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Management of Archaeological Heritage in Norway's Medieval Cities

Management of Norway's medieval cities depends on the application of a combination of assets and resources. These include the various major pieces of policy and legislation – particularly the Cultural Heritage Act and the Planning and Building Act – and interpretations, decisions and judgments based on these, a variety of management tools (databases, national heritage registers, maps), the individual manager's acquired experience and knowledge, and close collaboration between the state heritage authority and the local and regional heritage management apparatus, along with the various scientific bodies. And it is an increasingly important part of heritage management's job to make sure that information is made public, either through the media or via museums. The increasing use of digital methods for recording archaeological heritage, along with the increasing digitalization of analogue archaeological documentation, will aid and accelerate such outreach work.

This article will provide a historical overview of management of the archaeological heritage in Norway's medieval cities, particularly Bergen, and will present some important new directions that have emerged since around the end of the 20th century.

Historical overview 1850–1955

In the latter part of the 19th century, it was the Norwegian Society for the Preservation of Ancient Monuments that undertook the task of investigating and recording monuments in the medieval cities. In Bergen, Rector B. E. Bendixen (amongst others) carried out several archaeological investigations, in addition to his historical and antiquarian researches (Bendixen, undated). During this period, priority was generally given to the architectural heritage.

Architect Gerhard Fischer and cultural-historian Christian Koren Wiberg can be singled out as early pioneers in Norwegian medieval archaeology, two men who left a big mark on the period 1900-50. Fischer carried out archaeological recording in connection with the extensive railway building works in Oslo. He was inspired by the old sagas but desired to use the archaeological material as far as possible to reconstruct the city's earliest history, and he conducted a number of major investigations, notably at the fortress of Bergenhus in Bergen (Fischer 1951). But it was a local man, Christian Koren Wiberg, whose name will always be linked with early archaeology in Bergen. His main focus was centred on writing his hometown's cultural history, and to this end he drew heavily on the written sources, but he also supervised various diggings and recorded soil layers – such as firelayers, the deposits derived from the numerous fires that destroyed the city

over the centuries – as well as buried structures. These were the pillars of his studies on medieval Bergen. He concentrated primarily on identifying historical properties, property boundaries and ground plans, in order to reconstruct the settlement's development on the basis of maps and findings from archaeological excavations in, primarily, the southern half of Bryggen and the Vågsbunnen quarter. In light of Bergen's historical building traditions, he was able to show that many of the contemporary property boundaries could be traced a long way back in time, and using all this information he modelled the morphological development all the way down to the original shoreline settlement. The method he used to date the various settlement levels was the so-called 'firelayer chronology', whereby he worked out the sequence of historical fires in a given area and applied it directly to the sequence of firelayers that he had recorded on excavation sites. This method can be characterized as retrospective, and armed with it he strove to map the Bergen's development through the centuries (Koren Wiberg 1908, 1921).

Today, we can pick holes in the archaeological practices of their time – for instance, Koren Wiberg's firelayer dating method is faulty and can easily lead to erroneous results (Christensson 1988) – but that does not mean that we should not admire these pioneers' efforts. And even though both men devoted most of their time to 'big issues', they were also interested in the small finds that they found on their sites, and in how they had ended up in the deposits.

All the same, archaeologist Asbjørn E. Herteig had the following to say on medieval archaeology prior to 1950: 'Personal possessions like tools and household artefacts, all the paraphernalia of daily life in the Middle Ages, [...], were by and large paid little attention. The profane medieval archaeological heritage was not included in the revision of heritage protection legislation in 1951' (Herteig 1991, 7).

1955: the birth of modern urban archaeology

Riksantikvaren (Norway's Directorate for Cultural Heritage) was put in charge of conducting urban archaeological investigations from 1955, right after the start of the major excavations at Bryggen, Bergen (Fig. 1), which were brought about by an extensive fire that destroyed the old wooden settlement's northern part. These excavations were to change the face of Norwegian medieval archaeology.

Not long after the fire, plans for an archaeological excavation were drawn up, with Asbjørn E. Herteig (Fig. 2) as director. The main excavations lasted from 1955 to c. 1969, and with a total volume of some 20,000 cubic metres, they remain the largest excavations ever undertaken in Norway. They were the first modern urban excavations and their enormous scale made it necessary to devise new methods to record, systematize and date the vast numbers of structures, soil layers, and artefacts.



