

An Assessment of UK Heritage Coasts in South Wales: J A Steers revisited.

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ABSTRACT

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Much of the South Wales, UK coastline is designated as Heritage Coasts, based upon coastal scenic evaluations conducted in 1944-46, by Professor J. A. STEERS. He utilised a four category scale: 'Exceptional', 'Very Good', 'Good' and 'Undeveloped' (called 'Poor'). Stretches of coastline rated in the top two categories subsequently became the first 27 Heritage Coasts. The boundary for Heritage/non-Heritage status lies between the 'Good' and 'Very Good' categories, i.e. the median of this scale. The methodology relied on subjective judgment and did not relate to scenic preferences of actual coastal users. At 14 locations, the current study compared Steers' evaluations with a new scenic assessment technique using fuzzy logic based on a checklist of the main scenic coastal parameters deemed important by beach users. Results can be differentiated into 5 Classes by a dimensionless Decision parameter (D) value, calculated from checklist assessment attributes, which are weighted and subjected to fuzzy logic analysis. The checklist median was Class 3, with a D midpoint value of 0.53. If the Steers' scenic assessment was accurate, all Heritage Coast areas should have a D value >0.53. Only three anomalies were found. Furthermore, Heritage Coast beach D values, were significantly higher than that for non-Heritage Coast beaches ($t = 4.559$; $df = 12$; $p < 0.01$).

ADDITIONAL INDEX WORDS: *Checklists, Fuzzy logic*

INTRODUCTION

The Welsh tourism industry makes a significant contribution to the GDP of Wales and the decline of heavy industry in Wales means that this contribution is becoming ever more important. Moreover, tourism is focussed primarily on coastal areas which face increasing competition from inexpensive short-haul European holiday destinations. Excellent scenery is an important factor that attracts tourist to beaches within coastal areas and in the interests of protecting and bolstering the Welsh tourist industry – worth £3.5 billion, it is important that scenic quality is established so coastal planners/managers can make decisions that will aid (and not hinder) progress. Approximately 100,000 people in Wales are employed in tourism representing approximately 9% of the workforce (Visit Wales, 2006).

The importance of scenic landscapes to society for recreation, spiritual nourishment, and posterity has long been recognised and is reflected by the plethora of designations such as, 'Green belts', 'National Parks', 'Wilderness areas', 'National Nature Reserves' (NNR), 'Sites of Scientific Interest' (SSSI), 'Protected landscapes' and 'Areas of Outstanding Natural Beauty' (AONB). The number of people seeking scenic landscapes for recreation has increased dramatically (COOKE and DOORNKAMP, 1990) and, correspondingly, the desire to protect and conserve attractive landscapes has risen (WASCHER, 2001). Those responsible for environmental management have consequently been faced with a dilemma: should landscape development be impaired for the sake of conserving natural scenery, or vice versa?

World coastlines are currently facing enormous pressure from anthropogenic factors that seek to develop coastal regions to facilitate activities such as tourism, residential housing (POVH, 2000) and consequences of these for the Mediterranean, were recently identified by BENOIT AND COMEAU (2005). In South Wales, these problems are further exacerbated by a tourist industry that is struggling to fill the gap left in the economy by heavy industry decline (WILLIAMS *et al.*, 2004). The Welsh tourist industry largely depends on beaches to attract coastal tourists and excellent scenery is an important factor considered by tourists when choosing a beach holiday (MORGAN and WILLIAMS, 1995). Thirty four percent of the current coastline of England and Wales is protected by the Heritage Coast (HC) Program (containing 45 Heritage Coasts) and its main tenets are to (our italics):

- i). *Conserve scenic quality* and foster leisure activities that rely on *natural* scenery and not on man made activities, and provide for the sustainable usage of the coast for public enjoyment and recreation.
- ii). *Conserve/protect/enhance* the coastal environment and foster awareness and understanding of conservation.
- iii). *Maintain and improve* community involvement.
- iv). *Identify the finest* stretches of undeveloped coast.

The Countryside Council for Wales manages the Wales HC's, and some 500km of the Welsh coast (42% of the coastline), has been designated as Heritage Coasts, totalling seven in number (WILLIAMS and ERGIN, 2004). Strict planning and management strategies for these regions, has been recommended (WILLIAMS,

1992). Selection of the finest scenic coastal regions for entry was based on original coastal scenic evaluation surveys conducted in 1944-46, by a world leader in coastal work, Professor J. A. Steers (STEERS, 1944; 1946). The methodology used was subjective but 'any assessment of coastal quality is likely to meet with criticism' (STEERS, 1944, p7).

Establishing a scenic evaluation technique that is credible and accurate has often proved difficult because of a consensus lack regarding the precise source of aesthetic quality: is it inherent in the physical landscape, or is it a psychological product (APPLETON, 1975)? The former is an objective paradigm, the latter subjective and these opposing premises underpin two approaches to landscape evaluation: the 'expert' and 'perception-based' approaches respectively. The 'expert' approach relies on a standard of assumptions made by an expert surveyor regarding attractive and unattractive scenery and each landscape is evaluated according to this standard (See, for example, LINTON, 1968; LEOPOLD, 1969). Professor Steers used this approach for his coastal scenic evaluations (STEERS, 1944, 1946, 1978).

The validity of this approach has been largely rejected by the current academic community because it assumes that scenic preferences are homogeneous between individuals (PENNING-ROWSELL, 1982; COOKE and DOORNKAMP, 1999; CC 1987; 1993; DANIEL, 2001). Recently in Wales, GIS has been brought in and scenery analysed via a 4 phase plan – LandMap – moving from a general overview to specific finer details (CCW, 1996, 2001). However, scenery appreciation is dependent on a complex interaction of factors and the precise influence of each can often not be extracted from that of the others. These include psychological constructs and socio-demographic variables which combine in different ways to trigger a unique emotional response when an individual views a landscape (MORGAN and WILLIAMS, 1995; WILLIAMS *et al.*, 2000). Perception varies from person to person and whilst there is nothing wrong with a subjective view of scenery, for management, objectivity should be a must.

