



LONG-TERM COASTAL DEFENCE AND MANAGEMENT AT PEVENSEY BAY, UK: A PUBLIC PRIVATE PARTNERSHIP

ABSTRACT

When the British Environmental Agency issued a tender in the late 1990s for a Public-Private Partnership to build coastal defences, its first aim was the restoration of the basic coastline at Pevensey Bay, UK, including the management and maintenance of the area for 25 years. Ultimately, a consortium, Pevensey Coastal Defence Ltd (PCDL), comprising four parties was awarded the contract to improve defences that protect a 50 km² area of low-lying land behind the coast. This area includes the main south coast trunk road, a railway line, caravan parks, several villages and a Ramsar nature reserve with cultural-historical significance. The contract was the first of its kind for coastal protection to be undertaken in the UK and was thus designated a “pathfinder project”, a status allocated by the Treasury. This means that no model existed as a basis to work from. Till now the manner in which the project is being implemented has met with favourable reaction from the residents and from the Client, suggesting that the form of tender and contract utilised at Pevensey Bay may offer advantages for other coastal defence procurements and policies in the UK and other countries as well.

An added benefit of the 25-year contract with PCDL is that it offers unique opportunities for researchers to collect coastal data over a longer period. It allows them to test alternative methods that can potentially make the management of a beach more efficient, sustainable or more beneficial to the environment. Pevensey has as a consequence already attracted several research institutes and universities which should certainly provide useful data for all concerned with the long-term protection of coastal regions.

INTRODUCTION

Pevensey Bay lies along the east coast of England between Dover and Brighton. A number of permanent homes are built on the beach up to the floodline. Until recently, the beach, comprised of sea stones or shingle and timber groyne, provided sufficient protection for the coastal community.

Above: The coastline of Pevensey Bay during a storm. Over the years, the area has suffered extensive erosion which has worsened recently because of rising sea levels. Through a PPP contract the Environment Agency sought a long-term, cost-efficient strategy of improving coastal defences.

However, in the last several years because of climate change and rising sea levels, erosion had increased significantly. During a storm in October 1999 the threat of a breach was imminent. As a result, some 50 km² of hinterland where a main road, railway, caravan parks and a nature reserve with cultural-historical value were threatened with severe flooding. This included the ecologically sensitive Pevensey Levels, which is an important Site of Scientific Interest (SSI) now designated as a Ramsar site. Should the defences here be permanently breached, the area would be in danger of being inundated and damaged by salt water at every high tide (Figure 1).

Because of these circumstances, the Environment Agency had been considering initiating beach defence trials as a “pathfinder project”, a status allocated by the Treasury. This means that no model existed as a basis to work from, to assess the suitability of a PPP for flood defence procurement. In this framework, negotiations were begun to implement the Pevensey Bay Sea Defence Strategy, which would include a long-term sustainable care and maintenance plan and a strategic emergency plan. The storm in the autumn of 1999 served to confirm the necessity for such a scheme to protect the area.



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Figure 1. A location map indicates Pevensey and the site of concern.

The UK Environment Agency, which was established in 1996, is the Government entity responsible for coastal protection. Since many places along the English coastline are in need of maintenance, the then-newly-created Agency sought a new approach to coastal protection as well as a comprehensive, more modern financial construction.

The form of contract known as Public-Private Partnership (PPP) is one of the

methods that the UK Government uses to involve third parties in the realisation of large infrastructure projects. The Environment Agency felt that this form of tender would also be suitable for the coastal protection project at Pevensey Bay. In addition, the Agency felt that both the financing and the area management should be brought under the oversight of the Contractor. Having decided to pursue the PPP procurement route for the Pevensey Sea Defences, the Agency placed a notice in the *Official Journal of the European Community* in May 1997. Over 50 firms expressed interest and were sent information packs and questionnaire by the Agency. A total of 13 consortia responded to the questionnaire.

As a result of the tendering process, a consortium called the Pevensey Coastal Defence Ltd (PCDL) was awarded the contract in May 2000. The consortium comprises Westminster Dredging (an operating company of Royal Boskalis Westminster nv), Dean & Dyball Construction Ltd., J.T. Mackley Co. and the Mouchel Group.

PROJECT DESCRIPTION: THE PEVENSEY STRATEGY

The project consists of the restoration and reinforcement of the coastal defences at Pevensey Bay, including the care and maintenance of the coastline for a period of 25 years. Pevensey Bay’s sea defences are approximately 9 km long, running from Eastbourne to Bexhill-on-Sea in East Sussex. They consisted of an elongated shingle bank, supported by 150 timber groynes, which aid in absorbing and reducing the power of the waves. The coastal defence was required to protect the low-lying hinterland with some 3,000 residences and commercial properties and important nature reserves (Figure 2).



