

Phillips, M.R. (2009) Beach consequences of an industrial heritage. In: Williams, A.T. and Micallef, A., *Beach Management: Principles and Practice*. Earthscan, Case Study 12: 353-362.

Beach consequences of an industrial heritage: a case study.

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[1] INTRODUCTION

Europe's coast is under increasing threat from erosion. A fifth of the enlarged EU's coastline is already severely affected, with coastlines retreating by between 0.5 and 2m year⁻¹ and by 15m in a few dramatic cases (Europa, 2007a). A worldwide tendency to coastal erosion (Cipriani et al., 2004) has been locally aggravated by some of the very strategies implemented to reverse the pattern (Gillie, 1997; Weerakkody, 1997). Of the 875 km of European coastlines that started to erode within the past 20 years, 63% are located less than 30km from coastal areas altered by recent engineering works (Europa, 2007b). Natural beach changes usually involve erosive and sedimentary processes which are mainly a response to changes in incident wave regime and tidal range (Anfuso *et al.*, 2000). Since 1100AD there has been evidence of shoreline volatility on the eastern flank of Swansea Bay (Bullen, 1993; Figure 1). Historically, the development of South Wales industrial docks have affected to some degree, the equilibrium of the coastline and the Institute of Oceanographic Sciences (IOS, 1980) concluded that human intervention including port developments and seawall construction, had been the main erosion mechanism along South Wales beaches. Cipriani et al. (1999, 2004) reported similar findings on downdrift beaches at other European locations.

At the end of the Second World War changes in ship design meant that many were too large to negotiate the locks of South Wales ports. Coupled with limitations posed by the large tidal range, which meant access was limited over a narrow window of entry during

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the tidal cycle, it signalled the end of many of previously commercially viable trading routes. The construction of the Port Talbot Tidal Harbour (Figure 1: OS ref: SS750880) was a commercial venture between British Steel (now Corus) and the British Transport Docks Board, (now Associated British Ports). The need for large cargoes of imported iron ore and coal for economic steel production necessitated construction of a sheltered deep water harbour. During the capital dredging of the harbour, 11.2×10^6 tonnes of gravel, sand and silt were removed, which incidentally was similar to the volumes removed during maintenance dredging between 1960 and 1976 (Bullen, 1993). Current navigation dredging of the harbour entrance removes sand from the littoral system to a spoil area in Swansea Bay and there is a weak recirculation to the shore. The deep water harbour dominates the area (SBCEG, 1999) and there is an extensive industrial hinterland, mostly occupied by Corus and related industries. It has impacted on natural processes and affected the adjacent coastline to the north and south (Figure 1), including the beaches at Aberavon, Margam and Kenfig. This Chapter therefore assesses beach consequences and the management implications of this industrial heritage.

[1] PHYSICAL BACKGROUND

[2] Aberavon Sands (OS ref: SS735904)

Aberavon is a recreation beach (Figure 2) with a long seawall/revetment and long promenade (approximately 2.5km). It has a high degree of exposure with a spring tidal range of 8.4m and coal waste is often found on the beach, brought ashore by wave action (SBCEG, 1999). At low water there is a wide sandy beach on which a number of water related activities take place, such as sea bathing, wind and wave surfing, jet skiing and angling (MCS, 2008). There is a Royal National Lifeboat Institute (RNLI) station and a surf life saving club. However, the promenade seawall developed many internal voids and in January 1991, as a result of these cavities, a section collapsed in a not very severe storm (Bullen, 1993). Seawall location has resulted in two conflicting problems:

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- 1 The north-western half was constructed landwards of the natural high-water line and dry sand is blown against and over the wall;
- 2 The south-eastern part has been constructed seawards of the natural high-water line and toe erosion is occurring due to wave reflection and turbulence.

Comparative beach data from local authority records in 1958 and 1975, together with 1991 aerial survey information showed falls in beach level. Between 1958 and 1975, this was 0.8m while between 1975 and 1991, maximum erosion was 0.3m (Bullen, 1993). Furthermore, the tidal harbour interferes with accepted northerly net longshore transport (SBCEG, 1999), which therefore reduces sediment supply to the beach.

