5. Archaeology as a risk in spatial planning: manoeuvring between objectivity and subjectivity

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5.1 Introduction

The recent revision of the Dutch Monuments and Historic Buildings Act, which implements the ratification of the Valletta Convention by the Dutch parliament has left the archaeological sector in a somewhat confused state, even though not all archaeologists recognize and accept this. There are three major changes resulting from the new legislation. Firstly, archaeology is now part of a larger democratic process of decision making, in which it is only one of many spatial factors to be taken into account. It is treated just like soil, water and air quality, ecology and noise pollution. Secondly, this transformation from an inward-facing and 'sectoral' attitude to archaeology to an integral spatial planning approach is accompanied by a shift from purely academic to more practical 'public' archaeology and a change from government-based funding to a commercial, market-based system. Furthermore, decision-making has shifted from the national and/or provincial level to the local, municipal level. The archaeological sector still has to come to terms with this new situation, and the resulting confusion is mainly felt by civic initiators and contractors who now are officially and legally obliged to deal with and take care of archaeology in their specific development area.

The primary reason for the current confusion is the fact that the Dutch national government deliberately chose not to prescribe quantitative and qualitative archaeological norms. There are no norms to decide what kind of archaeology is important, rare and worth preserving, or to what level of detail excavation data should be analysed and reported. More often than not, decisions on these issues are based solely on expert judgement, instead of on objective and predefined criteria. This subjectivity is the source of many risks in archaeological heritage management for civil initiators, as it may seriously affect the time and costs involved in dealing with archaeology.

In this chapter, we will highlight some of the risks in present-day Dutch archaeological heritage management. We stress that we will consider the risk from the viewpoint of the civil contractor or initiator of a specific spatial development, and not as the risk for the archaeological remains in that specific area. We will focus on the risks related to the phase of inventory research, and will discuss possible solutions for risk management that may be found (1) in the use of predictive modelling and (2) in the necessary development of reliable core sampling survey strategies.

5.2 The process of archaeological heritage management in the Netherlands

The process of archaeological heritage management (AHM) in the Netherlands is now generally accepted and common practice for archaeologists. It is designed to ensure that archaeology is integrated in spatial planning in an early stage. Activities potentially threatening the archaeological heritage (*i.e.* all activities likely to disturb the soil, like the construction of houses) are accompanied by archaeological research from the start. Figure 5.1 shows the various steps that have to be taken in order to arrive at a decision on what to do with archaeology. It can be seen as a process of stepwise intensification of archaeological research. Starting out with a desktop study of the complete area under development, in each subsequent step decisions are made on if and where to intensify research. This intensification moves from reconnaissance survey (most often by means of core sampling) to trenching campaigns. The latter, more detailed investigations will only be done in the areas that were decided to be archaeologically 'valuable' in the preceding step. This 'zooming in' on the areas of interest will then lead

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to a final valuation of the archaeological remains found. By using a multi-criteria decision making framework (SIKB 2006), the results of the archaeological research are evaluated. The horizontal and vertical dimensions of the site and its intrinsic value must be clear, and on the basis of the valuation a decision is made on how to preserve the valuable archaeology present: by mitigation, excavation, or supervision[21].