Figure 2. The Pevensey Bay coastline after severe erosion.

In the mid 1990s, a variety of defence options for Pevensy Bay, ranging from doing nothing through to constructing rock islands, were examined in an Environment Agency study. The conclusion was reached that defending Pevensy Bay in the foreseeable future was possible, and that a good degree of defence could prevent the Pevensy Levels from reverting to permanent salt marshes. The sea defence would not necessarily guarantee protection against temporary breaches or overtopping of the defences at any location but it would defend against permanent flooding.

As an added requirement, the preferred option had to comply with strict economic guidelines that the costs of such a defence scheme would not exceed the potential flood damage thereby avoided. The Strategic Study for Pevensy Bay concluded that an "open shingle beach" solution would satisfy these economic criteria whilst other options involving large rock groyne structures could not be justified.

To achieve this in a cost-effective manner, the Government requested that the Agency explore the possibility of providing sea defences through a Public-Private Partnership (PPP). The Environment Agency wanted to achieve the following:

- Private pre-financing
- Better risk allocation (a spread between the contracting parties and the Agency)
- Opportunities to implement innovations directly
- Clear identities and responsibilities for the partnering companies
- Co-operation and ability to utilise opportunities
- The enjoyment of direct advantages from the delivered services
- Financial security and defined costs/ payments per year, with a savings on the project costs

Government was very aware that in the coming years, as a result of climate change and the accompanying rise in sea level, coastal defence will be an expensive affair. To make the coastlines conform to regulatory safety demands requires a rather large pre-investment. For instance, shingle for the project was available at another

English Channel location. Traditionally this was dredged and placed on land and then transported by lorry to the coastal area. This form of transport caused disturbances for residents, damaged local roads and caused unsafe traffic situations.

By choosing for a PPP, the costs have been spread over the long term, more efficient and innovative transport solutions have been found and this has led to increased financial security.

Specifically, in order to bring the coastal defences to the legally required levels, a large pre-investment was necessary. To achieve this, 200,000 cubic metres of shingle for the beaches and the construction of a new, hard defence mechanism (a boulevard), with the appropriate infrastructure, were recommended. After achieving these construction goals, the coastal area will have to be maintained at a safety level which required 20,000 cubic metres of shingle per year.

CHOICE OF CONTRACT FORM AND PREPARATION OF THE CONTRACT

Because of the lack of experience with a PPP for a coastal defence project, the contract preparations and tendering was time consuming and a learning process for all parties. The Client continued to find areas where more transparency was desirable and the questions seem to concentrate on the level of provided services: the regulatory stipulations of safety demands in relation to breaches, erosion and overtopping. In order to meet these legal requirements attention was focused on finding a collective vision in relation to design parameters. Examples, for instance, are: data about storms in the area and the long-term morphology of the coastline.

The risks which come under the responsibility of the consortium are:

- Storm conditions
- Rising sea levels
- Approval from the Client
- Expectations of the citizenry (customer satisfaction)
- Design uncertainties

An important concern was that the capital costs of the project would be higher by using a PPP than if the public sector had secured a loan for the same finances. This was a real possibility, as the interest on a Government loan is lower than one in the open market. This concern proved to be unfounded.

A Contractor can usually save on costs in two ways: One way is to design a total plan including long-term services that the public sector wants and then develop innovative tools to accomplish these goals that will result in significant savings. Another cost-saving method is that the Contractor can assume responsibility for a number of established risks that otherwise the public sector would have to guarantee, thus reducing the costs of the Client. In the maritime construction sector risks are often related to guaranteeing the timely delivery of the work which can be influenced by weather conditions, purchase price of materials, winning and transport of construction materials and the development of an emergency evacuation plan. In addition, the integral long-term concept and flexibility in planning of the operation are important. With the use of a PPP contract, the optimal balance between freedom and responsibility can be realised.

SPECIFICATIONS

The contract for the coastal protection of Pevensy Bay describes operational specifications which must be met by the designs of the tenderers. In addition, the bidders were encouraged to create innovative solutions which would result in cost reductions without compromising safety and sustainability. Out of a short list of three potential bidders, the consortium Westminster Dredging, Dean & Dyball Construction Ltd., J.T. Mackley Co., the Mouche Group were successful. Their design is based on a one-time restoration of the coast in order to meet safety standards. Not only would this include restoring the 200,000 m³ shingles but thereafter over a period of 25 years the consortium will provide maintenance to a safety level of < 1:50. When the safety



Figure 3. Placement of the bales with car tyres for the coastal defence system.



