Pevensey Bay PFI: An Example of Best Practice in provision of Sea Defence Services

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Abstract

In June 2000 the British government awarded the first – and only – private finance initiative (PFI) sea defence contract worldwide. A consortium, formed by Westminster Dredging, became responsible for the improvement of a rapidly failing shingle embankment sea defence in East Sussex, England, and its subsequent maintenance until 2025. Although the contract specifies the standard of defence required, the design and operation has been left entirely to the contractor. It is flexible enough to take advantage of refined techniques that have resulted from regular monitoring of beach behaviour under a variety of storm conditions, and actively encourages innovation. The contract is monitored by the Environment Agency. Nine years on, both Client and Contractor believe that the PFI procurement process has ensured delivery of a high quality service and represents best practice in provision of sea defence services

1. Background

Pevensey Bay's Sea Defences consist of a naturally formed shingle bank that extends for 9km between Eastbourne and Bexhill in East Sussex on the English Channel coast. It is supported by a timber groyne field that in the late 1990s was reaching end of its useful life. A permanent breach in the shingle bank would result in a 50 square kilometre area behind the defences flooding at high tide. Over 6,000 properties, several caravan parks, important road and rail links would be affected, as would Pevensey Levels, an important ecological site that has Ramsar Convention status as a wetland of international importance.

Natural erosion and a lack of maintenance investment had resulted in the embankment becoming dangerously narrow in some places. By 1997 it was believed that a storm with a return period of 1 in 20 years could breach the defences. If nothing were done continued erosion could mean that the situation would just get worse.

Figure 1: Typical erosion prior to improvement works

2. Legislation and the Environment Agency

Responsibility for the defences rests with the Environment Agency (the Agency), a Non-Departmental Public Body of the UK government's Department for Environment, Food and Rural Affairs (Defra). The Agency's principal aim is to protect and enhance the environment and in doing so to make a contribution towards the objective of achieving sustainable development. One of its key functions, for which it received regulatory powers, is Flood Defence. In addition the Agency has an operational role, which provides a range of permissive powers enabling it to undertake flood defence schemes where considered appropriate and justifiable from the national perspective. It is important to note that the Agency has no positive duty to provide or continue to maintain flood defences.

The Agency's annual expenditure on flood defence currently exceeds £500 million of which £300 million is spent each year on capital projects. The expenditure is funded primarily by a combination of levies raised on Local Authorities by Local Flood Defence Committees (LFDCs) and Government grant aid provided by Defra.

Traditionally flood defence capital projects have been procured by using Consulting Engineers for design, Contractors for construction using civil engineering standard conditions of contract, with the Agency's 'in house' direct works department undertaking maintenance of completed schemes. In the case of Pevensey, maintenance is complicated by the presence of more than 300 properties built on top of the defences, the result of poor planning control in the past.

As a new organisation in 1996, the Agency was keen to determine whether its expenditure was achieving best value for money. One of the first steps to this end was to review potential use of Private Finance Initiative (PFI) for procurement of some of its flood defence capital projects.

3. The PFI / PPP concept

PFI was launched in 1992 as another UK Government policy designed to increase the involvement of the private sector in the provision of public services. Other policies with a similar aim were already in existence, namely Public Private Partnerships (PPP), privatisation and contracting out.

PFI differs from privatisation in that the public sector retains a substantial role in PFI projects, usually as the main purchaser of the services provided. It differs from contracting out in that the private sector is typically responsible for the design, construction and financing of the capital assets necessary to deliver the service. It may be argued that PPPs offer opportunities for variance from the PFI concept but to all intents and purposes PFI and PPP projects are one and the same and the two terms are now used interchangeably.

The prime objective of both is to obtain better value for money in major public procurement and to secure the provision of improved public services more quickly than would be possible under more traditional routes.