Figure 1. Excavation site after the 1955 fire © University Museum of Bergen



Figure 2. Asbjørn E. Herteig
© Riksantikvaren

Many of the documentation methods developed during the Bryggen excavations are still in use in some fashion in today's archaeology. Herteig expressed his methodological approach thus: 'All the excellent existing works on the town's history and on earlier excavations were meticulously collected and laid aside for future reference. It was the archaeology that was to speak for itself, unaided' (Herteig 1969, 34). All the same, he elected to take the sequence of firelayers as the chronological framework. The firelayers made it possible to date building levels and finds with precision – but only once they had been correlated to historical fires. Despite this framework, study and presentation of the many different artefact types did not manage to keep in step with the excavations. In 1969, Herteig bemoaned the delayed work on the finds as follows: '(completion) is still many more years in the offing, and no-one knows with any certainty what it will bring, not least because the enormous finds assemblage has probably created more problems – considering the quantities involved – than it has solved' (Herteig 1969, 12). And the firelayer chronology is not without its problems – one can never be completely sure of the validity of the sequence of historical fires, the firelayer sequence may be 'corrupted' by minor, undocumented fires, and firelayers may have been removed on parts of a site – so that it has to be supplemented by other dating methods (Christensson 1988).

Herteig is widely regarded as ‘the leading innovator in Western Europe’ with respect to archaeological investigations in medieval cities (cf. Andersson et al. 2007, 21). The most important of his publications are: *The archaeological excavations at Bryggen, ‘The German Wharf’, in Bergen 1955-68. Excavation, stratigraphy, chronology, field-documentation* (Herteig, 1985), and *The buildings at Bryggen, their topographical and chronological development* (Herteig 1990a, 1990b, 1991), and there are numerous follow-up publications by him and other authors in the Bryggen Papers Main Series and Supplementary Series. Regarding scientific studies on the Bryggen material, the bulk has been carried out by undergraduates, Masters students and post-graduates. The archaeology of Bergen’s first 200 years has been explored in detail by Gitte Hansen in her Ph.D. thesis (Hansen 2005). In addition to the archaeological works, Professor Knut Helle has published a comprehensive history of Bergen in the Middle Ages: *Bergen bys historie, bind 1* (Helle 1982). But while Herteig and his associates always strove to publish and disseminate results, it was not until 1976 that Bryggens Museum opened its doors to the public.

Other urban archaeological investigations 1955–78

Despite the Bryggen excavations’ vastly important findings, archaeological deposits remained omitted from heritage legislation for a further 24 years. At the time of these excavations, there was a growing phase of building developments in all Norway’s cities. The major urban renewals that took place from 1960 and onwards involved a lot of digging work, and it quickly became apparent that the lack of protection extended to medieval archaeological deposits meant that many sites were destroyed without any scientific investigation whatsoever – and that much of the material that did get excavated during this period was never adequately studied and published. Contemporary with the major excavations at Bryggen, numerous smaller excavations were being carried out in Norway’s other medieval cities as well as on other sites in Bergen. The participants in these digs came from all over Europe, and the choice of methods and application of priorities could be relatively arbitrary, often depending largely on the excavation director’s expertise and educational background.

During this period, urban excavations constituted the largest area of activity in the field of Norwegian medieval archaeology. This was deliberately cultivated by Riksantikvaren, inspired by the discipline’s development thanks to the Bryggen excavations and the research and teaching carried out at, amongst others, Lund University in Sweden. As a result of the extensive urban renewals in the 1970s, Riksantikvaren was responsible for a series of excavations of all sizes in Oslo, Tønsberg, Skien, Bergen and Trondheim. This was complemented by syntheses of results from older excavations and observations to get a more detailed idea of the make-up of the medieval cities. Øivind Lunde’s Ph.D. thesis *Trondheims fortid i byggrunnen* was one such work, collating data from investigations in Trondheim prior to 1970 (Lunde 1977).

Even though much archaeological work was carried out, this was by no means something that could be taken for granted. Developers were not required by law to have excavations carried out prior to or alongside construction work. Several bodies therefore started working on ways of protecting the country’s archaeological heritage, no matter where it was located or how old it was; the archaeological discussions of the 1970s were pervaded by this issue. For this reason, the passing of the Cultural Heritage Act (hereafter abbreviated to CHA) in 1978 represents the most important single event in Norwegian archaeology (Regjeringen 1978).