Figure 4. Insulation of the tyre bales.

levels are at 1:50-400 the risk is then for both parties. At a safety level of >1-400 the risks and costs revert to the public sector.

After the contract with operational specifications was established, the negotiations for the formation of a PPP between the consortium and the public sector were begun. Agreements were made about the co-operation, the operation and the monitoring of the work. A private financier was sought and found. As pre-condition about 50 percent of the net cash value of the project had to consist of the annual maintenance costs and other additional services.

The Environment Agency saved about 15 percent on recurring obligations by signing a contract in which a good proportion of the risks were assumed by the contracting consortium. In addition, a number of cost-savings were realised by allowing the use of innovative methods. Furthermore, savings were achieved by closing a one-time contract for 25 years.

By creating a partnership for a lengthy time period, the consortium has time in which to gain experience in the area and to get to know the concerns of the residents who are interested in the management and safety of the region.

IMPLEMENTATION OF THE PROJECT

The consortium developed a design which will protect Pevensey Bay for the coming 25 years as well as comply with the needs for recreation and the development of nature reserves. Furthermore, a number of innovations offer both cost savings and advantages for the region. For instance, in the coastal protection design, 350 tyre bales containing 40,000 used car tyres – which otherwise had no other destination – were buried in the beach in front of the Environment Agency depot on Coast Road.

This disposed of unwanted tyres and also substituted for a good amount of shingles and achieved a better ground-mechanical balance in the construction. The trial helped examine whether bales of compressed, scrap vehicle tyres can help offer sustainable, economic and environmental solutions to some port, river and coastal engineering problems (Figures 3 and 4).

Another innovation developed by Westminster Dredging as part of the consortium was the method of bringing shingle onto the coast. Rather than using road transport, the material was mined up the coast by the hopper dredger the *Sospan Dau* (capacity 1500 tonnes) and then spouted onto the beach (Figure 5).



Figure 5. The trailer *Sospan Dau* delivering shingle to the coast.



Figure 6. Bulldozers at work spreading the shingle viewed from the sea.

When the tide was low, the shingle was spread by bulldozers and given the correct profile (Figures 6 and 7). This mitigated one of the disturbances (unwanted road traffic) for the area and also offered sizable cost reduction. The development of the nature reserves was given special attention. By separating the recreation areas from the nature reserves, people are able to enjoy recreational beach activities without damaging the very special biotope of the shingle beaches.

RESEARCH AND MONITORING

The 25-year contract with Pevensley Coastal Defence Ltd also offers unique opportunities to collect coastal data over a long period of time and to try different methods that can potentially make the management of the beach more efficient, sustainable or more beneficial to the environment. For these reasons, the long-term contract has attracted attention to Pevensley and several research institutes are actively involved with conducting ongoing monitoring and research projects. Monitoring of the project is being conducted by the consortium, in co-operation with the Client, and with universities and research

institutes, such as the Southampton Oceanography Centre, the universities of Brighton, of Bristol and of Sussex and others. Doing this work over such an extended period allows a good comparison of experiences with diverse monitoring techniques and it makes truly independent monitoring and evaluations possible.

CONCLUSIONS

As a "pathfinder project", the Pevensley Strategy using a PPP for coastal protection can certainly be considered to be successful, and its application to other European coastal projects in countries such as the Netherlands and Belgium is recommended. Using a system of benefits and burdens, a carrot-and-stick approach, has the advantages to stimulate private investors to pre-finance.

For the Client the advantage is that per project the fixed costs are paid over an extended time period, and the care and maintenance are done by third party experts. In these sorts of projects, contractual agreements and division of risks are important. Large unforeseeable risks

should not be allocated to third parties because this will cause the costs of the projects, in connection with insurance, to rise remarkably. So sharing the burden of risks is a more cost-effective solution. On the other hand, innovations suggested by the Contractor that may result in cost-savings must be allowed.

The experience with the project at Pevensley Bay indicates that taking on an integral coastal protection project, including improvement and maintenance, development and implementation of an emergency plan is certainly financially feasible.

Furthermore, long-term PPP contracts for coastal defence such as at Pevensley Bay, create an atmosphere in which important beneficial research data on coastal reinforcement can be accumulated. Of course, specific coastline situations will demand specific research by the Client or research institutes and, these may be influenced by the cultural-political situation which varies from country to country. Still, the PPP contract allows Client and Contractor to establish a mutually responsible relationship which benefits all parties.

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Figure 7. Viewed from onshore, bulldozers at work spreading the shingle.

