BACTON SANDSCAPING - BUILDING WITH NATURE TO SAFEGUARD THE UK'S GAS SUPPLY AND HELP COMMUNITIES ADAPT TO COASTAL CHANGE

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INTRODUCTION

The Bacton Sandscaping scheme is a large-scale beach nourishment, designed to protect the Bacton Gas Terminal from cliff and beach erosion while also reducing flood and erosion risk to the communities of Bacton and Walcott, buying the time they need for adaptation to coastal change. The scheme was inspired by the even larger Dutch Zandmotor project, translating the concept to the different geography and governance setting of the UK – it can be seen as the Zandmotor's 'little nephew'. The term 'Sandscaping' was introduced to illustrate the large-scale and ambitious nature of the concept: work at a large scale, designing to work with natural processes and to achieve multiple objectives.

THE CHALLENGE

The Bacton Gas Terminal and the neighbouring villages of Bacton and Walcott are under threat from long-term coastal erosion. Coastal defences were built after the disastrous 1953 flood, but these are now coming to the end of their life. In the meantime, attitudes have changed. The Shoreline Management Plan for the area indicates that the Gas Terminal can be protected by its owners, but only if this does not make the situation worse for the neighbouring villages. There, the eroded beach causes regular wave overtopping flooding over the concrete seawall, which is expected to fail in around 15 years. It would then not be reinstated: this would not be affordable, and the impacts further down the coast would not be acceptable. The communities will have to move inland; this is the sustainable long-term solution, but in the shorter term it is very challenging in practice.

COLLABORATION

The initial study started after the December 2013 storm, which halved the minimum distance between cliff edge and Terminal. This showed that a large-scale sandy solution was needed to provide very robust protection to the Terminal, while preventing beach erosion at the villages downdrift; the study also showed that this was technically, environmentally and financially feasible. This finding triggered a process to see if a win-win was possible: if there is a solution that doesn't make the situation for the Villages worse, then might there be a solution that actually improves the situation? This initiated a unique public-private partnership, where Terminal Operators, Local Authority and government agencies worked together to find a solution to meet each of the partners' (different but complementary) objectives.

THE DESIGN PROCESS

The client provided the opportunity for the team to follow the iterative process needed for innovation. This consisted of three strands: coastal process analysis (various models with significant input from expert judgement and local knowledge), environmental study (integrated rather than a post-design assessment) and contractor engagement (working with all five potential contractors in parallel, which created confidence and enabled optimization).

THE SOLUTION

A solution was found: the bulk of the sediment is placed in front of the Terminal, expected to prevent cliff erosion up to storms with a 1:10,000 per year chance of exceedance, for the coming 15 to 20 years. Sand from there will be transported from there toward the Villages, but modelling indicated that this may come too late. However, it appeared affordable to carry out an initial beach nourishment along the Villages; over time this will be supported by sand arriving from the Terminal. The enhanced beach will extend the life of the seawall by decades, while strongly reducing flood risk and re-creating a beach for use by local people and tourists.

The funding comes from a range of parties: the Terminal Operators, national government (for protection of the communities plus from its special Natural Flood Management budget), the local authority and a range of other sources, including local people and businesses.

The environmental impacts of the project are limited and acceptable. The study work has unveiled new knowledge about the local seabed and about behaviour of nesting birds near large-scale beach works. The scheme includes profiling to initiate natural dune growth, which could create important habitats while also mitigating the risk of wind-blown sand. The communities have been positive throughout, recognising that the scheme had created a solution where there was none.

CONSTRUCTION

Van Oord won the contract and used its very large, 35,000 m^3 capacity HAM318 Trailing Suction Hopper Dredger to place the 1.8 million m^3 of sand over five weeks in the summer of 2019. The sand was dredged from licensed areas on the seabed near Great Yarmouth, and pumped onto the beach through a pipeline where it was placed to achieve the required crest width and level.

MONITORING

The project turns back the clock, but the coast will continue to erode. When the time comes, the Terminal Operators will have to decide again about continuing to protect their site. For the Villages, the project has bought time, so that the communities can be supported and enabled to adapt to coastal change. There is now extensive and wide-ranging monitoring, beyond the standard approach. Various researchers have responded to the client group's invitation to use the project as a test ground. This includes ongoing development of a Digital Twin to support beach management decisions.