1978: the Cultural Heritage Act

The archaeological deposits in the medieval cities finally received statutory protection when the CHA entered into the statute books in 1978. Medieval settlements, churches and graveyards, monasteries and fortified sites are automatically protected pursuant to CHA § 4a. The preceding section (CHA § 3) has as its heading '*Prohibition against disturbing monuments and sites*' and its first paragraph states: 'No person shall, unless this is lawful pursuant to Section 8, initiate any measure which is liable to damage, destroy, dig up, move, change, cover, conceal or in any other way unduly disfigure any monument or site that is automatically protected by law or to create a risk of this happening'.

The CHA also contains specific instructions concerning aspects such as coherent archaeological strategy, developer funding of excavations, documentation, and publishing, and is the most important piece of legislation for Norway's medieval archaeological heritage. Its primary purpose is to make sure that when development plans entail the removal of non-renewable resources such as archaeological deposits, it is the developer who bears the costs of the fieldwork, report work, conservation of perishable artefacts etc.

Management of the medieval cities 1979–94

Management of the medieval cities' archaeological heritage has passed through a number of hands over the years. The Bryggen excavations were initially organized by Riksantikvaren, but were transferred to the then Museum of History after a couple of years. Riksantikvaren set up district offices in Trondheim, Oslo and Tønsberg in the early 1970s, while the office in Bergen, with archaeologist Siri Myrvoll in charge, had to wait until 1980. The district offices' responsibilities were comprehensive: management, fieldwork, research, dissemination etc. (finds were received, conserved if necessary and stored by the medieval collections section of the then historical museums in each city). The offices were staffed by up to 10 persons, swelling to as many as 40 short-term employees in some digging seasons. The period from 1980 to 1990 has been described by Myrvoll as follows: 'Archaeology during this decade can be summed up as consisting of a series of key systematic excavations supplemented by a wealth of watching briefs [...] Almost invariably, the principal archaeological problems addressed were aspects such as mapping the medieval settlement's building pattern and how it fitted into the physical topography, locating the original shoreline, determining the age of the various settlement levels and the use to which individual parts of the settlement had been put' (Myrvoll 1991, 69-71). In Bergen alone, for instance, more than 30 systematic excavations of all sizes and more than 200 watching briefs were carried out from 1979 to 1994 in the city's medieval area.

Despite the fact that developers were not obliged to pay for post-excavation research work – which therefore had to rely on funds from the state coffers – all four offices managed to carry out major pieces of basic research intended to be of direct benefit to heritage management: in Oslo, it was the *Gamlebyprosjektet*; in Trondheim, there was a series of publications on material from the Public Library Site; in Tønsberg, a synthesis of material from its *Nordre Bydel*; and in Bergen, the *Finnegårdsprosjektet*. One theme that the Bergen office worked with in particular concerned the depositional history of cultural layers: how did they form, and how were they affected after deposition? When Bergen first emerged as an urban settlement, the amount of space available for building was much smaller than it is today; the original shoreline lay



Figure 3. Early 13th century quayfront constructions
©Riksantikvaren

not so very far from St Mary's Church at the back of Bryggen. Land was therefore reclaimed from the harbour (Fig. 3), usually by means of sinking large, log-built boxes some way out from the contemporary waterfront and filling these boxes, and the spaces between them, with all the accumulated rubbish and refuse from dwellings, workshops etc. that the builders could lay their hands on. This earth is usually referred to as 'redeposited' or as 'secondary' contexts, because it has been moved from the place where it was originally deposited, i.e. rubbish heaps and the like. Layers containing material that has not been moved are said to be 'primary' contexts. Primary contexts are mostly to be found in areas of what was, at the time of deposition, dry land, and are generally relatively thin layers low in organic content. The secondary contexts, on the other hand, are mainly to be found in the areas of reclaimed land. The individual layers are usually thick, with a high organic content. These layers are mostly situated in the water-saturated zone, which provides good preservation conditions.

The artefacts recovered from secondary contexts are in an archaeological context, undeniably, but they are no longer in a *systemic* context – thus they do not reflect the activities that were carried out at the place where they were found (Christensson 1988, 1992; Myrvoll 1992). From the viewpoint of archaeological finds analysis – and of management – this is a complicated, challenging situation.