[2] Margam Sands (OS ref: SS768855)

The Corus frontage, south-east of the tidal harbour (Figure 1), has experienced erosion over many years and a once extensive dune line has been replaced by a 3km length of slag (waste from steel-making processes) and rock armour revetment (SBCEG, 1999). Comparative beach data from profiles established by the Institute of Oceanographic Sciences (IOS) in 1975 (IOS, 1980), and an aerial survey in 1991, showed recession in the back beach/dune line of between 20 and 40m. This was a pattern along the full frontage of this coastal section. Furthermore, a maximum fall in beach level of 1.1m was measured and parallels were drawn to similar losses between 1830 and 1870, where the coastline was seen to recede due to disruption caused by construction of Port Talbot docks. Bullen (1993) concluded there had been significant sediment loss and determined that in the 16 year period between 1975 and 1991, from back beach recession and eroding foreshore, 950,000m³ of material was lost, equivalent to an average fall in beach level of 0.7m over the whole area.

[2] Kenfig Sands (OS ref: SS782815)

Kenfig Sands front a National Nature Reserve and are located southeast of Margam Sands and separated by the River Kenfig. Analysis of data from 1975 (IOS, 1980) and the 1991 aerial survey indicated that the back beach had eroded whilst; the lower beach had

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either accreted or remained constant. The maximum recorded fall of beach level was 0.7m and Bullen (1993) once again determined a sixteen year loss of approximately 600,000 m³, equivalent to an average reduction in beach level of 0.43m. This is approximately 40% less than Margam Sands and may be explained by the diminishing influence of the tidal harbour. There is no built environment within 1km of the shoreline and the hinterland is comprised mainly of dunes with important conservation interests (SBCEG, 1999). The spring tidal range is 8.6m and due to the high energy but shore normal wave climate, the sandy foreshore is subjected to a weak southerly drift. Coastal defence is mainly provided by the Margam and Kenfig Dune systems (SBCEG, 1999).

[1] BEACH MANAGEMENT

[2] Aberavon

The tidal harbour interferes with accepted northerly net longshore transport (SBCEG, 1999), thereby reducing sediment supply to the beach. If a line joining the extremities of the breakwaters (Figure 1) is projected onto the shoreline, beach consequences differ to the north and south of this location. To the southeast, there is northward sediment movement with little replenishment. This causes beach levels to fall resulting in exposure of sheet piles at the seawall toe and in the past, this has been managed by placing rock armour against the seawall (Figure 3). To the northwest, beach levels increase as sediment supply is restored and the area is subject to wind blown sand (SBCEG, 1999). The Coastal Protection Authority (CPA) periodically removes this (Figure 4) and redeposit's it on the southeast beach section (Figure 1).

[2] Margam Sands

The Corus frontage, southeast of the tidal harbour (Figure 1) is experiencing ongoing erosion and slag has been used for coastal defence, which protects the steelworks and infrastructure such as access roads (Figure 5). However, the slag tip revetments themselves were susceptible to erosion and consequently, are further reinforced at certain locations with stone armour revetments (Figure 6). This coastal sector was highlighted as

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a priority area for erosion monitoring by SBCEG (1999) and they recommended implementation of recording and/or protection strategies.

[2] Kenfig Sands

Kenfig Sands are generally in a good condition but there are areas where patches of angular stone exist on the beach and this indicates sand loss. The current situation however, mirrors the findings of Bullen (1993) and may well be cyclical. Coastal defence along this section is primarily provided by the dune system, although erosion is ongoing, evidenced by vertical faces in the dune line. However, because human assets are located considerable distances inland, there is no active intervention.

[1] DISCUSSION

Post-war development trends have been to separate residential areas from employment centres, recreational facilities and retail outlets (Fuller, 1999). Development is increasing in tandem with growing economic prosperity but growth in coastal areas affects sustainability since issues become more complex (Cummins, 2004). The factors which influence sustainability in coastal management span social, economic, institutional, bio-physical and legal conditions (Christie, 2005). Therefore there is a need to evaluate resource demands of coastal communities and assess socio-economic influences.