A summary of the PFI/PPP process could be described thus;

- Bidders are invited to provide offers for the delivery of services over an extended contract period, typically f 20 to 30 years.
- A successful bidder is usually expected to fund the design, construction and commissioning of all assets necessary to provide the service.
- Once the service is available for use, the Contractor is paid an agreed periodic sum dependent on the level of service provided.
- The long term contracted cash flow offers security for the Contractor to raise the finance to fund the asset construction.
- Throughout the contract period the Contractor is responsible for the maintenance of the asset.

Emphasis therefore is on whole life costs, revenues and risk, which is in contrast to the traditional UK contract that has focused predominantly on the creation of an asset and gave insufficient attention to its performance over its economic life.

In any PFI/PPP contract, as the private sector has to fund construction of the capital asset, the cost of capital is likely to be greater than if the public sector were to borrow the same amount of money. In addition of course the contractor expects to make a profit over the life of the contract. Therefore if PFI/PPP procurement is to show better value for money for the public sector these additional costs need to be exceeded by savings from the process. The presumption that this will be the case is broadly based on two premises:

1. The contractor, by looking at whole life costs, will be able to provide innovative methods of delivering the service thereby reducing lifetime expenditure.

2. Contract risks will be the responsibility of the party best able to manage them. Thus the Contractor will take on some risks usually borne by the public sector. Through better management cost of these risks will be reduced and absorbed in the overall payment system.

In order for the Contractor to be able to innovate and assume risk, a project needs to comprise a suitable asset/operational split. If the vast majority of the whole life project cost is attributable to the early provision of an asset, for instance a concrete sea wall, value for money is unlikely to be achieved and the project may be little more than a hire purchase scheme. As a general rule at least 50% of the Present Value (PV) costs of a PFI/PPP project need to be made up of annual maintenance and the provision of auxiliary services.

Most importantly of all, if risk transfer and opportunities for innovation are to be achieved, a PFI contract must be based on an output specification that prescribes a service and not a design specification that describes an asset.

It is interesting to note that the PFI premise has now been adopted in many places around the world, including France, the Netherlands, Portugal, Ireland, Norway and Finland in Europe. This is in part because of its uptake by bodies such as the IMF, WTO and World Bank as they strive to reform their funding programmes. According to the National Audit Office, an organisation independent of UK government, PFI projects are more likely to be delivered on time and on budget than more traditional schemes. The exceptions tend to be where the public sector changes the specification part way through a contract.

The PFI contract at Pevensey Bay

PFI contracts have in the main been used to deliver solid structural assets such as schools, roads, hospitals, prisons, bridges and the like. Given sound geotechnical information for the site, proven construction techniques and use of quality materials, any contractor should be confident that maintenance costs for these kind of assets can be accurately predicted for the duration of the project. This degree of certainty does not apply in the case of a sea defence, particularly where the asset is a shingle embankment that is subject to tidal attack and is materially changed every 12 hours, of every day, of every year.

This was just one of the issues that had to be addressed by what is a bespoke contract. Given Pathfinder status by the Agency for what was (and still is) the only environmental and flood defence PFI, many unusual issues had to be tackled.

The Procurement Process

With no PFI experience of their own, the Agency appointed external advisers with suitable Commercial, Legal, Technical and Project service assistance experience to join their own project manager and a representative of the Treasury Taskforce to form the project team.

A call for competition notice was placed in the Official Journal of the European Community (OJEC) in May 1997 and from all the expressions of interest, six consortia were chosen to receive the Agency's strategy plan and pre-tender document. By December 1997 this number had been reduced to three, each of whom were issued initial Invitation to Negotiate documents and a draft of the proposed contract, allowing them to prepare formal bids.

An essential part of this process is the definition of a reference project and the preparation of the Public Sector Comparator (PSC). The reference project was the Agency's own preferred strategy for the area and the PSC provided an estimation of total costs were the project to be procured using traditional non-PFI methods and within the constraints of available funding at the time. This was a fully transparent process with all three bidders involved throughout.