A recurring problem connected with the developer-funded excavations that were so common during the period 1980-94 was the difficulty of drawing up specific research questions and hypotheses to be addressed by such projects – which is a defect, since the information potential of this kind of excavation is often considerable. One must regretfully acknowledge that during this period very few people tried to draw up – *prior to starting excavation* – research questions or excavation strategies based on archaeological theories. Having said that, the district offices were never set up, and never staffed or funded, to be powerhouses of research work – mainly because developers were not required to pay for such as part of the post-excavation process.

In the period 1950-1994, it was the institution – whether the museums or Riksantikvaren's district offices – undertaking the actual excavation work that was largely responsible for scientific analysis of the recovered material and dissemination of results, as well as the day-to-day management of the cities' medieval areas. In 1994, however, a major re-organization took place and a new agency – the Norwegian Institute for Cultural Heritage Research (NIKU) – appeared on the heritage scene (see below for a more detailed presentation of the process).

From 1982 to 1994, Riksantikvaren's district office in Bergen occupied premises on the opposite side of the harbour from Bryggen. In 1994, Ingvild Øye, Professor of Medieval Archaeology, took the initiative to bring the institutions involved in working with medieval Bergen – apart from the municipal and county management apparatus – under the same roof at Bryggens Museum, and this has had extremely positive results for the entire medieval archaeological community in Bergen. One might justifiably characterize this as a case of 'best practice'.

Management of the medieval cities after 1994

Riksantikvaren and NIKU

Up until 1994, it was Riksantikvaren's district offices that were responsible for administering the CHA, for planning and conducting archaeological investigations in the medieval cities, and for some of the research conducted on the excavated material (Eriksson 1994). In September 1994, the heritage management system was restructured, with management being divorced from fieldwork/research. Management remained in the hands of Riksantikvaren's district offices, while the newly created NIKU took over responsibility for the fieldwork side of things, along with the associated research. Up until 1994, the medieval cities had represented the district offices' chief management object. After that date, Riksantikvaren's district offices in Oslo, Tønsberg, Bergen and Trondheim were given responsibility for Eastern, Southern, Western and Northern Norway respectively, and took on the management of churches, graveyards, monasteries and medieval fortified sites, all of which had previously been dealt with by Riksantikvaren's head office in Oslo.

Riksantikvaren's Archaeological Section is responsible for issuing official exemptions from the CHA for all cases that may impact automatically protected heritage. Riksantikvaren's district offices in Oslo, Tønsberg, Bergen and Trondheim are the responsible management bodies for the eight medieval cities, along with churches and graveyards, monasteries and medieval fortified sites. The district offices evaluate all applications for works that may impact automatically protected archaeological heritage and issue permits specifying the conditions on which permission is predicated. Before any exemption can be issued, the institution responsible for undertaking excavation – such as NIKU – has to produce a detailed project plan and budget for approval by Riksantikvaren. Only then will Riksantikvaren issue a permit with attached conditions and with specifications regarding aspects such as recording methods, archiving of photos, drawings and monitoring data, and the treatment and storage of finds.

In accordance with one of the directives relating to the CHA, Riksantikvaren has delegated authority to NIKU to undertake investigations of automatically protected archaeological heritage of medieval date, hereunder churches, monasteries and other religious sites, fortresses and fortified sites, urban settlements and the like, and standing buildings from the Middle Ages.

Principal national policy documents

National strategies and targets are formulated in the Report to the Storting no. 16 (2004-2005) *Leve med kulturminner* (Regjeringen 2005), the Report to the Storting no. 35 (2012-2013) *Framtid med fotfeste* (Regjeringen 2013b), *Regjeringsplattformen* (the current government's political platform: Regjeringen 2013c), and the Proposition to the Storting 1 S (for the years 2010-2014: Regjeringen 2013a).

In the latter document, concerning Appropriation 1429 Riksantikvaren, one may read the following: 'Goal: To contribute to the management and safeguarding of knowledge about automatically protected and other archaeological heritage. The monies in the allocation are linked to revised national target 6.2: *A prioritized selection of automatically protected and other archaeological heritage is to be brought up to such a standard as to require no more than an ordinary level of maintenance by the year 2020*' (Regjeringen 2013a, 103, 105).

