

## VI

### FINAL REMARKS

Now that the relations between the LBK populations of the four settlements Sittard, Stein, Elsloo and Hienheim on the one hand and their environment on the other have been discussed, we wish, finally, to cover a few points which have been raised by the study of the material.

One point concerns the usefulness of the reconstruction of the environment. In the first place, we still believe it was a sensible approach to zonate the environment for the purpose of the reconstructions. The reason is that in practice the study of the environment involves drawing maps which compels the choice of the size of the area to be drawn. As such a choice is made at the outset of the study, it can never be based entirely on facts. Our choice was made on theoretical considerations, and the radii of the zones were fixed at 10 km, 30 km and infinite. The 10 km and the 30 km were considered as maxima. We now wish to say something about the final value of the reconstructions, which have been based on this zonation.

The 10 km radius is indeed a maximum radius. The zone with the most intensive economic activity, which it should describe, appears in reality to have been much smaller. Besides, it need not have been circular. These two conclusions are the result of our locational analysis, which we intentionally placed at the end of our study. Although it might seem plausible to begin with a locational analysis, we consider that this is not possible without knowledge of at least some aspects of the environment. Thus, for example, one will have to know the neighbouring settlements. It is also possible to start with a partial analysis of the environment, to follow with a locational analysis, to complete the environmental reconstruction, to describe the relations between the inhabitants of the settlement and the environment and subsequently to adjust the locational analysis. However, the risk exists then that the area to be reconstructed is restricted too soon, that too little is reconstructed and that certain relations are overlooked. A disadvantage of our procedure is that perhaps too much is reconstructed. In order to see to what extent our study was too extensive and therefore irrelevant, we shall review the different aspects of the reconstructed environment within the 10 km radius. At the same time the contrary can be judged, namely if the reconstructions have been adequate.

Looking in the first place at the climate, we have been able to give a rather global reconstruction which is naturally not bound directly to the 10 km radius. The reconstructed differences with the present climate have been used in answering the question whether the dry valleys in the loess areas carried water continuously or not, in the discussion of the yield of the fields, in the search for an explanation of the elm decline in the pollen diagram of the Heiligenstädter Moos, and in the study of the location of the settlements. The reconstruction was adequate in these cases and apparently has presented few direct problems to the investigation. We feel that the climate, within the context of the relation settlement-environment, exerts its greatest influence on the yield of the fields. The fact that the yield could not be calculated is not only due to the absence of certain climatological details, but to the lack of other necessary data such as the quantity of sowing-seed used and the density of the weed vegetation on the fields. A modification of the reconstructed climatological data would at this moment imply only a change in the

reconstruction of the watercourses in the dry valleys, which would influence nothing but the calculation of the distance between the settlement Elsloo and the open water.

The relevance of the reconstruction of the substrate is more questionable. The problem is related directly to the results of the locational analysis, by which the theoretical area with a radius of 10 km shrank to a real site territory of less than 100–200 hectare. One may wonder whether it was necessary to introduce details in the reconstruction of landscape units which eventually fell outside the area that is directly relevant to subsistence, at least as far as agriculture is concerned. The eolian sand area and the Jurassic limestone area may be cited as examples. That it makes sense to discuss the geology of the area within a 10 km radius, need not be argued, as only in such a description do the distinct landscape units begin to become apparent. Without a geological description, even the loess would not have been mentioned. We feel that there is certainly also sense in including the hydrology and the relief in the consideration. These aspects are of importance not only to the vegetation and the fauna, but they are also of relevance to communications and thereby to the contacts with neighbouring populations. The importance of a reconstruction of the soil profile is less evident. It has been of some consequence to the reconstruction of the vegetation, especially in the estimate of the tree growth on the Tertiary sands in Southern Limburg. As the relevance of this vegetation reconstruction is not great either, since the vegetation in question occurs only within the 10 km radius around Sittard and Elsloo, and even peripherally at that, the reconstruction of the soil profile could have been left out. The reconstruction of the profile in the loess deposits is the only reconstruction which, in retrospect, turned out to have been necessary, since the presence or absence of a clay illuviation zone is of importance in the judgement of the loess as a raw material for pottery and daub.