Final documents were issued almost a year later, with a return date in December 1998. As well as a reference bid conforming to the documents, bidders were also encouraged to submit variant bids on any aspect of the project. Following evaluation of the final offers, the Project Team made a recommendation to appoint Pevensey Coastal Defence Ltd (PCDL) as the Preferred Bidder with the intention of moving forward to awarding a 25 year PPP contract. Approval to proceed with the appointment was received from all the relevant approving authorities at the beginning of May 1999.

Finalising contract detail was a lengthy, time consuming but necessary process and involved each party's internal and external commercial and legal advisers. The intention was that this task should be completed in November 1999. In fact full agreement of all contract documents was only finally achieved in April 2000. With the benefit of hindsight this was probably inevitable since it necessitated a great deal

of original work – and getting four sets of lawyers to agree was always going to be a slow process!

4. Contract Structure and Issues

PCDL is a special purpose company formed solely for the purpose of performing the Pevensey contract. PCDL undertakes none of the work, subcontracting all obligations to the four shareholders;

- Westminster Dredging Co. Ltd
- Dean & Dyball
- Mackley Construction
- Mouchel Group

Each shareholder has a contract with PCDL backed up by a similar direct agreement with the Agency, which would allow the Agency to continue to maintain the defences should PCDL fail to perform. Scheme funding was provided by the shareholders rather than third party lenders and this was a factor in PCDL being able to offer the most competitive bid.

A structure where the shareholders, lenders and subcontractors are the same parties reflects the fact that the Pevensey contract, with a cash value under £30 million (1999, index linked), is small in PFI terms.

Key issues that had to be resolved fall broadly into the following categories:

- Service definition and measurement
- Defining the key physical features
- Paying for something not to happen
- Risk identification and allocation

3.1 Service definition and measurement

The principal service is provision of protection against flooding from the sea and the prevention of breach of the shingle bank for any storm with a return period of 1 in 400 years or less. This gives rise to two further definitions; evaluation of individual storms and a beach able to withstand a 1:400 year event.

Storms are defined by a combination of predicted astronomical tide and the storm surge, significant wave height and wave direction that occurs coincident with each high water. It was accepted that locally measuring wind, wave and water levels during storm conditions throughout the 25 year period was impractical, so water data comes from Admiralty Tide Tables and the Proudman Oceanographic Laboratory (POL) surge model, with wave information taken from the Meteorological Office (UKMO) wave model.

Joint probability curves were derived from comprehensive analysis of storms from the previous ten years, and these cover events from 1 to 400 years. Due to the contract length , there is provision to allow for review of these parameters, potentially adjusting for changes in sea level, isostatic tilt and increased storminess – hence the need to quantify all storms of greater than 1:1 year probability.

3.2 Paying for something not to happen

As with any contract between two parties involving the exchange of money for goods or services, an agreed system of measurement is essential for financial and quality control. The success and smooth running of any contract is invariably dependent on the clarity and ease of application of the monitoring and measurement system.

Applying the PFI concept to a sea defence scheme such as Pevensey poses particular challenges in this respect. Unlike any other similar contract to date, the service requirement is that something, namely flooding, should not happen. For more than 99% of the 25 years, protection service levels against storm events will not be tested and there will be no output to measure. Indeed in the case of the higher service levels they will probably never be tested.

Consequently it was necessary to show some physical evidence of service provision throughout the contract period. The chosen method was to agree certain key physical features of the sea defences, with monthly service payments then dependant on them being in place within certain tolerances.

Incorporated within the contract therefore is the right for the Agency to carry out inspections and surveys of the beach to ensure the key physical features are in place. A progressive points and financial deduction system encourages the Contractor to maintain the key physical features at all times.