And in 2010, Riksantikvaren drew up a proposal for a long-term management plan for archaeological heritage and cultural environments (Riksantikvaren 2010). This plan is to run from 2011 to 2020.

International obligations

As signatory to various international documents, Norway is duty-bound to manage its archaeological heritage in a responsible manner, in accordance with statements such as 'The foremost aim for the last 20 years has been to protect the archaeological remains, as recommended in the Charter for Protection and Management for Archaeological Heritage' (ICOMOS 1990).

Through its ratification of the Valletta Treaty in 1992, Norway has undertaken to '[...] implement measures for the physical protection of the archaeological heritage by making provision for the conservation and maintenance of the archaeological heritage, preferably in situ' (European Convention on the Protection of the Archaeological Heritage 1992). And if in-situ preservation is not an option, archaeological excavation and documentation are to provide what is termed 'Preservation By Record'.

Local and regional areal plans

The most important piece of legislation regarding urban planning is the Planning and Building Act. The local authorities – mainly the municipalities and Hordaland County Council – play an important role in ensuring that cultural heritage values are given due concern in areal planning. The central parts of the medieval city are all covered, having been designated as special conservation areas in the municipality's area zoning plans. Heritage aspects have been specified in particular detail in the most recent plan (Vågen, the Quays and Bryggen) in Bergen, this plan covering the areas surrounding the harbour, including Bryggen of course (Bergen kommune 2006).

In recent years, Riksantikvaren and the City of Bergen have been increasingly committed to getting regulations in place that prohibit unwanted impacts on groundwater levels (by pumping, for instance). In 2013, the City of Bergen included prohibitions concerning

groundwater removal by pumping in the area zoning plans for three areas: Vågsbunnen; Marken; and Vågen, the Quays and Bryggen. The preparation of these zoning plans provides good examples of collaboration between the various levels of heritage management, where the emphasis has been on avoiding potential conflicts through detailed planning beforehand, rather than trying to resolve conflicts by means of formal objections afterwards.

Mapping the medieval cities

When it came to using the information from urban excavations, priority was given at an early stage to mapping and modelling the greatest extent of each city during the Middle Ages. By the 1970s, maps delineating the medieval limits of Norway's eight historic cities had been produced, and everything lying within these limits is defined as the scheduled area. More recently, maps have been made showing the extent and varying thickness of the archaeological deposits in each of the four major medieval cities (Fig. 4).

Maps like these are an invaluable asset for heritage management officers when working on area zoning plans, for example, making it much easier for them to draw up detailed conditions and parameters for aspects such as excavation depths, foundation methods, and other conditions in connection with new development projects.

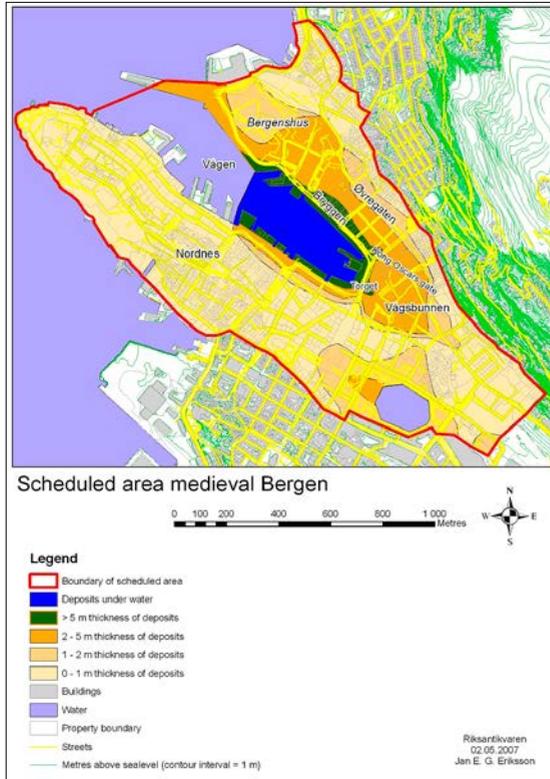


Figure 4. Extent and thickness of archaeological deposits within the scheduled area of medieval Bergen © J.-E. G. Eriksson, Riksantikvaren

Management moving forward: MABYGIS and monitoring

As we progress into the 21st century, heritage management is striving to increase its efficiency and consistency. This process depends heavily on having the right tools and a stream of up-to-date information. These aspects will be treated in the following sections.