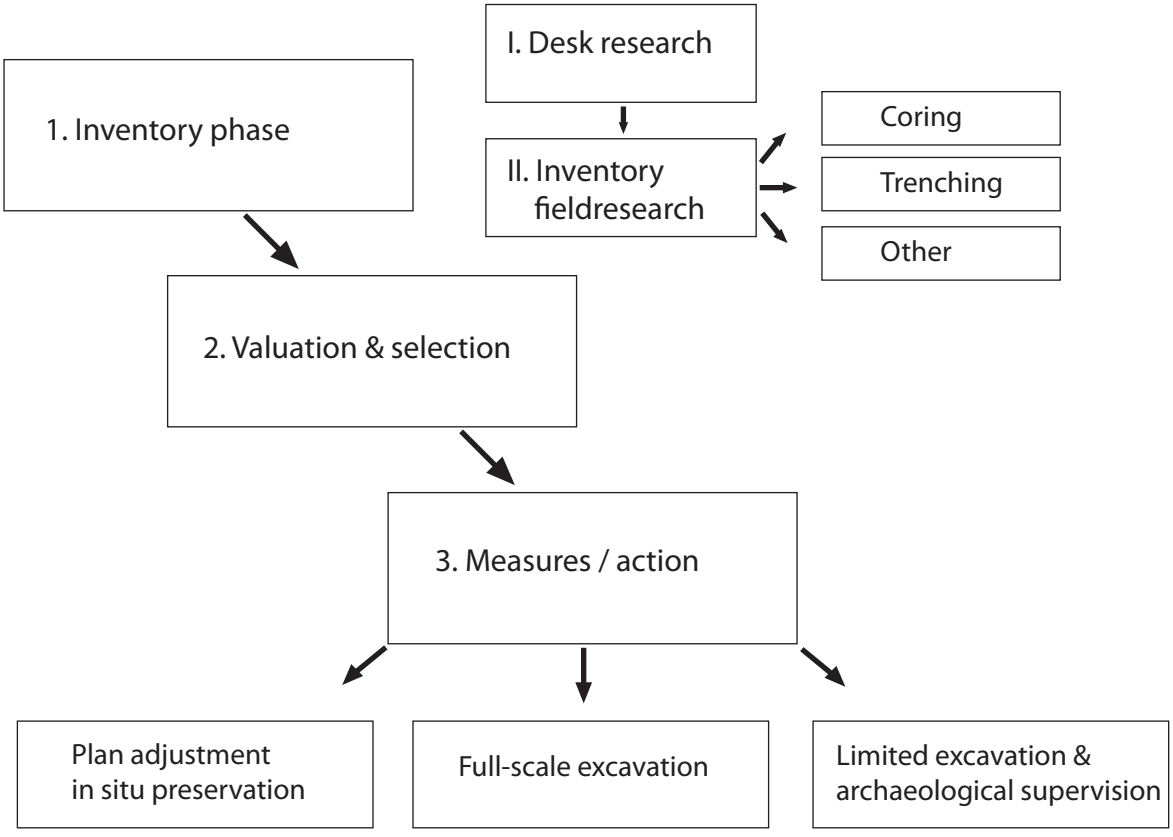

Figure 5.1 The various steps that have to be taken in order to arrive at a decision on what to do with archaeology.

We stress that this concerns *a* decision: due to the lack of norms on how to deal with archaeology (see next section) there is no single possible outcome of the decision-making process. The valuation scheme used is far from objective or transparent. Furthermore, the criteria and norms used for deciding on where to intensify research (*i.e.* in the stages before valuation) are not very well defined either. Instead, decisions are arrived at through negotiation and will inevitably result in a selection as not all the valuable archaeology can or has to be preserved *in situ* or excavated. A research agenda may serve as a policy instrument to include or exclude specific archaeological periods or research themes for the next 5 years or so, or for a specific project. But since well-defined research agendas are at the moment virtually non-existent, selection is in many cases based on the judgement of the archaeologists employed by the authorities to execute the Monuments and Historic Buildings Act.

[21] Supervision (or monitoring) is a cheap alternative to excavation, comparable to the watching briefs in English archaeological heritage management.

5.2.1 A lack of norms

Given the general absence of objective and transparent valuation criteria, it can be hard for initiators to deal with archaeology. After all, the revised Monuments and Historic Buildings Act does not prescribe any specific norms for protection of the archaeological heritage. This situation closely resembles the way in which environmental issues were incorporated in spatial planning in the late 1980s and early 1990s. Questions arose on how to measure pollution and assess its potential hazard for public health, and it was only after a decade of debate that norms were established and incorporated in daily practice. Nowadays, archaeologists have to answer similar questions about the value of archaeological sites: is it worth spending money on, and if so, is it better to excavate or preserve?

