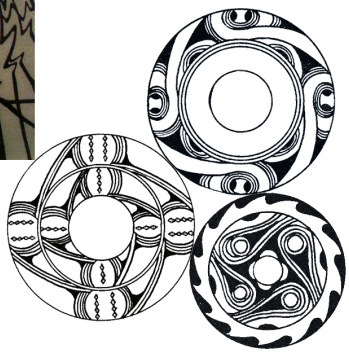
Bisserka Gaydarska & John Chapman

6 Discussion

In this chapter, we summarise the results of the Project and discuss them in broader comparative terms. We follow the nested approach of this volume and look first at Nebelivka itself, then the results of the most important of the recent megasite excavations and finally consider the place of Trypillia megasites in the debate over global low-density urbanism. We rehearse the debate between the maximalists and the minimalists, adjudicating in favour of the latter and presenting three models for the origins, development and abandonment of Nebelivka. These are the Distributed Governance Model, the Assembly Model and the Pilgrimage Model. We then turn to the major differences in plan and social practices between Nebelivka and Taljanki (the presence of kilns and absence of assembly houses at the latter) and between Nebelivka and Majdanetske (the invasion of the central open space and the complex inter-cutting house group plan at the latter) to produce a diachronic model of megasite development. Bisserka Gaydarska uses a relational approach to compare Nebelivka and the typical small Trypillia settlement of Grebeni to justify the attribution of the term 'urban' to megasites. Finally, we propose that the Trypillia megasites were the earliest global manifestation of low-density urbanism, even though their settlement involved smaller populations than had been thought earlier and perhaps seasonal settlement practices.



6.1 The Nebelivka Megasite

We have reached the stage where we have presented the findings from our fieldwork and laboratory analyses and proposed a series of interpretations. Even though we have written chapter summaries in which we attempted to bring out the links between different sections of Chapters 3–5, there remain for consideration the many links between chapters. It is also important to set the Nebelivka megasite in a broader context. Thus, in this discussion chapter, we consider the Nebelivka megasite on its own terms (6.1) before making a comparison between Nebelivka and the two other well-explored megasites of Taljanki and Majdanetske (6.2). We then move to the place of the Trypillia megasites in recent discussions of global urbanism, focussing on the emergence of low-density urban sites (6.3). A summary of the main conclusions reached in this chapter follows in 6.4.

6.1.1 Introduction

This section of the discussion chapter is divided into three parts. In the first part (6.1.2), the nested approach to the Nebelivka megasite is based upon its spatial plan, in which the 'empty' spaces and the four principal levels of the household, the Neighbourhood, the Quarter and the whole site structure our thinking about the Trypillia Big Other, the Trypillia *habitus* and the objects and persons whose identities were mutually constituted at the megasite and beyond. Each element of the megasite is considered through the three poles of Trypillia political economy – production, distribution and consumption.

The second part (6.1.3) consists of an evaluation of the three models of megasite development, relying on a combination of settlement pattern analysis and intra-site modelling. Each model is primarily linked to one spatial level. The Pilgrimage Model is based upon relationships between Neighbourhoods, while the Assembly Model is more closely related to the Quarters and the Distributed Governance Model posits a primary link to the entire site. A preliminary discussion relates the implications of each model to the question of megasites' urban status. Each of the models is explicitly compared with the four constraining criteria derived for the megasite: the modelled length of the duration of Nebelivka – 200 years; the number of houses built – 1,445; the number of houses burnt down – 1,077; and the absence of a major human impact on the Nebelivka landscape and its forest steppe. Any model inconsistent with these criteria will be rejected and modifications sought.

The third part (6.1.4–6.1.5) consists of an overall treatment of the origins and demise of Nebelivka. Through a discussion of the wider aspects of megasite origins, this section forms a bridge to the broader comparisons between Nebelivka and other megasites.

6.1.2 Four Nested Spatial Levels

Two of the four nested levels have been accepted as the basic units of megasite spatial analysis from the outset – the house and the entire site (Shmaglij 1980). The remaining two levels – the Neighbourhood and the Quarter – have emerged as part of the Second Methodological Revolution (Chapman et al. 2014b) and have been developed in later spatial analyses at Majdanetske and Taljanki (Ohlrau 2015), as well as in their pioneering application at Nebelivka. The full suite of four nested spatial levels is as essential to the understanding of Trypillia megasites as their discovery was for post-Classic Mayan cities such as Teotihuacan (Smith, M. E. 2010).

Through our investigations of all four nested levels at Nebelivka, we have come to appreciate that megasite archaeology is, at root, an archaeology of selective fragmentation and practices of episodic discard and deposition. Aspects of production and distribution are implicated in all excavated remains but the details of burnt houses, pits and Assembly Houses provide the primary data on discard and deposition – i.e., consumption. Consumption through the burning of houses has, after all, been the primary object of Trypillian archaeological practice for over a century. We have come to a view of Trypillia sites not widely shared among colleagues working on megasites – that the majority of discarded and deposited remains do not provide a direct reflection of daily lives (a 'living assemblage') but rather constituted a series of interventions, or performances, which brought together a range of people – whether one or 100 – in deliberate depositional practices, as part of everyday living on the megasite. This means that the deposited finds cannot be conceived as a direct reflection of the degree of specialization in, e.g., pottery production but can, rather, provide an oblique, fuzzy view. But we cannot deny that the discard of some food refuse and most lithic debitage indicated *in situ* practices rather than staged events. The comparison of primary acts of discard or deposition across Neighbourhoods, Quarters or the whole site can then provide valuable higher-level inferences about shared *habitus* or variability of practice. It is for these reasons that we begin our discussion of Nebelivka at the household level, commenting on house construction, use and destruction as well as the analysis of objects.

6.1.2.1 The Household

The location of the vast majority of houses at Nebelivka within 5–10 metres of their nearest neighbour meant that the everyday context of living was a context of neighbourly proximity. A very small number of houses inside the Inner House Circuit was located 40m or more from their nearest neighbour, suggesting possible relocation for additional space for horticulture or following a dispute. The house in Test Pit 17/1 was so far from its neighbour (ca. 85m) that we have proposed the possibility of a special function for this structure – perhaps a birthing-hut. But this was an exceptional location. The usual construction of a Neighbourhood meant a linear sequence of

house construction, whether clockwise or anti-clockwise in the House Circuits or outwards to inwards in the Inner Radial Streets. The excavation of large numbers of adjoining houses at Taljanki and Majdanetske means that we can consider inter-house variability in Section 6.2. However, we do not possess such data for Nebelivka, with its maximum test-pitting of three or four houses in a single Neighbourhood. This leads us to focus on the individual house as the basic unit of analysis.

Time and labour estimates for house construction were derived from the Nebelivka experimental programme. The total of 280 person-days for a one-storey house with a footprint of 15m × 5m, with 320 person-days for a two-storey house of the same dimensions, meant a month's construction time for 10–12 people, with a modest labour increase for a more imposing and spacious building. Smaller one-storey structures, covering 25m^2, were found predominantly outside the Outer House Circuit. Interpreted as sheds, workshops or storerooms for materials for house-building or -burning, they would have taken far less time to build, estimated at fewer than 100 person-days. The largest dwelling houses covered >150m^2, with estimates of 600–700 person-days or a month for 20–25 people or two months for 10–12 people. Building a larger house meant access to a larger pool of labour than was usual. The different construction methods of Assembly Houses involved far less labour, with the possibility of portable structural elements from unroofed structures moved to different locations during their use-lives.

Each house made a statement about the whole of the megasite landscape, for all parts of the landscape were built into a Trypillia house. Construction would have included less-skilled work, such as the gathering of reeds for thatched rooves or chaff for mixing with the clay, heavy work such as carrying wood, clay and water to the building site and more skilled work, such as carpentry and thatching. Provisioning of the building team also involved resources, including feasting at the end of the project. This implies that building was a co-operative effort by men, women and children from more than just the household itself. Building a house meant building social relationships in the Neighbourhood or further (Hofmann & Smyth 2013).

Each house also made a spatial statement concerned not only about proximity to antecedent structures but also about the impact of the house on visibility patterns in, and movement around, the Neighbourhood. Many Visibility Graph Analysis (VGA) plots showed an extension of private or low-permeability space outwards from individual houses, showing the constraints on movement close to a house (Fig. 4.19–4.25). The visual impact of houses in their immediate area extended over an entire Neighbourhood and often over much of a Quarter. The predominance of 2-storey buildings over 1-storey houses by a factor of five would have altered the Nebelivka skyline, providing a highly visible form of house differentiation which may have been reinforced by the diversification of household practices.

Just as at a higher, site level, dwelling on the Nebelivka promontory converted a space into a place, so the building of a house on a certain area gave that spot the cultural value of a place, partly through its visual impact (see Section 4.3.2) but also related

to the identities of the residents. The length and complexity of the house biography would augment that place-value until the decision to end its life (Tringham 2005). At that point, the household would encounter one of the Trypillia group's strongest principles – viz., never to build a second house above the burnt or unburnt remains of an earlier structure. This meant that the cultural memory of a burnt or unburnt house survived in the cognitive maps of the local residents, unless the burning produced what we have termed a 'memory mound' of burnt debris (see below, p. 421). In this journey of a house's life, a small area of Nebelivka began as undifferentiated public 'space', became a domestic 'place' and then returned to public space but enriched by ancestral connotations.

Although prehistorians make the assumption that household production was dominant in the Neolithic and Copper Age, direct evidence of household production is rare at most sites – as is the case at Nebelivka. The piecing-together of the use-lives of Nebelivka houses from scattered evidence (mostly test pits but also two excavations of entire houses) creates a varied picture of maintenance activities (Alarcón García & Sánchez Romero 2010). Soil micromorphological analyses show that houses were kept clean of coarse organic and cultural residues. Practices such as lithic tool-making and -repairing were only occasionally represented: curated tools tended to be found in houses, whereas débitage from short-term tools was found in pits. Pottery in burnt house 'death assemblages' was dominated by vessels for food preparation and consumption. However, there was little materialization of food storage, textile production (either spinning or weaving) or cooking. Moreover, low discard rates are attested for lithics, polished stone tools, worked bone tools, ornaments, figurines, fired clay counters, whole vessels, complete animal bones, plant processing residues and prestige metal goods. Deposition and discard were dominated by fragments of pottery and fragments of animal bones, although we also encountered 'complete' vessel profiles with or without sherds missing. The deposition of whole vessels was a special act of reverence by a household or person. The marked absence of what we may call 'functionally coherent' pottery assemblages reinforces the conclusion that we are not, for the most part, dealing with 'living assemblages' but, rather, staged deposits to mark quotidian or special ritual events. An example of the locus of such events concerns the unusually large number of platforms in the Mega-structure, where eight such ritual foci were distributed across the building, some inside rooms and others in the open central courtyard (Fig. 4.31 & 4.35 upper).

Turning to consumption, the most dramatic ritual event on a Trypillia megasite was the burning of the Mega-structure. It greatly exceeded the visual impact of the burning of a dwelling-house, engaging a wide array of senses which included smell, sound and sight. Fires were started in two different parts of the Mega-structure – the South-West corner and the Eastern rooms – with little evidence for burning in the central open space or the Eastern courtyard. Extrapolation from the volume of fuel required to burn the two-storey Nebelivka experimental house indicates ca. 292m^3 for the Eastern rooms and 64m^3 for the Western rooms – a major communal effort

of fuel collection. This collection is approximately double the fuel required to burn a 'normal-sized' two-storey 15m × 5m dwelling house (an estimated 187.5m^3). These figures emphasise the huge collective undertaking needed to achieve a successful, and obviously deliberate, burning of the Mega-structure!

The house 'death assemblages' contained sherds as well as rare complete vessels, indicating the deliberate fragmentation of pots before deposition and the placing of sherds from the same vessel in different deposits, as was occasionally found in the Mega-structure. The ceramic groups in the Mega-structure's destruction layers amounted to almost 60kg of pottery, comprising over 2,500 sherds – an indication of multiple depositional events. The sherds probably derived from the entire megasite, with a low closed: open ratio showing an emphasis on communal consumption vessels. Preferential deposition of large sherds, often from open vessels, typified the living floor of the Mega-structure. The placing of foetal/neonatal bones of at least one pig and two caprines on the living floor in the South-West corner suggests another form of special deposition. The large concentration of miniature vessels had probably fallen from a shelf in one of the East rooms after storage for ceremonial use. The very special graphite-painted decoration underlines that these were precious parts of the Mega-structure possessions, not readily exchangeable for other vessels.

A similar pattern of deposition of large sherds was found in the basal layer of the large clay pit in Sondazh 1, whose secondary use included widespread discard of objects in a short period of perhaps years rather than decades. The episodes in the Pit in Sondazh 1 comprised mostly small assemblages, perhaps placed by members of a single household, but with occasional larger assemblages of parts of over 40 vessels derived from several houses or perhaps a whole Neighbourhood. However, the high closed: open ratio of vessels in most Pit episodes shows that food consumption was more likely to be small-scale than large, communal events. Variations between excavation units in the fabrics used for various vessel types revealed different contributions by different people to the depositional assemblages of the Pit in Sondazh 1 and House A9 – perhaps an indication of links between the local place and contributing groups of neighbours.

The faunal assemblages from different excavation units showed variations between a preference for domestic cattle in the Mega-structure and House A9 and a more even consumption of domestic species – caprines, cattle and pigs – in House B17 and its pit, as well as the Pit in Sondazh 1. Given the large quantities of meat yielded by butchering a bovid, these local dietary preferences may be related either to larger-scale consumption in the Mega-structure and House A9 or to the choice of animals from different herds and flocks in the other contexts. The construction of the 'industrial feature' for communal cooking (? baking or roasting) is consistent with the faunal evidence for large-scale meat consumption.

The identities of household residents were focussed on family membership and consolidated by choice of house location and the process of house-building itself. Expansion of identities beyond the house was related to resource acquisition and

consumption choices. A rare example of personal identity comes from the recognition of multiple ways of producing projectile points on high-quality imported flint – here interpreted as different knappers acquiring exotic flint to make their *own* points for hunting. The recognition of only two figurines made in a realistic style, each with their own distinctive faces, hints at the ways in which persons could be differentiated at Nebelivka, although this was a rare occurrence. Each miniature vessel in the group stored in the Mega-structure was different, suggesting an element of personalisation in this group. The household member who deposited a sherd stylistically linked to the ancestral settlement of Volodomyrivka, or an Early Trypillia-style lunate or rhomboid point, was making a personal point about cultural memory – about their links to a valued past out of which the Nebelivka megasite emerged. It is also possible that the household preference for beef over mutton or pork was a traditional form of diet maintained by the latest members of the lineage in that house.

The final question about houses at Nebelivka concerns their chronology. Although the overall chronology of the dwelling of Nebelivka is not in doubt, a wiggle on the calibration curve has prevented us from producing a definitive intra-site sequence to enable us to place houses and Neighbourhoods precisely within the period 3970–3770 BC. However, it was possible to model the proportion of houses that were coeval depending upon the mean length of house usage (10, 25 or 50 years) (see below, pp. 426–427).

In summary, houses were familiar parts of the Trypillia Big Other, known from all the home communities who came to live at Nebelivka. In the absence of functionally coherent pottery assemblages at Nebelivka, most pottery was placed as a 'death assemblage' in the house before it was burned and the locale abandoned. In a minority of cases, the burnt mass of house remains formed a low memory mound to mark the place of an ancestral dwelling.

6.1.2.2 The Neighbourhood

The concept of a 'Neighbourhood' provides a multi-dimensional, social significance for the otherwise neutral term 'house group' (cf. Rassmann et al. 2014; Ohlrau 2015). The definition of a Neighbourhood is a group of at least three houses with no internal space between them and gaps at either end separating the group from the next Neighbourhoods (see Section 4.2; Chapman & Gaydarska 2016). In terms of two-dimensional planning, there were two space-time characteristics of a Neighbourhood – linearity and length. Linearity assumes spatial direction – building started at one end rather than in the middle and continued with the addition of one house to the current end of the line and not a building some distance away on the projected line. Linearity also assumes temporal direction – the second house in the line is built after the first house, the third after the second and so on. We are still unaware of the duration of the intervals between the expansion of the line with a new house. If all houses in a Neighbourhood were **not** built at the same time, the length of a Neighbourhood line also reflected a temporal dimension, with the assumption that longer Neighbourhood

lines meant a longer dwelling period – perhaps more successful Neighbourhoods, if 'success' is seen as enduring. Although improbable, we cannot currently refute the notion that a single family lived in an entire Neighbourhood, with successive dwellings replacing the last burnt house until the final house was built and abandoned.

The number of houses in a Neighbourhood ranged from three to 27, but, interestingly, over half of the Neighbourhoods were small, comprising between three and seven houses. Whichever model for Nebelivka is preferred (see Section 6.1.3), there is a shared assumption of people from different communities coming to live at/visit Nebelivka and build houses in groups perpetuating those 'home' communities (cf. Kruts 1989). The construction of seven houses in a single building season would have required a labour input of ca. 2,000 person-days, or 40 days for an incoming group of 50 people from the same home community, whose seven families could then inhabit those seven houses. Larger Neighbourhoods may well have not been built in one season, with the addition of houses to the longest Neighbourhoods over time. The total of 150 Neighbourhoods identified at Nebelivka indicates that temporal differences must have existed between Neighbourhoods. But the key factor in Neighbourhood creation was the communal labour required to build the houses, whether deployed in a series of building teams from the same home communities or involving co-operation between people from different home communities.

While most Neighbourhoods at Nebelivka were linear in layout, there was a small number of exceptions which we have called 'Squares' – all six of which were found inside the Inner House Circuit. This special kind of arrangement of houses most probably derived from small home communities outside Nebelivka from which the people came to the megasite. We have named the most regular of the squares 'Nebelivka Square' (Neighbourhood 137, Quarter N) in recognition of its special layout; this square features prominently in the Pilgrimage Model as the residence of the Nebelivka 'Guardians' (see below, Section 6.1.3).

One important feature of Neighbourhoods was the considerable variation in house size. In addition to the visual differentiation of 1-storey and 2-storey houses, many Neighbourhoods contained one or two houses in the highest size class as well as much smaller dwellings. It is suggested that house size differentiation was a standard feature of many Neighbourhoods, although whether these differences were inherited from home communities or developed at Nebelivka remains unclear[98]. Alongside the regular dwelling houses were smaller structures, which may be considered sheds, workshops or storerooms – often located outside the Outer Circuit. A last feature found in the OOC was a special kind of weak geophysical anomaly which suggests garden features – perhaps paths or garden beds.

98 Functional differentiation between houses based upon size and internal distribution of objects has been claimed for Majdanetske (Müller & Videiko 2016; Müller et al. 2017).

An important point about Neighbourhoods concerned their curtailment or abandonment. The decision whether to burn a house or abandon it with little or no burning (conventionally termed 'unburnt') was closely related to the location of the house on a major House Circuit, an Inner Radial Street or other less prominent areas of the megasite. Much higher proportions of houses on the Circuits were burnt in comparison with those inside or outside the Circuits. But there were many Neighbourhoods in which houses were treated in both ways – up to 80% burnt in Quarters B, C and L, in comparison with 40% burnt in Quarters F, I and N (Fig. 4.5). The proportion of mixed house firing practices is a good indicator of inter-household differentiation in respect of small-group agency, with implications for access to labour and fuel for house-burning.

The discussion of variability in the deposition of objects at the Neighbourhood level is constrained by the previously-mentioned issue of sample size from small Test Pits but, nonetheless, some interesting patterns have emerged, confirming what we should expect – variable discard in a basic social unit in which people spent most of their time at Nebelivka. There was a tendency for different amounts of pottery deposition in different houses in the same Neighbourhood, which was especially marked in Nebelivka Square. By contrast, and with one exception (NBH 124), similar amounts of pottery were recovered from the central part of test-pitted houses (Zone 9). The decorative motif linkage study showed that, although almost all households selected their own distinctive motif combinations, half of these appeared in more than one Neighbourhood, with some motifs deposited in four Neighbourhoods. This shows that some linkages were manifested at the Neighbourhood rather than at the household level. The only Special Finds link between Neighbourhoods concerns lithics, found in four different Neighbourhoods; all other Special Finds are variously distributed, each in a single Neighbourhood (Fig. 5.45–5.47).

The overall conclusion from the modelling of the AMS dates is that there is no statistical difference between the dates of houses within a Neighbourhood whenever there are two or more dated houses. This does not, however, mean that the Neighbourhoods were not occupied for different timespans.

In summary, the importance of Neighbourhoods lay in mutual support in a new social environment – one created on an unprecedented scale, with no person familiar with the architectural totality. While the initial challenge for the megasite was the creation of a site-wide identity – the 'megasite identity' – the local identities of home communities could be replicated or developed within the Neighbourhood, if not also the Quarter.

6.1.2.3 Quarters

The key point about the identities of those living in different Quarters was an outside-to-inside relationship that was stronger than the lateral relations existing across the boundaries of the Quarters. The diachronic development of these outside-

to-inside relationships across zones, even in the five Quarters with fewer than ten Neighbourhoods, was achieved largely through reciprocal movement from the outside to the open inner area, often channelled through the Inner Radial Streets. In all but two Quarters (Quarter M in the Inner Circuit, Quarter E in the Outer Circuit), there were gaps between Neighbourhoods which allowed easy movement between the outer and the inner open spaces. We should not, however, overlook the potential for lateral movement in all three spaces – opportunities within as much as between Quarters.

The second important characteristic of the Quarters was the major increase in scale over and above the next dwelling unit – the Neighbourhood. Since few Neighbourhoods covered more than 1ha, there was a regular tenfold increase in the scale of dwelling in a Quarter. Allowing for the near certainty that not all houses, or all Neighbourhoods, in a Quarter were in coeval occupation, this scalar change would have led to between five and ten times the number of people living in a Quarter, with all the attendant opportunities and risks. Each of the alternative models for Nebelivka (see below, Section 6.1.3) makes the same point that the scale of dwelling in a Quarter could have encompassed, if not exceeded, the scale of dwelling in a small Trypillia site (see also Section 6.2 for the Grebeni site). This meant that, whichever way Nebelivka developed as a megasite, the Quarters offered a structural equivalent to a home community – an important way of coping with scalar stress through reliance on prior social relations. The size range of Quarters – from 5.3ha (Quarter E) to 21.8ha (Quarter B) – suggests that home communities of varying sizes contributed to the Quarters and/or to their subsequent growth over different periods of time.

Assembly Houses constituted a key feature of Quarters, with distinctively open access. Whatever the details, the VGA results emphasise the significance of Assembly Houses through their high visual accessibility to corridors of movement. Assembly Houses were located in the most integrated and public zones of the Quarters, with these locations being a key feature of their temporal development. The variations in the number of Assembly Houses per Quarter can best be explained by the temporal development of the megasite (e.g., in the Pilgrimage Model), with the inner Assembly House of a pair built outside the only existing House Circuit and the second Assembly House built after the construction of the later, Outer Circuit. It could be argued that, in the four Quarters with only a single Assembly House, that building continued to act as a focus for both House Circuits, whereas the sole Quarter with three Assembly House locations attests to the greater mobility of the building in response to the increased need for formalised space.

Given the frequent house size differentiation within Neighbourhoods, we may expect similar variability between Quarters. Indeed, we have found results supporting the general trend in two different analyses of house size by Quarter, but these two analyses differed in detail. The analysis of the variation in classes of house size by Quarter (the so-called ‘mean breadth scores’) shows marked variability between Quarters (Fig. 4.16–4.18/1), meaning that some Quarters showed much wider ranges

of house size than others. Eight Quarters comprised the group with lower mean breadth scores – G (lowest) – C & A–I–F–E–H & N. The other six Quarters comprised the group with higher scores – L–K–B –D & J–M (highest). Potential inter-household social differentiation was also found in a GINI coefficient analysis of house sizes by Quarter, in which there was a good spread of values, with many of the Quarters scoring close to the mean value but with four Quarters (C, D, E & G) markedly lower and three (A, K & M) higher than the mean value (Fig. 4.18/3). There is a tendency for greater house size diversity in the South half of the megasite in comparison with the Northern half. Was this finding corroborated by the Visibility Graph Analyses (VGA) or in the distribution of objects?

The results of the VGAs for both entire Quarters and for the successive stages of two of the alternative models for the development of Nebelivka show that each Quarter would have had similar structuring of visibility and movement across the entirety of the site and across significant periods of time. There is a widespread similarity in visual accessibility measurements for most Quarters, except for a group of Quarters located in the Southern half of the site. Buchanan advances two possible reasons for the minor differences in spatial arrangements from their neighbours to the North: temporal (these areas were developing at different times) or 'kinship' (different social groups inhabited or used these areas). It is interesting that these Southerly Quarters were the same as those with higher GINI co-efficient scores.

There are several examples of the differential deposition of objects across Quarters. The most general case concerns motif linkage, with sherds with different multiple motifs indicating identities at the Quarter level in most areas of the megasite. This feature is reinforced by differences between Quarters in the location of the same motifs – whether on the inside or the outside of the vessel (Fig. 5.19). More specific traits include the largest concentration of miniature vessels outside the Mega-structure – found in several houses in Quarter H. The interpretation of this concentration depends on one's views on the function of miniature vessels – whether containing special foodstuffs or ritual substances – but the concentration differentiates Quarter H from the others. A fourth difference between Quarters concerns the various ratios of open vessels (dishes: plates), with the highest ratio of communal eating plates in Quarter G – also the Quarter with the greatest degree of ceramic fabric variation in all Quarters. Taken together, these findings suggest an emphasis on communal consumption for a wider variety of persons than was usual at Nebelivka. This same Quarter G was one of the Quarters with a lower-than-average GINI score, while at the same time scoring the lowest out of all the 14 Quarters on the house mean breadth analysis!

Special Finds distributions indicate a threefold division per Quarters: a group of Quarters with many SFs (Quarters B, G and L–N), a group with no or few SFs (Quarters A, C–F and H) and two Quarters (I and J) with middling numbers. Exotic flints (Fig. 5.47) and figurines (Fig. 5.46) were found in all five Quarters in the first group, whereas they were rare in the other two groups (Fig. 5.47). These data offer a crude measure of inter-Quarter differentiation, with exotic flints providing a rare example

of the dispersion (? re-distribution) of an exchanged object within the megasite. There is a match between the higher frequencies of Special Finds in the Southern half of the megasite and the tendency to higher GINI values in this half.

A further comment concerns the AMS dating of the different Quarters (Fig. 4.63/2). While there was no statistically significant difference in the start-dates and end-dates of most Quarters at Nebelivka, Quarter E may well have started earlier, and finished later, than other Quarters, with Quarter G also ending later than most other Quarters. The combination of temporal specificity and the possibly higher level of social differentiation in Quarter G singles out this Quarter from the others at Nebelivka – perhaps as a place where longer dwelling times led to social diversification. However, there is as yet no other evidence to confirm the temporal singularity of Quarter E.

To summarise, comparison of the Quarters with distinctive pottery deposition and high Special Finds deposition with those with high scores on one or other of house size analyses and those Quarters which were outliers in the VGA shows a difference between the Southern and Northern halves of the megasite. There could have been two pathways to this modest social differentiation: a Nebelivka pattern where local variations in exchange led to local architectural differentiation; and the replication of pre-existing variations in home communities in the various Quarters. At present, we have no conclusive evidence to differentiate these two processes, both of which contradict the notion of intra-site hierarchy.

6.1.2.4 The Whole Site

The highest spatial level of consideration – the whole site – also takes into comparative account the two spatial divisions cutting across the Quarters – the main Zones, from outside the Outer Circuit (OOC) to inside the Inner Circuit (IIC), as well as the four Areas (North, East, South and West: see Fig. 4.5). Given that the scale of construction – whether the number of houses, the timber and other resources required or the co-ordination of builders and helpers – inevitably means that there is a temporality to the megasite, we begin with a consideration of the AMS dates before moving to the plan and the distribution of objects.