MABYGIS

There has been an increasing focus on digitalization of the documentation material to facilitate its use by both management and research institutions, not least as a result of technological advances in archaeological fieldwork; for instance, NIKU and other institutions

are steadily implementing the use of an integrated digital system for archaeological recording. For the last 15 years, Riksantikvaren has been working to collect the data from excavations, drillings, watching briefs etc. and to make these data available in the form of databases. The current database is called *MABYGIS*, which combines archaeological, geographical and topographical information from recent investigations and can be accessed via an Internet portal. Riksantikvaren's vision – and part of its contribution to the government's 'National Curriculum for the Knowledge Reform' – is to have comparable information from older archaeological investigations digitalized and eventually transferred to *MABYGIS*, and furthermore to have *MABYGIS* integrated in the national archaeological-heritage register called *Askeladden*. For more on this, the reader is referred to an article by J.-E. G. Eriksson (Eriksson 2013). These efforts will facilitate the dissemination of archaeological results, and the importance of heritage preservation, to the general public.

Environmental monitoring: new direction, new data

As a discipline, environmental monitoring in Norway's medieval cities is a relative newcomer, and was largely inspired by the efforts of English Heritage. The first-ever monitoring well was installed at Schultzgate in Trondheim in 1996 (Peacock 2002), followed by the initiation of more comprehensive monitoring projects at Hotell Brygga in Tønsberg in 1999 (Eriksson 2006), Bryggen in Bergen in 2000 (e.g. Dunlop 2008), and in Trondheim in 2004 (e.g. Reed 2006). The ongoing programme for systematic monitoring of Bryggen's archaeological deposits was initiated in 2002 as a response to the discovery of serious subsidence affecting the historic buildings. Expanded annually in the course of the past 12 years, the programme now comprises 48 monitoring wells in a network covering the world heritage site, along with other monitoring instrumentation (there are a further 25 monitoring wells in the city's Vågsbunnen quarter).

Monitoring wells proved to be the ideal method for investigating the conditions under ground. A monitoring well is basically a hollow PVC tube that is installed by means of rotary drilling with a large auger; the auger is drilled down one metre at a time under rotation, and then retracted without rotation so that the soil will adhere to the grooves. Soil samples taken from desired depths are analysed to determine the current preservation conditions; this is baseline data that provides a basis for comparison with the results of analysis of water samples taken subsequently. The method also allows the attending archaeologist to assess the state of preservation of the various archaeological strata encountered in each one-metre length (Fig. 5).

Information about each stratum is recorded on a detailed context recording form, and its state of preservation is assessed in accordance with the methods described in Norwegian Standard NS 9451:2009 (much of the standard's content is a direct result of the work at Bryggen). The prototype of the current context recording form was developed and refined by staff of Riksantikvaren's district office in Bergen (Golemnik & Dunlop 1996), and further refined by NIKU. The monitoring well can also be used for the installation of sensors that take continuous readings of hydrological and chemical parameters; the chemical data reveal the composition of the groundwater, which means that any change in preservation conditions can be detected almost immediately. Monitoring can thus quickly show us whether or not there is a need for mitigation measures – and, not least, whether or not any implemented mitigation measures are having the desired effect.



Figure 5. Rory Dunlop (NIKU) inspecting a length of deposits brought up on an auger drill © E. Rotevatn, Riksantikvaren

Monitoring enables us to follow the underground situation in connection with any kind of activity that may have a negative impact on the deposits' preservation conditions. This does not mean that monitoring necessarily should be viewed as a substitute for archaeological investigations, but rather as part of a strategy to ensure the preservation of the deposits surrounding an excavated site (Riksantikvaren will in most cases not block planned development projects, especially not those that are of benefit to society in general or are environmentally friendly, but permission will normally be contingent on archaeological excavations and follow-up monitoring). Accumulated monitoring data – archaeological, geochemical and hydrogeological – will make a substantial contribution in connection with the forthcoming preparation of conservation plans concerning the archaeological deposits within the scheduled area of each of Norway's eight medieval cities. Riksantikvaren and its partners in the work at Bryggen are currently exploring ways of making selected monitoring data available on the Internet – via MABYGIS, for instance. The ultimate intention is that with the aid of a city-wide mapping of state of preservation and preservation conditions, the heritage management authorities will be able to decide which areas of the city should be set aside for long-term conservation, and which can be freed for development. For those who wish to learn more about this aspect, there is an excellent article by Dr. Henning Matthiesen from the National Museum of Denmark's Conservation Department (Matthiesen 2014).