We already showed that the AHM process consists of several decision-making moments. In practice, we can distinguish four critical steps (figure 5.2), all of them potentially giving rise to debate and conflict. The first one is the decision whether archaeology is in fact present at a specific location. This decision is based on the results of desk-top study and reconnaissance survey. The second step is the decision on the size and value of the archaeological remains under consideration. This is based on the multi-criteria valuation scheme mentioned in the preceding section. Thirdly, a decision has to be made on how to realize site preservation: mitigation, excavation and/or supervision. And finally, a decision has to be made on the extent of the selected preservation measures. The level of detail of analysis and publication can be basic, but on the other hand an excavation may harvest enough data for someone to write a PhD thesis!

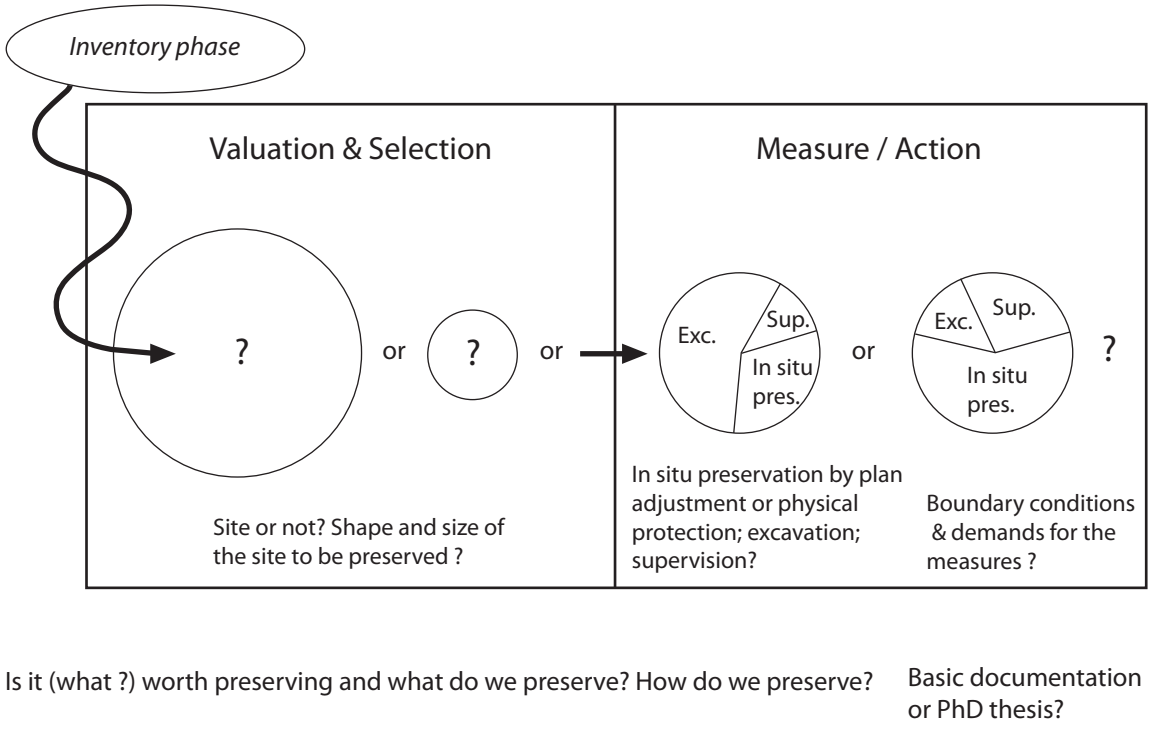

figure 5.2 The four critical steps of decision-making in the archaeological heritage management process.