The results of the modelling of the duration of Nebelivka show two peaks of high probability – 100 years (3970–3870 BC) and 200 years (3970–3770 BC) – with a higher probability of 200 years (Fig. 4.62). The initial modelling of the number of coeval houses was based upon both megasite durations. The high-input version of a 100-year occupation and the building of 30 houses *per annum*, each of which lasted 50 years, shows that a maximalist model would have required both high building rates and a long house duration. The model produced an increase of 300 houses per decade up to a peak of 1,500 houses for a maximum of 10 years (the 5th decade), with a symmetrical fall-off of 300 houses until the 9th decade. This trajectory does not fit with Müller et al's (2016) three-stage model for megasite developments, with a maximum number of coeval houses at the end of the occupation and would have required the burning of 30 houses *per annum*, or one per week in the dry season –

the effects of which are not attested in the Nebelivka pollen diagram. For the 200-year duration, the 10-year house life implies abandonment so soon after construction that there was little continuity in the dwelling plan. Thus, the middle-range models of houses with a use-life of 25 years produces the most realistic number of coeval houses – between 210 and 250 houses, with modest building rates of between 9 (210 coeval houses) and 20 houses (250 coeval houses) *per annum* and burning rates rarely if ever exceeding 12 *per annum*. The goodness of fit of this model with the three alternative models is discussed below (Section 6.1.3).

The severe effect of the wiggle on the calibration curve on modelling the Nebelivka internal chronology prevents clear sequencing of even the major planning elements. Three statements about sequencing may be made: (a) the end of the occupation of the Outer Circuit post-dates the end of the occupations of the Inner Circuit and the Inner Radial Streets; (b) there is a clockwise order in construction in the Inner Circuit in Test Pit Group 25 and (c) there is an inner to outer sequence for two out of seven Inner Radial Streets (Test Pit Groups 20/35; Test Pit Group 26). The later abandonment of the Outer Circuit may have been consequent upon its later construction but also from closer relations with the Assembly Houses built in the OOC. The clockwise order of construction is interesting but does not affect any of the three models. The early date for a house well inside the IIC suggests that this may have been a dwelling for one of the Nebelivka Guardians who first occupied the site and planned its skeleton outline. Alternatively, this date may relate to early signs of local dwelling recorded in the Nebelivka sediment core – dwelling related to the early stage of the Distributed Governance occupation of the megasite.

The essence of the development of the megasite plan is the creation of new spatial arenas for novel discourses [99], to which may be added at an entirely unprecedented spatial scale. Indeed, as Pauketat (n.d.) reminds us, every (re-)building project (re-) created the site anew, with fresh political opportunities for expanding social power and the potential transformation of the social order. In each of the three Nebelivka models, there are key decisions about how the megasite would next develop – and it was at those critical transformational junctures that the megasite was re-created anew, with revitalised opportunities for political negotiations. The most obvious junctures were the decision to start building a second house circuit and the plan to construct inner radial streets. Both elements offered new opportunities for households and Neighbourhoods located near the places of planned expansion.

What differentiated megasites from other contemporary sites was the key initial feature of all megasites – the inner open area for large-scale assembly. This space started off at Nebelivka as a space of 105ha – bigger than any small coeval Trypillia site and 2/3rds as big as the largest megasite known before Nebelivka. It is important

99 This idea was discussed by Doonan & Hommel (n.d.) in relation to the invention of new objects but is equally relevant for the creation of new settlement forms.

to note that the inner open space was intentionally defined from the very foundation of the site, rather than a space that emerged organically as the site developed or that was wedged-in over time.

Monica Smith (2008) has discussed the importance of open spaces in settlements of different sizes, emphasizing that empty spaces were not neutral spaces but were controlled – indeed, in the case of urban sites, formally sustained to support a wide range of cultural memories at different temporalities and to allow a variety of uses and denoted meanings. Smith underlines the possibilities for conflict as well as consensus over open spaces, reminding us that open spaces can be used against 'official expectations'. An excellent example of Smith's ideas concerns the alternating uses of the Igbo village arena, at the physical and socio-cultural centre of village life, between a sacred space for hosting initiation rites and religious rituals and a profane space for meetings and ceremonies (Ugwuanyi & Schofield 2018). The inner open space at Nebelivka can also be conceptualised as the physical and socio-cultural centre of megasite life, with alternating sacred and profane uses.

However, it was not a question of copying the principal plan elements from an earlier 'blueprint' inherited from the Trypillia A and BI Phases, as has long been assumed (Videiko 2013). Critical analysis of the plans of large sites prior to Phase BII shows that some of the main plan elements were found at earlier sites but never on the same site. This means that the construction of Phase BII megasites such as Nebelivka was more a creative synthesis – or *bricolage* – of earlier plans than a copying of a well-known plan (for elaboration, see Section 6.1.3). This conclusion makes bottom-up heterogeneity in Neighbourhoods and Quarters all the more likely from the viewpoint of emergent planning. But such heterogeneity was also a property of the fusion of groups from many different communities in a single large site.

Architectural variability is apparent in every aspect of megasite planning, of which 17 can be noted here (Table 6.1). Indeed, it is quite startling to find that the main planning elements at Nebelivka continued to be operational in the face of such heterogeneity! How was this possible?

Table 6.1: Types of planning and architectural variability, Nebelivka megasite (by J. Chapman).

Type of variability	Variations observed
length of causeways in the perimeter ditch	20–55m
length of uninterrupted ditch lengths between causeways	32–640–720m
width of the outer open space between the perimeter ditch and the Outer Circuit	40–70m
presence or absence of dwellings, or even Neighbourhoods, in the outer open space	Outside OC – total of 78; from 0 (Quarters C, M, N) to 16 (Quarter K)

Continued **Table 6.1**: Types of planning and architectural variability, Nebelivka megasite (by J. Chapman).

Type of variability	Variations observed
presence or absence of pits inside or outside houses in either Circuit or Inner Radial Street and the relationship of the pits to those houses	OC NBH 76 & 102 – no pits; OC NBH 9 & 10 – pits outside houses; OC NBH 47 & 48 – pits inside some houses; OC NBH 62 – pits inside all houses; IC NBH 26 & 34 – no pits; IC NBH 118 – pits outside some houses ; IC NBH 3 & 4 – pits inside houses; IRS 20 & 28 – no pits; IRS 42 & 83 – pits on one side; IRS 95 & 96 – irregular location of pits vis-à-vis houses
presence or absence of an Assembly House in the outer or middle open space	9 outside the outer circuit; 14 between the circuits
number of houses in a Neighbourhood (excluding Squares)	3–22
Number of houses in Squares	15–27
alignment or otherwise of gaps between Neighbourhoods and causeways in the perimeter ditch and between Neighbourhoods in both Circuits	No alignment: Gap 2, Quarter F; Gap 6, Quarter H; Gap 7, Quarter I; Gap 10, Quarter J; Gaps 12 & 13, Quarter L; Alignment: Gap 8, West entrance; Gap 14, Quarter L
presence or absence of kinks in Inner or Outer Circuits	Inner: NBHS 64 & 79 / border of Quarters G & H; NBHS 112 & 117A / border of Quarters K & L; NBHS 134 & 135 / Quarter N; Outer: NBHS 48 & 58 / border of Quarters F & G; NBHS 75 & 76 / Quarter H
alignment or otherwise of kinks in both Circuits	NBHs 104 & 110 (Inner) + 103 & 106 (Outer) – Palaeo-channel at border of Quarters J & K
width of the middle open space between the two Circuits	60–160m
length of offsets (kinks)	25–40m
presence or absence of Inner Radial Streets inside the Inner Circuit	Highest in E–H, lowest in I–K; 52 RS – houses from 2 to 26
presence of squares in the IIC	In Quarters B, C and N
presence or absence of blocking streets (streets cutting off the further development of Inner Radial Streets)	NBH 18, Quarter B; NBH 73, Quarter G; NBH 146, Quarter N
number of Neighbourhoods in a Quarter	6–18
number of Assembly Houses in a Quarter	A, C, E, M – 1; B, D, F, G, I, J, K, L – 2; H – 3

Each of the alternative Nebelivka models does, in fact, propose a different solution to the problem of integrating such diversity (see Section 6.1.3). But the general point is that alongside the 'local' identities of each community whose members dwelt at Nebelivka was a 'global' Nebelivka identity which had to be created, nurtured and maintained from the very origins of the megasite and which provided sufficient common ground for all the various residents/visitors for the project to continue and thrive. This growth required time for the slow build-up of depositional practices which led to the Nebelivka global identity without undermining local identities as well. This was an unprecedented problem for Trypillia communities, with success and enduring dwelling for those megasites who found new ways to reconcile heterogeneity.

None of the lines of evidence discussed in this chapter has supported the notion of a megasite hierarchy functioning to impose top-down decisions about the layout and character of the megasite. The absence of materialised hierarchy is one of the most surprising aspects of a site as large as Nebelivka and points to the significance of heterarchy, the *habitus* and the Trypillia Big Other as alternatives to hierarchy. Alongside the daily household practices which characterised the *habitus*, the Big Other also played an overarching, integrative role. It is worth recalling Žižek's (2007) point that the Big Other was not only something which was sufficiently general and significant to attract the support of most members of society but was, at the same time, sufficiently ambiguous to allow the kinds of localized alternative interpretations that avoid constant schismatic behavior. These localised interpretations became materialised in different types of painted pottery, different kinds of figurines and houses of different shapes and sizes. The general conclusion from the multiple analyses of buildings and objects is that material culture was used to build up a relational picture of social differences, with the broader use of graded differences between objects (greater frequencies of plates and dishes) and houses (bigger or smaller structures) in preference to oppositional strategies (the presence or absence of figurines in houses). Such an overall preference for the use of material culture supports hetararchical relations at the megasite, as well as being consistent with the Big Other and the *habitus*.

6.1.2.5 Production, Distribution and Consumption

The question of production, distribution and consumption at the overall site level is best addressed through an examination of the evidence for specialised and quotidian practices. We can identify at least six Limited Interest Groups (or LIGs: see above, p. 31) at Nebelivka – builders, potters, flint-knappers, bone toolmakers, figurine-makers and metallurgists. T. Taylor refers to persons united by a common skill set in the production of similar structures or objects. Although not necessarily implying the existence of 'specialists' or indeed a formal structure (such as 'craft guilds'), LIGs indicate a local identity which is likely to have underpinned connections between craftspeople at more than one site. An obvious advantage of belonging to a LIG is the

way that members may have shared production information and innovations between settlements.

One caveat over the diagnosis of specialised production concerns site formation processes. The interpretation that most of the Nebelivka deposits were 'death assemblages' rather than a direct reflection of lifeways complicates the assessment of the scale of production. Does the small number of bone tools mean few were produced or few were discarded? Lacking a grasp of the scale of production hinders our discussion of productive specialisation. Moreover, all of the three alternative models feature many visitors to Nebelivka, who may have brought objects with them made in their home community and also taken objects made at Nebelivka away with them. This issue is of particular concern with painted pottery.

These issues leave us with an approach based on the skill levels which can be inferred from the objects themselves. Skilled production in LIGs can be seen in the individual knapping of different projectile points, worked bone tools with the fashioning of various animal tooth ornaments or metalwork in the creation of the gold hair-ornament. It is likely that the paucity of bone, stone and metal objects was related to depositional strategies on what to in/exclude in a house 'death assemblage'.

There were only two examples of specialised production at Nebelivka – the construction of public buildings and the production of painted pottery. The public buildings known as Assembly Houses were made, used and burnt in contradistinction to the usual dwelling houses, perhaps as moveable structures that could be set up again in other places. These structures were, in essence, public buildings with specialised purposes, made by builders with a higher level of skill than those building dwelling houses.

The specialised production of painted pottery at Nebelivka does not depend only on the disputed interpretation of the 'industrial feature' – whether a pottery kiln or a communal cooking installation (Section 4.7.4). Hale's rejection of a number of high-intensity magnetic anomalies at Nebelivka as 'kilns' (see above, Section 4.2) differentiates Nebelivka from the Phase CI megasites of Majdanetske and Taljanki, with their multiple examples of excavated pottery kilns (see Section 6.2). What is important about the Nebelivka painted ware assemblage is the scale of production (higher than for any other material), the complexity of the new *châine opératoire* and the high level of skills shown in the preparation of the clay, the painting and the firing. It is not coincidental that the two examples of specialised production at Nebelivka were often brought together in some of the most spectacular performances made at the megasite – the burning of Assembly Houses, including the Mega-structure.

It is difficult to infer the form or intensity of exchange practices from the scale of deposition of local and exotic, imported flint on the megasite, although there may have been some integration of West-to-East exchanges in three materials – Volhynian flint, manganese pigments for pot-painting and Transylvanian copper. What was important in Phase BII was the regular exchange of low-bulk high-value manganese

pigment to produce trichrome painted wares. Central places such as megasites would have been natural attractors for such exotic materials. The household, or at most Neighbourhood, level seems appropriate for local flint acquisition, with small-scale re-distribution within the Neighbourhood, while Neighbourhoods or Quarters may have acquired black pigments for re-distribution to local potters.

The range of consumption practices discussed for Nebelivka covers individual events by one or two persons or a single household (e.g., small-scale Episodic deposition in the Pit, Sondazh 1) up to large-scale depositional events involving many households – perhaps an entire Quarter – when it came to the burning of the Mega-structure. It is hard to describe any of these depositional events as 'specialised' – rather, the cumulative scale of the practice could have involved many people in the materialisation of the Big Other or it was confined to the iteration and reiteration of the local household ritual *habitus*. Only the largest-scale depositional practices would have constituted novel ritual practices not found on smaller sites and which could have acted as focal points for the development of 'Nebelivka identities'. Confirmation of the Nebelivka 'industrial feature' as a large-scale cooking facility kiln would be consistent with the ceramic and pit depositional evidence for collective consumption events including feasting.

By contrast, the consumption of the dwelling houses at Nebelivka – over 1,000 burnt at temperatures high enough to create a *ploshchadka* – was almost universally a large-scale practice but hardly a specialised one. The communal effort of collecting enough firewood to fill the house and then burn it down unified the residents and their closest kin, friends and neighbours in a ritual practice that not only tied that individual house into the millennial Trypillia tradition of house-burning but also cemented the household into Nebelivka's specific ancestral relations. The appearance of a memory mound in one house-burning out of nine located the household for ever in the Nebelivka landscape, which slowly evolved from a centre for the living into a combination of ancestral site and living place.

These points lead to the conclusion that limited interest groups did pursue specialised production at Nebelivka in two fields – the construction of public buildings and the production of painted pottery – but that the scale of production in other areas, such as lithics, bone tools and metallurgy, cannot yet be established. This should not lead us to the incorrect conclusion that Nebelivka was only a small Trypillia rural village writ large. Nebelivka was so much larger than the usual Trypillia site that it was relationally different in so many ways, leading us to consider its status as an urban place (see Section 6.3). The question of scale was central to the significance of the Nebelivka megasite.

6.1.3 Modelling the Growth of Nebelivka

We have just noted the size and scale of Trypillia megasites. The question of the actual size of their population has produced wildly fluctuating answers for the nearby megasite of Majdanetske (Fig. 6.1). We have characterised the views of those colleagues who have placed estimates of between 12,000 and 46,000 people at the megasite of Majdanetske as 'maximalists' – views which have long typified the debate on Trypillia megasites (see Chapter 2.1). This was a view which we shared at the outset of the Project and indeed for some years later – but which we have felt compelled to abandon. In the same manner as Kuhn's (1970) hypothesis of changing paradigms in science, the paradigm accepted as useful for doing 'normal science' was never able to fit all of the empirical data but these anomalous data were conveniently ignored until they could no longer be sidelined. At this moment, there was the possibility for a new paradigm. We began to accumulate discrepant observations on Trypillia megasites until it became clear that the 'maximalist view' was no longer tenable. We have called this process reaching the 'tipping-point', when the maximalist view could be challenged on no fewer than nine different lines of evidence (Chapman 2017; Gaydarska & Chapman 2016), to which we have subsequently added a tenth (Table 6.2).

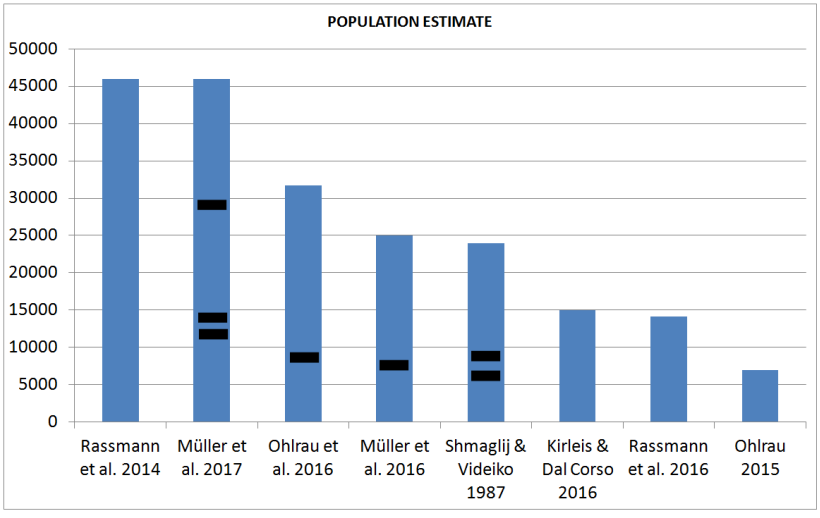


Figure 6.1: Population estimates for the Majdanetske megasite. Horizontal bars show range of population estimates by author(s) (by J. Chapman).

Table 6.2: The tipping-point for the understanding of the Nebelivka megasite (by J. Chapman).

Topic	Problem	Monograph Reference	ADS Archive Reference	Reference
Megasite planning	There is so much variability in the Nebelivka plan at all levels that this does not fit a top-down model; many plan features show a temporality that does not fit with maximum coeval occupation.	4.2	4.2–4.6	Hale et al. 2016; Chapman & Gaydarska 2016
Assembly Houses	The heterogeneity in their size, their spacing and the number of AHs per Quarter indicate bottom-up development; the lack of the materialisation of hierarchy in the Mega-structure.	4.2	4.6	Chapman & Gaydarska 2016
Scalar stress	A large number of coeval houses leads to the problem of four or five levels of decision-making – something not remotely possible in a Neolithic or Copper Age society.			Chapman 2017
Communal cooking	The interpretation of the 'industrial feature' as a large-scale cooking place rather than a pottery kiln is more in line with Neighbourhood communal consumption than Quarter-wide feasting or large-scale pottery production.	4.7.4	5.5	Videiko & Burdo 2016
The absence of hinterland	The absence of fieldwalking scatters indicating small sites within the 5-km radius of Nebelivka and the presence of only a few coeval sites within a 25-km radius shows that Nebelivka had no hinterland – a serious objection to a hierarchical central place, with no small sites to provide logistical support.	3.3, 4.1.1	2.2, 3.4	Chapman 2017; Albert et al. 2019
The agricultural basis	The absence of manuring scatters within a 5-km radius conforms to an absence of arable intensification shown in the low-yielding cereals found during flotation. All these data support Pashkevych's model of inefficient, low-yielding Trypillian agriculture – hardly the basis for huge populations.	5.4	3.5	Chapman 2017; Albert et al. 2019

Continued **Table 6.2**: The tipping-point for the understanding of the Nebelivka megasite (by J. Chapman).

Topic	Problem	Monograph Reference	ADS Archive Reference	Reference
Provision of salt	Modelling of salt requirements for large megasite populations led to estimates far beyond the capabilities of Neolithic – Copper Age transport technology, given the distance of 200–400km from the two probable sources to the megasites.			Chapman & Gaydarska 2003
Resources for house-building & -burning	The assumption of thousands of coeval houses in the closing decades of a megasite would have placed an impossible burden on the forest-steppe for firewood needed to burn these houses: 20 million trees for the burning of 1,000 houses.	4.4	6	Johnston et al. 2019; Johnston et al. 2018
Scale of deposition (lithics, bone tools, Special Finds)	The minimal scale of deposition of a wide range of finds raises the question of the intensity of the megasite occupation, with very few flint and bone tools, in particular, deposited in comparison with the proposed number of houses and people.	5	5	
The Nebelivka pollen core	The expectation of a major human impact on the local environment, as recorded by a sediment core less than 250m from the edge of the megasite, was not met for five measures: deforestation, peaks in agro-pastoral indicators, burning, soil erosion and water quality. The modest human impact signals were dated to before or after the megasite occupation rather than during the dwelling phase.	4.1.1	3.4	Albert et al. 2020

Reaching the tipping-point led to the urgent need for alternative accounts of the megasite phenomenon. It was this process that has led us to three alternative formulations – the Distributed Governance Model, the Assembly Model and the Pilgrimage Model. The choice of three models rather than one, two or five has been explained above (Section 2.1.3).

A full account of each model has already been published. In this section, we present a summary of the models and make an assessment of each model in terms of

the goodness-of-fit to four criteria: the modelled length of the duration of Nebelivka – 200 years; the number of houses built – 1,445; the number of houses burnt down – 1,077; and the absence of a major human impact on the Nebelivka landscape and its forest steppe.

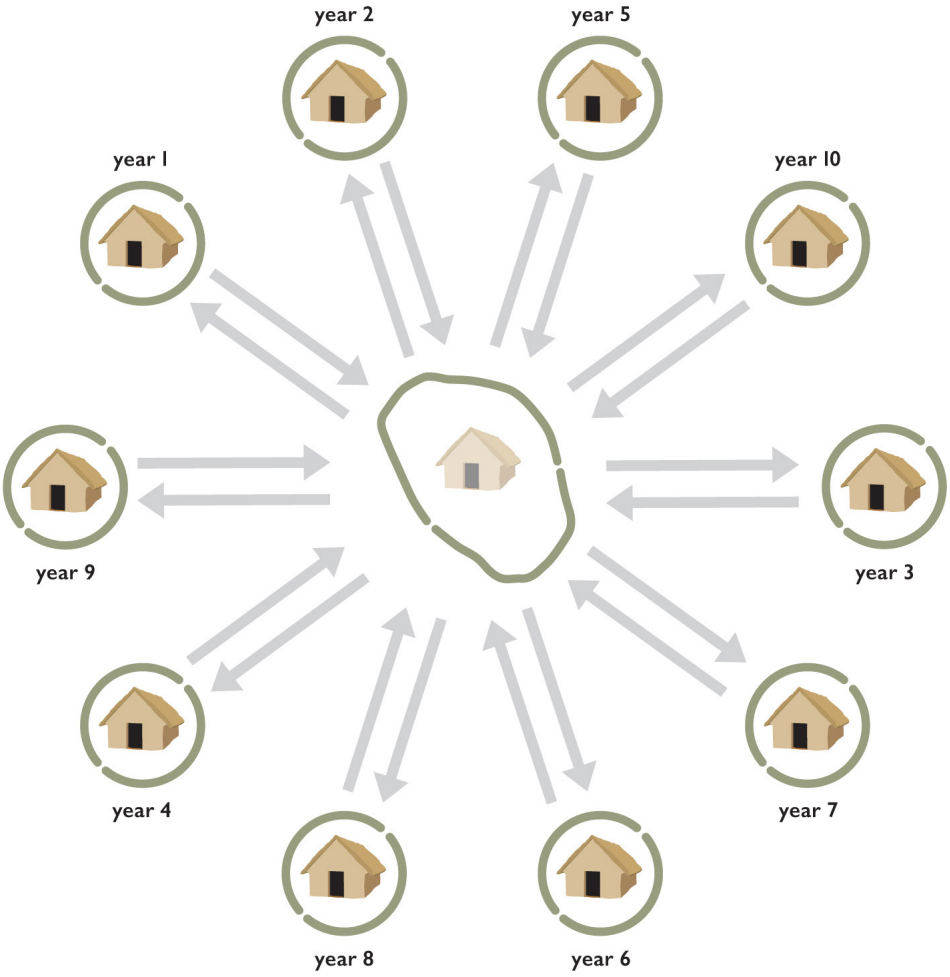


Figure 6.2: The Distributed Governance Model (by C. Unwin).

The Distributed Governance model (Gaydarska, submitted) works on the premise of a permanent but substantially scaled-down contemporary occupation of 400 houses (Fig. 6.2). Members of ten extended kinship groups (clans) occupied 40 houses each at the site, while other members of the same clans were living in smaller sites within the Nebelivka 100-km catchment area. Ten groups meant that there was a 10-year cycle during which each clan was consecutively in power for one year. The group responsible for running the megasite provided food, water and fuel, waste management, the organization of feasts and ceremonies and conflict resolution. The organising clan was strongly supported in this enterprise by their counterparts living in the wider catchment area, namely by supplying regular provisions of grain, timber, salt, meat and milk. The rewards for such responsibilities included the power to make decisions on behalf of the group, to impose policies or sanction free-loaders, as well as contribute to the formation of alliances. But all of the clan members would have benefitted from the greater opportunities for interaction, more frequent access to a wider range of traded goods, meeting relatives married to women in a distant village or just enjoy gossip. Power and responsibilities were not concentrated at one place or vested in one person but shared across a social network based on common descent. The building and burning of seven houses *per annum* would have produced the footprint of 1,450 structures in 150 years that fits well with the current evidence.

The Assembly model is based upon a month-long seasonal aggregation of increasing numbers of visitors at a centre maintained through the year by a small number of permanent occupants (Nebbia et al. 2018) (Fig. 6.3). The interlinked processes of house-building and house-burning were modelled over five 30-year generations in two iterations – Models A and B – with the latter showing the highest number of houses occupied in the fourth generation and a steep decline in the last generation. The continuous increase of the index showing the proportion of houses occupied over two or more generations underlined the importance of the local 'built heritage' at Nebelivka, while also suggesting that visitors continued to come from the same or related small sites throughout the life of the megasite. There was a tension between the 'local' identities of visitors from many small sites and the 'central' or 'Nebelivka' identity which was dominant at the time of the assembly and which sustained the development of a regional political unit to create and run the seasonal assembly. The assembly model created a place of such scale that, in relational terms, dwarfed all other Trypillia settlements, leading to its seasonal functioning as a local city.

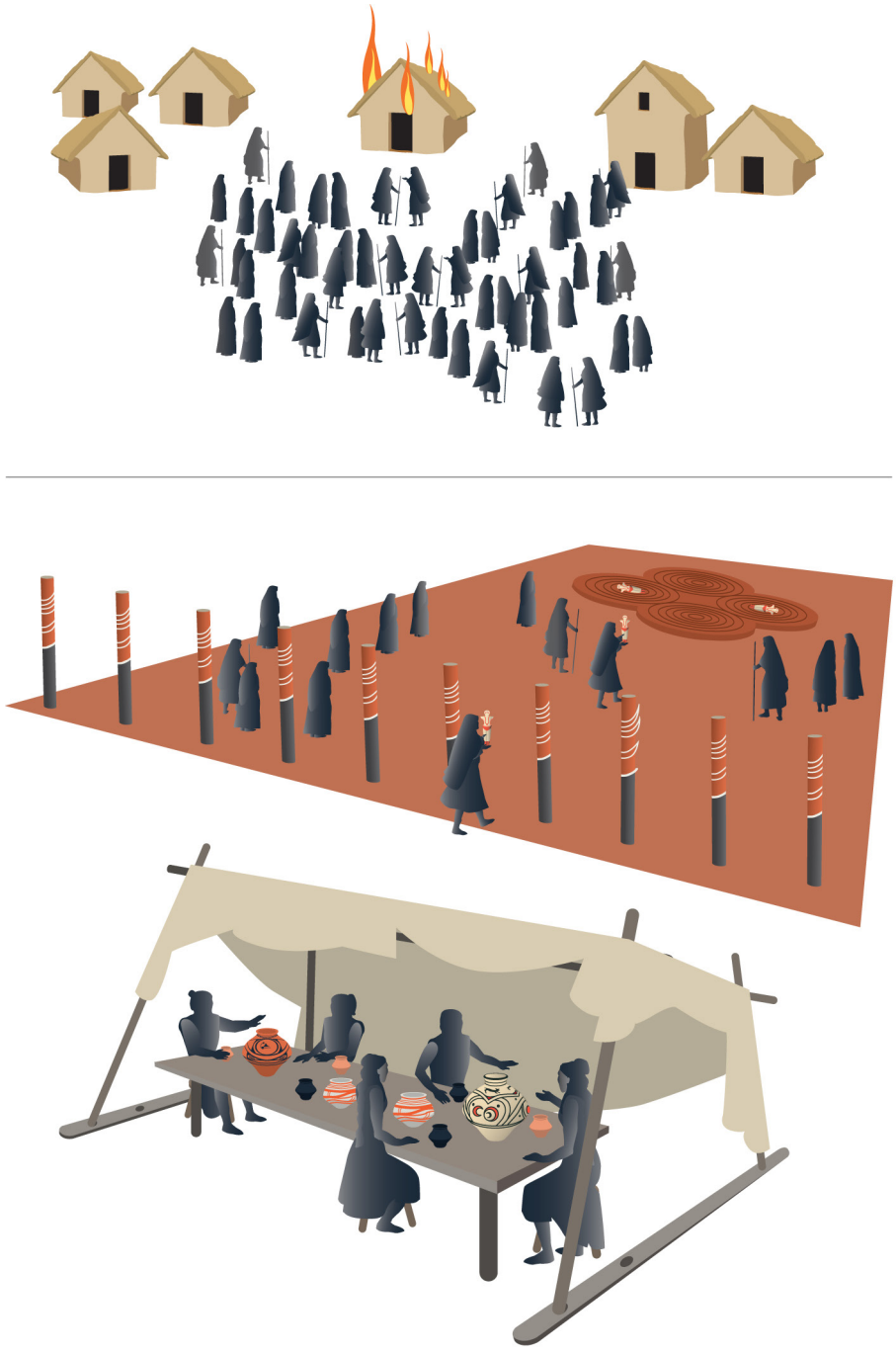


Figure 6.3: The Assembly Model (by C. Unwin).

