The future is ....... wet
Fiona Haughey investigates erosion on the Thames foreshore

Global warming and the Thames
The concept of global warming is one with which we are all too familiar, even if we do not know exactly what it will mean for us now, in ten years or in fifty years time. The warming of the world’s oceans has a direct effect upon the British Isles, particularly when fish stocks are examined. Cod has now moved further north to the cooler waters nearer to the Arctic and adult sea bass, once only found on the south coast of England, which marked the northern-most point of their range, can be seen all around the UK including the north of Scotland.\(^1\) The effect of ocean warming and the continued melting of the ice caps can be seen in the rising sea-level and the expanding tidal range. In the Roman period the tidal range on the Thames was approximately two metres – it is now seven metres and rising.\(^2\)

Meteorologically there are observable changes. There is, for example, an increase in storm surges which principally affects the east coast of the UK, but with the likelihood of entering the Thames estuary at the narrowest exit from the North Sea via the Channel.\(^3\) If this combines with a high spring tide, the potential results can be catastrophic as were seen in 1953.\(^4\) In addition, severe rainstorms with their associated flooding are projected to be a regular feature (if not annual) of the British summer.\(^5\)

Because Britain is a comparatively small island, coastal and inter-tidal archaeology has always comprised a significant part of our cultural heritage, albeit a part that has until fairly recently been unexplored. The effects of wind and wave have put this heritage at risk – even more so than that found on land sites or underwater. Survey of both the coastal
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Fig. 2: (left) the clay/glass layer and the peat stratum (right) alder roots in the peat stratum (scales 10 cm)

and estuarine areas has been undertaken during the recent past in order to rectify and audit this omission. Since London is situated on a tidal river, it is not immune to the effects listed above. While a tsunami may not be seen in central London, as suggested in the film FLOOD, the effects of erosion caused by the twice daily tidal current and the fluvial current is all too visible to those familiar with the archaeology of the foreshore. The effect of global warming has been to accelerate that attrition, and while the full effects may not be seen by the current generation, it behoves us to protect our cultural heritage, as exhibited by the London Thames, for those of the future.

The effects of accelerated erosion

While many inter-tidal sites show evidence of erosion and accretion, one area in particular can demonstrate the problems which face the survival of the archaeology on the foreshore. Bankside, which lies on the southern bank of the Thames in central London between Blackfriars and London Bridges, has suffered both natural and humanly-generated erosion. It lies in a part of the river that is now almost straight, as a result of the embanking which was begun by the Romans and continued into the mid-1900s. The speed of the water flow is most intense between Westminster and the Tower of London, and each new obstruction in the form of piers, struts or stanchions has caused additional pressure on the hydrology, and hence on the foreshore with its fragile deposits. The inter-tidal zone at Bankside has been deeply affected by the floating pontoon adjacent to the Globe Theatre, which services this stretch of the river. Construction of the struts which support the pontoon and the subsequent movement of the water around the structure in one of the narrowest parts of the river as well as the continual agitation caused by the boats which use the jetty, has resulted in stripping of the foreshore over the past few years. A barge bed, hardly visible ten years ago, has now been revealed, as has its various phases of construction and extensions. These phases are now themselves being eroded, exposing earlier stages beneath. The amount of erosion measures from 0.60 to 0.90 m in depth (Fig. 1). The timbers seen in the centre of Fig. 1 on the riverside of the barge bed were not visible before the construction of the pontoon. An extension added possibly in the 1930s to the upstream end of the barge bed was built using sacks of glass and earthenware bottles packed down and then covered with a deep layer of chalk. This extension came to light in late 2004 when the overburden eroded and the glassware particularly was seen to be thickly packed into clay within a prescribed area. By the summer of 2005, the exposure had also revealed what was beneath the glass/clay layer on the riverside of the barge bed (Fig. 2). The 20th-century clay is lying directly on top of peat, which has alder roots visible in many places and is traceable upstream along the foreshore. Similar peat layers nearby have been dated to the early Neolithic period. When the peat bed was first recorded in 2005, as seen in Fig. 2, the layer was fairly extensive and even in the spring of 2007, while having suffered some erosion, was still quite widespread. In September 2007, following the summer rains and the subsequent additional freshwater flow in the Thames, many of the peat deposits had disappeared, eroded from beneath the clay/glass causing this layer to collapse and break up in places.

Near the pontoon and upstream of it is the Millennium Bridge, which was constructed in 1998–2000 (although closed for corrections to the ‘sway’ from 2000–2002). The two slim stanchions, ovoid in shape, supporting the bridge were designed to create the least disturbance to the water flow of the Thames at this crucial point on its journey through central London. Unfortunately the use of box-shaped coffer dams during the construction phase negated, at least in the early stages, this careful design and caused worrying damage both ecologically and...
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Fig. 3: changing levels of the foreshore at the Globe Stairs. Observation at the foot of the stairs in November 2007, two months after this picture was taken, noted that a further 2 cm of the foreshore had disappeared, revealing more of the base of the supports.

The archaeological features referred to above are for the main what might be termed fragile and/or even ephemeral deposits, but even robust structures are suffering. Timbers from all the barge beds have disappeared, leaving gaps in which river water ‘excavates’ the strata buried beneath the compacted surface layers. Causeways are losing cobbles and stones as well as timbers. These alterations will be noticed only by those very familiar with the foreshore on this stretch of the river. To the occasional visitor, the changes will go unremarked, the losses unappreciated.