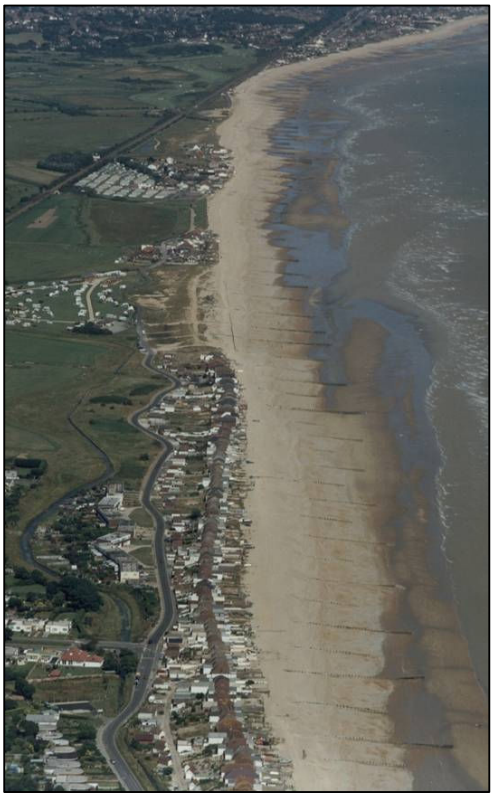

Figure 2: Aerial view looking East. Property line seen seaward of natural beach alignment

3.3 Defining Key Physical Features

The key physical features are essentially two million cubic metres of shingle distributed over nine kilometres. It moves around under wave action to the extent that its shape can alter rapidly in a few hours. The Agency has used aerial surveys to annually monitor the beach since 1973, which allowed for long term trends to be identified. Advances in GPS technology during the 1990s meant that undertaking real-time beach surveys with a vertical accuracy of 25mm became commercially viable. The speed and accuracy afforded by GPS results in beach volumes being known to between ±5,000 - 10,000 cubic metes – less than half of one per cent of the total volume.

With a 1:400 storm defined, a beach capable of withstanding such an event was needed. Put simply, a minimum width for the shingle embankment was agreed, assuming typical rear and front beach slopes beach were maintained. This included an allowance for day to day recession, so that in lesser events the Contractor has sufficient time to restore defences and allow some natural recovery to occur. In practical terms the beach is required to be a minimum of 22m wide at its crest. To allow for local variations, it is subdivided into 53 sections, each with its own volume and allowable recession level.

It is interesting to note that PCDL now monitors the beach far more than the client. A GPS receiver has been mounted on to a quad bike, which enables the 9km of foreshore to be surveyed far more quickly than on foot. Consequently a survey has been completed every month for the last six years. This not only confirms the Contractor's compliance with the contract, but also identifies any areas where work is required and provides invaluable data that will help identify continuing long term trends as well as help refine maintenance techniques. Pevensey is now the most monitored beach in the UK.

3.4 Risk identification and allocation

A key aspect of a PFI contract is that risks are carried by the party best able to manage them. At Pevensey these fall into three categories;

Contractor's Risk

- Performance of the scheme's design to agreed weather standards.
- Costs of obtaining all materials
- Shingle movement
- Completion to cost and timetable
- Responsibility for all operational matters including health and safety, liability to third parties and unforeseen ground conditions
- Provision of emergency strom response

Shared risk, carried equally by PCDL/ the Agency:

- Placing of an acceptable Environmental Statement and obtaining all statutory approvals.
- Reinstatement costs for the permanent loss of shingle as the result of a weather event with a return period between 1 in 50 and 1 in 400 years.

Client Risk

- Changes instructed by the Agency
- Changes in law or government policy relating to flood defence
- Reinstatement costs resulting from events above 1 in 400 year service level
- Impacts on the project area resulting from work outside the project area

It is also worth highlighting that a PFI contract such as this positively encourages innovation and examples of innovative ideas that have been applied will be discussed later. In recognising that future design changes and therefore reductions in cost could occur, the contract allows that any savings of this nature are to be shared equally between the Agency (and therefore the public purse) and PCDL.

3.5 Management Issues and Structure

The success of any project depends, of course, on effective management. A complex set of relationships exists between PCDL, its shareholders, the Agency, other Government departments, local authorities and interest groups and, importantly, the local residents at Pevensey. Unusually the project area is not owned by the client and indeed most of the crest-top properties on the defences own the land down to mean high water. Work is legitimately undertaken using the Agency's permissive powers, but the sensitivities of residents and other land owners cannot be ignored.