The Pilgrimage Model considers a concept hitherto rarely developed in prehistory – the megasite as a pilgrimage centre (Chapman & Gaydarska 2019) (Fig. 6.4). This model is based upon extensive pre-existing social networks linking sites across regions, as well as on the ubiquitous shared symbolic order of the 'Trypillia Big Other'. Following on from the assemblies of the earliest megasites (Phase BI), pilgrimage centres were selected for a range of different reasons by ritual leaders who became 'site guardians'. It was these guardians who prepared the ground, organised the large-scale woodland management necessary for initial house-building and negotiated with other settlements for major contributions to the construction of the site. The life of the pilgrimage centre was divided into two stages – an initial stage in which the skeleton of a site structure was constructed in two years, and a later stage, in which house-building and -burning proceeded at a much slower rate, with variable numbers of pilgrims visiting from sites within a 100-km radius for one month within a pilgrimage season of eight months. The pilgrimage centre was controlled by the site guardians, who were initially Nebelivkans but who may have been gradually replaced by non-locals in later generations. The pilgrimage model claims to be capable of explaining many of the key features of the megasite plan.

6.1.3.1 Assessment of the Models

In assessing the three alternative models, we should bear in mind that no Trypillia groups had ever created such a large site before, or integrated all of the pre-existing planning elements into a single, coherent settlement plan. It is hard to factor the significance of improvisation and flexibility of planning into these models but this must have been an important characteristic of the successful outgrowth of any model. It is important to note that the successful maintenance of any of the models would have created an alliance between the residential centre and those living on other sites outside Nebelivka – potentially at the regional level but possibly stretching even further. The location of Nebelivka at the heart of such a regional alliance would have increased the megasite's reputation and made it a political centre of some significance.

While two of the models – the Distributed Governance and Pilgrimage Models – were found to fit the three requisite criteria in their first iteration, the Assembly Model required a second variant before a good fit was found. In Model A, a multi-focal, low-growth version starting off in only one Quarter and with a low percentage of new houses and a low house abandonment rate failed to reach the requisite number of 1,445 houses in the Nebelivka footprint. This led to the rejection of Model A. However, building in a faster growth rate into Model B was achieved by settlement starting in four Quarters and with double the percentage of new houses than in Model A. This Model reached the desired number of new houses by the 4th generation, thus meeting all three criteria (Nebbia et al. 2018).

Figure 6.4: The Pilgrimage Model (by C. Unwin).

Table 6.3: Model comparisons (by J. Chapman & B. Gaydarska).

VARIABLE	DISTRIBUTED GOVERNANCE MODEL	ASSEMBLY MODEL	PILGRIMAGE MODEL
Spatial development	Inner Circuit built over 5 years in blocks – one block per Clan; later building of Outer Circuit & Inner Radial Streets	Quarter-based: GEN1 + 5 Quarters, GEN2 + 5 new Quarters; GEN3 + 4 new Quarters	Inner Circuit built first in 2 years; slow growth of Outer Circuit from GEN1 onwards; slow growth of Inner Radial Streets from GEN2 onwards.
No. of permanent 'residents'	2,400–3,200, living in 400 houses and divided into 10 Clans	100 in GEN1, 200 in GEN2 and 300 in GEN4	100 site guardians, some replaced each generation
No. of 'visitors'	Food and resources brought in to Nebelivka from Clan territory / settlements	900 in GEN1; 2,400 in GEN2; 3,300 in GEN4.	1,500 builder-pilgrims in Years 1–2; thereafter, maximum capacity of 1,920 pilgrims, varying by month and year
Timing of 'visits'	All through the year, whenever supplies needed	1-month assembly season	After initial construction phase (builder-pilgrims for 8 months p.a.), visits of 1 month for 8 months p.a. for groups of 20–100 pilgrims from any Pilgrim Home Community (PHC)
Trajectory of house-burning	Flat: 7–10 houses burnt (and built) every year, 1 for each Clan; 400 unburnt houses left standing at end	None in GEN1; rises to a peak of 371 burnt houses in GEN4, falling off again in GEN5 to 300	Low in GEN1, rising to just under 300 burnt houses in GEN2, remaining at that level until GEN5; 361 unburnt houses left standing at end
Main threats to human impact and their timing	No particular threat after initial deforestation	GEN3, with 452 built houses and 171 burnt houses (woodland requirement of 6.5km^2 of forest steppe)	Years 1–2, with 381 houses to build; thereafter, minimal because the building and burning was spread over the 8-month pilgrimage season
Extent of woodland management	Vital hazel coppicing and general management of timber before the start, with general management thereafter	Vital hazel coppicing and general management of timber before the start, with general management thereafter	Vital hazel coppicing and general management of timber before the start, with general management thereafter

Continued **Table 6.3**: Model comparisons (by J. Chapman & B. Gaydarska).

VARIABLE	DISTRIBUTED GOVERNANCE MODEL	ASSEMBLY MODEL	PILGRIMAGE MODEL
Discard / deposition	Special deposition / discard reached peak at special 'Change of Clan' ceremonies, with other seasonal events	Special discard, especially of exotics, and intensive discard of fine ware ceramics during the 1-month Assembly period; otherwise, settlement discard	Ritual objects (especially figurines), exotics and intensive fine ware ceramics discard during periodic ceremonies in each month and one major festival p. a.
Extent of specialisation / heterarchy	Each Clan managed the site for one year, drawing on supplies from 10–13 small sites in Clan territory	Tension between the overall 'Nebelivka Identity' and the Identities of the home communities; overall plan organised from top down, but Neighbourhoods and Quarters organised from bottom up; political body controlled only the Assembly time, so heterarchical	Key group of 'site guardians' who made most important decisions about setting up the site and running its large, quick building programme; otherwise, Neighbourhood and Quarter leaders, some of whom would have become 'site guardians' in time.

Key: GEN – generation

Although all of the models met the three criteria, each model has advantages and disadvantages in comparison with other two models (Table 6.3). The Distributed Governance Model (DGM) has three strong advantages over the others – its dwelling permanence, its creation of a reasonably coherent plan at an early stage and its relatively low, steady consumption of timber. The solidity and spacious layouts of the Nebelivka houses would appear to favour permanent dwelling, since it is not clear why such solid houses would have been built for seasonal occupation. The development of the Inner House Circuit as the major structural element in the DGM produced a robust plan but this achievement took five years – longer than the rapid development of the Inner Circuit and the Perimeter Ditch in the Pilgrimage Model. Thirdly, the building and burning of seven houses *per annum* would have consumed an estimated 1.4 million trees from the forest-steppe within a 2km radius of the megasite (assuming the megasite occupied the innermost km ring). Spread over the eight snow-free months, this building and burning programme would scarcely have produced a large impact on the surrounding landscape.

However, there were also challenges for the DGM in terms of the five-year build-up of the initial population, the means of maintaining the clan logistics of supply, the question of how to deal with freeloaders and the operationalisation of a model of social order never tried before. The initial population estimate leading to between 2,400 and 3,200 after five years remains high, requiring major co-ordination between clans. The organisation of a clan whose members were split between their home community and the megasite – with a distance of perhaps 100km – raises questions of leadership and the chain of command, while the continuity of supplies from the home community would have been threatened in times of bad harvest. A robust mechanism by leading members – for example, a Nebelivka Council – involving the principles of the Big Other would be needed at clan level to deter small groups of freeloaders who might take advantage of other clans' logistical supply but who refused to make their own fair contribution. It is accepted that the DGM was, with high probability, an innovative social practice which could have led to local difficulties, if not rejections, especially in the early stages. The concomitant ability to negotiate with a range of community leaders would have strengthened the position of the Nebelivka Council in the DGM.

The terms of the Assembly Model (ASM) stipulated a one-month assembly season and 11 months of small-scale settlement at the megasite by the Nebelivka Guardians. The greatest attraction of the ASM was obviously the one-month assembly which would have formed the highlight of many Trypillia communities' social calendars. Maximum social interaction of all kinds provided the stimulus for visitors to return year after year to Nebelivka, leaving early if meetings went badly and staying if they went well. Feasting, marital exchanges, trading, resolution of inter-village (or inter-village groups) disputes and religious rituals were all potential collective activities that were prioritised in the assembly period. The 11-month period after the assembly time enabled the recovery of both liver and landscape after the hectic, resource-consuming assembly month. In fact, the second advantage of the ASM was that it required the lowest contribution of timber for construction and destruction of all the models – utilising an estimated 1.3 million trees in the forest-steppe, available within 1.7km radius of Nebelivka and closer to home with a 30-year forest regeneration period and if building took place in the remaining seven snow-free months. This remained true even with the peak of house-building in the 3rd generation and the high peak of house-burning in the 4th generation.

However, two significant weaknesses were built into the ASM – a planning issue and the question of maintenance of the megasite over 11 months of the year. The decision to use Quarters as the main planning element in the ASM left the development of a coherent plan until the 3rd generation – far later than in the other two models. It is not altogether clear how decisions were made on which gaps between settled Quarters would next be filled – perhaps this was part of the improvisation and flexibility needed to make the ASM work? The short period of one month meant that visitors to Nebelivka spent ten times more time in their home community than at Nebelivka. This left the intensity of the assembly month as the main time to

create a 'Nebelivka identity'. The Nebelivka Guardians fulfilled the important role of megasite maintenance, including small-scale agriculture and pastoralism for eating and drinking, house repairs and some degree of building as well as the gathering of materials in readiness for the assembly month.

Finally, the Pilgrimage Model (PIM) developed three important advantages to offset its main weaknesses: a rapid route to a coherent settlement plan, a long pilgrimage season enabling the spread of activities over this period and a relatively low consumption of timber for both building and burning after the critical initial construction boom. The decision to create an entire House Circuit and dig the entire Perimeter Ditch provided the level of intensity of ritual action to spread the fame of Nebelivka far and wide (cf. comments on British Neolithic pilgrimage sites: Loveday 2015). Moreover, the rapid construction of two of the main planning elements of the megasite enabled the development of a coherent plan for Nebelivka – something which had never been accomplished before on Trypillia sites. The eight-month-long pilgrimage season meant that far more activities could be completed than in the ASM, with a concomitant gain in strengthening the 'Nebelivka identity' alongside 'local community identities'. Perhaps the ritual ramifications of the pilgrimage season strengthened the Nebelivka pilgrimage identity more than the bonds of the assembly identity. The much slower, more gradual expansion over almost 150 years of the Nebelivka plan to include a second House Circuit and all of the Inner Radial Streets meant relatively little impact on the forest-steppe, with ten houses burnt *per annum* at an estimated annual cost of 2 million trees, collected during each of eight months from 1.2km radius of the megasite. From the prehistorian's viewpoint, there is much to support the PIM which alone can explain many aspects of megasite planning focussed on the practice of processions, including the building of pairs of Assembly Houses, with one AH outside each House Circuit in most Quarters.

The biggest challenge of the PIM concerned the initial two-year phase, with its very high demands on both labour and construction resources. The timber alone would have required clearance of a radius of 2.2km of forest-steppe in the first year and up to 2.5km radius in the second year, with no time for forest regeneration. The organisation of 1,500 pilgrim-builders was also no small task, with the co-ordination of pilgrims from 13 home communities a major social task of persuasion and encouragement. However, a successful two-year construction phase would have created one of the most intensive pilgrimage experiences that any Trypillia group could have experienced.

A second issue for the PIM concerns the number of new houses built by pilgrims visiting for one month but then left unoccupied until the home community's next visit. The regular establishment of agreements between different home communities to share unoccupied houses would probably prevent the PIM from reaching the total of 1,445 houses required in the model.

Another question for the PIM concerns the abandonment of the pilgrimage centre, given that McCorriston (2011) emphasises the great stability of pilgrimage practices. This question will be discussed below (Section 6.1.4) but schismatic behaviour and the availability of rival pilgrimage centres would both have undermined the Nebelivka centre.

It is thus by no means easy to discriminate between the three models and choose one with obviously greater advantages and fewer disadvantages. At this stage, we cannot reject any of the three models and thus our proposal is to leave all three models in play until we can discount any one of them. It is, however, clear that, on some level, while sharing some characteristics, the three models are mutually exclusive and so a decision is ultimately required, if, that is, that ambiguity cannot be tolerated.

We now move to a key topic in megasite discussions and the Project's second fundamental aim – their origins. Just as the three models presented here show striking differences, so it is that a single model of megasite origins cannot fit all three models.

6.1.4 The Origins of the Megasites

There has been a long history of traditional explanations for megasite origins, which have centred on migration and internal or external warfare (see critique in Section 2.1.2). However, an account of the origins of megasites needs to move beyond these traditional factors to examine in more detail the social, settlement and exchange networks into which emerging megasites were embedded.

In a recent paper (Chapman et al. 2019), we discussed the origins of megasites in terms of smaller, long-term occupations or seasonal assembly places, creating a settlement rather than military perspective on origins. Shukurov et al. (2015)'s model of Trypillia arable land use demonstrates that subsistence stresses begin when site size exceeded 35ha. Over half of the sites dated to the Trypillia BI stage – the stage before the first megasites – were larger than 35ha, suggesting that some form of buffering involving exchange of goods for food was in operation. There were two settlement responses to buffering – clustering of sites with enhanced inter-site exchange networks and the creation of megasites. The trend to increased site clustering can be seen over a period of more than a millennium, from Phase BI to CI (Nebbia, Section 3.4; here Fig. 6.5). During this period, megasites emerged not as an alternative to site clusters but **within** site clusters, leading to the question of why megasites were created in such social groupings.

We can summarise the picture of Trypillia settlement at Phase BI/II, before the emergence of the first planned megasites, in the following way. The underlying factor is the pre-existing Trypillia Big Other, which enabled the expansion of networks while being strengthened by those same networks. The three key material traits of the Big Other – the house, the pottery and the figurines – were all demonstrably part of the initial agro-pastoral expansion East of the Dniester valley, proving to be the

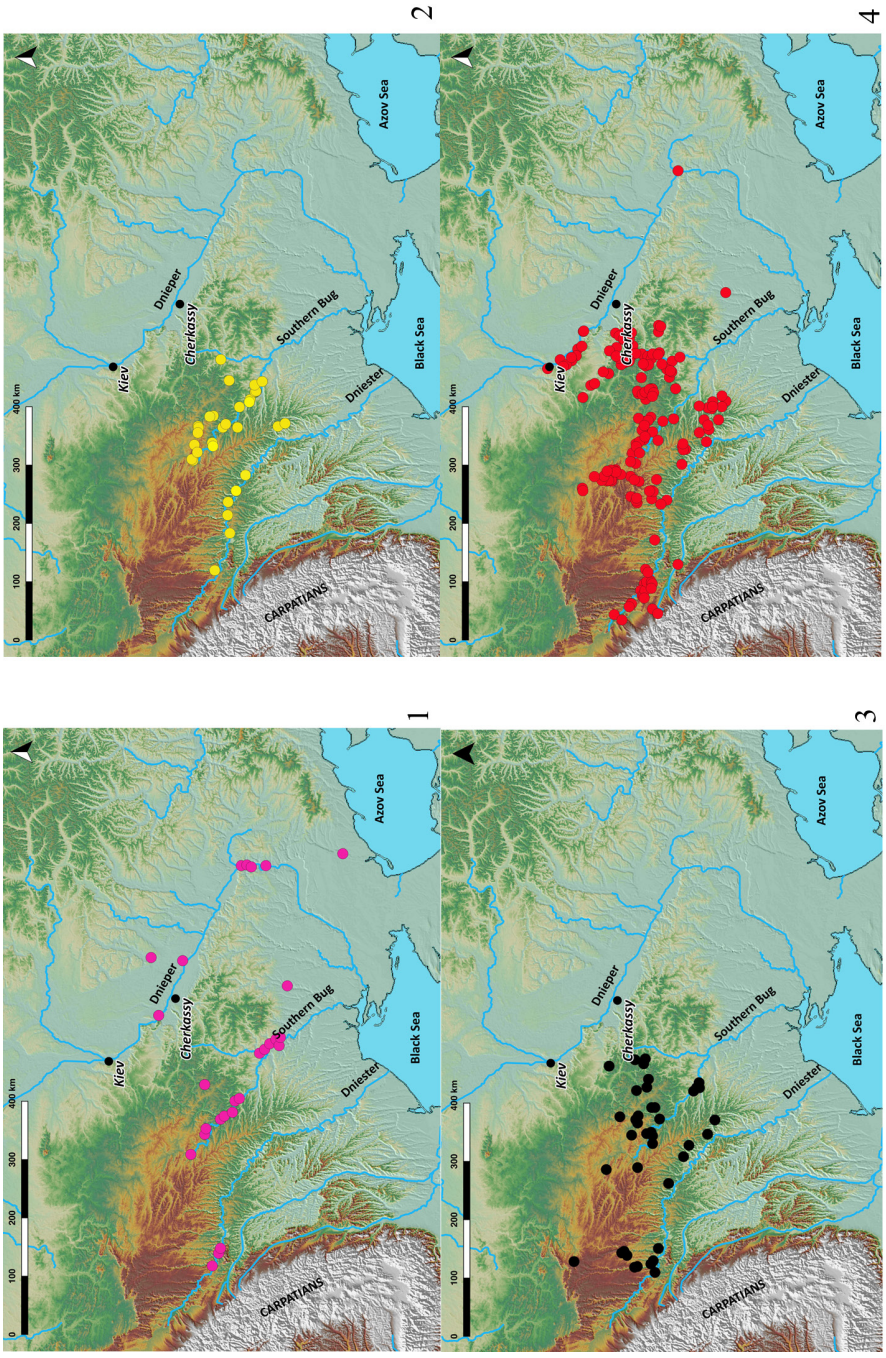


Figure 6.5: Distribution maps of (a) Forest Neolithic and Trypillia (b) Phase A; (c) Phase BI; and (d) BII (by M. Nebbia).

Table 6.4: Early Trypillia settlement plans (by J. Chapman).

Site name	Phase	Size (ha)	Type of Investigation	Reference	Nest(s) of houses	Concentric circuits around nests	Free-standing concentric circuits	Inner radial streets	Division into sectors	Empty inner space	Concentric nests AND circuits
Mogylna 2	A	2	Magnetic	K.ris 2.3, 2.5	Present	Absent	Absent	Absent	Absent	Absent	Absent
Mogylna 3	A	14.5	Magnetic	K. ris 2.7, 2.8	Present	present	Absent	Absent	Absent	Absent	Absent
Stepanivka	A/BI	15	No plan								
Trifaneşti	BI	2.7	Magnetic	K. ris 5.7	Nest in inner area	3 weakly concentric circuits	Absent	Absent	Absent	Absent	Absent
Putineşti	BI	3.1	Magnetic	K. ris 5.8	3–5 nests	Absent	1 outer circuit	Absent	Absent	Absent	Absent
Cobani	BI	4.5	New magnetics	Rassmann et al. 2016 Fig. 16	Absent	Absent	Absent	Absent	Absent	Absent	Absent
Ivanovka	BI	4.7	Magnetic	K. ris 5.16	Central nest + 1 other 'block'	Absent	2 weakly concentric circuits	Absent	Absent	Absent	Absent
Brynzeni-Ostrov	BI	6.2	Magnetic	K. ris 5.2, 5.3	6 or 7 nests	Absent	Absent	Absent	present	Absent	Absent

Continued **Table 6.4**: Early Trypillia settlement plans (by J. Chapman).

Site name	Phase	Size (ha)	Type of Investigation	Reference	Nest(s) of houses	Concentric circuits around nests	Free-standing concentric circuits	Inner radial streets	Division into sectors	Empty inner space	Concentric nests AND circuits
Chyzhivka	BI/II	20–30	No plan								
Tzvizhyn	BI/II	15	No plan								
Singerei	BI/II	22	New magnetics	Rassmann et al. 2016 Figs. 5–6.	Multi-focal plan	Absent	Absent	Absent	Absent	Absent	Absent
Veremya I	BI/II	25	No plan								
Kolomiytsiv Yar	BI/II	30	No plan								
Onopryvka	BI/II	60–80	No plan								
Kharkivka	BI/II	100	No plan								
Vil'hovets II	BI/II	100	Magnetic	Videiko 2004, 99	Several nests	Absent	Absent	Absent	Absent	Absent	Absent
Vesely Kut	BI/II	150	Magnetic	Videiko 2012, ris. 27	Several nests	Absent	Absent	Absent	Absent	Small empty area	Absent
Myropillya	BI/II	100–200	No plan								
Trypillia	BI/II	200	No plan								

Key to references: K – Koshelev 2004.

most attractive elements of Trypillia communities to the Forest Neolithic groups, who produced a limited range of fine wares but lacked figurines and rectangular houses. In comparison to the earlier Phases, figurines in Phase BI/II showed tendencies towards more realistic modelling, with even some portraiture, as well as a greater incidence of painted decoration. The BI/II network brought modest amounts of copper and Volhynian flint from the Western CT area into settlements which, by Phase BI/II, had grown to 100ha and, in the case of Vesely Kut, 150ha. All three large sites were found in the **same** site cluster, located in the small Northern tributaries of the Southern Bug but with access to the rich chernozem soils of the interfluves. While some elements of what would become central elements of Phase BII megasite planning (concentric house circuits, sectoral growth, Assembly Houses and open inner areas) had already developed by Phase BI/II, they were not apparent on the very large sites and no site showed more than a single 'advanced' planning element (Table 6.4). What socio-cultural changes stimulated the growth of the planned megasites?

A key aspect of megasite origins concerns their temporality – whether they are conceived of as permanent settlements or seasonal assembly sites. This debate concerns Neolithic and Chalcolithic sites in many parts of Europe – not just Ukraine (for the Balkans, see papers in Bailey et al. 2005). The expansion of remote sensing research in Central and Eastern Europe since the 1990s has brought to the fore previously unknown classes of enclosed sites, especially the *Rondel*, which can be seen as a seasonally occupied ritual assembly site (Bertok & Gáti 2014) (here Fig. 6.6). It is thus hardly controversial to suggest that some Trypillia sites may have been seasonal assembly places rather than long-term permanently occupied settlements. However, the three alternative models that we have developed for the Nebelivka megasite include both a model with permanent occupation and two models focussed on seasonal assembly places. The vast majority of these assembly sites was laid out around an open inner space that acted as the ritual core of the site and which was intentionally created from the outset. Each alternative model would need to account for the significance of the inner open area that was central to the Nebelivka megasite, whether it is a model with permanent occupation or a model focussed on a seasonal assembly place. Any account of megasite origins must take into account both forms of temporality. We begin with the permanent, Distributed Governance model.

The idea to develop a megasite in a special place was predicated upon the occurrence of prior gatherings in that place, which drew not only on a widespread settlement network but also on pre-existing site clusters. For Distributed Governance, the decision to make a megasite as a more permanent arrangement in such a place was an agreement made by the whole network, as mediated by representatives of the many home communities who would settle at the megasite, and was based upon the greater potential for meetings, exchanges and ceremonies than was available in the home communities. This act had five implications. The first was to consolidate alliances between those clans participating in the megasite dwelling, bringing those groups closer to each other than to other neighbouring clans. Secondly, the permanent

arrangement led to a more formalised site plan which, in turn, supported the idea of a community identity. Thirdly, a system of what may loosely be described as 'tribute' needed to be put in place to provide subsistence resources for the megasite in the social context of heterarchical organisation. The early megasite community derived several benefits from these new lifeways: increased place-value accrued to the locus of the megasite as a result of recurrent visits to what gradually became an ancestral place, leading to the rising importance of places where large gatherings were held and the flexibility of making decisions at the most relevant and effective stage of the annual cycle, rather than being postponed or limited to the season of occupation of a less permanent settlement. Fourthly, the unprecedented scale of exchange occurring on such early megasites led to cumulative social advantages for those dwelling on such sites. And fifthly, the combination of the traditions embedded in the Trypillia Big Other with innovations in planning and pottery production led to highly desirable lifeways that many other home communities would wish to emulate. The sum total of these advantages led to the attraction of the megasite lifeways to a wider pool of people living in the extended Nebelivka network of 100km radius.

The origins in the other two, seasonal models – the Assembly Model and the Pilgrimage Model – incorporates elements from Kopytoff's (1987) African frontier model of colonisation. In this model, Kopytoff sought to develop an alternative to the linear model of North American East-West colonisation – one that fitted the mosaic character of African settlement. Thus, he emphasised the social primacy of the first settlers in evolving lineage relations over secondary settlers and *their* relative superiority over still later settlers. This relational model seems highly relevant to the spatial development of early megasites.

In both of the seasonal models for Nebelivka, the organisational role for the megasite Guardians – people who represented and acted for their home communities in the evolution of early megasites – was more important than in the Distributed Governance model. This group of up to 100 people founded the megasite, chose the promontory for settlement, laid out the basic outline of the plan, began the programme of woodland management that enabled building at the requisite large scale, maintained a distinctive form of Trypillia Big Other and negotiated with the members of surrounding small Trypillia settlements to contribute to the take-off of the Nebelivka centre. While the Guardians formed a corporate group composed of members of different lineages and various Trypillia home communities, their identity as a founding group would also have provided individual Guardians with opportunities for preferentially different kinds of interactions with visitors, whether in exchange or ritual practices. These interactions would have led to the formation of alliances between Nebelivka and the most regular visitors and their home communities. In this way, there was the potential for heterarchical differentiation between the Guardians, as a group and as individuals, and early visitors to Nebelivka who settled there in the 1st Generation. The residential area for the Guardians was likely to have stood apart, or been differentiated, from other early houses in the Neighbourhoods or Quarters

and it would have been to the Guardians's area that leaders from other Trypillia home communities would have arrived to discuss how to join the Nebelivka centre. Thus, the social network of the Guardians would have been wider than any later group's network. The overall advantage from these opportunities would have motivated the site Guardians to make a success of the megasite.