In practice, the currently employed non-normative system frequently evokes debate between the 'antagonists' in archaeological heritage management: the initiators of spatial developments and the municipal, provincial or national authorities. The developers will benefit from clearly predefined and objective criteria in order to control and direct time and money in a development project. After all, archaeology is only one of the conditions they have to deal with. The authorities on the other hand have the legal obligation to protect the archaeological heritage, and will have to provide the developers, preferably beforehand, with norms for dealing with archaeology in a specific project. This clearly may lead to conflicts of interest and to discussions on the validity of the outcome of the valuation. This is exacerbated by the fact that the archaeological companies doing the research also bring their own opinions. Commercial advisors acting as mediators between developer and authorities are also adding to the debate. Obviously, the different value systems employed by the various parties involved in archaeological heritage management can easily lead to miscommunication and emotional debates.

For this reason, we feel that we should try to minimize the grounds for misunderstanding, by introducing more objective and transparent valuation criteria, and clear norms on where to draw the line between 'important' and 'not important', thus between valuable and not valuable.

5.2.2 Dealing with risk in archaeological heritage management

In the remainder of this paper, we will focus on the first decision-making step of deciding whether we are dealing with archaeology or not. It is probably the most debated and crucial issue in Dutch archaeological heritage management at the moment: decisions made in the beginning of a project cannot easily be reverted in a later stage. Furthermore, we feel it is an issue where recent scientific research in especially predictive modelling and archaeological survey has come to a stage where we can actually start to implement the desired objective decision-making criteria in practice. In order to do so however, we will first have a look at the concept of risk in archaeological heritage management.

We can look at risk from two different angles: first of all, it can mean the risk that archaeological remains are destroyed without any form of intervention. This is what most archaeologists will understand by risk in the context of archaeological heritage management. However, from the point of view of the developer, there are very different risks involved. Firstly, there is the risk of delay of the development plans. Carrying out archaeological research and obtaining permits from the authorities takes time. Secondly, there is the financial risk: if (unexpected) archaeology is present in the development area, the developer may have to pay for more research than anticipated. In practice, developers do not have many options to control these risks. They are dependent on the authorities for obtaining permits, and given the absence of norms, the authorities can pretty much do as they like, in some cases downright obstructing development plans or forcing developers to carry the costs of very expensive research. In our view, the key issue is that no one seems to be able to tell whether the (perceived) archaeological risk justifies the decisions made by the authorities.

If we look at the tools currently available to control the archaeological risk, we have to conclude that these are not very well suited for an assessment of either the archaeological or the developer's risk. Predictive models are employed to enforce survey in medium and high probability zones, but the models used do not say anything about the potential number and nature of the archaeological sites that may be found. So, the developer will only know that a survey needs to be carried out, but not what the result of the survey may be in financial and temporal terms. Similarly, core sampling is often enforced as the survey method of choice for reconnaissance survey, but without specifying the probability that certain types of sites may be missed. Furthermore, it doesn't take into account the possibility that the archaeological indicators found are not sites at all, but for example, reworked artefacts. As a consequence, survey results may show site contours that have little meaning, and in later phases sites may pop up that were not detected during survey. In those circumstances, the authorities will usually demand for new research. The key question is: who is responsible for the delay and costs?

5.2.3 Predictive modelling and risk assessment

To make predictive models a more useful tool for risk assessment, we have to stop being vague about the meaning of low, medium and high probability. A predictive map will only tell whether survey is necessary or not. It is a norm, based on (usually) an expert judgement assessment of the relative density of archaeological sites. It does not tell the developer how much of the area surveyed will be selected for further investigation. So, the only risk that can be established with some reliability is the amount of time and money that will go into reconnaissance survey.

Actually calculating the potential number and nature of sites that may be encountered during survey is far from trivial, but it is not impossible. Recent developments in statistics like resampling (see chapter 8) and Bayesian statistics (see chapter 9) now enable us to get a firmer grip on the numbers involved, and the associated uncertainties. Unfortunately, these techniques still need further study and development before they can be implemented in practice.

We can however also use a more pragmatic approach by analysing the surveys done in the past, and calculate the area that was selected for further investigation. Some of these data were collected by us, and show that in a sample of 23 projects, 23.9% of the area surveyed was selected for further archaeological research. Students from the University of Groningen (Schepers and Vosselman 2005) did a similar exercise for the province of Drenthe in the years 2003-2004. They concluded that for high probability areas 23% of the area surveyed was selected for further research; for low and medium probability areas this was 18%. While this is useful information in itself, a bandwidth for these figures would even be more helpful. For our own data, we calculated that there is a 97.5% probability that the area selected for further research will be less than 37.2% (see chapter 8, 111).