PCDL has an 'open door' policy at their local office and actively encourages residents to visit. By learning of what is being done and why, local communities gain a greater understanding of what is needed to maintain a sea defence and that a degree of intrusive work will always be necessary. At the same time both PCDL and the Agency have recognised that the use of large and noisy items of plant on the beach should be minimised.

This last point is particularly pertinent. All coastlines are perpetually evolving and the 'soft' shingle beaches of the English Channel change remarkably quickly at times. Trying to adequately define something this ephemeral in a contract document is very difficult. All involved believe that the existing documents are workable and fair to both parties. To date both Agency and PCDL project managers have taken a pragmatic view and manage the beach day to day on a commonsense basis, using the Contract only when necessary. It is unusual for there to be more than two or three items of contractual correspondence every year.

It is clear that the relationship between project managers could on its own make or break the Contract, and to keep it close, cooperative and effective for a full 25 years will be a major challenge. Relationships that exist between PCDL and its shareholders also required careful consideration. As well as being shareholders, the participating companies are also sub-contractors, each providing different services. In certain circumstances a company's interests as a sub-contractor and as a shareholder may conflict. In order to avoid such a situation it is vital that all decisions are made in the interest of the shareholders alone. Clearly this requires self-discipline but, more importantly, an ability to work openly, constructively and honestly together. This was an important consideration when selecting the team in the first place. During the negotiation process, which was at times quite difficult, the cohesion of the group was tested and proved to be a real asset.

4. The Pevensey Bay Sea Defence Strategy

The service required of PCDL is the improvement and maintenance of a shingle embankment. Historically the Agency has used timber groynes to help stabilise the defences and reduce losses through littoral drift. In June 2000, PCDL inherited a foreshore with 150 groynes in place, most of which were at the end of their useful life due to many years of under investment by successive governments. Replacing them either with new timber or rock 'T' head structures would have significantly added to project costs. Similarly, growing environmental awareness resulted in a movement towards working with natural processes rather than fighting against them. Consequently the overriding strategy became one of maintaining shingle supply and managing it as it is driven west to east by prevailing wave action. Expenditure on beach structures only provides

benefit in relatively small areas. Concentrating on aggregate supply and allowing it to move naturally means that downdrift beaches benefit too. Expanding this policy so as to manage a coastal process unit as a single entity rather than a series of disjointed Unitary Authorities would undoubtedly result in further savings for the UK taxpayer[1].

Lack of planning control has over the years led to inappropriate development in many places, so much so that it is now impractical to do away with all groynes and manage Pevensey Bay as an open beach. Several discontinuities in beach alignment have to be maintained, but this can be achieved by maintaining about six of the original timber groynes. As mechanised plant continues to grow in both size and efficiency, it is today far easier and more cost effective to move shingle along the foreshore than it has been before.

A variety of methods are used to maintain the frontage. Given that the embankment has to be kept within certain width parameters, bulldozers are used throughout the winter to reprofile the upper foreshore and move sediments back up the beach after they have been drawn down during a storm. Excessive beach movement requires the use of large dump trucks, loaded from areas of temporary accretion, they then deposit beach in depleted sectors. The construction of Sovereign Harbour Marina on the eastern edge of Eastbourne means that now shingle washed on to its western harbour arm and has to be mechanically bypassed round to the downdrift side. Most importantly, there also needs to be an annual maintenance recharge of sea dredged aggregate.