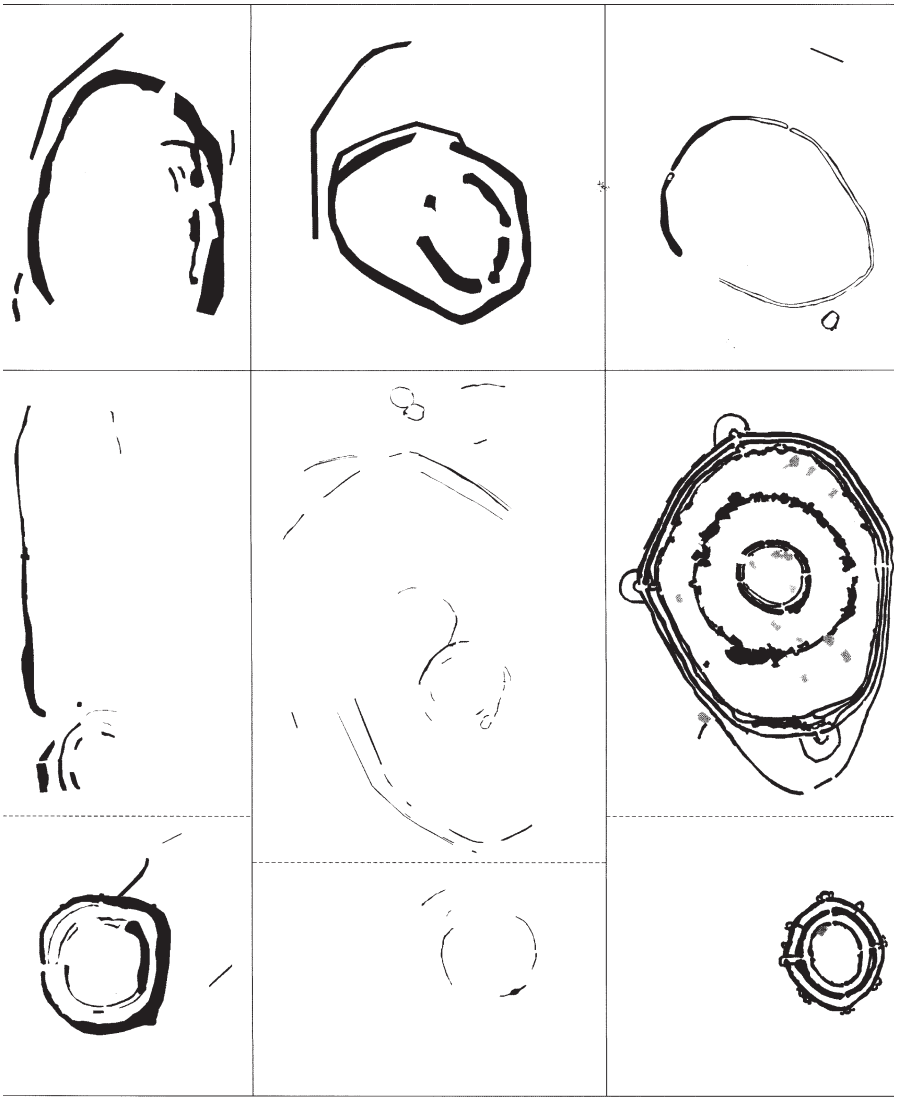


Figure 6.6: Lengyel enclosures and *Rondels*, South-West Hungary (after G. Bertok & Cs. Gáti 2014, Fig. II.89).

However, there were limits to the extent of power differences between Guardians and later settlers, whether because the Guardians became numerically less important with each successive generation, because of the traditional ideology of limiting material differentiation or because excessive differences would have discouraged new home communities from joining the Nebelivka centre. As in Kopytoff's model, the first generation of settlers at Nebelivka was therefore in a subordinate lineage position to the Guardians but were closer to the ancestors and the Guardians than the settlers of Generation 2, and so on. Every successive generation of settlers was equal but some were more equal than others. Complex heterarchical relations of precedence and subordination were developed and played out across the megasite, partly through the locations of households in Neighbourhoods and Quarters and partly through supra-household practices such as feasting and pit deposition. One visual marker of distinction was the memory mound that appeared at one out of nine house-burnings, which materialised the role of key ancestors in local mental maps in the different sectors of the megasite. Another important sense which changed properties in time and space was sound. Whatever chants, songs, music or rhetorical performances comprised the assembly events and processions, their audial execution and perception perhaps changed very little from generation to generation.

We now return to a discussion of the key innovations in production, distribution or consumption that shaped the early development of the megasite for each of the three models. The key innovation concerned the introduction of painted pottery, with changes in the importance of animal husbandry also found. It is important to note that, while major changes were apparent in one aspect of the Trypillia Big Other (pottery), there was relative stability in the other two elements of houses and figurines.

The painted pottery that gradually replaced incised fine wares in the Southern Bug-Dnieper Interfluve introduced one of the biggest changes in the Trypillia Big Other in Phase BII. Not only did this mean a new mode of decoration but also a new and much more extensive range of decorative motifs applied to a different suite of vessel forms in which painted decoration was often the *only* decorative style for many shapes. This meant that painted vessels would come to dominate the visual world of the household (Figs. 5.4, 5.16–5.18). But there were also implications for the entire *châine opératoire* of making painted vessels, starting with the kinds of clay which could be used for the new, finer vessel surfaces but also the procurement of pigments for the red and black motifs and the requirement of better controlled and higher firing temperatures. These unintended consequences of the adoption of painted wares as the fine ware of choice led to profound changes in Trypillia lifeways, themselves leading to entangled organisational changes (cf. Hodder 2012) with yet further ramifications in Trypillia settlements. Thus the acceptance of the new painted ware style had a transformational effect on the megasite and its relations with other, smaller sites. Four key inter-linked changes can be noted.

First, the higher quality of painted wares led to a differentiation in the traditional method of household production, with skill differentials in forming

vessels – especially very large plates and storage-jars (Fig. 5.1) – and the design and realisation of large painted scenes much larger, more complex and less repetitious than on incised vessels (Ryzhov 2000). The emergence of potters with higher skills in forming and painting led to specialisation – not necessarily full-time – but certainly leading to the creation of a Limited Interest Group with similar skills and connections between Trypillia sites. Secondly, while local iron oxides were available for red and yellow pigments, black pigments were made from exotic manganese, probably from the Eastern Carpathians but possibly from other, remote sources – requiring an expansion of the exchange networks already delivering Volhynian flint and salt. Any small Trypillia settlement desiring trichrome painted vessels would have needed to participate in this extended network and it may well have been easier for such sites to procure manganese from a well-known local central site rather than negotiate a place with strangers in an extended network. The use of manganese provided the potential for local site differentiation in network linkage, with the greatest opportunities most probably falling to the emerging megasites. Thirdly, as Ellis observed long ago (1984), the increased size of storage-jars enabled a new scale of food storage which offered subsistence buffering for large sites. But, just as importantly, the parallel innovation in large plates expanded the potential for communal food consumption over the opportunities supported by the small to medium-sized bowls and dishes of the Phase BI fine wares (Palaguta 2007, Fig. 7). This in turn opened up new possibilities for feasting at both household and wider scales, with significant impacts on animal keeping. Fourthly, the quality of the new painted wares created a different class of material – so plentiful that it could not be classed as 'elite' or 'prestige goods' but distinctive enough to be considered as 'fine products' which developed special roles in many social practices. This distinction enabled painted pottery to develop opportunities for identity-formation in depositional practices such as house-burning and pit deposition.

In summary, changes in pottery making, use and deposition offered opportunities in differential, specialised production, access to widespread exchange networks and new consumption patterns and depositional practices which were by no means inevitable but, if they developed anywhere, would have been most likely to have appeared at megasites.

Elsewhere (Chapman et al. 2019), we have referred to these developments in settlement planning and pottery production as examples of *bricolage* – an anthropological term signifying the construction or creation of a work from a diverse range of things that happen to be available (Levi-Strauss 1962; Derrida 1970). We consider the integration of the different plan elements into a coherent, overall plan to parallel the assembly of different elements of pottery-making to produce the distinctive Phase BII painted style as two critical bricolage-led contributions to the emergence of megasites. It was the sea-change in the integration of practices at megasites – both in site planning and in pottery-making – that enabled scalar transformations in the

quantity of people involved, the quantity of material involved and the quantity of house-building and -burning involved.

A further change may well have developed from the bottom-up – changes in animal keeping. Orton (see above, Chapter 5.3) has proposed that the preference for domestic over wild animals was as much a spatial as a temporal trend, with Eastern (Trypillian) sites often selecting more than 90% domestic animals by Phase BII. This greater control over animal keeping would have developed at the household level, with preferences for cattle over caprines and pigs for larger sites with wider-scale feasting opportunities. The 100kg of meat available from a single sheep could have been consumed in a small site's feast for 200 people, whereas slaughtering a bull to produce 350kg of meat would have been (literally) overkill for a small site! However, visitors to Nebelivka could have readily brought live animals to the megasite (Halstead's (1982) 'storage on the hoof') for contributions to feasting on a far wider scale of potentially hundreds of people. The deposition of more cattle than caprine bones at megasites makes sense in terms of feasting logic. One of the greatest attractions of a megasite was the increased scale of interaction, not least at feasting events.

Yet quantitative scaling-up was not universal in the new world of Trypillia Phase BII megasites, where continuity in many social practices can be observed. There is no sign of change in the scale and efficiency of arable production at this time. House design and size hardly changed at all in Phase BII. Equally, the frequency of figurine production, once corrected for excavated area and settlement size, remained just the same in the megasites as in earlier and smaller sites (Gaydarska 2019), although most figurines were now made from the same paste as painted wares, sometimes with realistic painted faces, body parts, clothing and ornaments and occasionally portraits (Monah 2016) (here Fig. 2.3). It is likely that the increased similarity of most Phase BII figurines is related to the creation of a Limited Interest Group for figurine-makers (cf. Orphanides 2010). The Trypillia Big Other may have changed through the introduction of painted pottery but other aspects remained broadly the same. Moreover, declining deposition marked Phase BII in the two areas of lithic and copper production. Kiosak (Chapter 5.2.5) emphasises the small size of lithic assemblages found on Phase BII–CI sites, including Nebelivka and Taljanki, relative to the large number of lithics deposited in Phases A and BI. Two traits characterise the Nebelivka assemblage – an efficient and often skilled production of lithic items, including re-sharpening and re-working, and a diversity of knapping styles for the same lithic type which does not fit greater specialisation or centralisation of production. Once again, the household basis for lithic production could well explain both of these patterns, with members of a Limited Interest Group of flint-knappers making projectile points in a variety of styles (cf. Wiessner's (1983) San points) and repairing flint tools as often as possible.

Ryndina (1998) envisages copper metallurgy at two scales – clan and household, with a chronological development. In Trypillia Phase A & BI, clan specialists moved between various settlements while, from Phase BI/II onwards, specialists settled in

specific villages, developing greater skills in the Cucuteni zone. Again, the notion of a Limited Interest Group for copper metallurgists would cover both phases of the Ryndina sequence. The small number of copper objects deposited on Phase BII and CI megasites (including one axe at Majdanetske (Ryndina 1998, Fig. 66/6), one awl at Taljanki (Ryndina 1998, Ris. 66/12) and no copper finds at all at Nebelivka), as well as on other, smaller sites, is also related to continued working of increasingly small copper items (Greeves 1975) but perhaps more to Taylor's notion of lateral re-cycling by which damaged copper items are melted down and re-fashioned rather than being deposited in special places (as in the Phase A hoard of Karbuna). This practice reminds one of Annette Weiner's (1992) famous phrase used to describe Melanesian exchange – 'keeping-while-giving', in which the most important objects are not exchanged but kept in the household as a key element of its ritual identity. In the megasite case, copper items were perhaps not even brought for display to Nebelivka but retained in the smaller home communities as ancestral items. Whatever the exact mechanism for preventing the deposition of copper goods, the pattern is diametrically opposed to the lavish metal deposition occurring in cemeteries such as Varna and Durankulak 500 years earlier (Higham et al. 2018).

We have seen how a series of structural changes in Phase BII Trypillia society could have benefited the original megasite settlers more than later arrivals, to the extent of their strong commitment to megasite success. But there is still a residual concern that these structural changes were necessary but insufficient factors in the emergence of these extraordinary sites. It is hard to envisage the scale of social interaction at an early megasite, with visitors meeting people from 30–50 home communities whose previous face-to-face engagement had been limited. In return for commitment to corporate projects (ditch- and pit-digging, the gathering of materials and house-building), early residents participated in an unprecedented range of special events, from 'local' Neighbourhood pit deposition and feasting to annual 'global' celebrations of the megasite itself. There was an element of success feeding success, with tales of the events, their scale and magnificence, spreading through the Trypillia network and attracting more and more people to visit the megasite for themselves. The stimulus of the megasite community for the creation of alliances made Nebelivka and other early megasites such special centres. Thus, the megasite developed an internal network of special places, including houses, Assembly Houses and pit clusters, where memories of past events fuelled repetition, elaboration and differentiation. It was this upward trend of alliance-formation and diversification in meeting that was the spark leading to the emergence of megasites.

6.1.5 The Demise of the Megasites

Turning to the demise of the megasites, the first point to note is that we can observe at least three cycles of megasite foundation and decline – in Phases BI–BI/II, BII and CI.

Any explanation of megasite demise should pay attention to the revival of megasites except in the final cycle. The second point to note is that the collapse of the largest Trypillia sites was not the same process as the demise of the Trypillia group *tout court* (Diachenko 2016a). Current AMS dating suggests that the latest Trypillia communities survived the fall of the megasites by many centuries – perhaps 600 years. In an article entitled 'Small is beautiful', Diachenko (2016a) is surely correct to characterise the latest (post-megasite) settlements as much smaller than the megasites, even though sites larger than 70ha were occasionally found even in the CII phase (e.g., Kosenivka and Kocherzhyntsi: Videiko 2013, Tab. 4). The third point is that, although the dating of the latest Trypillia sites shows contemporaneity with the earliest barrow construction on the North Pontic steppe (Ivanova 2014), even the earliest barrows were not coeval with the latest megasites. These were two separate demises and cannot necessarily be explained by the same processes of change.

We have already considered the traditional reasons proposed for the demise of the Trypillia megasites – external or internal invasion, environmental collapse and socio-economic changes (see critique, pp. 25–26). How can the demise of the Trypillia megasites be explained in the context of the three alternative scenarios of less intensively occupied megasites with lower, perhaps seasonal populations and far lower tendencies to reach the local carrying capacity? We can identify three key factors in any account of the demise: personal or small-group agency; shifts in social networks; and the availability of alternative assembly places.

Small-scale agency at the individual or small-group level was vital for the success of a permanent DGM, an assembly site with meetings in one month *per annum* or a pilgrimage centre with a longer season of eight months *per annum*. A negative scenario can be proposed for each model. For the DGM, the inability of a home community to sustain the additional demands of megasite provisioning, perhaps owing to a succession of poor harvests and negative family growth, would threaten the model. For the PIM, a crisis of legitimacy causing families or whole communities to abandon the pilgrimage centre could threaten the PIM. For the ASM, a succession of assemblies dominated by tensions rather than good times could undermine the model. Each of these negative scenarios shared two key features – they started off small and spread to wider social groups and different communities and their effect took several years/seasons to provoke change. Even the *modus operandi* of smaller megasites than those envisaged by Müller & Rassmann (2016) were subject to vulnerabilities which could not be overcome by social formations comprising many communities, depending upon widespread consent, supported by the Big Other and with little or no permanent hierarchy. This form of explanation is potentially applicable to all megasite cycles.

The social networks underpinning megasites as assembly places of one kind or another were in as much need of successful interactions at the central sites as the central sites needed strong and stable exchange networks. One material which was not so dependent upon exchange was metal (mostly copper and occasionally gold), because of its potential for what T. Taylor (1999) calls 'lateral cycling' – the melting and

re-shaping of existing copper objects into 'new' items. The discovery and exploitation of local lithic sources meant that although, in theory, there was no need for exotic Volhynian flint, in practice there would have been a high status attached to the acquisition and use of exotic lithics. Any major fluctuations in supply of exotic lithics may have created an issue but variable provision of manganese for pot-painting would have created a much more serious problem – leading to major depositional changes and perhaps the switch to incised fine wares, so widespread in the Eastern Trypillia group. Such fluctuations could well have impacted on the stability of the Big Other, which in turn may have affected the functioning of exchange networks. Both of these mutually amplifying threats would have posed problems at the major assembly sites where exchange and ritual deposition were vital for social reproduction. However, such fluctuations were not necessarily permanent, with recovery within a generation, but could have caused the abandonment of megasites until a new cycle of megasite construction. The final decline of the exchange network would have been so serious as to threaten the stability of the latest megasites.

The third factor militating against the stability of any single megasite to contain its problems was the availability of alternative assembly places to which people could have moved. The AMS dates for the start of dwelling at Majdanetske and Taljanki estimate 3850 BC (at 68% probability) for the former and 3830 BC for the latter (Fig. 4.63/4). This means that both of these megasites started at least a century after the start of Nebelivka and overlapped with Nebelivka for 80 years (at 68% probability: Majdanetske) and 60 years (Taljanki). Thus there were two alternative megasites to attract dissatisfied or dissident members away from the Nebelivka community. Such possibilities opened up new alliances for people prepared to risk the unknown positive and negative consequences. The severity of the problems besetting the Nebelivka centre, whether small-scale local decisions and the wider-scale problem of discontinuities in exchange networks or indeed the undermining of the Big Other, determined a response from the Nebelivka network. One response was the attempt to solve 'global' and 'local' difficulties because there were no other megasites to move to. But if there were alternative assembly places, the principle that 'the grass is always greener on the other side' may have come into focus and prompted small groups to try out either Majdanetske or Taljanki. A cumulative consequence to this scenario would have led to the weakening and ultimate collapse of the alliances on which the Nebelivka megasite depended over a period of decades. Although leaving open the question of how and why the last-surviving CI megasites collapsed or declined (see Section 6.2), this proposal could explain the demise of megasites in earlier cycles.

In summary, the traditional explanations for the demise of the megasites remain unconvincing, not only because of their reliance on highly questionable maximalist assumptions, but also because there has been little detailed palaeo-environmental modelling on which to base arguments about the unsustainability of the megasites. Social explanations have begun to gain traction, with the alternative modelling of

the megasites as smaller and sometimes less permanent and seasonal offering more appropriate accounts of megasite decline and fall.

6.2 Megasites – a Comparative Approach

6.2.1 Introduction

The investigation of Trypillia megasites has been patchy in the extreme, with detailed, inter-disciplinary investigations at the sites of Taljanki and Majdanetske and a much lower research input at all other megasites. For that reason, most of the comparative attention in this section will be devoted to Taljanki and Majdanetske, for whom data has been published in contrasting ways. The Taljanki excavations have been published in a series of annual reports which, despite the variable level of details from volume to volume, provide a good start for assessment of the data (Kruts et al., 2001, 2005, 2010, 2011, 2013). By contrast, the excavations at Majdanetske have been published in a series of general overviews, the most comprehensive of which is Shmaglij and Videiko (2001–2) – an excavation report offering a more holistic insight into the functioning of a megasite. Both ways of presenting the data have their advantages and disadvantages; the best approach might have been a combination of detailed annual reports, complemented by summaries and syntheses. More recently, both sites have been highlighted in the EAA volume on Trypillia megasites (Müller et al. 2016), where there are excavation reports on the Ukrainian-German research at Majdanetske and other chapters referring to the geophysical plan and excavation of kilns at Taljanki.[100]

A comparison of the ceramic finds from Taljanki and Majdanetske with those of Nebelivka has already been made (see Section 5.1.4). The main findings were the differences in daily practices that resulted in contrasting burnt house ('death') assemblages at the three sites – all of which comprised pottery deliberately placed (? staged) before the burning of the house. This finding is reinforced by the contrasting open to closed vessel ratios found at the three sites, with collective consumption materialised more often in Nebelivka and Taljanki than in Majdanetske. Both Nebelivka and Majdanetske showed varied pit deposition but shared some large-scale events.

We now turn to megasite planning before a consideration of the resource base of the megasites, whether daily resources, including plants, animals and salt, or house-building and -burning resources.

100 We note some different views on the modelling of Majdanetske in a recent paper from the Kiel team (Dal Corso et al. 2019), which move closer to our position on some points on house construction and -burning but not others.

6.2.2 Megasite Plans

Both Taljanki and Majdanetske have been partially surveyed by cesium magnetometer, with claims that 70% of the settled area in Taljanki has been surveyed, while, for Majdanetske, this figure varies from 65% (Ohlrau 2015, Table 2) to 79% (Rassmann et al. 2016, p. 39).

6.2.2.1 Taljanki

There are some uncertainties about the size of Taljanki (320 or 340ha) and the number of burnt houses (1,335 or 1,370), which probably reflect the variability of the boundary between settled and unsettled area, as well as a clear cut-off point of what is/ is not a burnt house (Fig. 6.7). In any case, the burnt houses in Taljanki were more numerous than at Nebelivka in both absolute numbers and as a percentage of all dwellings. However, given that Taljanki was almost 50% larger than Nebelivka, such figures should be considered from a different angle. If the un-surveyed area is taken into account, it is possible that the total number of Taljanki houses will rise to 2,000–2,200 (Ohlrau et al. 2016, p. 207). This will be again ca. 50% more houses than at Nebelivka, suggesting a consistent pattern of keeping house density between 5 and 6 per ha and pointing to overall continuity in settlement planning between the two megasites. Another line of evidence showing the two megasites' similarity is the location of most radial streets in the Northern part of each site, with a square, converging streets, streets 'running into' circuits and blocking streets seen at Taljanki (Ohlrau 2015, Abb. 34). The incompleteness of the Taljanki plan does not allow the adoption of the nine criteria used in Nebelivka for the separation of Quarters but a formal computation has identified large numbers of house groups that broadly correspond to the category of 'Neighbourhood' in Nebelivka, whether 200 (Rassmann et al. 2016, Fig. 15) or 302 (Ohlrau 2015, Table 5 and Abb. 47). The range of houses in the Taljanki house groups was broadly comparable with the Nebelivka range – two to 30 at the former, three to 27 at the latter.

Another similarity between Nebelivka and Taljanki is that the large houses in the latter were primarily found in the Outer Circuit, with house sizes in the Outer Circuit in Nebelivka peaking at 66–75m^2, comparable to a mean house size of 72m^2 at Taljanki. Thus, there are several lines confirming the shared planning aspects of the *habitus* between Taljanki and Nebelivka.

A number of tracks has been identified at Taljanki, which, together with the claimed eight entrances, suggests high accessibility and refutes the possibility for a defensive function (cf. above, p. 127). Rather, the huge open (public) space points to high permeability and an emphasis on assembly, with a variety of sacred and profane uses (Smith, M. L. 2008).

The minimum distance between houses at Taljanki was 3m, while the maximum was 305 m. This once more confirms that, within an overall integrated planning, there was also a great degree of variability that was a result of bottom-up growth rather than the replication of ready-made modular plans. Although 3m left enough space for movement, houses built at odd angles to standing structures would have blocked views and constrained various outdoor activities. It would have made much more architectural, visual and phenomenological sense if structures at odd orientation to each other were built at different times, whereby the ancestral space of where once a house stood was respected and not over-built. Interestingly, this was exactly the opposite on tells, where over-building emphasised the incorporation of ancestral identity (Chapman & Gaydarska 2018a). Converging streets and blocking of radial streets undermined the premise of careful planning that has been often cited as evidence for contemporaneity. Thus, either there was not careful planning – which is doubtful given the experience of constructing large sites accumulated to this point – or there was a certain temporality involved in the Taljanki planning. However, claims for coeval use of all burnt houses continue unabated (Ohlrau et al. 2016, p. 207).

A significant difference from the ancestral pattern in Nebelivka was the almost complete lack of Assembly Houses at Taljanki. Two larger than usual houses were located opposite gaps (entrances) in the outer circuit in the Northern and Southern part of the site (Ohlrau 2015, Abb. 42) – locations echoing the position of the Mega-structure at Nebelivka at an entrance but within the inner circuit. So although there were certainly differences in the architecture and location of these large houses, there was also a memory, albeit distant, of an ancestral pattern, showing the combination of tradition and innovation. This structural difference indicates a very different form of social and spatial organisation at Taljanki, with either Neighbourhoods, or Quarters not founded on Assembly Houses, playing more important roles than at Nebelivka or Majdanetske.

There are 74 anomalies on the Taljanki plan that have been interpreted as kilns (Korvin-Piotrovskiy et al. 2016, Fig. 5). Until this is confirmed by excavations, such a pattern remains hypothetical. The implication of such a pattern would be an unprecedented scale of pottery production, whose effects on other aspects of Taljanki lifeways would have been expected to be great. However, forty years of excavations at Taljanki have not revealed a distinctly different way of life on this megasite. If we assume that even half of the anomalies were cooking facilities similar to that found in Nebelivka, the number of production units would be still high but comparable with the estimated number of 20 kilns at Majdanetske. This would also open up the possibility for communal cooking and feasting that has been argued for Nebelivka.

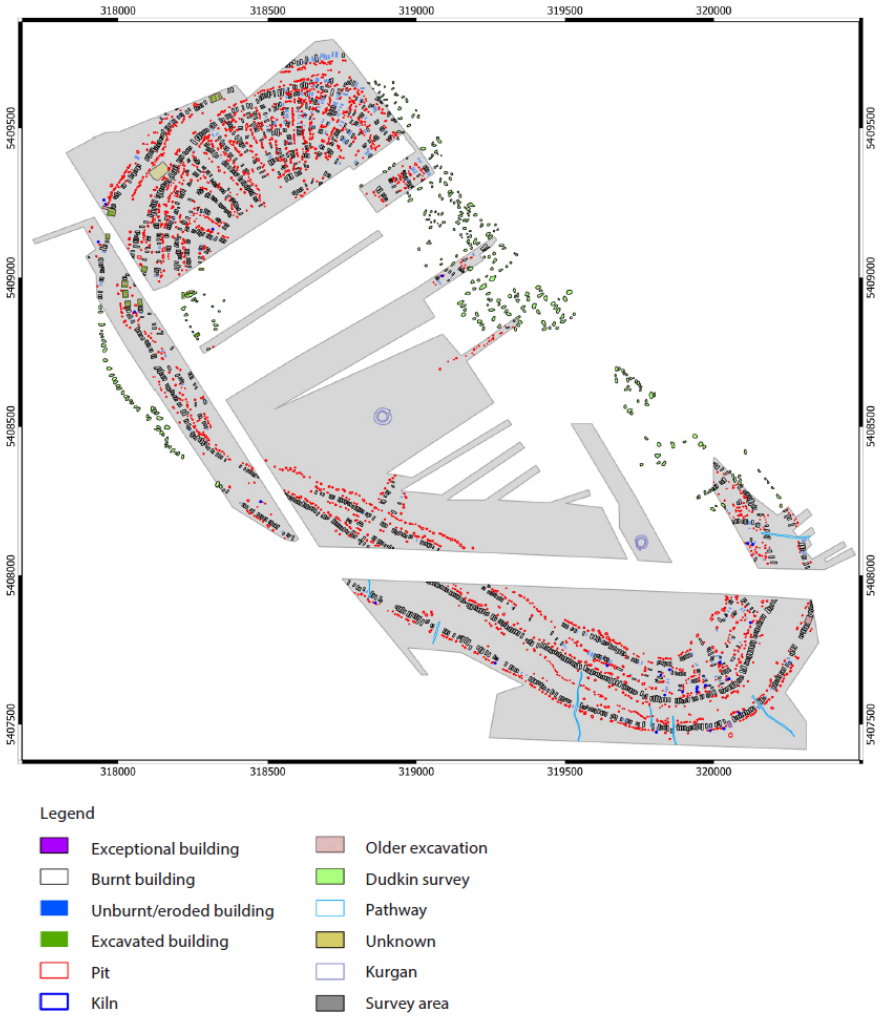


Figure 6.7: Magnetometer plan of Taljanki megasite (by R. Ohlrau in K. Rassmann et al. 2014, Fig. 9a).

6.2.2.2 Majdanetske

This megasite was the smallest of the three most studied settlements but still impressive at 200ha, of which 165ha have been surveyed. Even a simple visual inspection of the plan (e.g., Ohlrau 2015, Abb. 44) shows that the contemporary use of house circuits and radial streets would have led to access problems, whether radial streets blocking movement along the circuits or the circuits limiting the expansion of radial streets (Fig. 6.8). This would have resulted in radial streets of varied length, very few of which would have been open-ended, and multiple cul-de-sacs resembling

a rabbit warren, which contradicts the idea of careful, single-phase planning. The house circuits added outside the principal 'Outer Circuit' – varying from one in the North-East part to four in the South-West part – appear to represent an alternative to the addition of houses inside the Inner Circuit and suggest populations from different home communities settling at Majdanetske.