Aberavon and surrounding areas, as well as other Welsh cities and towns, originally expanded in response to successful coal and steel industries. Many of these urban centres are being regenerated using their waterfronts as the development focus and the process is well advanced at many locations. Along with the attraction of new industries, the redevelopment rationale includes taking advantage of potential increases in tourism income. It is only with the recent decline of the coal and steel industries that Aberavon's high redevelopment potential has been realised. It is close to industrial and commercial activities while the beach has no recommendation from the Marine Conservation Society or Blue Flag award. Therefore Aberavon will benefit from regeneration and subsequent

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improvement (MCS, 2008). This is currently ongoing with residential and commercial development, which due to location has little conservation impact (Phillips et al, 2007a; Williams et al., 2008). New executive residential development is screened from the tidal harbour and orientation is northwest so that properties have a coastal view. Coupled with an extensive buffer zone between the promenade and the older housing stock which once accommodated an industrial workforce, Aberavon is becoming a desirable executive location (Phillips et al., 2007b). Other Welsh regeneration examples have shown that run down areas can be transformed into vibrant centres of entertainment, providing attractions for new tourism markets. They are also attracting new commercial development and “Hi-Tech” industries which in turn, have reinforced their status as desirable residential areas. This is the rationale behind the Local Authority’s redevelopment strategy for Aberavon.

An assessment of Aberavon’s scenery following the methodology of Ergin et al., (2004) identified many low scoring parameters and an overall low classification representative of poor scenic quality. However, it scored well on three of the highest-weighted human parameters, ‘Disturbance Factor’, ‘Litter’ and ‘Sewage’. This is good for an urban beach and showed the value of the beach’s buffer zone and local authority beach cleaning measures. The beach scored poorly on other human parameters such as ‘Skyline’, ‘Built Environment’ and ‘Utilities’. These are a direct consequence of urbanisation, and in particular, the predominant steelworks which seriously blights the beach panorama (Figures 2 and 3). The beach also scored poorly on many physical parameters, including ‘Water Colour’, ‘Landscape Features’ and ‘Vegetation Cover’, indicating the industrial environment had further influenced scenic quality. Consequently, industrial heritage has transformed Aberavon to a point where it retains little to none of its original landscape. However, current improvements to the built environment had a positive impact on its overall assessment.

The Aberavon coastline has low ecological value (Phillips et al., 2007a) while beaches suitable for development are generally urban, situated near large cities or towns that are

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already highly developed (Williams et al., 2008). This often leads to further beach development pressures to increase economic growth. It appears there is likely to be more benefit from developing these areas rather than introducing conservation measures, and nearby beaches such as Kenfig Sands can be managed for conservation. This helps achieve a sustainable balance of development and conservation. Kenfig Sands and dune system has a diversity of habitats/species of European importance and its large slacks support fen plants. Although it is a National Nature Reserve, there are no coastal defence interventions despite ongoing erosion. However, as argued by Schroeder (2000), erosion does not represent a problem for unmodified areas and often provides a net benefit, while it represents a serious recurring problem for human development. This is once again highlighted by coastal defence interventions either side of the tidal harbour

The tidal harbour is a substantial structure that is here to stay, irrespective of the consequences of reduced steel production and poor economic outlook. According to SBCEG (1999) it receives >12 million tonnes per annum of iron ore and other raw material for steel production. Interestingly, the harbour is used only for importing material and all ships carry no cargo when they leave. If the Corus steelworks (Figure 7) are closed it will follow the pattern of previous industrial decline in the area, where the old docks (Figure 1) have been run down and derelict for over 20 years. However, there will be future uncertainty regarding maintenance of the slag and rock armour revetments.

[1] CONCLUSIONS

Industrial developments at Port Talbot have historically caused local beach and dune system loss. The tidal harbour, necessary for maintaining economic steel production, has impacted on the adjacent coastline, up and down drift. Coastal defence measures to combat beach erosion impacts on human infrastructure include rock armour revetments to protect concrete and blast furnace slag seawalls at Aberavon and Margam respectively. However, at Kenfig where human assets are located considerable distances inland, there

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is no active intervention. This confirms erosion is not considered a problem for unmodified coastlines. Regeneration at Aberavon is continuing and utilises its coastal location to good effect. However, the recent economic decline threatens its continued success and if steel production stops, a significant rethink of beach management strategies along the whole coastal sector will be needed.