4.1 The Role of Marine Aggregates

Sediments that form fringing beaches such as Pevensey tend to come from three sources; river run-off, cliff retreat or the sea. In Sussex there are no rivers of sufficient size to provide meaningful quantities of material. Chalk cliffs retreat relatively slowly, are low in flint content and in many cases are now protected from further erosion. The vast majority of beach material therefore has come from the sea bed. Water levels have been rising since the end of the last ice age, and as the English Channel formed and expanded, wave action gradually moved glacial and other debris landward. This process continued unabated for thousands of years depositing substantial quantities of aggregate on the foreshore. However, once water depths went beyond a critical point, waves were no longer able to continue to delivering sufficient sediment. From this point on, littoral drift became the dominant force as wind and waves combined to move shingle along the coast faster than it arrived. Initially a feed of material was maintained as many of the substantive shingle beach structures that had formed during times of excessive supply gradually eroded, but once they had gone many fringing beaches faced destruction. For much of the last 500 years the Sussex coast has been fed by littoral drift alone, and the last few decades have shown there is no longer enough sediment in the system for them to survive without intervention.

In this regard Pevensey is a typical example. Beach monitoring showed that there was a net loss of 20,000 cubic metes every year. Without intervention it was clear that the defences would not last long before they would be breached. The provision of marine aggregates is therefore critical for Pevensey's survival. No amount of groyne construction or shingle recycling can ultimately sustain a system that is fundamentally short of supply.

4.2 Project Delivery & Innovation

Put simply, delivering the flood defence service for Pevensey revolves around the supply and management of shingle. The prospect of two major replenishment campaigns of between three and five months duration each, as well as annual maintenance recharges of three weeks, was a major factor in Westminster Dredging deciding to have split-bottom barge Sospan Dau converted into a trailing suction hopper dredger. With a draft of only 3.6m fully laden, she is able to operate inshore in many areas where it had previously not been possible. Traditionally beach recharge at Pevensey had been carried out either using either road lorries or larger dredgers, transhipping their load to barges that would bottom-dump sediments on the lower foreshore. Sospan Dau rainbows her cargo onto the beach, but because of the proximity of houses on the crest, the technique has been adapted by using a larger diameter nozzle with a steel plate welded in front that deflects the material almost straight down. The result is a discharge mound immediately in front of the vessel, often up to mean high water, and almost always with the upper section clear of the sea. This has many advantages;

- A single vessel means no transhipment area and general reduced impact on the local commercial fishing fleet as well as reduced costs
- Losses due to tidal action before recovery are lower because the material is deposited so much higher up the beach.
- Recovery can be achieved with a single bulldozer as opposed to a dozer, excavator and dump truck as used to be the case.
- Less plant means less noise pollution to the benefit of local residents
- Deposition mounds have a more natural segregation of material, which can help in dealing with "cliffing".

This last point is a major consideration for managers of newly replenished beaches. By the time sea dredged aggregates have been recovered to the beach crest they are well and truly mixed. Introducing too much sand to the upper beach means that it "cliffs" once put under wave attack. This not only results in more material being introduced to the swash zone, hence increasing littoral drift, but also affects the health and safety of beach visitors as "cliffs" are liable to collapse.

Because material falls from the Sospan Dau's nozzle practically from the force of gravity alone, relatively coarse particles tend to move the least distance, whilst the sandier content migrates to the fringes, forming an apron around the resultant mound. Selective recovery of the coarse elements becomes relatively simple, with the sandy portion left in situ lower down the foreshore where it is usually found.

Undoubtedly regular and repeated beach monitoring has been a major part in the evolution of Pevensey's maintenance regime, for instance;

- Understanding how the beach behaved after completion of the Capital scheme

[1] PCDL undertook a broad brush review of sea defence works carried out between Brighton and Rye on behalf of the Environment Agency during autumn 2008. Work was linked on the PFI frontage with recharges at Seaford and Bulverhythe in October 2008, with significant saving to the public purse compared to costs that would have resulted if works had been commissioned independently.

enabled plant to be targeted at the right areas at the right time so that sufficient beach was moved back to depleted areas.