A structural analysis of a Northern segment of the Majdanetske plan (Ohlrau 2015, Abb. 44A: here, Figs. 6.9–6.10) reveals a complex layout constructed from seven circuits or segments of circuits, seven routes into the central open space from the outside and six different groups of inner radial streets. The proposed reconstruction of the building sequence takes into account the multiple blocking of radial streets by the concentric circuits which are themselves limited by the routeways (Fig. 6.9). Considerable local diversity is attested, with between none and five radial streets beginning from a single Neighbourhood (Fig. 6.10: cf. NBH 5 with NBH 3). The minimum number of phases to allow the evolution of this building plan is five (Fig. 6.10). In the first phase, the inner circuit was established; in the second phase, the construction of the Outer group of IRSs could have been contemporary with the building of the first and second Inner Circuits. In the third phase, building the third group of ICs could have been coeval with that of the Inner group of IRSs, while the construction of the fifth group of IRSs could have been contemporary with all of the Innermost group of ICs except IRS 18. The final phase shows that IRS 18 must have been built before the sixth and seventh ICs. The duration of Majdanetske at 250 years (Müller et al. 2018, p. 253) suggests a period of 50 years for each of the building phases proposed here.[101] In any case, it is quite impossible for a contemporary use of space in this Northern part of the Majdanetske megasite. This is tacitly acknowledged by Rassmann et al.'s (2016, p. 34) sensible statement that contradictions in the planning layout '… might indicate two settlement phases' (but cf. Ohlrau et al. 2016, p. 207).

The method of Kernel Density Estimation (KDE) was used for a formal 'calculation' of the number of Neighbourhoods in Majdanetske, producing the high figure of 533 (Ohlrau 2015, Table 5 and Abb. 46) as opposed to 282 (Rassmann et al. 2016, p. 44). The number of buildings in a house group varies between two and 41, with the maximum dwelling in one Neighbourhood well above that at Nebelivka. Further modelling taking the presence of Assembly Houses into specific account has been undertaken to identify larger special units. Nine such units, each ca. 9ha in size, were recognized consisting of an average of 185 houses in 66 clusters (Neighbourhoods), three to five

101 This multi-phase proposal is confirmed by the four-phase scheme for Majdanetske – a scheme first provided with AMS dates during the proof-stage of this monograph. According to the Bayesian modelling, Phase 1 lasted 55 years, Phase 2 135 years, Phase 3 100 years and Phase 4 55 years (Dal Corso et al. 2019, Fig. 2).

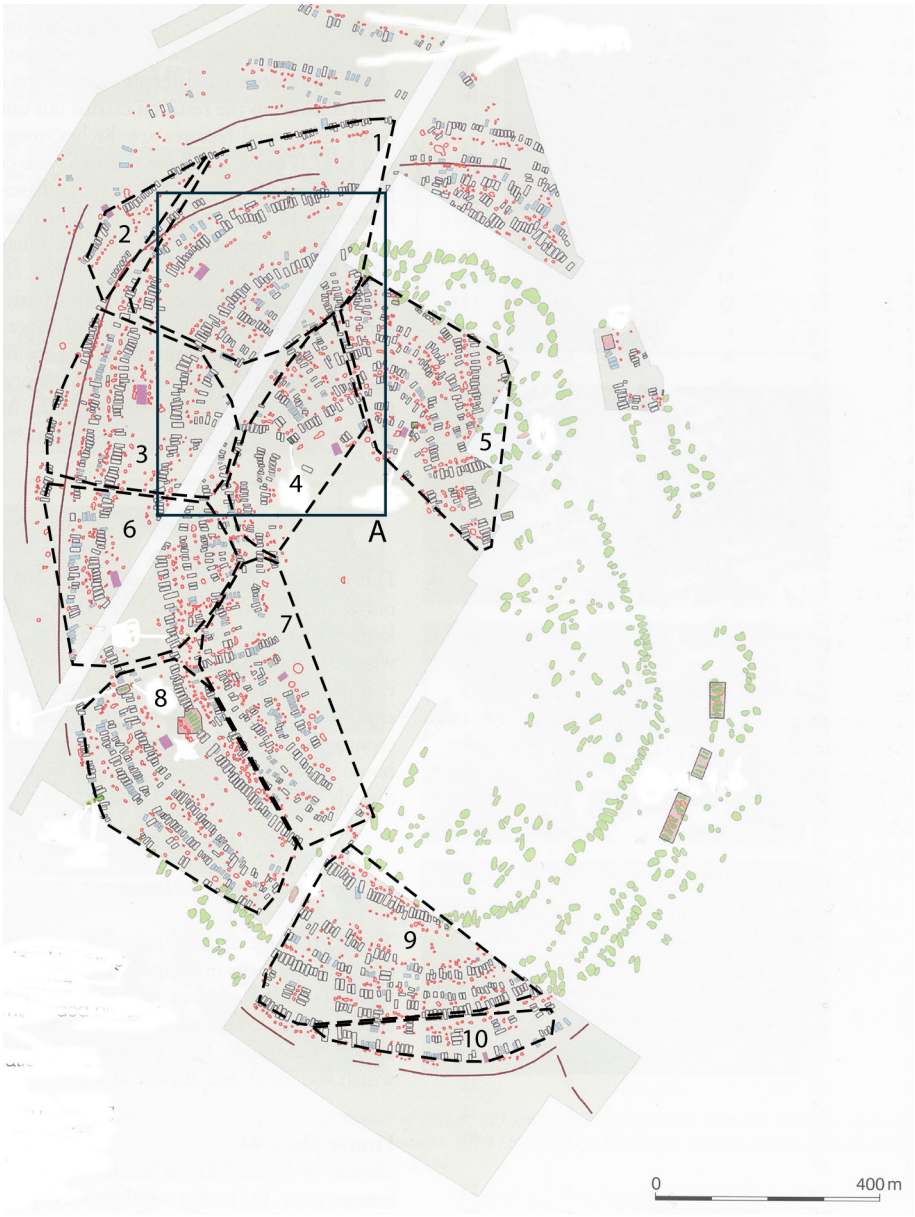


Figure 6.8: Magnetometer plan of Majdanetske megasite with Ohlrau's Quarter boundaries; numbers refer to Ohlrau Quarters; A – inset to be found in Fig. 6.9 (by L. Woodard, based on Müller & Videiko 2016, Fig. 2).

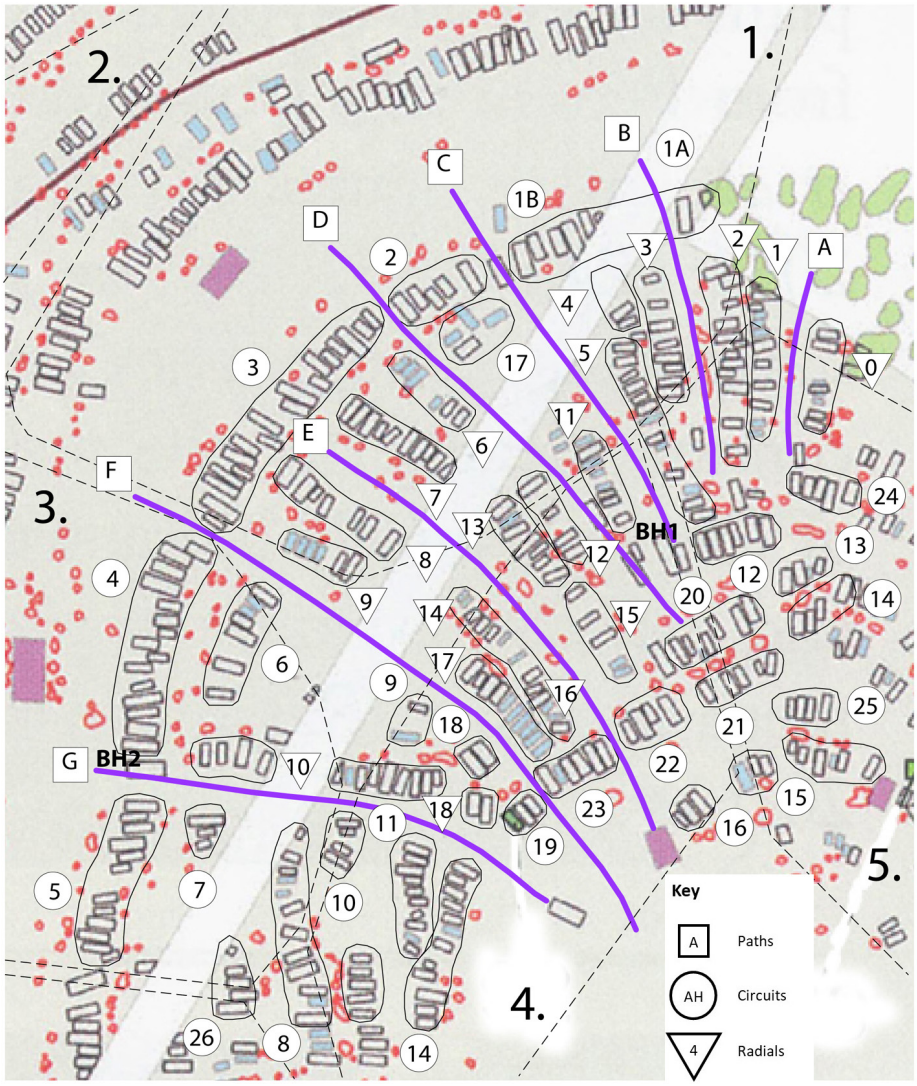


Figure 6.9: Detail of Northern part of magnetometer plan, Majdanetske megasite (Area A in Fig. 6.8). Key – large numbers refer to Ohlrau's Quarters; small numbers refer to individual paths, house circuits and radial streets (by L. Woodard, based on Ohlrau 2015, Abb. 44A).

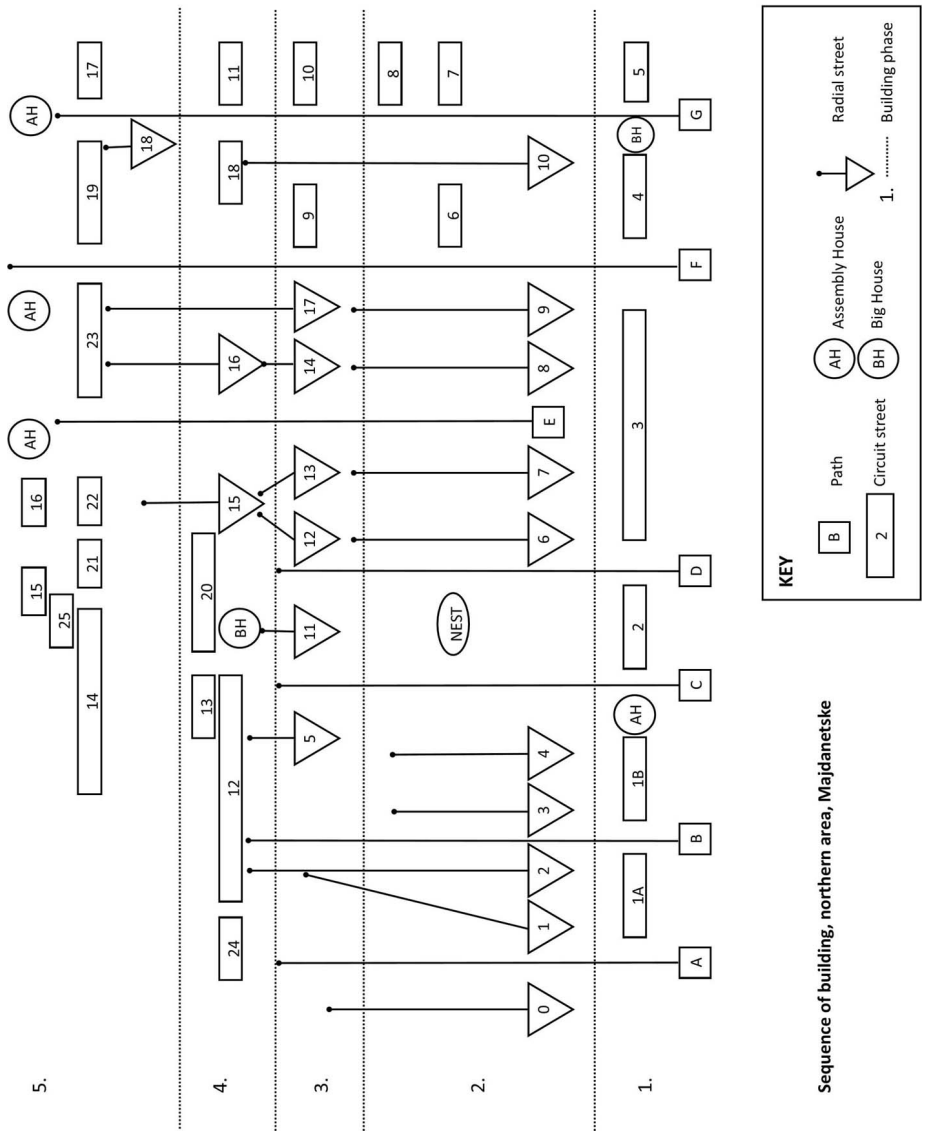


Figure 6.10: Building sequence of Northern part of Majdanetske magnetometer plan (as shown as Box A in Fig. 6.9) (by L. Woodard).

economic units consisting of a large building and a pottery kiln, and one Assembly House with a large pit (Ohlrau 2015, p. 62 & Abb. 51). It is not clear how this division relates to the previously identified house groups. The layout of these units is by no means similar (Ohlrau 2015, Abb. 52) and contradicts the idea of regularity that is obviously sought in this modelling by assuming that the constituent components of the units – notably ten Quarters, nine Assembly Houses and 20 kilns – should and would be the same.

The final configuration of the empty space in the middle of the Majdanetske megasite was far smaller than in the other two megasites – a mere 26ha – although it would have started out as a much bigger space of over 100ha. The close links between the foundation of Majdanetske and the ancestral pattern in Nebelivka and Taljanki would have reinforced the importance of a much larger empty space than was found. The most obvious candidate to have enclosed a larger space is the 5th circuit (counting inwards), providing space for assembly, ceremonies and rituals. The later encroachment of that space, thus limiting the size of the assembly, may well have caused the demise of Majdanetske, especially given the multi-functional centrality of the inner open space in all megasites (cf. Smith, M. L. 2008: see above, p. 428).

The average house size in Majdanetske was 67m^2 – less than the 72m^2 in Taljanki but similar to the range of Nebelivka house sizes. The minimum distance between houses at Majdanetske is 3m, just as at Taljanki, while the maximum is 165m. There is a lot of uncertainty about the number of unburnt and/or eroded houses in all three sites, and comparison between them is further hampered by the incomplete plans of Majdanetske and Taljanki. Nonetheless, some general observations are possible. If we assume that the rate of unburnt houses is the same in the unsurveyed as in the surveyed areas, then Majdanetske would reach the Nebelivka figure of about one-third weakly burnt/unburnt dwellings, in comparison with a quarter of Taljanki houses from all recorded houses. Given the amount of natural and human resources needed to burn a house, Taljanki seems to have been unusually adept at mobilizing these resources. The declining forest component in the forest steppe at Majdanetske may also have contributed to the higher number of unburnt houses there. Once again, a temporal dimension to construction is implied in the relationship of building to the opening up of the landscape.

In contrast to the Taljanki decision to abandon Assembly Houses, the 'typical' Assembly House was a strong presence at Majdanetske and has been used as a major component in modelling socio-economic units (see above). The location of most Majdanetske Assembly Houses was a combination between the pattern observed in Nebelivka – at 90 degrees to a house circuit – and that found at Taljanki – opposite gaps (entrances) in the outermost circuits. Three Assembly Houses were exceptions to this pattern by being embedded within Neighbourhoods in IRSs. The apparent neutrality of the Nebelivka Assembly Houses was partly vitiated at Majdanetske by showing a deliberate preference for one Neighbourhood over others.

In summary, apart from the evident similarities between all three megasites in planning elements and their nested patterns of Quarters, Neighbourhoods and households, there are far more similarities between Nebelivka and Taljanki than between the other site pairs, not least in the concentration of Inner Radial Streets at the North end (although this may have been an early feature at Majdanetske before the infilling of the North end), the overall house densities, the distribution of larger houses in the outer circuit and the range of houses in Neighbourhoods. But the differences between Nebelivka and Taljanki were perhaps even more significant than the similarities – the virtual absence of Assembly Houses and the presence of kilns and trackways at Taljanki.

Given the centrality of Assembly Houses in the Nebelivka Quarters, the shift away from these communal structures at Taljanki suggests a weakening of the structuring effects of the Quarters in the site organisation. The demise of the Assembly Houses and the start of kiln production of painted ware may not have been coincidental. The partial replacement of the Assembly Houses by limited interest groups formed by potters using the new kilns led to the introduction of a system of ceramic production based on the collaboration of several households in the collection of raw materials (clay, temper, red and yellow paints and kiln fuel), the pooling of manganese from different exchange operations and the construction and maintenance of the kiln. The new Limited Interest Groups were task-based, flexible and temporary and may have vitiated the need for Assembly Houses because of the growing importance of fine painted pottery. The non-overlapping distribution of kilns in relation to Quarters suggests that Neighbourhoods sought to control the operations of the LIGs rather than to allow the Quarters to take full control of the new productive system. The distribution of the kiln products to the Neighbourhoods would have consolidated daily relations with the LIGs, as well as strengthening the Big Other at the intermediate scale.

By the time that the early circuits had been laid out at Majdanetske, there were two coeval alternative models for the social organisation of megasites – one with Assembly Houses but no kilns and one without Assembly Houses but with many kilns operated by Limited Interest Groups. The Majdanetske community leaders will certainly have visited both other megasites and gained insights into the strengths and weaknesses of each model. The resultant plan was a mixture of both models, with one Quarter with a kiln but no Assembly House, five Quarters with an Assembly House but no kiln, four Quarters with both and one kiln placed between three Quarters (Ohlrau 2015, Abb. 52). Moreover, Majdanetske is the only megasite known where Assembly Houses were incorporated into normal Neighbourhoods as well as being located 'neutral' to the Neighbourhoods (e.g., in Quarters 2 and 5 and possible 5 and 7). This shows a dispersion of social power into smaller units than the Quarter, where Assembly Houses were traditionally rooted, as at Nebelivka.

The diachronic infilling of the North end at Majdanetske shows no difference in the type of Quarter-ly arrangement, with two different configurations (two cases with

only Assembly Houses; one case with both Assembly House and kiln) found in the inner Quarters. This pattern strongly suggests the presence of people at Majdanetske with a knowledge of their own planning 'heritage' and the possibilities to install it at the new centre. Not surprisingly, the co-existence of these different formations would have led to considerable tension between the Quarters, one response to which would have been to build their way out of trouble. This is where we become aware of the full significance of the building sequence at the North end of Majdanetske (see above, p. 462), which includes parts of five of Ohlrau's Quarters (here Quarters 1, 3–6 on Fig. 6.8).

The five-stage building sequence not only demonstrates diachronic development – the notion that buildings in stage 3 were built before those of stage 2 contravenes basic megasite planning principles – but also embodies local politics on the ground. One of the important megasite planning principles which allowed the inward expansion of Quarters was the unbroken development of Inner Radial Streets (Fig. 6.10). This is evident at Majdanetske in the SW and NE parts of Quarter 1, where IRS 3 - 4 (NE) and 6–9 (SW) and their continuations 5 (now in Quarter 5) and 12–17 (SW) were blocked only by the 6th Inner Circuit. The summary of Majdanetske (Müller et al. 2018) implies that IRSs were part of the development of Quarters. However, no IRS development was possible in Quarters 3/4 and 6/4 because inner circuits were laid out instead. The summary of social organisation explicitly linked inner circuits to different lineages (Müller et al. 2018), although another way of blocking IRSs is seen in the central Part of Quarter 1 through the building of a nest of houses – the most traditional form of house grouping. The continued blocking of IRSs in the SW part of Quarter 1 allowed the construction of the 7th Inner Circuit which incorporated a large house and an Assembly House (Fig. 6.10). Quarter 1 best exemplifies the tensions between different organisational principles, specifically between the Quarter and the Lineage, with the blocking of IRS development in the central part and its full inward extension in the NE and SW parts (Fig. 6.10). But what was important was that the vast majority of the new Inner Circuits were not laid out as part of a site-wide planning initiative but as an aspect of the local development of a Quarter; here is an example of an important planning principle being taken over by the people of the Quarter, in a way that was not seen at either Nebelivka or Taljanki. Quite how this clash of socio-spatial units – the Quarter and the Lineage – is resolved is never clarified (Müller et al. 2018). These planning decisions were made by settlers who were staking out their building heritage in a bricolage of planning contrasts, being pulled in different directions by competing identity groups. These tensions were perhaps related to the inclusion of both an Assembly House and a kiln in this Quarter. By contrast, the Quarters with the strongest attachment to Inner Circuits rather than IRSs (Qus. 3 and 4) included only an Assembly House, although Quarter 6, with its multiple Inner Circuits, included both an Assembly House and a kiln (Fig. 6.9). Again, there is no discussion of the overlap between supra-household economic units, Quarters and Lineages for this part of the Majdanetske plan (Müller et al. 2018).

Moving away from the area of detailed analysis, Majdanetske shows profound differences from the other two megasites (Fig. 6.8). First, people in Quarter 9 built the only case of Outer Radial Streets known to us. Secondly, outside what is normally regarded as the 'Outer Circuit', there were several Quarters (e.g., Qus. 1–3) in which further circuits were added to increase the fragmentation of planning at Majdanetske. As in some Inner Circuits, these additional circuits were often the width of a Quarter, indicating that they were not subject to site-wide planning principles but added *ad hoc* as part the development of several Quarters. In view of all of these variable planning decisions, it is perhaps not surprising that there was no neat correlation between Quarter-ly organisation and the preference for either IRSs or Inner Circuits. Instead, people living in Quarters made active use of their own settlement backgrounds and their affiliations to other Majdanetske settlers to make choices over their local layouts. The tensions between a preference for IRSs over Inner Circuits can be added to the disputes over how to organise a megasite Quarter – all of which playing out over two centuries and leading to the most complex plan yet seen on any megasite. Although Majdanetske may well have begun its life as a classic megasite plan, closely resembling Nebelivka and Taljanki, the decisions of later residents to differentiate the internal layout and expand outwards (as well as inwards) suggests that, if the megasite had started life as a pilgrimage or an assembly centre, its principal function had changed at some point during its development – perhaps into more of an exchange centre or as a political centre with larger populations. It seems highly improbable that the functions of Majdanetske remained unchanged for the whole of its life. What it evolved into is a most interesting question.

6.2.3 Daily Resources

The daily functioning and temporal continuity of every settlement required solutions to the logistical issues of food provision, including salt. We consider how the inhabitants of Majdanetske and Taljanki faced these large-scale issues, beginning with food production.

The German group has attempted much palaeo-economic modelling for Majdanetske and, to a lesser extent, for Taljanki. Kirleis and Dal Corso's (2016) research tacks between the remains from a single house at Majdanetske (House 44) and a general comparison of plant species found at all hitherto known Trypillia sites.[102] They make it clear that, despite the very disparate list of exploited plant species deriving from the Majdanetske house, it was still possible to reach the (to the authors surprising) conclusion that there was very little change over time in arable

102 A new study by Dal Corso et al. (2019) broadens the range of activities for which wood was widely required.

practices, even with the appearance of the megasites. If anything, there is a slight relative decline in the frequency of the only 'advanced' (viz., bread) wheat found over time. This is why Kirleis & Dal Corso consider Trypillia to operate a broadly 'Neolithic' economy.

The availability of productive subsistence resources discussed and mapped by Ohlrau et al. (2016, Figs. 2–5) is separated into periods of 100–150 years. What neither the maps nor the discussion addresses is the possibility of bad years and crop failures over this rather long period, while there is an underlying assumption that soil fertility remained constant. However, this contradicts one of the major reasons put forward for the abandonment of the megasites, namely resource depletion (Diachenko 2016a).

The lack of a sediment core near Majdanetske and the necessary use of site data limits Kirleis & Dreibrodt's (2016) reconstruction of the palaeo-environment to the site itself. While the generic environmental account lacks any temporal references to the stages of the archaeological settlement, there is a clear account of the site's soil development from an Early–Middle Holocene cambisol to the early stages of a chernozem at the same time as the start of dwelling. The authors state (2016, p. 177) that "the location of the excavated houses explicitly excludes a greater age for the Chernozem compared with the Trypillia settlement" and "only thin A-horizons correspond to the level of the Trypillia surface". We would reconstruct this as the clearance of forest cover over the site area to allow the start of construction, with subsequent development of the chernozem during the Trypillia dwelling. However, Vysloužilova et al.'s (2016, p. 93) conclusion that "chernozem is a result of the process that has been going on for thousands of years" surely means that a "thin A-horizon" cannot be considered as a fully developed chernozem on the area of the settlement. Thus, the chronology of the proposed pedogenesis caused by agricultural steppe development (Kirleis & Dreibrodt 2016, p. 178) is poorly related to the duration of the Majdanetske occupation between 3900 and 3650 cal BC (Müller et al. 2018, p. 253).

More importantly, this proxy soil record does not give us information about landscape changes in the Majdanetske micro-region, which we assume to have been covered in a soil mosaic typical of a forest steppe environment. The statement that the initially wooded area of Majdanetske was followed by an open environment (Müller et al. 2017, pp. 75–79) is not supported by any proxy palynological evidence, although the cumulative effects of a hypothetical massive coeval occupation with intensive utilization of resourses would have had a major impact on the environment (for discussion of the Nebelivka core, see Section 4.1). It is important to note that chernozem formation has also been documented for forest steppe conditions in Central and Eastern Europe (Eckmeier et al. 2007; Ehwald et al. 1999).

By the same token, the modelling for the megasite of Taljanki offered in the same article (Ohlrau et al. 2016) should be revised by factoring in cumulative environmental impact. The available radiocarbon and botanical data for this site are so problematic as to vitiate any meaningful discussion about flexible subsistence strategies, sustainability and resource management. However, some general observations are

Table 6.5: Estimates of salt requirements for various population estimates for Trypillia megasites (by J. Chapman & B. Gaydarska).

Site	Human population + requisite herd size	Low annual salt intake (kg.)	High annual salt intake (kg.)
Small-site model	100 people + 30 cattle + 150 sheep	450	>1,000
Jatranovka Phase B	1,500 people + animals	7,335	22,005
Nebelivka Phase BII	2,000 people + animals	9,780	29,340
Majdanetske Phase CI	7,000 people + animals (Ohlrau 2015)	31,675	95,025
Majdanetske Phase CI	12,000 people + animals (Müller et al. 2017)	54,300	162,900
Majdanetske Phase CI	24,000 people + animals (Shmaglij 1982)	108,600	325,800
Majdanetske Phase CI	46,000 people + animals (Rassmann et al. 2014)	208,150	624,450

still possible. The site is the largest of the currently known megasites, it has the largest empty middle area and its house density is closer to that of Nebelivka than to Majdanetske. By implication, the middle space may have been variably utilized, including small-scale gardening/horticulture with rotation of crops and fallow years. A residential density close to that of Nebelivka may indicate a continuation of a known pattern delivering stable resource consumption backed by experience in working with large numbers of households.

Another vital resource for any human and animal population was salt (Chapman & Gaydarska 2003). The sources of Trypillia megasite salt is still under discussion. The two prime candidates – the multiple Eastern Carpathians brine sources and the limans of the North Pontic – both have arguments for and against. While the Eastern Carpathian sources have been associated with exploitation by local groups from the Early Neolithic onwards and have unambiguous signs of Cucuteni exploitation (Weller & Dumitroaia 2005; Weller et al. 2008; Chapman & Monah 2007), it is a long distance to the Southern Bug-Dnieper interfluve, across four major rivers and their interfluves. While salt from the North Pontic limans could have been brought by river transport to the Trypillia megasites core area, there is as yet no evidence for 5th or 4th millennium BC exploitation of these potential sources (Mircea & Alexianu 2007). Modelling of the salt requirements of a range of Trypillia sites, as well as the Uman area, indicates high cumulative values based even on the lowest salt requirement of 2g per person per day (pppd), with 10g pppd leading to a major increase in demand (Chapman & Gaydarska 2003, Table 6; here, Table 6.5).

The salt requirements of 10–30 tons for a 'minimalist' Nebelivka population still represented a major logistical challenge, whether or not the sledge had been developed for land transport. But even the lowest population estimates for Majdanetske would have posed a massive logistical problem of moving 30–95 tons of salt across country. Moving up the scale to the higher Majdanetske estimates of 24,000 creates an unrealistic annual salt demand of between 100 and 325 tons. The dilemma was to cut down on salt intake, with threats to human and animal health and the quality of dairy products such as cheese or spend increasing amounts of time and effort in bringing salt to the megasites. The 'minimalist' solutions to this dilemma would seem to have been an obvious way out.