The reconstruction of the vegetation appears to have been far from adequate. This is felt especially in the determination of the location and the extent of the pastures and in the calculation of the area that provided the settlement with wood. Nor was it possible to say anything about the laying out and the location of the fields. Again one may wonder whether it was necessary to try and reconstruct an aspect, in this case the vegetation of landscapes that are not a loess or a river-valley landscape and therefore do not fall within the site territory. Still we think that these reconstructions are relevant. Without them we would not know whether any special commodities, such as grazing grounds, could be present in certain landscape units. Thus it is important to know that there were no moorlands yet on the sands in Southern Limburg. Had they been present, then they might have given reason to review our ideas concerning animal husbandry. We feel therefore that there is a potential loss of information if more extensive reconstructions of the vegetation were left out.

As the reconstruction of the fauna had to be based, as a result of the lack of well-conserved bones, for the greater part on the reconstruction of the substrate and the vegetation, it cannot be seen apart from the latter two. If, for instance, ideas on the composition of the vegetation change, then the reconstruction of the fauna will change accordingly. The reconstruction is hampered further by the fact, that we are poorly informed about the natural density of game. This obstructs a sound judgment of the hunting potential. We feel, by the way, that it also makes sense with respect to the resources for hunting and gathering, to look beyond the limits of the site territories which, perhaps, are defined only by agricultural activities.

Establishing the fact that the settlements were not isolated, but had neighbours, has been of great importance to the analysis of the location of the settlements. More details would have been welcome for this analysis. We were not able to give more than a rough and probably far too wide estimate of the distances between the settlements. In the ideal case it is essential to locate all settlement areas, with their population and the period during which they were occupied. So the reconstruction was certainly relevant, but again too many details were lacking.

We think that we have now answered the question whether the reconstructions within the 10 km radius were purposeful and adequate. The procedure followed indeed led to the reconstruction of too many factors, especially with respect to the soils.

The second theoretical zone, that with a limit of 30 km outside the settlement, appears to elude any appraisal of its real value. As was noted in chapter V p. 147, our study is still too restricted in scope for that. The only aspect which was examined more closely was the possibility of contact with neighbouring populations. The reconstruction appeared to be of significance in the search for the origin of adzes and was, in that respect, adequate.

The third zone describes the environment outside the two defined zones and has been included because it should not be assumed a priori that the environment beyond the 30 km radius would be completely without importance. Indeed that was not the case. The zone provided at least two categories of objects or materials, namely adzes or rock for adzes, and paints.

In conclusion, it can be stated that the environmental reconstruction indeed provided data, which were of use in the investigation of the relations between the inhabitants of the settlements and their environment and in this sense proved valuable, though it has also become clear that the information gleaned is far from sufficient. In chapter I it was pointed out that a reconstructed environment cannot be described with the accuracy that can be reached in the description of a recent environment. This lack of precision has manifested itself clearly.

In chapter II we warned against considering the four examined settlements Sittard, Stein, Elsloo and Hienheim as a random sample from the total of LBK settlements. They could, however, be compared mutually. The comparison might give reason to signal characteristics that might be of general validity within the LBK culture. This might be checked by means of a real test. Since we repeatedly made comparisons in the preceding chapters we can now attempt to establish whether indeed certain of the aspects noted could be of wider application. For this purpose the similarities and differences, which emerged from the investigation will first be enumerated.

In as far as can be established, the similarities are the following. The settlements Sittard, Stein, Elsloo and Hienheim are characterized by the same type of location, one which is determined by the presence of a loess area and a watercourse. The loess area and the valley of the watercourse were forested with a deciduous forest when the respective settlements were founded. The fauna living therein included, among other species, red deer, roe deer, wild boar and aurochs. The inhabitants provided in their subsistence by agriculture and animal husbandry. These activities were more important than hunting and gathering. The cultivated plants included at least emmer, einkorn, pea, lentil and linseed, grown on small fields laid out in the forest. The live-stock consisted mainly of cattle but there were also pigs, sheep and goats. The cattle were not kept in stables. The wild cattle from the surroundings of the settlement were used to supplement the live-stock. The area necessary for subsistence activities, at least for agriculture, cannot have been larger than 100 to 200 hectare and was probably smaller. The inhabitants of the settlements obtained not only food, but also raw materials from their environment. The raw materials found in Sittard, Elsloo and Stein are in no way distinguished from one another. The inhabitants of Hienheim used exact equivalents. In as far as could be established, the majority of the raw materials seems to have come from the surroundings of the settlements. Clear exceptions are adzes and paints. These must be considered as imports.