- It was discovered that beach lost from volatile areas does not initially move very far. If collected soon afterwards, it can be returned at a relatively low unit rate. If left too long, it dissipates over a much wider area and cannot be so easily found, costing far more to load and return.
- Detailed surveys enable the correct amount of shingle to be ordered for the annual recharge (adding twice as much one year does not mean it will last twice as long)
- Minimising the use of mechanised plant on the beach is financially beneficial, better for the environment and is less intrusive for the local residents

In managing a shingle beach potential innovative opportunities are quite limited. Aside from the Sospan Dau, the Pevensey team has experimented with groyne components made from recycled plastic, as opposed to tropical hardwoods as is the norm. The next step was to participate in a research project that examines the suitability of lesser known and underused tropical hardwoods. Given that groynes are expected to last for at least 25 years it will be some time before any benefits from these experiments are realised. It is important that potential alternative materials are tested and although the results may be of no direct benefit at Pevensey, PCDL and the Agency are keen to help advance our knowledge base in these areas.

Having the same management regime in place for 25 years is very attractive to academic institutions wishing to research coastal processes. As a result PCDL has worked closely with graduates and researchers from six Universities and colleges in southern England, participating in PhD studies as well as the Beaches At Risk (BAR) project, an Anglo-French venture funded by the EU as an Interreg III project. Whilst no single study is expected to provide a breakthrough in understanding or predicting beach behaviour, each will add a little more insight into the subject. And of course being based on observational data collected at Pevensey, it will be of direct benefit to the project.

5. Conclusions

In the same way the contract had to address the issue of "Paying for something not to happen", PCDL had to consider how their involvement would be perceived by local communities, who after all are really the end client. It would be entirely possible that Sussex would not flood regardless of PCDL's actions. It was decided that involving local residents and interest groups at all stages of the project was not only key, but could also be considered to be part of the service requirement. This process was started by the Agency with the formation of a Key Stakeholder group way back in the mid 1990s. The start of the contract saw PCDL continue and develop this liaison, particularly with residents most directly affected by the works. There is now a regular full and frank exchange of views between PCDL and a whole range of stakeholders – from individual residents through to national organisations such as Natural England. By giving people the opportunity to learn about the works when it suits them, and encouraging continued dialogue, there is a growing understanding and acceptance of what is involved in providing the flood defence service. As sea levels continue to rise – either through natural processes or as a result of human activity – management intervention in our coastal areas will continue to increase. In time there will inevitably be locations where maintaining the present shoreline proves unsustainable. Although strategy decisions will remain political, it will only be through dialogue between managers and local stakeholders that compromise operational decisions can be made.

The importance of a 25 year agreement cannot be understated. In 2000, Pevensey homeowners knew that they would be protected until at least 2025, something no other area in the UK could boast.

Involvement of insurance companies will play a significant role in future strategies. Generally insurers are happy to provide cover as long as the level of protection is greater than 1:75 years. In the event of future claims, companies will want evidence that the stated level of defence was indeed provided. In doing so coastal managers will need to know the severity of the weather event that precipitated the problems and that defences were in suitable condition beforehand. In turn this will mean that funds are made available to undertake beach maintenance when required rather than just when budget remains. Long term contracts such as Pevensey ensure that whole life costs are considered as a matter of course rather than a longed-for luxury.

Whilst the UK may not have a long list of coastal projects suitable for future PFI schemes, many of the lessons learnt at Pevensey can be applied equally to extended period maintenance contracts. If these were established on the basis of sediment cells rather than political boundaries, then a more unified strategy would result. Recent changes mean that the Environment Agency has now taken an overseeing role of coastal issues. It is now entirely possible that a single organisation could have responsibility for a sediment cell, introducing economies of scale as the norm. For instance, small annual replenishments are more effective than larger less frequent ones. Smaller contracts are generally less attractive because of relatively high mobilisation costs. By linking several small shingle deliveries on different frontages via a single contract, far lower unit rates will be achieved. Similarly, using a single gang to recycle multiple areas in sequence will result in favourable plant hire rates.

All involved in the Pevensey PFI scheme agree it has been successful, and a series of national awards stand testament to the fact that it has been a team effort throughout. It is equally important that lessons learnt are taken forward and used to derive a more unified approach to future coastal management.

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