6.2.4 Building and Burning Resources

The Nebelivka house-building experiment enabled estimates of the quantities of several different materials all essential to house construction – timber, thatch, chaff for daub production and hazel withies. The scale of house construction implies that the collection of each of these materials posed a logistical challenge. The only way in which megasites could have faced these challenges was through the organisation of communal labour. Here, the estimates for timber, thatch, chaff, withies and fuel for burning are compared for Nebelivka, Taljanki and Majdanetske.

There are several issues with the most recent timber estimates for a range of sites (Ohlrau et al. 2016, p. 208 & List 1; see also Section 4.4), despite the allowances made for forest regeneration: (1) the type of house (1- or 2-storey) is not specified; (2) the architectural style of the house – log cabin or timber-framed or combination – is not mentioned; (3) firewood requirements are excluded; (4) broad-leaved deciduous forest timber densities rather than forest steppe densities are used to calculate the area of forest exploited; and (5) most seriously, the quantity of timber required to burn the houses is omitted. It is also self-evident that timber was not the only resource required to build a house; consequently, we include estimates for the use of reeds for thatching, withies for wattle construction and chaff for daub-making (Table 6.6).

The calculations begin with Nebelivka, where 28,890m^3 of timber collected from 246ha of forest steppe[103] was estimated to build a total of 1,445 houses with a mean requirement of 20m^3 per house[104]. We have estimated the area of forest steppe required for timber to burn a house at 2ha, or 2,140ha given the total of 1,077 burnt houses.

103 The question of the development of the forest steppe in the Nebelivka landscape is discussed above (see Section 4.1).

104 The figure of 20m^3 per house (Ohlrau et al. 2016, p. 208) is close enough to Stuart Johnston's figure of 17m^3 for a two-storey house of average size to be used in these calculations.

For Taljanki, the comparable figures are 2,200 coeval houses, built from 52,800m^3 of timber from an area of 352ha of forest steppe (or 176ha of deciduous forest: Ohlrau et al. 2016, List 1). In using the higher number of houses – an estimated 2,700 – Kruts et al. (2001) argued that the exploitation of the forest steppe for house-building and everyday firewood for cooking and heating the houses was unsustainable, forcing abandonment of the site after 50 years. But Kruts did not even factor in the addition of timber for burning 1,553 houses, which translates Ohlrau et al.'s estimate into the figure of 328,680m^3 of fuel, collected from 3,106ha of forest steppe, or Kruts' figures into 405,000m^3 of timber collected from 3,820ha of forest steppe. Each of these maximalist estimates would have led to a severe resource crisis, which would not necessarily have occurred using alternative models for the megasites.

Comparable figures to those of Kruts et al. (2001) for Taljanki are provided for Majdanetske – 3,000 coeval houses built from 78,200m^3 of timber collected from 260ha of forest steppe – figures which translate into a requirement for burning 2,300 houses of 486,680m^3 of fuel from 4,600ha of forest steppe. The same conclusion can be drawn that the high population estimates for megasites were unsustainable for something as basic as construction building and fuel for successful house-burning. This conclusion, incidentally, does not take into account all of the other resources required to build a house.

Johnston (Section 4.4) has estimated the quantities of three key building materials required for house construction at Nebelivka, with extrapolations for the other megasites. Large quantities of reeds would have been required for thatching the houses, with collection from the wetlands and valleys nearest the megasites. The higher level of water quality shown in the Nebelivka core during the megasite occupation than before or after the site means that reeds would have been widely available (Albert et al., https://doi.org/10.5284/1047599 Section 3.4). The extent of past productive wetland near Taljanki or Majdanetske has not yet been quantified; modern wetland exists on three sides of Taljanki and on the East and South sides of Majdanetske (Müller & Videiko 2016, Fig. 1).

Johnston's estimates for the quantities of chaff required to make daub for house-building, as observed by Kirleis & Dal Corso (2016) (see Section 4.4), indicates a potentially serious logistical problem for storing the chaff, whose requirements vary between almost 3m^3 of chaff for a 1-storey house to 5.7m^3 of chaff for a two-storey house. Without other storage containers such as linen bags or wooden boxes, this may have been a serious issue in view of the rarity of large storage-jars of 2m^3 volume at Nebelivka.

Finally, Johnston's estimates for the quantity of hazel withies needed to construct wattle-and-daub walling emphasise the forward planning essential for any Trypillia building project – let alone projects on the scale of the megasites. The coppicing of hazel bushes for long, straight rods (withies) for use as wattle takes forest management over a five-year period – an important consideration at the start of the creation of a megasite.

Table 6.6: Estimates for the collection, storage and use of building timber, reeds, chaff, hazel withies and fuel for burning at megasites (based on Ohlrau et al. 2016 for timber and S. Johnston for remaining materials: https://doi.org/10.5284/1047599 Section 6.5.2).

BUILDING MATERIAL	NEBELIVKA	TALJANKI	MAJDANETSKE
Total no. of houses	1,445 houses	2,200 houses	3,000 houses
Timber for building	28,890m^3	52,800m^3	78,200m^3
Volume of reeds for roofing	22,013m^3	33,393m^3	45,688m^3
Time for thatching	108,338 person-days	164,340 person-days	224,845 person-days
Number of houses (15 × 5 × 4m) required for winter storage of reeds	73 houses	112 houses	152 houses
Volume of chaff for daub-making	6,237m^3	9,460m^3	12,943m^3
Time for mixing daub (chaff + clay)	76,558 person-days	116,134 person-days	158,890 person-days
Number of granaries/houses (15 × 5 × 4m) required for winter storage of chaff	22 granaries/houses	31 granaries/houses	43 granaries/houses
Volume of withies required for wattle production	2,578m^3	3,912m^3	5,350m^3
Time for weaving wattle	76,558 person-days	116,134 person-days	158,890 person-days
Number of houses (15 × 5 × 4m) required for winter storage of withies	9 houses	13 houses	19 houses
BURNING MATERIALS			
Fuel for burning (timber)	219,048m^3	328,680m^3	449,690m^3

These estimates suggest large-scale advance planning was necessary not only for the collection of such quantities of each material but mainly for its storage, which may have required the construction of special structures, such as granaries for chaff

storage. However, it is to be doubted that storage for such large quantities of building materials could have been provided in any megasite, which could have amounted to over 210 additional storage buildings at Majdanetske. In other words, the scale of resource provision seems at odds with the capacity of the megasite itself. The important implication is that the maximalist figures for megasite populations are far in excess of the maximum possible from resource and labour inputs derived from the complete *châine opératoire* of house-building and -burning.

There is one possible escape from this fundamental conclusion, viz., the coeval use of all houses at the megasites does not necessarily imply a massive burst of coeval construction. The materials estimates suggest the possibility that the building of megasite houses was spread over a considerable time – on a decadal timescale and perhaps over a century. Modelling the labour requirements for 100 years of construction by a Quarter of 200 people means an annual contribution of 10 person-days per Quarter at Nebelivka, 20 person-days at Taljanki and 26 person-days at Majdanetske. Acknowledgement of this construction scenario could bring the maximalist view closer to the alternative views, at least for house-building. But was such a scenario possible given the number of houses built at Taljanki and Majdanetske in the space of two centuries respectively?

Millard's modelling of the ca. 1,500 Nebelivka houses built over 200 years introduced three values for the variable of house-duration: 10 years, 25 years and 50 years (for details, see Section 4.8: summary – Table 6.7). This produced three estimates for the number of coeval houses, with the maximum of 1/3rd occupancy. Comparable models for Taljanki and Majdanetske produced similar results of 1/3 maximum occupancy if the duration of the sites was 200 years. Increasing the site duration to 300 years would lead to an even lower occupancy.

In other words, unless strong AMS evidence is produced that the Taljanki and Majdanetske sites lasted less than 200 years or the houses themselves lasted 200 years, there is indeed a very low probability that there was ever a coeval occupation of all the houses at either site.

Table 6.7: Modelling of the number of coeval houses at megasites (by A. Millard).

Site duration	House use-life	Number of coeval houses/total no. of houses, Nebelivka	Number of coeval houses/total no. of houses, Taljanki	Number of coeval houses/total no. of houses, Majdanetske
200 years	10 years	80/1500	115/2200	157/3000
200 years	25 years	210/1500	314/2200	428/3000
200 years	50 years	500/1500	733/2200	1000/3000

Even with minimalist house estimates at these three sites, we are still contemplating a building 'industry', supported by provisioning through families or kinship partners, mobilised labour on a large scale and long-term forest management practices which ensured a regular flow of construction materials to the right part of the megasite[105]. The key point to emphasise here is the overriding need for communal labour at every megasite, with the requirement for recruitment and deployment of skilled workers (carpenters, roofers, wattle-makers), unskilled workers (to gather materials and prepare them for use) and supporting groups (especially cooks) becoming ever more important with the rising scale of construction. The continuity in keeping the communal labour force mobilised and ready to work on the next project meant that every completed task – whether a single house, a Neighbourhood complex, an Assembly House or an entire Quarter – would have been the occasion for celebration of the achievement through feasting and special depositional events. By the same token, communal activity fostered a sense of attachment to co-workers and support groups, to the local place, with its own local identity, and to the overall 'Nebelivka identity'. All communal activities based upon huge labour inputs would have been underpinned by alliances between Nebelivka and the home communities providing the labour.

Given the serious logistical issues at all megasites, it is all the more surprising that the supposed 5-km hinterlands of the three megasites were almost empty of sites, with no sites in the Nebelivka 5-km micro-region, two sites of uncertain chronology in the Taljanki micro-region (Moshurov 2 and 3) and two sites of equally uncertain chronology within 5km of Majdanetske (Talnoe 2 and 3). None of these four sites has produced AMS dates, so the general attribution to the same phase as their nearby megasites by pottery typo-chronology, as well as similar ceramic imports from other regions in Talnoe and Majdanetske (Shmaglij & Videiko 2001–2), does not document coeval dwelling of the kind that would suggest small sites providing logistical support to the megasites. The absence of fieldwalking in the Taljanki or Majdanetske micro-regions precludes comparisons with the Nebelivka micro-regional survey.

6.2.5 Testing the Alternative Models at Taljanki and Majdanetske

It is important to see how the three alternative models developed to account for the building, burning and environmental footprint at Nebelivka work for the other two megasites. While house-building and -burning estimates are available, there is one major obstacle to this procedure – the lack of a fine-grained palaeo-environmental record for either Taljanki or Majdanetske to act as a control over the pace of building

105 Accessing the right part of a megasite is of some significance, given that, for example, Taljanki measured 2.5km from the Northern to the Southern outer rings.

and burning. The alternative has been the use of a building *châine opératoire* for all three megasites to provide an overall control on labour inputs (see above, pp. 467–468). The incompleteness of the Taljanki plan meant that modelling of only the Pilgrimage and the Distributed Governance Models was possible, while Ohlrau's (2015) excellent combination of the earlier and the recent geophysical data allows the testing of all three models at Majdanetske.

6.2.5.1 The Assembly Model at Majdanetske

The chronological component of the Assembly B Model was five generations, each of 30 years. The division of the Northern part of Majdanetske into 10 Quarters (see Fig. 6.8, based upon Ohlrau 2015, Abb. 52) was modified to combine Quarters 1 and 2 into one, and 9 and 10 into another. The range of all houses except the Assembly Houses (*Sonderbauen*) in these Quarters was 176–341, substantially more than in the Nebelivka Quarters. This left a total of 924 houses in the remainder of the plan, which were divided into six smaller Quarters (n = 151–159 houses), since there were fewer IRSs in the rest of the site. In each Generation, up to the 3rd, new Quarters were built – five in each of Generation 1 and 2 and the final four in Generation 3. The sequence of Quarter creation was partly dependent on the layout of Ohlrau's (2015) Quarters.

The number of houses in each of the 14 Majdanetske Quarters was scaled up from the house statistics for the 14 Nebelivka Quarters (Fig. 4.5) to produce an equivalent model for Majdanetske. The difference in scale at Majdanetske was that the peak of new building reached 1,079 houses in Generation 3, the maximum number of structures in coeval use (in the same Generation) was 1,316–1,383 and the peak of house burning was reached in Generation 4 at 585 houses. If future palaeo-environmental research in the Majdanetske hinterland produces a fine-grained pollen diagram with the same minimal human impact factors as in Nebelivka core, then Assembly Model B would fail because of the peaks in building and burning. Even if human impacts were shown to be higher at Majdanetske than at Nebelivka, the footprint of over 1,000 new houses in 30 years would have required 6,500 person-days *per annum* to process reeds, chaff and withies, not to mention the collection of timber and its shaping into a house structure. It is highly probable that the creation of open landscape recognised in the later stage of the Majdanetske sequence (Kirleis & Dal Corso 2016) was caused by the building programme, which must have placed extreme stress on the landscape of the Majdanetske hinterland. If such a degree of stress is deemed acceptable, it is possible that the trajectory of Assembly Model B would have been logistically possible at Majdanetske.

However, one problematic aspect of the Majdanetske plan concerned the whittling away of the inner open space from a potential 114ha, as measured from the dominant Outer Circuit, to 78ha, as measured from the dominant Inner Circuit, to a mere 26ha after factoring in all of the IRSs and Inner Circuits (Fig. 6.8). The performative aspect of the inner open space centred on a dramatic and impressive open space bigger than

any of the participants had ever seen before. The effects of this infilling on the central meeting area within 60 years – or living memory – of the start of Majdanetske would have been to diminish the core area of the megasite, perhaps even posing a threat to the central function of the site. It would appear that Majdanetske became a casualty of its own success! The creation of additional outer circuits outside the dominant Outer Circuit may well have been a way of coping with problems caused by the infilling of the inner open space.

The Pilgrimage Model in the form developed at Nebelivka required a large burst of building activity in the first two years, as well as a major ditch-digging programme. After this intensive phase, the pace of construction dramatically slowed, with often no more than 200 houses built per generation – coincidentally the length of time for the regeneration of deciduous woodland. Thus, the main threat to the Pilgrimage Model concerned the potential over-exploitation of forest resources in the intensive building phase – a threat that the model suggested was contained. What would have been the consequences at Majdanetske for an intensive building and digging programme in the first two years of the megasite?

6.2.5.2 The Pilgrimage Model at Taljanki and Majdanetske

The incompleteness of both the Taljanki and the Majdanetske plans led to the estimation of the total number of houses in each main Inner Circuit. At Taljanki, 392 houses were found in an estimated 60% of the Inner Circuit (Ohlrau 2015, Abb. 49), leading to an estimated total of 650 houses in the whole circuit. An initial construction time of two seasons would have meant labour input of 85,000 person-days – a heavy demand even for a megasite. It is thus suggested that three years of initial construction, with an input of 57,000 person-days per season, would be a more reasonable model. The building of up to 40 houses per month would have necessitated close collaboration between two or more pilgrim home communities.

The principal elements of the Taljanki plan would have fitted the Pilgrimage Model just as well as the Nebelivka layout, with two exceptions. The absence of a perimeter ditch would have removed from the pilgrimage centre a critical defining characteristic – what separated the centre from its outside world. In effect, the house circuit at Taljanki became the perimeter line **and** the first construction feature, probably limiting the main procession to inside the house circuit. The second absence at Taljanki concerned the Assembly Houses, which at Nebelivka were considered to be important elements of processional practices, even though not built until the second generation. The implication is that the organisation of the processions was carried at the site level or at the Quarter level. Neither of these absences would have prevented the development of a pilgrimage centre at Taljanki in what should be considered as a rival establishment to Nebelivka.

The estimation of the number of houses in the principal inner house circuit at Majdanetske is complicated not only by the incompleteness of the geophysical

plan but also by Ohlrau's (2015, Abb. 27) incorporation of Dudkin's earlier and less precise geophysical results. The counting of both Rassmann's and Dudkin's house-sized anomalies produces a total of 267 houses for the inner circuit but this is almost certainly an under-estimate. Scaling-up the total of recent houses to a complete plan suggests a higher total of 350 houses, which is the estimate used in this model.

The total of 350 houses required to be built in the initial intensive construction phase means an estimated total of over 90,000 person-days in an eight-month season. This task is certainly excessive even for a megasite, leaving the choice of a two-year period, with over 45,000 person-days and up to 22 houses built per month, or over 30,000 person-days for each of three years, with up to 11 houses per month. Both of these options seem possible but the three-year option may be preferred, given that additional labour input would have been needed for the perimeter ditch. An estimate of the length of the many separate perimeter ditch segments can be made, using the 47% of the ditch present (Ohlrau 2015, Abb. 27), with the result that digging a total length of 273m, or 300m^3 of earth, was required. Much of the clay excavated from the ditch segments could have been used immediately for daub-making for the houses in the house circuit.

The two principal issues with the Majdanetske plan for the Pilgrimage Model concern its evolution into a very complex layout with many cross-streets (inner circuits) blocking the processional ways of the IRSs, and the infilling of the inner open area which was central to the main pilgrimage ceremonies (see above, pp. 444–445).

6.2.5.3 The Distributed Governance Model at Taljanki and Majdanetske

The DGM is well suited to both Taljanki and Majdanetske in terms of a permanent, if scaled-down population and a planned layout incorporating elements of earlier megasites. The model assumes a more or less static number of houses, with a constant rate of house-building and -burning throughout the duration of the site. Testing the model involves setting the initial building rate and the number of builds and burns per annum against the estimated duration of the site and the likely capacity of the site for achieving the initial build.

Given the total number of houses at Taljanki as 2,200, two values were tested for the initial build – 400 houses and 500 houses – and two values were used for the number of houses built and burnt each year – eight and ten. The four calculations produce variations of site duration between 170 and 225 years – all of which are compatible with the modelled AMS date range (see above, Millard, Section 4.8). The construction of 400 or 500 houses in one major constructional phase would undoubtedly have tested the builders of Taljanki to the limits unless the constructional phase was spread over five years.

The much larger number of houses at Majdanetske, at 3,000 structures, led to an extremely high initial build of 800 houses and two values for *per annum* house-building and -burning. The building and burning of 15 houses per annum led to a

modelled duration of 150 years, while a decrease to 10 houses per annum extended the duration to 220 years, with both durations being consistent with Millard's range of modelled AMS dates. However, an extension of the site duration to 300 years meant a lower initial build of 600 houses, with eight houses built and burnt *per annum*.[106] Alternatively, ten houses could have been built and burnt *per annum* if the site duration was 240 years. The initial build of 800 houses is problematic insofar as it represents the highest total of houses to be built in a short time of any of the variants of the three models. The reduced initial build of 600 houses, perhaps spread over three years, means that the DG Model could have worked at Majdanetske.

6.2.6 Summary

It is a platitude to note both similarities and differences between the three largest megasites or that there were both continuities and innovations in a temporal sequence. The effect of the new AMS modelling of the three sites (Dal Corso et al. 2019; see above, Millard, Section 4.8) is that, with high probability, the three sites were in coeval occupation for some decades. This leads to the possibility of a more dynamic interpretation of these sites, not least in planning terms.

Before we attempt that, it is worth turning to the comparison of basic daily resources and resources for house-building and -burning. Despite differences in animal bone recovery, the faunal spectra of all three megasites show broadly similar patterns, with a low percentage of wild animals and a dominance of domestic cattle over caprines[107] and few pigs.

Equally, the botanical reports for Nebelivka and Majdanetske show a similar range of wheats and barleys, with some pulses and wild fruits of the forest. What remains surprising is the lack of extensification or intensification of arable farming at either of the megasites but rather a continuation of the same low-efficiency agriculture found from Phase A onwards (Pashkevych 2012). The low representation of the only six-row bread wheat found at the megasites – *T. aestivum* – is particularly striking in terms of the neglect of an opportunity for increased productivity. Only fieldwalking in the Taljanki and Majdanetske micro-regions would confirm or deny the absence of manuring scatters as established at Nebelivka. Low-efficiency agriculture would seem to be a counter-intuitive strategy for some of the largest settlements in Eurasia. A major difference between Nebelivka and Majdanetske was the development of chernozems before the megasite occupation at the former, while a human-induced chernozem is claimed for the late stages of the latter, representing a change from fertile loams in parallel with forest clearance of the forest steppe to a more open landscape.

106 The 300-year duration of Majdanetske has been confirmed by the most recent Bayesian modelling (Dal Corso et al. 2019, 3).

107 Orton et al. (2016) (Section 5.3) show inter-house differences in preferences for cattle or caprines.

The last, essential food resource presented in a comparative manner was salt. The estimates for salt procurement for varying scales of population size at Majdanetske show the need to transport massive amounts over hundreds of km, using basic technology (cart or sledge). Such estimates are far too high to be feasible for the megasites, leaving an insoluble logistical conundrum.

The same type of insoluble conundrum has been posited for all four of the main building materials for houses – timber, reeds for roofing, chaff for temper in daub and hazel withies for wattle-making. Moreover, Kruts et al. (2001) concluded that exhaustion of the forest for cooking and heating fuel would have limited the megasite occupation to only 50 years. Neither Kruts' nor Ohlrau et al's (2016) estimates for house-building have ever taken into account the much larger quantity of timber needed to burn the houses to create a *ploshchadka*, as demonstrated in the Nebelivka house experiment. The huge scale of collecting reeds, chaff and withies in a single mass building programme, not to mention the importance of their winter storage, was far too great for even a megasite. Even taking the Nebelivka minimalist models into account, we are still talking about a large-scale building industry, combining specialist joiners and roofers and long-term woodland management to ensure a supply of all the key resources when necessary. But the overall conclusion from the resource study is that populations of more than 10,000 people on a megasite created insoluble logistical problems for basic resources. How do these conclusions relate to the comparative study of megasite planning?

The partially overlapping occupations of the three largest megasites create an opportunity for interpretation in terms of major structuring and planning principles. The earliest megasite of the three – Nebelivka – shows a combination of acceptance of the main planning principles together with a bottom-up growth at all levels of aggregation – the typical nested pattern of households, Neighbourhoods and Quarters (for the cross-cultural significance of the nested spatial levels, see below, pp. 501–502). Assembly Houses were well integrated into the Quarters and the only 'industrial' feature has been interpreted as a large-scale cooking facility for communal feasting. We propose that the combination of an almost total absence of Assembly Houses with a large number of kilns at Taljanki meant the increased importance of Limited Interest Group potters who built, managed and supplied the kilns for production of fine painted pottery. It is suggested that the LIGs led to the mobilisation of Neighbourhood labour in such a way that this by-passed the Assembly House structure. The people who started settling at Majdanetske, therefore, had a choice of two models of Quarter-ly organisation – the Nebelivka model with Assembly Houses but no kilns, and the Taljanki model with LIGs to organise kiln production and which replaced the Assembly Houses. The intriguing aspect of the Majdanetske plan is the occurrence of both forms of model in the same site, suggesting that people with knowledge of both social models settled at Majdanetske. Many aspects of the Majdanetske plan indicated tensions between the two Quarter-ly models, while other architectural responses to tensions in settlement layout are evident. If Taljanki took the classic megasite plan

of Nebelivka and enlarged it, then Majdanetske was an example of the fragmentation of the classic model through the local politics of planning and building what is the most complex megasite plan yet known. Without fine-grained palaeo-environmental data from near Taljanki and Majdanetske, it is impossible to make a direct test of the three alternative models formulated for Nebelivka. While all three models could conceivably conform to the footprint of the respective layouts, progressive infilling of the inner open space at Majdanetske threatened the Assembly and Pilgrimage models at that site but not necessarily the Distributed Governance Model.

There is no reason to suppose that Taljanki and Majdanetske followed the Nebelivka model of large-scale communal practices but the scale of the house-building and -burning activities makes the maximalist model highly improbable, if not downright impossible. This conclusion leaves the megasites as something of a paradox – massive planned layouts in the landscape but far fewer people living there than had once been accepted. What does this paradox imply for the notion of megasites as the world's first cities?

6.3 Low-Density Urbanism – a Global Approach

The first of the Project's fundamental questions concerns the urban status of Trypillia megasites such as Nebelivka (Chapman & Gaydarska 2016a). In this section, we develop a fresh, relational approach to the question of what constitutes 'urbanism' by adopting a methodology from the social sciences and recently summarised by Cartwright and Runhardt (2014). But before we can turn to the characterisation of megasites using this methodology, we must answer the key question – 'urbanism relative to what?' through a comparative examination of the typical small Trypillia site of Grebeni. The scalar differences pinpointed between Grebeni and Nebelivka are then further discussed for the Trypillia megasites of Taljanki and Majdanetske. Only then do we turn to the question of the place of Trypillia megasites in global perspective, comparing them to other huge anomalous sites and grounding them in the perspective of low-density urbanism.

6.3.1 An Example of a Small Trypillia Settlement

If Trypillia megasites were a little later or had been in an area with a tradition of urban development, it would not have been difficult to argue that such agglomerations were inter-regional centres (Ryndina 1998), whose function in hindsight modern scholars call 'urban' in character. Their space-time location and lack of legacy are the megasites' worst enemies. More efforts are spent to portray them as 'normal, only bigger' and to undermine the implications of what their size entails rather than to see them for what they are – the earliest low-density massive occupations of urban status.

So far, we have been arguing against an idealised, essentialised view of urbanism and insisting on a relational view (Gaydarska 2016, 2017). Here we start with a different approach. We ask the question 'how are the lifeways on a megasite consistent with Neolithic lifeways? At first sight, such a question falls straight into a Childean Urban–Neolithic opposition. However, as pointed out earlier, his two revolutions are often conflated in the theoretical stances of Trypillia specialists. This is because, strictly speaking in Childean terms, the megasites are neither entirely 'Neolithic' nor are they entirely 'Urban'. They are also an exception in R. Fletcher's (1995) global model of settlement growth. At this point, the discussion could have taken one of two routes. The first assesses the nature of the various classificatory systems and how and why the Trypillia megasites fall between their cracks. In the second, preferred pathway, we compare the life on a small, 4.5ha site (e.g., Grebeni: Kolesnikov 1993) at the beginning of the 4th mill. BC in Ukraine which may be considered as an archetypal Neolithic site, with life on a 238ha megasite of the same period.

We are currently uncertain about the overall area of the Grebeni site, as well as about the total number of dwellings (Fig. 6.11). If we take the maximum figures of 4.5ha and 38 dwellings, that will mean a residential density of ca. 9 houses per ha on a larger than usual dwelling place, given that 55% of sites with size information in the Trypillia Encyclopaedia (Videiko 2004) fall within the size range 0.3h–1.0ha (using a sample of 499 sites: Nebbia 2016). The circuit layout may account for this occupational density, which may have been a deliberate choice. Such a residential density leaves room for small gardens and/or pens near each of the houses, with additional fields for cultivation and grazing beyond the settlement boundaries. Even the most distant arable areas would not have been more than half an hour's walk, with communally organised pasture for domestic animals. The household scale of animal-keeping of five caprines and two cattle would have meant that the flocks of fewer than 200 caprines and ca. 80 head of cattle would have been a responsibility of two small groups of experienced herders.

It was unlikely that a total of 38 dwellings would have been divided into Quarters but five to ten Neighbourhoods were probable (Fig. 6.11). Coeval construction of all the buildings in one building project would have taken two months of intensive building by almost all the site inhabitants. Alternatively, the settlement was constructed over a longer period or with the additional help of skilled workers from related communities. In either case, even the most intensive operation would not have involved more than 420 people – a large enough but manageable number considering that no more than 10–12 people would have participated in a single house construction. Given the social undesirability of living on a settlement with strangers, such an operation would have strengthened the already existing ties between neighbours and future occupants.