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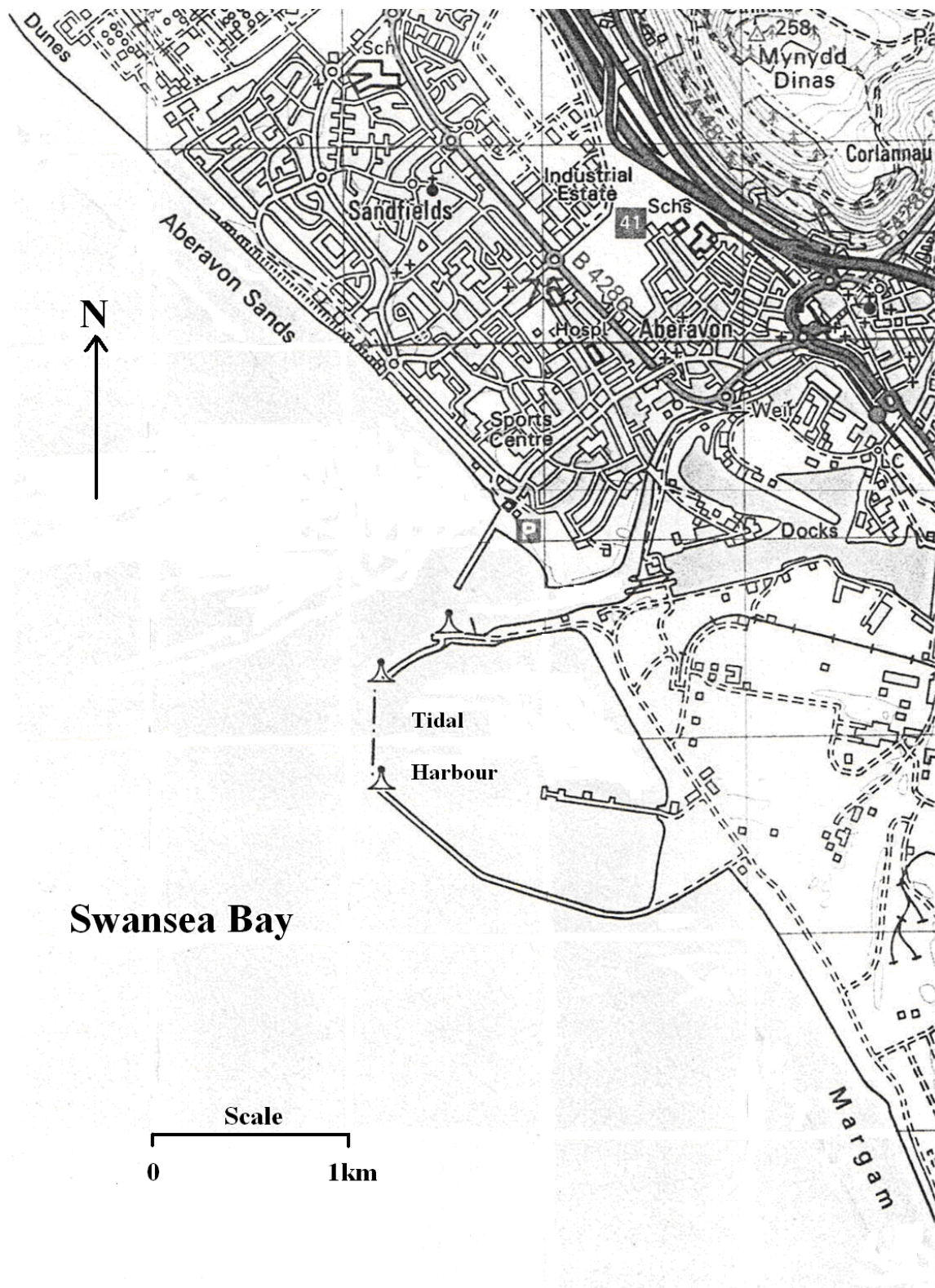
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Figure 1: Tidal Harbour (Reproduced by kind permission of Ordnance Survey, Crown Copyright. All rights reserved.)



Figure 2: Aberavon Beach



Figure 3: Rock armour fronting promenade seawall

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Figure 4: Sand redistribution on foreshore



Figure 5: Coastal defence Corus (SBCEG, 1999)

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Figure 6: Slag and rock armour revetment (SBCEG, 1999)



Figure 7: Steelworks viewed from Kenfig dunes (Lobb, 2008)