Besides these similarities, it was considered that certain differences, could, with reservation, be

identified. These are related to agriculture and stock-breeding and are more of a quantitative than of a qualitative nature. It is possible that the inhabitants of Sittard, Stein and Elsloo grew the crops in different proportions than the inhabitants of Hienheim. In IV.2 the possibility was mentioned that less live-stock was kept in Hienheim than in the settlements in Southern Limburg. However, this is not certain, as the evidence is far from adequate. It consists in fact of the observation in Müddersheim, which was the model for Sittard, Stein and Elsloo, and of the poorly conserved bone material from Hienheim. However, we do not wish to exclude the existence of regional variations, the more so because the environment of the settlements shows some differences besides the obvious similarities.

In III.7 two differences were mentioned. The first is the difference in climate between Southern Limburg on the one hand and Hienheim on the other hand. The climate would have been more continental in the Hienheim area. Such a difference could have influenced agriculture. Perhaps the possibility, mentioned in IV.2, of a regionalization of the agriculture had something to do with climatological factors, but this is not clear at the moment.

The second divergence between the regions is the difference in landscape. The surroundings of Hienheim are characterized by partly other substrates than in Southern Limburg. It is conceivable that this difference exerted an influence on the cattle-breeding potential. Also the distribution of the substrates over the area has a different nature, because they do not occur in continuous stretches. The question is to what extent this variation influenced the relations between the inhabitants of the settlements and their environment. We feel that this effect was limited. Even where the extent of the landscape units had any economic significance, they are generally not smaller than the size of a site territory. The relatively small size will therefore have had little influence. In this statement we are aware of the fact, that we have used the size of the most relevant unit, the extent of the loess, to estimate the size of the territory, so that this statement is in a way based on a circular reasoning. Nevertheless we feel that the dissection of the landscape units around Hienheim could have affected the relations between the population and its environment in only one respect: the difference with Southern Limburg may have been noticeable in the contacts with neighbouring settlements. Sittard, Stein and Elsloo lay in a spacious landscape with, it seems, many neighbours. Hienheim gives the impression of having been somewhat more isolated.

From the above it is clear that more similarities were observed than differences as far as the relations between the inhabitants of the four settlements and their environment are concerned. It appears that the general validity of most similarities has already been tested. In chapter V we called the location of the settlements "classical". Indeed it has been demonstrated many times already, that the presence of a loess area (or an equivalent substrate) and of a watercourse have been determining factors in the choice of a settlement site. The fact that the surroundings were forested has often been discussed (see e.g. III.4 p. 40). The importance of agriculture and animal husbandry is nothing new either (see IV.2 p. 77). The species of plants and animals which were the basis of agriculture and stock-breeding have been demonstrated repeatedly in a LBK context. The following aspects should, however, be submitted to further confirmation. The first aspect concerns regional differences in agriculture. We gain the impression that these are real, but the number of studies published is insufficient for really well-founded statements. The second aspect relates to the size of the fields. The hypothesis as to their small size is based on observations from one region only. The third aspect is the relation between the composition of the live-stock and the environment of the settlement. Although Müller finds it unlikely, it is conceivable that the natural vegetation has something to do with the number of live-stock and the animal species that were kept (Müller 1964 p. 63). In the fourth place we should like to know whether the idea elaborated in IV.4 p. 120

regarding the origin of raw materials is generally valid. It should be investigated more particularly whether querns are local in origin, cherts were transported over medium distances, and adzes came from distant places. It should be possible, by systematically gathering data, to make more generally valid statements concerning these four aspects.

This study was announced as a case study in human paleoecology. It was an attempt to establish just how completely the relation between the inhabitants of Sittard, Stein, Elsloo and Hienheim and their environment could be described. The result is a description that mainly illuminated relations of an economic nature, only a segment of the interactions which must have existed in reality. Two reasons can be given for this limitation. One of them is that an important relation, namely the influence of the inhabitants on their environment, to a great extent eludes description because the necessary data are lacking. A complete analysis of the interaction between settlement and environment was therefore impossible. The second cause is our own lack of knowledge about the structure of the relations between people and between population groups. Consequently it was not possible to discuss the relations between neighbouring populations. Thus the result of our study has remained relatively one-sided.