Members from each Neighbourhood would have seen each other daily, while inter-Neighbourhood encounters were, if not a daily, then a weekly event. And when a member of this community passed away, a gathering of mourners would have been

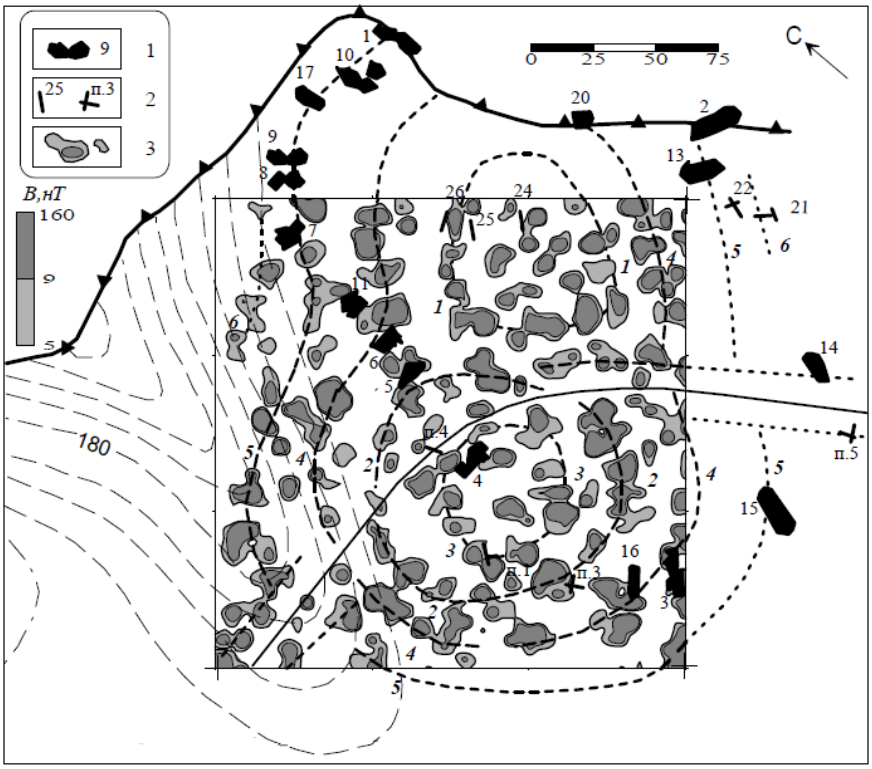


Figure 6.11: Geophysical plan of Grebeni site. Key: 1: excavated buildings; 2: test pits; 3: geomagnetic anomalies (by B. Gaydarska, based on Koshelev 2004, Ris. 4.14).

materialised by the deposition of feasting remains and other objects and materials in a pit. If the deceased was an important member of the community, this may have been accompanied by a spectacular symbolic burial through a house-burning performance.

This was a largely self-sufficient community, with occasional encounters with relatives living at other settlements, with travellers/traders passing by their site en route to an exchange centre and with members from the wider Trypillia community at regional gatherings. In other words, this was an archetypal Neolithic way of life (cf. Childe 1958). Now imagine that the site of Grebeni is smaller than the smallest of the Nebelivka Quarters (Quarter E, at 5.3ha). Scalar contrasts of this level make us appreciate the stark differences between megasites and 'normal' small Trypillia settlements.

6.3.2 An Analytical Construct for 'Urban' Sites

If there is a common feature between the various definitions and understandings of what is urban, it is that this form of dwelling is somehow different from other and/or

contemporary forms of dwelling. The nature of this difference (e.g., between Neolithic and Urban in Childean terms, and between city and village more generally) is what causes endless definitions, re-definitions and discussions. If this difference is not to be essentialised, as it often is, its characteristics could be very useful indicators for the local variants of the *modern analytical construct* of urban.

In 2016, the authors of two articles both argued against the fixed concept of cities (Gaydarska 2016; Smith, M. E. 2016). Both echoed Cowgill's (2004, p. 543) inspirational plea to think about alternatives to typologies of cities by introducing measurable axes/variables along which specific cases can be arranged in multivariate space. While Gaydarska cautiously offered a non-prescribed range of variables and insisting on the development of the methodology of measurement in archaeology, Smith expounded his analytical construct using 21 traits measured in one of three ways – presence/absence, according to scale and in absolute numbers (Smith, M. E. 2016, p. 159 & Table 10.1). Smith calls his approach 'attribute-based' and although he warns that this is a provisional list of attributes, it is a list, nonetheless, that together with the cut-off point of 12 traits could easily resurrect the ghost of check-list definitions. Gaydarska calls her approach 'relational', putting the emphasis on local contexts. At first sight, the measurement methodology she seeks is covered by Smith's attribute-based table and discussion. Indeed, there is some overlap between Smith's change of emphasis when asking questions about ancient cities (2016, p. 160) and Gaydarska's conclusion that the definition of cities depends on the research question asked (2017, p. 182). However, we feel that a better framework for answering these questions is provided by the Cartwright and Runhardt (2014) approach to measurement advocated by Gaydarska, as it allows for both a sensible degree of fuzziness and the social construction of concepts. Nonetheless, both Smith's attribute-based approach and the Cartwright & Runhardt approach make use of the polythetic nature of urban data sets.

The outlines of the Cartwright & Runhardt approach are presented above (see Section 2.2). Here, the actual measurement – just as in Smith – includes presence/absence, according to scale and in absolute numbers but for all three components (characterization, representation, procedures) rather than just one or two. Table 6.8 summarizes the three components for the category '*urban*' in the Trypilian context. If the characterization (and hence representation and procedures) is extended or shrunk, it still will be socially constructed but may become too general, or create boundaries. Provided that these two caveats are avoided, there remains the key question 'is the revised characterization useful for its purpose?' In other words, there is no prescribed number of factors for characterization, as long as each is consistent with the four principles of utility, social construction, a lack of rigid boundaries and a lack of generality. Ideally, the entire Trypillia dataset should be assessed according to Table 6.8 in order to see which and how many sites would fall into the category 'urban'. At present, there are too many gaps and inaccuracies in our data set to allow such an endeavour. Instead, we hope to provide an example of the process.

Table 6.8: Constituent parts of the 'urban' category in the Trypillia context.

Characterization	Representation	Procedure
Territory/area to which a site is central	More links in a network analysis	Formal network analysis
	Distribution of contemporary sites	Field survey, remote sensing, ground-truthing, spatial analyses, Moran test (whether megasites are outliers)
	Formalized space where interaction could take place	geophysics
Size (although in absolute numbers, scalar in meaning- after which point size becomes an obstacle/ issue of logistics and infrastructure)	Settlement planning	Geophysics
Population number (like size – absolute in number, scalar in meaning)	Number of contemporary houses	AMS dates, palaeo-environmental analysis
Population heterogeneity	Various and overlapping identities (e.g. different clans, permanent dwellers vs visitors/traders, members of the same guild/trade – potters, metalworkers, etc.)	Excavations of wide range of features; depositional analyses; detailed artefact and ecofact analyses
Concentration of skilled labour and management	Limited Interest Groups (e.g. potters, metalworkers), workshops, kilns, special buildings, precision of settlement layout, planned and managed resource utilization, waste management	Field survey, geophysics, excavations, palaeo-environmental analysis, depositional analyses, detailed artefact and ecofact analyses.
Built environment/ formalized space with non-quotidian function	Assembly houses, fortification, ditches, large cooking and/or storage facilities, large delineated space for assemblies, pilgrimage or other social gatherings	Geophysics, excavations, palaeo-environmental analysis, depositional analyses
Scale of subsistence (self-sufficient or combined (self-produce plus tribute/ sponsorship))	Agricultural fields, animal bones, logistics and infrastructure	Field survey, geophysics, palaeo-environmental analysis, osteological analysis
Affordance to be a node and re-distribution centre of far-reaching exchange networks	Wide range of exotic (rare) and imported (bulk) objects and raw materials, non-local mode of production	Excavation, detailed artefact and ecofact analyses. technological analyses
Social framework that allows such sites to function	Intra-site: nested social structure of household, Neighbourhood, quarter. Inter-site: shared symbolic fiction (Big Other)	Theoretical justification, spatial analyses, depositional analyses, detailed artefact and ecofact analyses

The representations and procedures are often overlapping (e.g., a formal toolkit made of exotic raw material may represent both a wide-ranging exchange network and skilful labour; excavation and geophysics feature in almost all procedures). Not all of the procedures were followed when measuring the data from Nebelivka (e.g., network analysis). Also, not all measurements were possible (e.g., the affordance for wide-ranging exchange networks), since such measurements are scalar and the comparison data are only selectively available. These are all tasks for the future. Still, there is enough data allowing the measurement of the category 'urban' in the Trypillian context at Nebelivka. We now turn to a discussion of each of the nine characterizations.

Territory/area to which a site is central

Nebbia's analyses (Chapter 3) of the wider settlement pattern established the social catchment area of Nebelivka at 100km. Since centrality is not measured by outdated Thiessen polygons but by the intensity of interaction possibilities, a future network analysis may confirm Nebelivka as a central place. At present, such a status is argued on the basis of two points: (a) a LISA (Local Indicators of Spatial Association) test supported the hypothesis that megasites are *outliers* and provided further confirmation that it is highly likely that these are *outliers* of high values within a 100km Neighbourhood of low values, indicating an overall even spacing with regional regularities of settlements attached to each megasite; and (b) specifically for Nebelivka, the creation of an initial 105ha central empty space implies a scale consistent with being able to accommodate large numbers of people. A LISA test would give no sense at all of a site the size of Grebeni as being central to a settlement network.

Size

By the time Nebelivka emerged, there was perhaps a social memory and practical knowledge of up to five previous 100–150ha sites, although the only site with a geophysical plan (Vesely Kut) lacked a large inner open area. The full extent of Nebelivka reached 238ha, while, through time, the open inner space shrank to 65ha. It is very important here to remember Barrett's cautionary note (1994) that the final footprint of a site does not necessarily reflect its initial appearance. The Nebelivka perimeter ditch outlined the maximum extent of the site, perhaps at an early or even initial stage, thus declaring an intention to scale up previous large gatherings by 50% to 80%. In absolute terms, Nebelivka was the largest site in the Trypillia world at that time. If Nebelivka was permanently occupied, its daily interactions would have encountered serious communication and logistical issues, especially if the *habitus* with which residents were familiar was formed at settlements that were 200 times smaller. If the occupation was seasonal, broadly similar interaction issues would have arisen, if the normal scale of the most distant neighbour was 500–600m, rather than 1.5km, away. Thus, in relational terms the size of Nebelivka provided a very different

experience for its inhabitants and visitors, as compared to life on a small Trypillia site such as Grebeni, with a probable site size of 200m × 200m and therefore furthest neighbour distances of no more than 200m.

Population numbers

How many people lived on a megasite is and will remain a contentious issue. It is clear that the potential of large sites to accommodate hundreds of people is many times greater than any of the smaller sites. It is unlikely that such potential was not used for some or all of the time. After all, megasites were probably created to host more people than usual. And, just as with size, living with 100 people is different from living with 500 people, and even more different still from living with 3,000. Colombijn (1994, 1) observes that, in urban sites, the larger the number of people, the more complex is the use of space in comparison with villages. The plans of Nebelivka and Grebeni confirm this observation, showing the complex nested spatial order which characterises Nebelivka in comparison with a single house circuit and houses both inside and outside the circuit accounts for the structures at Grebeni.

At present, the radiocarbon dates from Nebelivka are inconclusive about the contemporaneity of houses but modelling of the overall duration of the site (150 to 200 years) with various house durations (10, 25, 50 years) suggests that if the houses lasted for 50 years, the maximum number of coeval dwellings would be 500 for periods of 10 years. The three models for Nebelivka operate with a range of 400 to 700 contemporary houses that is broadly comparable with such estimates, given the inherent probability of variations in house duration. In any case, both the social modelling and the radiocarbon modelling are in good agreement with the palaeo-environmental data for low to moderate human impact and the lack of massive fires to account for the contemporary burning of hundreds of houses. We have accepted that six to eight people occupied each house (for demographic considerations, see Gaydarska, submitted). The structure of a megasite based upon Quarters and Neighbourhoods helped to reproduce 'Grebeni-type interactions' at the smallest settlement scale but the multiple opportunities for meeting people from other home communities ('strangers') meant much stronger links between individuals from different communities than could ever have occurred on smaller sites. The regular scale of face-to-face contacts on settlements rarely exceeded 450–500 people (Forge 1972). While everyone could potentially have seen or met everyone else, people's interactions were probably channelled so that there were some more regular and other less regular meetings, introducing heterogeneity into the range of social contacts.

Population heterogeneity

Who were the people living or visiting Nebelivka? It is unlikely that they all belonged to one extended social group, whether a clan or a lineage, since a massive congregation of people of common descent at one place could have created a threat to other clans that may even have escalated to conflict. In any case (see above, pp. 25–26),

the evidence for warfare is minimal. Thus, our assumption is that varied groups of people from many home communities came to live at, or visit, Nebelivka. The complex relationship between material culture and group identities can be teased out at Nebelivka using our analyses of architectural variability, modes of deposition, consumption of animals and the stylistic analyses of pottery, figurines and lithic tools.

The counterpoint to the overall Nebelivka plan, with its grand planning principles of concentric house circuits, radial streets, a perimeter ditch and a vast inner open area, was local variability in the size and shape of houses and Assembly Houses as well as the layout and size of Neighbourhoods and Quarters (Table 6.1). The most obvious explanation for this ubiquitous variability was the creation of local versions – hardly copies – of home community architecture and layouts as a way of adjusting to a settlement scheme on a far greater scale. It was the juxtaposition of so many different house groupings at the megasite that differentiated it from a single home community such as Grebeni, which itself may have made a small contribution to Nebelivka's architectural heritage.

A similar point can be made concerning deposition which, at Nebelivka, showed scalar differences from the household deposition in 'events' at a single pit, characterised by mostly small consumption units, through a range of medium-sized deposition events in which most or all of the houses in a Neighbourhood offered goods to a death assemblage before the burning of a house, up to the contribution of many houses, if not all houses in use at the time, to the mega-event of the burning of the Mega-structure, in which an estimated 322 vessels, or parts of vessels, including a group of 21 complete miniature vessels, were placed in rooms and outdoor areas in a multi-phase destruction process. These scalar differences betokened a nested set of depositional contrasts, moving up from single house events to whole-site events. Once again, it is clear that sites of the size of Grebeni could have contributed only to the lower part of the depositional scale.

The Nebelivka faunal assemblage comprised sub-assemblages from different houses, one pit and the Mega-structure. The bone remains show a pattern of different meat preferences, with beef strongly selected in House A9 in contrast to more lamb/mutton in the Mega-structure and some of the Pits. These contrasts may refer to the latest set of meals in the house contexts and different emphases in feasting remains in House A9, some Pits and the Mega-structure. In each case, the size of the animals and the quantities of meat available for consumption tell a different story about various contexts in the megasite. However, we should note that such variations in household consumption may also have occurred at smaller sites such as Grebeni.

Pottery is the commonest material relating to the identity of the people and potentially demonstrating whether Trypillia sites were exclusively inhabited by separate descent groups. However, Trypillia pottery studies are currently dominated by the typo-chronological approach and one is well advised to stay clear from relating such time-space entities to people (Shennan S. J. 1989). The positive aspect of such pottery studies is that they demonstrate that certain ceramic styles are shared between

sites, rather than exclusively related to one, with varying preferences of ceramic styles selected at different sites. Instead of using the similarities and variations only to build typo-chronology, we can view them as choices that people make from a wide range of available forms and decorative schemes that suit best their aesthetic and personal preferences. Only in that sense can we accept that variations in ceramic production bore traces of group identity. It is unfortunate that intra-site variability on Trypillia sites is difficult to prove or disprove due to selective publication of shapes and decorations in typo-chronological schemes rather than assemblages according to excavated units (e.g., household assemblages). As the pottery analyses at Nebelivka have shown, even incomplete ceramic assemblages from a small part of an excavated house (up to 3%) can provide a good basis for intra-site comparison. The differences in forms, fabric and decorative motifs may have varied through the passage of time but these variations had social referents which require explication. This is one further facet of the heterogeneity characterizing material culture at Nebelivka – one that was highly improbable at a small site such as Grebeni.

The variations in the small lithic assemblage were primarily related to three variables - the use of higher-quality exotic flint or lower-quality local flint, different *châines opératoires* and the presence of various individual knapping strategies for the production of projectile points. All of these causes of variability can be related to household lithic knapping rather than centralised production, with the acquisition of exotic Volhynian flint by some households only leading to different cultural narratives connecting Nebelivka to the outside world than for houses with access to local flint only.

By contrast, the fragmentary figurines at Nebelivka showed little variability in form, breakage and condition, with the exception of changes in the number of fragments deposited in pits and houses. This finding supports Orphanides' (2010) contention that figurines of similar form mediated community agreements on important concepts of being or place in the social order. It is also important to note that the density of figurines per site as a whole, and the sub-group of realistic figurines, hardly varied with the size of the site or its date (Gaydarska 2019). This finding reinforces the notion of the Trypillia Big Other as a stable entity functioning in similar ways on megasites and on small sites such as Grebeni. This tells us something important about the Big Other: the replication of practices deriving from acceptance of this framework for life on all Trypillia sites confirmed the Big Other as a strong force for social integration which transcended even the differentiation of practices on small and large settlements.

Concentration of skilled labour and management

An important aspect of personhood is the range of personal skills and abilities that individuals develop over their life-course (see above, Section 5.2.1: Chapman & Gaydarska 2011). Very different persons can be defined for their closeness to one of the extremes – a person with high skills in one area whom we may call a 'specialist' or a person with a broad range of low-level skills in a range of different areas (roofing,

flint-knapping, grinding), such that we may term them a 'generalist'. Generalists would have been more typical, and more useful, in small sites such as Grebeni, whereas megasites with such large populations may well have included specialists in many households. Although, at first sight, the absence of kilns and other workshops at Nebelivka would suggest few concentrations of skilled labour, there is a lot of indirect evidence for skilful production and careful management. We have already suggested the presence of Limited Interest Groups for several types of production. First, nearly 1,500 households would have required an enormous amount of pottery. The local production of at least some of pottery, as shown by raw material analyses (Chapter 4.9), reveals that Nebelivka is midway between a small Trypillia site with its household-based pottery production and Taljanki and Majdanetske, with their much larger scale of kiln-based production. The graphite painting of typical decoration motifs on three special miniature vessels certainly betokens highly skilled work by a non-local. This may indicate movement of skilled labour attracted by the reputation of Nebelivka which would hardly have been possible at the Grebeni site. Secondly, the variety of styles for producing projectile points shows a range of highly-skilled flint-knappers at the megasite. The higher degree of weapons standardization as a good predictor for greater incidence of warfare (Brill 2016) confirms the low significance of warfare in Trypillia communities. Thirdly, the construction of Assembly Houses, that, at least until very recently, is typical only for megasites, is an unique example of either off-site modular building and on-site assemblage or a still unidentified method of on-site building and burning that leaves a very distinctive footprint. Larger than usual houses are known from the inception of the Trypillia-Cucuteni network (e.g., Baia: Hofmann et al 2016; or Olexandrivka: Videiko 2005). They are rare and their position within the overall settlement planning is unclear but there is a tendency towards a central location. Among the pre-BII large houses, so far there is only one example at Adâncata – Dealul Lipovanului in Moldova (Hofmann et al 2016, Fig. 16) which displayed the construction features of future Assembly houses but not their specific location in relation to the house circuits. Hence, this is an additional plan element which, through bricolage, was later included in planned BII megasites such as Nebelivka.

A vital inter-personal skill for the megasite was the ability to plan and manage the people and the resources on which the site was dependent. Many facets of woodland management came into play at Nebelivka, including an understanding of forest regeneration, the coppicing of hazel, possibly planting and most certainly maintenance of trees and reeds. Procurement of chaff and clay (for pottery as well as for house-building) and drying of wood/withies would have required planning and storage. This ability also concerned the temporal scheduling of tasks completed by different groups (e.g., the coppicing of hazel should have been started five years before the start of house-building) and planning for the availability of tools and facilities before a task was started (e.g., the making of quantities of antler picks and scapula shovels before the digging of a stretch of the perimeter ditch). These skills

were no small matter, in view of the staggering number of people needed to build the site, collect the fuel for daily needs over 200 years and assemble the timber to burn over 1,000 houses (Table 6.6).

None of these skills would have been necessary for the development, building and running of Grebeni with its 38 buildings, provided that the builders had access to a sufficiently large area of forest to search for hazel withies. If Grebeni was close to other settlements, woodland management may already have been in place, enabling relatively easy exploitation. The advantage of planning woodland utilization two or three years in advance for even a small new settlement would have been the provision of materials close to the site, with a marked reduction in transport requirements (S. Johnston, pers. comm.).

Finally, we should not forget that the agglomeration of so many people and animals would have generated a large quantity of daily waste that also needed to be managed, especially to conserve local water quality in the Nebelivka wetlands. The same problems of waste management would hardly have existed at small sites such as Grebeni.

The built environment/formalized spaces with special functions

One of the most skilful operations in Nebelivka was the vision and precision needed to achieve the layout of a regular site plan, especially in the face of the variety of grass-root opinions. The Nebelivka promontory offered a gently sloping area of almost 300ha. The intervisibility of most parts of the megasite from the central zone facilitated the layout of a site over 1.5km in length from North to South. Although concentric arrangements and large settlements were known before the emergence of Nebelivka, they were rare and their plan elements were not juxtaposed at such a scale. The irregular nature of the settlement planning data of the only earlier 100+ ha site with a geophysical plan (Vesely Kut) justifies the claim that Nebelivka represents a novel social and spatial concept that combines dwelling areas with a place for massive assemblies. Palaeo-environmental data indicating rising levels of cereal pollen (Section 4.1) suggests that the place where the future site would appear was settled before and may even have hosted gatherings. Formalizing the inner open area through enclosure with a house circuit was a conceptual breakthrough enabling the integration of an assembly function with a novel scale of dwelling. This is not to deny that rituals, ceremonies or structured deposition took place on small sites like Grebeni – rather to suggest a limited scale of feasting and exchange of exotic items and low-bulk, high-value materials. Megasite assembly for up to 3,200 people would have been a major event in the regional calendar, where people from many sites could meet each other and celebrate their belonging to the Trypillia way of life in inclusive performances.

The creation of a distinctive form of large, public structure – the Assembly House – also differentiated megasites from most, if not all, small Trypillia settlements. Although the excavated Nebelivka example – the so-called ‘Mega-structure’ – was

not a place for extravagant deposition (see Section 4.5.1), finds such as the gold hair-ornament and the fragments of the gaming board point to special practices found rarely on megasites, if at all on smaller sites. Moreover, the formal roles and distinctive locations of the Mega-structure and other Assembly Houses at Nebelivka were quite different from the sole example of a pre-Phase BII Assembly House.

The scale of subsistence

This aspect of characterization depends entirely on the number of inhabitants on the site and on the type of occupation – whether seasonal or permanent. In any case, the organization of subsistence practices at a megasite would be different from that of Grebeni. Starting with the Pilgrimage Model, growing crops and keeping animals for the small group of site guardians seemingly reproduced the small-scale economy of a standard Neolithic site. However, key pilgrimage practices of ritual and feasting necessitated larger-scale production of food and drink, that in turn would have been replenished by pilgrims' gifts. Such a gift-oriented arrangement led to risks of over-production (superfluous giving) or under-supply (supply issues), with experience gained over the years mitigating these risks with forward planning and storage. In that sense, the apparent lack of storage vessels at Nebelivka is intriguing but we should not forget that containers could be made of perishable materials. More importantly, the ceramic assemblages at Nebelivka were not 'living assemblages' but, for the most part, the results of deliberate deposition.

The Assembly Model would have had a similar arrangement – small-scale mixed farming for the permanent occupants, topped up with provisions and donations by the visitors catering for their own consumption but also planning for trade, exchange and gifts.

The Distributed Governance Model relied on a different principle of a social pact to which the supply of off-megasite resources was essential. A wide support network assured the constant or seasonal flow of foodstuffs to Nebelivka, as the burden was shifted annually among the participating social groups. There were enough contemporary smaller sites in the 100km catchment of Nebelivka to have sustained both themselves and also the permanent occupants of Nebelivka (maximum 3,200 people) over a 10-year cycle (Gaydarska, submitted).

A key element in each of the Models was the provision of live animals to Nebelivka as a contribution to subsistence and/or feasting. Here is a good example of the agency of animals, whereby one 400kg bull or a 300kg cow would cover the contribution of a home community to a megasite pilgrimage for one season. It has now been recognised that the slaughtering of animals was a weakness in any household economic model which emphasised separate household identities, simply because the quantity of meat produced could not have been consumed by household members in a short time (Halstead 2011; Mlekuž 2005). Even on a small site such as Grebeni, 400kg of meat, at 500g of meat per person, would have been sufficient for a feast for its entire population of 240 people and many hundred visitors as well, with surplus meat preserved by

imported salt. This calculation suggests that slaughtering a bovid at a small site was not a common occurrence, with caprines more likely than bovids at feasting on small sites. By contrast, a grand feast for the entire population of 3,200 people in the DGM would have required the slaughter of four mature bulls.

In summary, the scale of subsistence is where the allowance for fuzziness in the characterization is particularly useful as what is produced locally and what is brought as gift/tribute depends on which of the three models is preferred. Once again, whichever model is preferred is far removed from Grebeni subsistence practices, with the most distant fields located half an hour's walk from the settlement and two communal flocks of 80 cattle and 200 caprines pastured near the settlement by a handful of shepherds.

Affordance to be a node and re-distribution centre of wide-reaching exchange networks

That Trypillian communities were parts of different-sized exchange networks is evident from the metal supplies, initially related to the Balkan copper sources but which shifted to Transylvanian sources in Phase BII (Ryndina 1998). Such a large-scale network was the basis of the introduction of Balkan copper to Hvalynsk in the Volga Basin via North Pontic or South Trypillian communities (Chernykh 1992). Medium- and small-scale networks would have involved the exchange and/or trade of salt, flint, pigments including manganese and graphite, pottery and animals. Some of these low-bulk goods could have been distributed in a 'down-the-line' manner, whereby adjacent sites such as Grebeni and its neighbours took what they needed and passed on the remainder to the next settlement. Alternatively, they may have been a by-product of high-bulk (e.g., salt) exchange activities that were re-distributed in certain nodes of the network within a social practice that we now associate with assemblies. Megasites are obvious candidates for such centres, because of the open space allowing the storage or exchange of high-bulk (e.g., animal) goods and access to a wide range of consumers – pilgrims, or assembly visitors, or permanent occupants some of whom may have been specializing in trade and exchange. Direct, although limited, evidence for exchange is the golden hair ornament found in Nebelivka – a rare and exotic find in the Trypillia world; other important items include the imported graphite-decorated dish from South-East Romania and Volhynian flint from the Prut-Dniester valleys. The scarcity of copper on megasites and small sites related principally to the lateral recycling of copper into other objects (cf. Taylor, T. 1999). Thus Grebeni-type sites could have occasionally acquired exotic objects directly via down-the-line exchange or by sending representatives to assembly sites such as Nebelivka to benefit from redistribution[108]. It was only in large sites such as Nebelivka

108 An example of such a high-value item occurring on a small Cucuteni site is the pre-Balkan Platform flint blade from North-East Bulgaria found at Silişte-Prohozeşti, near Moineşti, Moldavia, presumably as the result of redistribution from the nearby tell of Poduri (Chapman & Monah 2007).

that redistribution was feasible because of the scale of assembly or dwelling, with 10 times more potential exchange partners than on sites such as Grebeni.

The social framework for megasites

The perceptive reader will immediately have noticed that the persistently discussed concept of the 'Trypillia Big Other' features in this section as a form of representation rather than an element of characterization. This is deliberate and in accordance with the principle of characterization not to create boundaries. The analogous problem would be that we listed 'hierarchy' or 'heterarchy' as a characterization rather than considering them as alternative representations of the characteristics of 'social framework'.

On current evidence, the social framework of the vast Trypillia network is more heterarchical than hierarchical in nature, as there were no proxies for the latter, unless the status symbols were subject to destruction or poor preservation, such as the feather cloaks, tattooing, wood carving and boat-building of East Polynesian stratified societies (Kirch 1989). The idea of heterarchy would also better fit the widely accepted egalitarian tendencies visible in Trypillan sites of all sizes, Grebeni included. There is an important caveat for such an equation. The term 'egalitarian' is often conflated with communities which are socially undifferentiated. But the kind of inter-personal differentiation (personal ranking) which may have arisen in persons who had, for example, mastered certain high-level skills did not necessarily imply structural ranking on a wider social scale – more a greater distinction for the household of that skilled person or their LIG.

