrow landscapes? Who created these barrow landscapes and to what purpose? These questions will be addressed in Chapter 8.