Obviously, this is only a first step towards a financial risk assessment that will be helpful to the developers and provide a necessary counterweight for the more subjective and emotional alternative. For that, we also need more information on the actual costs of dealing with different aspects of archaeology, and an assessment of the probability of particularly expensive types of research being necessary. This in turn implies that risk assessment studies must be carried out at a wider scale than the current development project, as we need to have comparative data. Who should pay for this kind of research, and how do we make the necessary data available?

5.2.4 Interpreting survey results

The principal method used for reconnaissance survey in the Netherlands is core sampling. For many years, core sampling was applied without a clear idea of its limitations. Research by Tol *et al.* (2004) shows that core sampling will never guarantee a complete detection of archaeological sites, because of its restriction to very small sampling units that are relatively widely spaced (see also Verhagen 2005). Core sampling survey results can be manipulated by changing the density and configuration of the sampling grid, and by taking smaller or larger cores. However, sites that are characterized by a low density of artefacts are typically very difficult to detect. Furthermore, core sampling survey will not always be able to tell whether the artefacts encountered are ‘in situ’. So, core sampling may both under- and overestimate the actual extent of archaeological remains in a study area.

From the point of view of the developer this is hardly satisfying, because it will cost time and money in both cases. Undetected sites that pop up in a later stage will usually prompt the authorities to demand additional research, whereas erroneously interpreted non-sites will waste precious research money and time.

The problem of non-detection is extensively discussed by Tol *et al.* (2004). They suggest that the choice for a particular survey strategy should be based on a hypothesis about the type of site that can be expected in a study region. This is called a ‘specified prediction’, and determines what survey method should be used, as not all sites are equally easy to detect. Their suggestion has currently been added as a guideline to the Dutch Archaeology Quality Standard for Archaeology (KNA version 3.1; SIKB 2006). Using this guideline, we can judge the probability of detecting site type A or B using a specific survey method. For example, if we want to

have an 80% probability of detecting a medium-sized Stone Age site, we need a 20x25 core sampling grid, using a 15 cm diameter core, and a 3 mm sieve for detection of the flints (Tol *et al.* 2006).

Despite this important step forward, a *norm* for detection probability is still missing: is 80% an acceptable limit for the specific authority (municipal, provincial, national) and developer? After all, it implies that 20% of the sites we are looking for will not be detected. And if we accept an 80% detection probability, does this mean that we will not spend any money even when we find the other 20% in a later stage of the development plan? So, while using objective and transparent criteria is necessary, establishing norms based on these criteria is even more crucial. *Most* crucial however is accepting the possibility that archaeology may be missed and, despite this, accepting the fact that the developer is not liable for the consequences.

Even then, the 80% detection limit only tells us that we will be able to detect the expected artefact concentration 4 out of 5 times. It will not allow us to correctly delimit a site. When we have struck an artefact, this will be a reason to look closer, by taking more samples in the vicinity of the find location and trying to establish a site contour in this way. This approach is also known as adaptive sampling (see Orton 2000). However, since we are dealing with imperfect detectability of the artefacts, the neighbouring samples will also be empty 1 out of 5 times – and this is assuming that we are still dealing with the same artefact density. So here we have a classical Catch 22-situation: we do not actually know what artefact density we are dealing with, so how can we be sure that a non-artefact observation is proof of the absence of a site?