It seems almost trite to reiterate that, on a megasite as vast as Nebelivka, the spatial recapitulated the social. In each of the three alternative models, residents from between ten and 40 home communities settled at, or visited, Nebelivka, constructing well-built, sometimes two-storied, houses whether they lived there permanently (the Distributed Governance Model) or seasonally for a month each year (the Assembly and Pilgrimage Models). The long-term tension between the 'global' Nebelivka Identity and the 'local' identities of the home communities was spatially replicated by the contrast between top-down planning (the global identity) and bottom-up planning and architectural heterogeneity (local identities). Just as each Neighbourhood was rooted in and reproduced the spatiality of its own home community, so the leaders of each Quarter sought to integrate several different home communities into *their* understandings of the overall Nebelivka planning schema. The differing numbers of Neighbourhoods in each Quarter influenced the way that Quarter leaders tried to reduce their planning tensions, leading to the different shapes and sizes of each Quarter as well as varying widths and shapes of the vital intra-concentric circuit space. The intriguing result of the VGA (Section 4.3.2) was that, despite all of the variability, the Quarters produced a consistently similar spatial order over the long term and across the megasite.

At the more local scale, there were endless spatial ways of differentiating a specific group from another group, whether laying out a separate 'square' in the area inside the inner house circuit, the use of a 'kink' by those laying out the next Neighbourhood to separate their houses from the previous house group, or the decision to 'block' the continuation of an Inner Radial Street with a segment of a concentric street at right angles to the IRS. The most extreme example of such 'political' planning was the Northern area of Majdanetske, where the tensions between IRSs and concentric streets erupted into planning chaos (see Section 6.2). But such differentiation of Neighbourhoods did not prevent interaction between the house groups, with grander ceremonies such as Assembly House-burning attracting participants from several or many Neighbourhoods.

For the Assembly and Pilgrimage Models, the long-term tension between 'global' and 'local' identities could be sublimated in a one-month visit but what happened for the permanent residents of the ten clans in the Distributed Governance model? The simplest scenario was that each clan built one or two Quarters and lived there permanently, with Neighbourhoods reproducing local clan variations whether in one or several home communities. In this way, those clan leaders in the 100km Nebelivka macro-territory who played important roles at the central site would have become Quarter leaders and, in some cases, members of the Nebelivka Council.

Behind all of the changes in the evolving megasite layout was the group who had initially made the decision to begin a centre at Nebelivka – for the Assembly and Pilgrimage Models the site Guardians, for the DG Model the Council. How did this group not accrue such status or worldly goods as to be translated into a 'Royal Lineage' or some such exalted title? The strong possibility of such a development means that any constraints on household or small-group accumulation would have been established in the deep structure of the Trypillia group, for example in the Trypillia Big Other (for the disadvantages of small-group competition on urban sites, see Jennings & Earle 2016). An egalitarian ethos was fundamental to many of the Balkan Neolithic and Copper Age groups from which the Cucuteni-Trypillia group emerged (e.g., LBK, Boian and Vinča: Chapman, in prep.) and such a strong principle would have guided many of the Trypillia social practices. The founding group obviously held an important position - the founding group with lineage primacy if this were based upon a descent group system. But if members of the founding group decided to extend their kinship authority or ritual primacy into a more general social dominance, one would have expected strong resistance against such an inegalitarian policy which ran counter to the Big Other. In a similar way, it is unlikely that households with members showing signs of distinction, whether as particularly skilled flint knappers, carpenters or figurine-makers, would have desired, let alone achieved, the structural prominence of their household on a permanent basis. They may also not have desired to become the leaders of their particular Limited Interest Group. However, this did not preclude the expression of different types of personhood as denoted by figurine styles within the Trypillian Big Other (Gaydarska 2019).

In the megasites of Taljanki and Majdanetske, the transformation of pottery production from a largely or wholly household affair, as in Nebelivka, into a system of dispersed, kiln-based production created the first serious caesura in the communal mode of production. Importantly, the new system changed the basis of the relationship between households, Neighbourhoods and Quarters, with specialized workshop production underpinned by Limited Interest Groups of skilled potters, who fostered communal co-operation with individual households and Neighbourhoods. Thus, a specialized production practice combining the labour of many persons was itself integrated into pottery production – one of the key aspects of Trypillia lifeways. The fact that pottery kilns were widely dispersed across two megasites suggests the importance of the Quarter as a heterarchical organisational and decision-making unit, in contradistinction to a centralised model of a single, specialised pottery-producing Quarter organised at site level in a hierarchical manner.

It is clear that such a complex social structure, based largely on the reproduction of prior socio-spatial relationships in home communities onto the megasite planning frame, would have been entirely superfluous in a Trypillia site as small as Grebeni. Indeed, if the reader were searching for a single, decisive differentiating trait between urban and smaller settlements, it would come in the form of social complexity at the former and its complete absence at the latter.

6.3.3 Summary

In summary, a clear distinction between a megasite and a smaller Trypillia settlement can be drawn for every single characterization discussed above. The relational analysis can thus be said to have reached a successful conclusion – we have demonstrated that there is no possibility that the Nebelivka megasite was simply a very large example of a typical small rural settlement. Such an equation would be a **categorical** mistake, of the kind which suggests that aircraft carriers are simply very large examples of yachts. This result indicates that, for the 4th millennium BC on the forest steppe of Ukraine, there was a class of sites which was so different from typical small settlements that it merits the title of 'city'. The claim is that Trypillia megasites exhibited the same order of qualitative and quantitative differences from the typical small Trypillia settlement as the city of Uruk did from small tells in the Fertile Crescent, or Roman London from the villas of South-East England. The fact that this class of megasites can be dated to the earliest part of the 4th millennium BC – several centuries earlier than what had been supposed to be the earliest cities in the world – is a further ground for considering their significance in world prehistory in a new light.

Before considering this finding in a wider context, it is worth pausing to consider the two recent comparisons between what has been for long believed to be the earliest city in the world – the Late Chalcolithic 5 phase at Uruk – and the Trypillia megasites which we now claim as the earliest cities. In the first account (Müller &

Pollock 2016), large sites in the South Mesopotamian alluvial lands were inhabited for millennia, while small sites were more volatile. The city of Uruk in Late Chalcolithic Phases 2–4 was said to be too large to be self-sufficient, requiring tribute from people living outside it. Increasing centralization was seen in Uruk Phase LC5, with a wide range of objects associated with administration. However, it is conceded that Uruk urbanism was 'exploratory' in the sense that many architectural innovations were not perpetuated. By contrast, although large, the absence of a tributary system and an elaborated urban management at the Trypillia megasites showed that they were a social 'experiment' in nucleated living. The parallel notions of 'exploratory urbanism' (Uruk) and 'social experiments' (megasites) show that there were common elements between the two regional cases.

In the second account (Wengrow 2015), the case is made that there were two examples of cities before the state in the 4th millennium BC – in South Mesopotamia and in the Ukrainian forest-steppe. There is an emphasis on the diversity of 4th millennium BC social organisation, with significant autonomy of smaller households and kin groups in agrarian and craft production – including local irrigation systems – alongside the large-scale centralised institutions. This diversity is matched in decision-making bodies, which included civic assemblies, tribal councils and other bottom-up groupings in addition to the centralised temple institutions. Wengrow does not deny the obvious differences between Uruk and Trypillian megasites in the capacity of the exchange networks in the 'Uruk Expansion' and the standardisation of Mesopotamian pottery in comparison with the elaborate variety of Trypillia painted wares. But he does emphasise that the differences between the political backgrounds of the two cases were not as extreme as Müller and Pollock suggest.

The key point from these two comparative studies is the idea that cities before the state could develop in two such different ways in the two regions of South Mesopotamia and the Ukrainian forest-steppe. We now turn to the further application of the relational approach to two other Trypilla megasites.

6.3.4 Comparisons with Other Trypillia Megasites

It has been possible to complete only a partial comparative assessment of the characterization of the megasites of Taljanki and Majdanetske in the way attempted for Nebelivka, since the respective projects were not formulated with such questions in mind. Similar comments as were applicable to Nebelivka may be assumed for the other two megasites in respect of the territory/area to which the megasites were central, the heterogeneity of their population, the built environment with special areas of formalized space, the scale of subsistence, their affordance as re-distribution centres in wide-ranging exchange networks and the social order. Concerning site size, scaling-up from Nebelivka to Taljanki by an additional 50% would have introduced logistical pressure, even for people with experience of living on large sites. Although

the site clearly thrived for one or two centuries, it is probably not a coincidence that such a size was never attempted again. Majdanetske reverted to the more manageable size of 200ha, with the much more crowded layout representing the major difference from Nebelivka. The difficulty of testing any of the three alternative models on the incomplete site plans of Taljanki and Majdanetske precludes discussion of alternative population estimates which would be more reasonable than the maximalist views. However, the identification of trackways and pottery kilns indicates a greater concentration of skilled labour and management than in Nebelivka – something that is highly improbable at small sites such as Grebeni.

In other words, it is worth assuming that the more expansive discussion of the characterization of the Nebelivka megasite can stand for the megasites of Taljanki and Majdanetske. In all three cases, the structural differences and variations in possible social practices on megasites and small sites show that there is a relational gulf between the two site types. As proposed above (p. 482ff.), this result is very important in terms of the relational model of urbanism, for it suggests that we can identify in the Trypillia megasites the earliest known case of European urban settlements. How do the Trypillia megasites relate to other urban sites of the type known as low-density urban sites?

6.4 Low-Density Urbanism

6.4.1 The Low-Density Urbanism Model

This section is not the place for a wide-ranging and detailed analysis of the many and varied trajectories towards low-density urbanism (henceforth LDU) that can be identified across the world today (but see Fletcher & Kim, submitted). Instead, we can accomplish a lesser goal – to compare and contrast Trypillia megasites with the characteristics of other megasites which have become part of the global debate on low-density urbanism (Chapman & Gaydarska 2016a).

Roland Fletcher (2009, n.d.) has characterised LDU as a different kind of urbanism from the classic nucleated form – one in which the urban centre moved outward and colonised the rural areas to produce a patchwork of monumental foci, residential houses and agro-pastoral areas. This insight led to the search for other large, LDU sites which did not, by definition, fit well the traditional definitions of a city. The global distribution of low-density urban sites is currently patchy, owing to variable research but covers the temperate zone in Europe (Trypillia, Iron Age *oppida*), North America (Cahokia, Chaco Canyon) and East Asia (Longshan group, China), the savannah zone in Africa (Great Zimbabwe), as well as the tropical zone in Africa (Yoruba towns), East Asia (Co Loa, Angkor Wat) and South America (Amazonia) (Fig. 6.11). Current areas without obvious LDUs include much of the Near East, North Africa and South Asia.

For a decade, these low-density urban sites comprised a group without a satisfactory name. Our proposal was to give the generic name of 'megasites' to these embodiments of LDU (see above, p. 22). These sites were settled in immensely varied landscapes, demonstrating varied forms of architectural and social complexity as well as trajectories of development, peak and decline. Yet there are seven polythetic traits shared by most, if rarely all, forms of LDU.

First, the importance of major building projects, which transformed the LDU site at each new phase. There was a sense, at major monumental foci such as Cahokia (Pauketat 2009, n.d.), that the world was created anew each time a new temple or monument was constructed. The foundation of each new stone compound by a different Shona king at Great Zimbabwe (Pikirayi, n.d.) also re-formulated royal interactions, creating new foci of elite attention for the entire population. If we think, together with McAnany (n.d.), of building projects as 'experiments' in agglomeration – in sociality – we can avoid the dangers of anachronism and teleological reasoning.

Secondly, there was a strong modular component of kinship-base, house-oriented planning practices in LDU. This element was especially significant in the emergence of Yoruba towns, where, from a starting position of houses linked to mega-houses ca. AD 500–800, with with a corporate head, under an overall ruler, the mega-houses were dismantled and replaced (AD 11^{th}–12^{th}) by an urban component of multiple corporate groups under a centralised government and a divine king (Ogundiran 2013, n.d.).

Thirdly, many of the smaller LDUs – sites of 50–70km^2 rather than 500–1000km^2 – had seasonal components in their populations. The most extreme example may be the Solomonic Empire of Ethiopia (AD 1270–1529), which moved its low-density capital of some 40,000 residents, with a standing army of a further 40,000 soldiers, every few weeks (Marcus 1994; Fletcher 1998). White suggests that many of these smaller LDUs may have had a seasonal component which had the perhaps unintended consequence of weakening household ties (White, in prep.).

Fourthly, most cases of LDU downplayed the mortuary domain. Although the Early Shang period of China was an exception, many other examples of LDU showed very little burial evidence (Cahokia, many European *oppida*, Amazonian megasites, Yoruba towns and Great Zimbabwe). The concentration of ideological power in the hands of the ruling elites would have created tensions between households and the centre, especially at the time of deaths in the family.

Fifthly, there was rarely an obvious successor to the LDU site, whether on the same place or in the same region. Regional capitals such as post-Han Co Loa were abandoned ca. 150 BC, not to be re-settled again (Nam 2013, 2015). After the great house-burning events at Cahokia, depopulation took the form of sub-group out-migration with no monumental centres left (Pauketat n.d.). Pauketat (n.d.) has drawn an ontological contrast between mud-brick cities, which lasted millennia, and wattle-and-daub cities, which lasted centuries if not mere decades.

The sixth feature was the transformation from higher-density to lower-density large sites in the creation of LDUs. Fletcher (1995) postulates that a common urban trajectory began with high-density cities with a size of up to 100ha and a population density of 300–600 people per ha, but that these cities morphed into increasingly large but also increasingly low-density settlements of 1–40km^2. While the most noteworthy modern example is Megalopolis on the East Coast of North America, there are also many ancient examples which have been transformed from higher-density precursors into huge low-density centres (e.g., Angkor, Cahokia and Co Loa: Fletcher & Kim, submitted).

The time taken from the origins of agriculture to the formation of urban communities is the seventh trait which differentiates high-density from low-density centres (Feinman & Nicholas 2016, Fig. 13.2; Fletcher, n.d.). The large, compact, high-density examples took far longer to develop after the initial domestication of plants and animals – up to 4,000 years – but then lasted far longer. By contrast, megasites took a far shorter time to develop since the regional emergence of agro-pastoralism and generally lasted far shorter than the high-density capitals.

There are many other interesting aspects of the global pool of LDUs but these seven characteristics provide a picture of dynamic, changing settlements whose population may have been more mobile than we may have expected and whose building projects created a succession of 'new worlds' in which successive generations of residents made their lives.

How do the Trypillia megasites compare and contrast with this heterogeneous bunch of 'misfits'? Or do the megasites accord better with Gabriel Cooney & Eoin Grogan's (1999, p. 232) characterization of the Neolithic as 'local worlds linked by exotic elements'? Were Trypillia megasites 'Neolithic' in subsistence, with their inefficient, extensive mixed farming and scarce prestige goods, but 'urban' in appearance, with their massive size and organised planning?

It is surely not coincidental that the Trypillia megasites meet all seven shared characteristics for global megasites. The major building projects required for the creation of the megasite plan provided the kind of inter-generational temporality at the planning scale which Kujit (n.d.) deemed necessary for households. One of the key elements in the plan – the Quarters – was found in other megasites such as the Swahili cities (termed 'wards': Kusimba et al. 2006), while focal Assembly Houses of the Nebelivka type were important in the house clusters of the Moundville complex as much as in those of Tahitian villages (Kahn n.d.). Moreover, there is a structural parallel for the Quarters/Assembly Houses in the development of 30 seasonal ceremonial centres each with a mega-mound in the 3rd millennium BC in the Norte Chico group of Northern Peru (Piscitelli n.d.). The range of housing density on all well-studied Trypillia megasites is compatible with the low density of other newly-designated megasites (Fletcher 2009).

The next characteristic of megasites – the modular component of kinship-based, house-oriented planning – is fundamental to Trypillia megasites. While the modular unit of the household has been recognised as basic to all Trypillia sites, the large-scale planning which prioritised the location of each house relative to its neighbours was restricted to the Trypillia megasites. The significance of house groups from the same home community arriving together at the start of the Nebelivka megasite is reminiscent of the importance of extended households in the origins of the Central and West European Iron Age *oppida* (Moore 2017).

In two of the three models proposed for Nebelivka – the Pilgrimage and the Assembly Models – there is a strong seasonal component: for the former, an eight-month-long pilgrimage season when the pilgrimage centre was open for visits from Trypillia pilgrims, while, for the latter, a one-month Assembly period in the summer for a high-intensity period of gathering, ceremony and consumption. One aspect of the Trypillia megasites which differs from other urban practices is the way that links between the centre and the home communities were never broken – if anything they were even strengthened through seasonal movement or, in the Distributed Governance Model, by regular provisioning of the megasite. This contrasts strongly with Underhill's (n.d.) description of urban centres deliberately 'forgetting' the ties that bound people to local places in the urban hinterland, and especially to the ancestors, in the search for a stronger urban identity.

From the outset ca. 5000 BC, the entire Cucuteni-Trypillia group developed a much stronger domestic arena than a mortuary domain, with no sign of formal cemeteries until centuries after the end of the megasites. The fact that there was a pre-existing dearth of extra- and intra-mural burials in the Trypillia group may have facilitated the creation of a distinctive megasite identity, which could have been threatened by local ancestral ties.

Fifthly, in the post-megasite part of the Trypillia group's development, small settlements began to dominate the landscape, followed by a strong reaction to the predominance of the domestic arena in the barrow-building period (very late Eneolithic–Early Bronze Age), when monumental barrows gained visual and material control of the landscape. There was thus no obvious successor to Trypillia low-density urbanism, whose wattle-and-daub architecture provided limited potential for material survivorhood.

The only apparent exception in the suite of shared LDU characteristics was the decreasing density of Trypillia megasites with increasing size in comparison with earlier sites. We cannot yet confirm this sequence for the maximalist model of Trypillia megasites, perhaps because so few complete Early Trypillia settlement plans have been published using modern geophysics (but cf. Mogylna III and Nebelivka, Fig. 6.12). However, the comparison of occupational densities for any one of the three alternative models for Nebelivka with earlier Trypillia sites shows a steep decline in the number of structures per ha, with fewer than four buildings per ha for each

model[109] – well below any of the occupational densities published for Early Trypillia settlements.

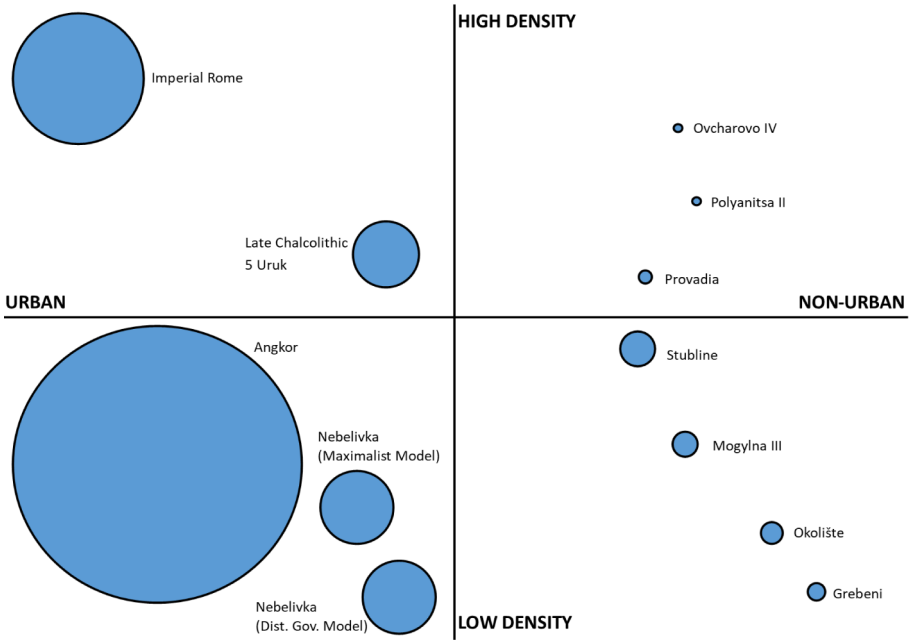
The short period of time of less than one millennium between agricultural origins and megasite formation was also confirmed for the Trypillia settlements. Since it is hard to discern traces of domesticated plants and animals in the 'Forest Neolithic' which preceded the spread of Trypillia pottery-using groups Eastwards from the Prut valley, the current view is that the Eastward spread of agriculture coincided with the expansion of maximal settlement size in the forest steppe zone through the 5th millennium BC, with planned megasites dating from the beginning of the 4th millennium BC.

These comparisons show that the Trypillia megasites have as much justification for inclusion in the list of LDU sites as any other regional class of sites, sharing all of the seven most widely distributed characteristics in the global distribution of low-density urban sites. While the appearance of all seven LDU characteristics does not prove with absolute certainty the claim that the Trypillia megasites were part of the global LDU Phenomenon, their presence in 4th millennium BC Ukraine makes a strong case for the inclusion of these extraordinary sites in the emerging group of low-density urban sites.

This claim should not obscure the point that there are both urban and non-urban sites in both categories of occupational density – high and low (Fig. 6.12).

We have deliberately chosen the small number of sites in Figure 6.12 lower to emphasise the range of sizes/densities in play. As a total contrast, the tiny North-East Bulgarian tells of Ovcharovo and Poljanitsa - by no stretch of anyone's imagination a pair of cities - have some of the highest residential densities in Eurasia, while the residential density of 7.5 persons/ha applies to one of the world's largest sites – the 1,000km^2 LDU of Greater Angkor. In between these extremes lie most known archaeological sites. The estimated populations of the non-urban settlements from South-East and Eastern Europe fall between 59 and 180 people/ha, with sizes of between 1ha and 16ha. Two urban sites of comparable size – Late Chalcolithic 5 Uruk and Nebelivka – show population densities of 100–200 for the former and 10–42 for the latter. There can be no doubt that living on any of these exemplary settlements would have engendered a very different experience from living on most other sites. The contrasting residential densities of Late Chalcolithic 5 Uruk and Nebelivka make the strongest point about the kind of lifeways experienced on these two sites of similar size.

109 The highest occupational density estimates for the three models show 1.6 structures/ha for the Distributed Governance Model (all generations); 2.7 structures/ha for the Assembly Model (Generation 4); and 3.3 structures/ha for the Pilgrimage Model (Generation 3).



SITE	SIZE	ESTIMATED POPULATION	ESTIMATED NO. OF STRUCTURES	DENSITY (PEOPLE / HA)	DENSITY (STRUCTURES/ HA)
Ovcharovo IV	0.1ha	78	9	786	91
Poljanitsa II	0.15ha	77	14	524	98
Provadia	1ha	150 - 200	20	150 - 200	20
Grebeni	4.5ha	228 - 304	38	50 - 68	8.4
Okolište	7ha	600	120	85	17
Mogylna III	10ha	630	105	63	10.5
Stubline	16ha	2880	480	180	30
Uruk Late Chalcolithic 5	230ha	23,000 - 46,000	???	100 - 200	???
Nebelivka (Distributed Governance Model)	238ha	2,400 - 3,200	400	10 - 13.5	1.7
Nebelivka (Maximalist Model	238ha	10,000	1,445	42	6.1
Augustan Imperial Rome	1,783 ha	1 million	20,000	561	11.2
Greater Angkor	500 km^2	375,000	???	7.5	???

Figure 6.12: Densities of people and structures per ha, urban and non-urban sites of low- and high-density (upper by L. Woodard; lower by J. Chapman).

6.4.2 Summary

The comparison of Trypillia megasites with the broad range of low-density urban sites found elsewhere in the world produces a convincing demonstration that the Trypillia megasites are currently the earliest known examples anywhere on earth not only of urban settlements but also of low-density urban settlements. Moreover, the acceptance of two of the three alternative models of megasite development means, in effect, that not only do we have low-density urban centres whose occupations may well have been seasonal in nature but their political economy was also partly restricted by the small volume of exotics crossing the Ukrainian forest steppe. This is perhaps not the conclusion that supporters of classic Childean urbanism would have been happy to contemplate. But it is a conclusion that places the Trypillia megasites closer to the worlds of the Neolithic than to those of the Near Eastern Late Chalcolithic or Early Bronze Age, in the sense of Cooney and Grogan's (1999) characterization of the Neolithic as a series of 'local worlds linked by exotic elements'. What we are seeing is a local world fitted within a 100km radius of a megasite and developing close network links with many of the sites in that macro-territory – a combination of Cooney and Grogan's insight with the megasite characteristics of low-density urbanism. The second point is to underline that the very low quantities of exotics so far found at any of the three most widely explored megasites fits the second part of the description rather well.

6.5 Summary

This chapter has focussed on a complex, comparative approach which has covered a huge amount of ground, from the lowest spatial scale of the household up to global comparisons of low-density urban sites. There are seven conclusions which are of the greatest significance for our study of Trypillia megasites.

First, the spatial and artifactual analyses at Nebelivka confirm the importance of the four nested levels that we have proposed for the megasite. The performances of house-burning were reinforced by the 'death assemblages' of pottery and other objects, which rarely reflected the living assemblages of the time but instead showed the selection of objects which conveyed the relationships of other groups to the burnt house and its residents. The variability of content and house size in the second nested level of Neighbourhoods showed how different 'home communities' were represented at Nebelivka – a practice that reduced the size of the entire megasite to more manageable, 'local' proportions. The VGA analysis of Quarter space confirmed that, despite local variability in size and arrangement, the Quarters respected similar rules of spatial patterning across the whole megasite. In view of the surprising lack

of materialisation of a hierarchical social order, the principle of heterarchy was important at the megasite level for each of the three alternative models.

Secondly, three models have been developed as alternatives to the rejected 'Maximalist' model of large, permanently occupied, all-year megasites with massive populations. Each of the three models – the Distributed Governance Model, the Assembly Model and the Pilgrimage Model – is consistent with the four principal constraints of the Nebelivka occupation – the modelled length of the duration of Nebelivka at 200 years; the number of houses built at 1,445; the number of houses burnt down at 1,077; and the absence of a major human impact on the Nebelivka landscape and its forest steppe. While each model has its own specific strengths and weaknesses, on current evidence we cannot eliminate any model. This remains a research priority for the future. Preliminary testing of the models at Majdanetske and Taljanki gives promising results.

Thirdly, the origins of the megasites were founded on the site clustering that began as a long-term settlement trend in Phase BI and their emergence as nodes in wide-ranging exchange networks in this Phase. The first combination of the key planning principles of inner open areas, concentric house circuits and inner radial streets dated to Phase BII, with the establishment, at sites such as Nebelivka, of a new combination of inner ritual space and outer residential space. The key potential for alliance formation differentiated megasites from other, smaller sites.

Fourthly, any successful account of the demise of the megasites must explain the three cycles of decline and recovery, from Phase BI onwards. There is weak current evidence to support the traditional explanations of the demise – warfare and unsustainable subsistence. The alternatives concern fluctuations in long-distance exchange networks (flint, copper, pigments) and the competition between the megasites of Nebelivka, Majdanetske and Taljanki, whose partially coeval occupation has been demonstrated by new AMS modelling.

Fifthly, the new approach of 'relational urbanism' has yielded a positive result in terms of the comparison between the Nebelivka megasite and a typical, small Trypillia settlement such as Grebeni. The comparison took the form of nine different characterisations, on all of which there were substantial differences between the megasite and the small settlement[110]. This means that the experiences of people living on megasites and small settlements were so different that the megasites could not be considered as simply 'very large settlements' but, in relational terms, were different types of site – urban settlements.

Sixthly, a global comparison of Roland Fletcher's category of 'low-density' urban sites – an alternative to the classic high-density urban sites such as Rome, London

110 The only exception to this pattern of difference can be found in one aspect of the characterisation of 'population heterogeneity', in which the Trypillia Big Other, identified through the proxy of the density of figurines per site size was similar on large and small sites (Gaydarska 2019).

and Constantinople – shows that the seven principal characteristics of low-density sites were also found in the Trypillia megasites.

This means that, finally, the Trypillia megasites can be considered not only as urban centres but also as the earliest urban centres in the world; not only as low-density urban sites but also as the earliest low-density urban sites in the world. Furthermore, future acceptance of either the Assembly or the Pilgrimage Models for megasite growth would mean that the earliest urban centres in the world were not only low-density but also featured temporary occupations.