Most noticeable, however, even to the untrained eye, are those differences which can be observed at the Globe Stairs (Fig. 3). As can be seen, the level of the foreshore at the foot of the stairs has been dropping to the point where clambering up and down them is beginning to require a little effort! The stairs are not dangerous – they will not fall down in the foreseeable future – but they are a graphic indicator of what is happening on the adjacent foreshore and a symptom of the river as a whole. In 1995, the accretion on the foreshore had covered the depth of the bottom riser but the subsequent development of the pontoon near to the stairs referred to above resulted in considerable loss of deposits. Erosion continued at a slower rate for the next few years, but the last 12 months has seen this escalate so that the supports underneath the foot of the stairs are now exposed to a considerable depth.

The future of the tidal Thames

The Environment Agency is developing plans for flood defences on the Thames for the rest of the century, in a project called Thames Estuary 2100. In order to do this they have acquired information on four climate change futures based on current best available science working alongside the Met. Office (Hadley Centre), Proudman Oceanographic Laboratory and the UK Climate Impacts Programme. These range from current Government climate change predictions which are released by Defra (more can be found on their website), via a UKCIP medium-high scenario all the way to the worst climate change scenario we can anticipate on the Thames. This provides us with a maximum water level by 2100 at Southend and is a combination of sea-level rise, surge and freshwater flow increases. The most conservative estimate suggests a tidal rise in the Thames of 0.94 m and ranges through to the worst-case projection of a little over 4.0 m. All of these scenarios are based on a 20% increase in peak flows over Teddington Weir (further
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work is currently being done on the impact of climate change and river flows – but at the moment this is the best estimate.1

How will this affect the inter-tidal zone archaeology? An increase in the number of surge tides and the encroaching sea-level rise are the most obvious evidence of the movement of water on the Thames, and it would be logical to assume that the erosion is caused by these marine incursions. Empirical observation, however, suggests that this might not always be the case. The increase volume of water over the lock at Teddington following flooding in the upper basin in 2000/1 resulted in a stripping of foreshore deposits measuring 20–30 cm in depth along many stretches of the river. This action by the fluvial current was noted at Chelsea, Putney, Vauxhall, Bermondsey and Erith, as well as at Bankside and Winchester Wharf. This latter site lies between Cannon Street and London Bridges. A Neolithic submerged forest2 which can be seen at very low tide lost a third of its trees at the upstream end but equally gained approximately a third more on the downstream end. A jetty adjacent to St Mary Overy dock, some of whose timbers were initially only visible at ground level, were revealed to a depth of 20 cm. The Bronze Age bridge substructure at Vauxhall3 gained three more timbers on the landward end, and the attached Iron Age fish trap gained six additional stakes. In the last few years these timbers at Vauxhall have been covered by accretion4 and as such might be considered protected for the time being.

If the projected 20% increase in peak flows at Teddington is a conservative estimate of what might be expected, then greater damage to the deposits and structures on the foreshore can be expected during the next few decades. Combine that prospect with the increased strengthening of the twice-daily tidal current, and the future looks bleak to say the least for the archaeology of the inter-tidal zone on the London Thames.

Conclusion

The current tidal range of seven metres means that the land surfaces visible in the Neolithic are once again to be seen on the foreshore at low tides.5, 6 This is borne out by the number of forests and woodlands dated to the Neolithic, visible in the inter-tidal zone from locations at Richmond and all the way down to Erith – from one end of Greater London to the other.6 It also indicates that as the tidal range continues to grow, Mesolithic land surfaces will begin to be exposed and the number of Mesolithic tools will potentially swell as occupation levels and kill sites are revealed. And after the Mesolithic, the Palaeolithic and then archaeologically sterile deposits will appear.

Accretion or burial of deposits is not a long-term answer. It will only help where robust features (such as the Vauxhall bridge) are involved. Where surfaces and artefacts have been eroded, they cannot be replaced or recovered.

Investigations in the past, such as the Thames Archaeological Survey 1996–1999, gave a baseline of what archaeological deposits were to be found and where, but they are a snapshot in time. It is a different foreshore in many ways now than it was eight years ago. A new three-year survey is projected; this is excellent news, but it is not the total answer to an ever-evolving problem. Funding for a permanent post (or posts) to monitor the London Thames is long overdue.

So what can be done in the face of the onward march of global warming? We cannot halt the effects, but we can prepare ourselves for what they might bring. The Environment Agency is encouraging public involvement in consultations for the next round of flood defences.5 We have been warned. The archaeology on the Thames foreshore is a finite and very fragile resource – it behoves us as archaeologists to not waste what it can tell us.

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1. Information courtesy of Steve Colclough, Fisheries, Environment Agency.
3. For information on storm surges and the North Sea see http://www.environment-agency.gov.uk/subjects/flood/826674/882909/426221/426886/long_tides
5. Rachael Hill (Thames Estuary 2100 Technical Strategy Manager), Environment Agency. For more information concerning the Thames Estuary 2100 project, and to register an interest in taking part in the current round of consultations, go to http://www.environment-agency.gov.uk/te2100.