A case in point: the Groundwater Project at Bryggen

Bryggen's historic buildings were inscribed on UNESCO's World Heritage list in 1979, while the underlying archaeological deposits had to wait until 1994 to be included as part of the heritage site. In the area zoning plan for Vågen, the Quays and Bryggen, drawn up in 2006, the entire Bryggen area – buildings and deposits alike – have been designated a special conservation area (Bergen kommune 2006). The buildings are under a special protection order and the archaeological deposits are automatically protected under the provisions of the Cultural Heritage Act. Riksantikvaren is responsible for management of the archaeological deposits – along with the groundwater within the heritage site – while Hordaland County Council has responsibility for the historic buildings (Fig. 6).



Figure 6. Bryggen's historic buildings
© E. Rotevatn, Riksantikvaren

After 10 years of systematic monitoring of Bryggen's archaeological deposits and groundwater, and with regular surveying of fixed measurement points on selected buildings and the ground surface, one was confronted by the following ominous findings: that there was an annual loss of a volume of material corresponding to 30 cubic metres of archaeological deposits, that the groundwater-level had been lowered by up to 2.65 metres in the worst-affected areas, and that the buildings were experiencing a rate of subsidence of up to 8 mm per year in places. This could only mean that decay of the organic material in the deposits was proceeding at an accelerating rate – a rate that might justifiably be called 'runaway'. This represented a serious threat to the continued survival not only of the deposits, but also of the buildings supported by them. In 2011, in connection with the revision of the national budget, the government approved a one-time grant of NOK 45,000,000 to Riksantikvaren for the implementation of sustainable mitigation measures – known as the Groundwater Project – designed to slow the process down to a manageable rate (Regjeringen 2013a).

The project's primary goal is to reduce the annual rate of subsidence affecting the historic buildings to 1 mm or less, and to raise groundwater levels to generally about one metre below the ground surface. From 2011 to 2014, extensive construction works have been conducted, mainly in the World Heritage Site's northern part, to implement numerous mitigation measures designed to achieve these targets. Riksantikvaren has, right from the start, made the following requirements explicit: the mitigation measures should be sustainable and cost-effective, and should involve minimal removal of archaeological deposits. The project has been guided by a permanent working group of national and international experts, and numerous innovative water-management methods have been proposed and adopted, such as the rainwater garden shown below, which is designed to capture, retain and infiltrate rainwater into the ground (Fig. 7).



Figure 7. Rainwater garden at the back of Bryggen © A. R. Dunlop, NIKU

Concluding remarks

When it comes to managing and preserving urban medieval deposits today, we have at our disposal a substantial knowledge base. If successful management were just a matter of facts and figures, there would be few difficulties. The main challenge lies in resolving conflicts between heritage interests and the demands of urban renewal. Riksantikvaren has done its best to address this problem, by – among other things – issuing guidelines for building on archaeological deposits, part of which involved a detailed study on the effects of pile foundation methods. In any case, management must be based on close cooperation between the heritage management authorities at all levels and their scientific advisors.

Voices in the archaeological community call for more and larger excavations in the medieval cities, but while recent advances now make it possible to undertake ever more detailed and comprehensive fieldwork, the high costs connected with today's archaeology in Norway mean that some institutions are starting to discuss what groups of artefacts are to be excluded from collection in the field – or, if collected, to be excluded from analysis in the post-excavation and research phase. This is a somewhat paradoxical, worrying and frustrating situation. For one thing, wouldn't such a course be a dereliction of the spirit, if not the letter, of the Preservation-By-Record principle?

Publication and publicizing of the archaeological results and research that *do* get produced must therefore be prioritized. We have to invest more, not only in traditional channels such as exhibitions and books, but also in new avenues such as web-sites, blogs, Facebook and the like. One of the most interesting challenges is to ensure that we are capable of conveying that each of the medieval cities has its own historical identity, and that the historical development of each still has a great deal to say in its future development.

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