In fact, the only reliable method for establishing site contours is trial trenching. Yet site contours are still drawn on the basis of core sampling surveys as if they constitute real boundaries, and trial trenching, when advised, is usually limited to those zones. Furthermore, in some cases artefact concentrations may not even be sites at all. A flexible approach should be applied instead: we should dig the trenches as far as is needed. In some cases this will be a more limited zone than the survey contour indicates, because the artefacts found were not an indication of an archaeological site. In other cases it will be more extended, because the site contains features that were not detected during survey. However, this will put the developer in a difficult position, as it means that a 'worst case' scenario will have to be adopted in order to assess the risks involved. It also complicates the situation for archaeological companies doing the research, as they will have to take into account the possibility that they will only have to do a small part of the original project proposal. And they will also have to evaluate the results of their research in the field, and keep in close contact with the developer and authorities during the fieldwork.

Bayesian statistical methods may be helpful in this context for establishing the risks involved. Nicholson *et al.* (2000) discuss the problem of trying to estimate the risk that archaeological remains of a certain size may be missed given a specific research intensity. For example, when using classical statistical methods, the probability of not detecting remains with a size of 1% of the study area (*e.g.* a 100 m^2 site in a 100x100 m survey area) is still 61% when taking 50 samples. However, since we have started our survey with a specific hypothesis in mind about the type of sites we're looking for, we might as well use Bayesian statistics to come up with a more realistic estimate. For that, we need to specify the smallest area of archaeological remains that we want to detect. The problem of imperfect detection is tackled by dividing this area by the detection probability involved. So, in the case of the medium-sized Stone Age site with a 80% detection probability, we should reduce the 'site area' to 200*0.8 = 160 m^2. We also have to specify an assessment of the probability that these remains are present at all. For the purpose of illustration, let's assume that earlier research indicated that in 10% of cases, these remains were actually found. This means that the initial probability of such sites being present is 3.7%. When taking 50 'empty' samples in the survey area, this risk is reduced to 1.0% (for the actual mathematics, see Nicholson *et al.* 2000). The risk that we missed two of these is then 0.3%. Such an approach seems helpful in analyzing the risks involved with archaeological survey, but it implies that sufficient data should be collected to estimate our prior assumptions on the presence and size of archaeological remains. The method described also has to be translated to real situations, and evaluated for its effectiveness.

5.3 Concluding remarks

No doubt, archaeology is a true risk to civil developers. In our experience, it is not the amount of money going into archaeology that most annoys the developers. Instead, they are frustrated by the fact that the 'rules of the game' are continuously changed during the AHM process, and that decisions are based on expert judgement without a clear scientific vision on the value of archaeology. As a result, the whole process may look like an endless tunnel, and archaeology is seen as a planning condition that is completely out of control. In comparison with other environmental factors like ecology, noise pollution and soil quality, archaeology lacks a clear degree of objectivity and thus professionalism. At least four non-normative steps in the AHM process can give rise to potential debate and conflicts between developers and municipal, provincial or national authorities. Decision making in archaeology is largely a subjective process.

To a certain extent, the use of expert judgement in decision making is inevitable, as not all aspects involved in valuating archaeology can, at the current state of knowledge, be translated into objective decision making schemes and norms. But even 'subjective' norms and criteria can in most cases be formulated in a transparent way. And in our view, we also have to move toward using more objective and quantitative criteria. Even at the current state of affairs, at least some objective norms can be defined at the start of a project, for example by selecting a preferred research theme based on an objective inventory of local or regional lacunae in archaeological knowledge.

Furthermore, it is essential to focus our attention on the first step in AHM of deciding whether we are dealing with archaeology or not, the most debated and crucial issue at the moment. It is not only necessary to arrive at a norm for detection probability, whether this be 70, 80 or 82.34%. We also have to learn to live with the consequences of establishing norms. This means accepting, as a rule of the game, that the developer is not liable when, because of using predefined norms, a certain portion of the archaeology is missed.

Finally, it is necessary to find financing for research that can help to control the risks involved in AHM. At the moment, hardly any funding is available for this type of research, most probably because the need for it is not generally recognized by the archaeological sector. This may to a certain extent be due to the mathematical and statistical character of this type of research – not the most sexy form of science to the conventional archaeologist. It may therefore very well be necessary to turn to the world of contractors and spatial planners to get the necessary funding.

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