Given that the tourist industry in Wales is under pressure, it is essential that the right areas of coastline are protected and developed if beach tourist potential is to be maximised. This can be achieved through application of a scenic evaluation technique that looks at scenic quality relative to the preferences/priorities of the general public. The technique put forward by ERGIN *et al.*, (2004), allowed a test of the aptness of the Heritage Coast's placement, and can highlight factors that detract from scenic quality. This technique was used to assess the scenic quality of 14 South Wales localities chosen because they contain a variety of landscape types (e.g. developed/undeveloped) and land-use types (e.g. tourist, industrial, residential), both within and adjacent to the Gower and Glamorgan Heritage Coast, UK (Figure 1) in an attempt to identify factors that might be causing a reduction of scenic quality. The selected localities were beach areas subsumed within the general coastal area and which overall determines the characteristic make up and hence designation of the coast.

METHODS

The objectives of this paper were to compare two techniques of assessing scenic beauty: the STEERS (1944, 1946) coastal surveys, and subsequently its appropriateness to delineation of Heritage Coasts, against a scenic assessment methodology put forward by ERGIN *et al.* (2004). Out of the seven HC sites in Wales, the southern two were chosen for investigation. STEERS (1944, 1946), rated coastal scenery using three categories: 'Exceptional', 'Very Good' and 'Good'. He omitted developed coastlines because he believed they were of poor scenic quality. Coastlines rated in the

top two categories ('Exceptional' and 'Very Good') became Heritage Coasts.

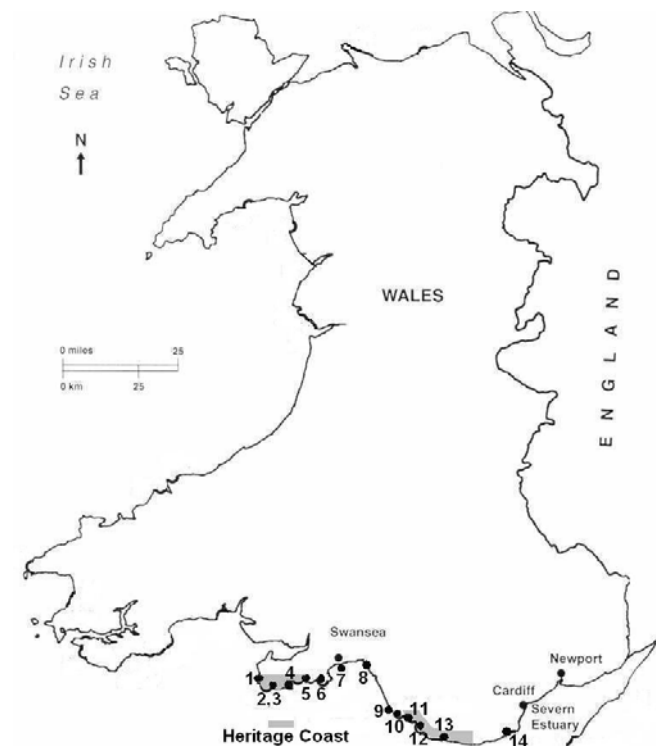


Figure 1. Location of beaches: 1 Rhossili, 2 Port Eynon, 3 Horton, 4 Oxwich, 5 Caswell, 6 Langland, 7 Swansea Bay, 8 Aberafan, 9 Rest Bay, 10 Coney Beach, 11 Ogmores-by-Sea, 12 Southerndown, 13 Llantwit Major, 14 Barry Island.

The 14 localities (Figure 1), chosen because they incorporate sites that lie inside/outside the Gower and Glamorgan Heritage Coast boundaries, allowed comparison of the scenic quality of both areas by the ERGIN *et al.*, (2004) checklist. This checklist contained the 26 parameters used in both the ERGIN *et al.*, (2004) original surveys in Malta, Turkey, and the UK, and the WILLIAMS *et al.*, (2004) survey in South Wales. Figure 2 gives the 26 parameters. Parameter selection for both surveys was based on results from a perception study which assessed preferences/priorities (together with subsequent weighting) of coastal users from South Wales and elsewhere.

Fieldwork consisted of checking an attribute box at each locality for all parameters. Attributes represent the sub-set indicator of each parameter (1- poor quality or absent to 5 - good). For example, beach type attribute: 1 = absent; 2 = mud, 3 = cobble/boulder, 4 = gravel/pebble, 5 = sand. In essence, the higher the attribute number, the better the scenery. Parameter scores were weighted and a fuzzy logic process, removed matrix data vagueness caused by viewer subjectivity, producing Membership degree values - the final assessment matrix (R) of attributes 1-5. The fulcrum of the attribute scale is represented by attribute 3. Two dimensions either side of this attribute, reflects scenic positive influences (to the right) and negative (to the left), and mathematically the dimensionless Decision Parameter (D) value can be represented as:

$$D = \frac{-2A_{12} - A_{23} + A_{34} + 2A_{45}}{A_T} \dots \dots \text{Equation 1}$$

where: the area under the membership vs. attributes curve (e.g. Fig 2c) between attributes i and j is named A_{ij} with $i = 1,2,3,4$ and $j = 2,3,4,5$. A_T is the area under the curve.

ERGIN *et al.*, (2004) gives a detailed mathematical explanation of the above process.

RESULTS AND DISCUSSION

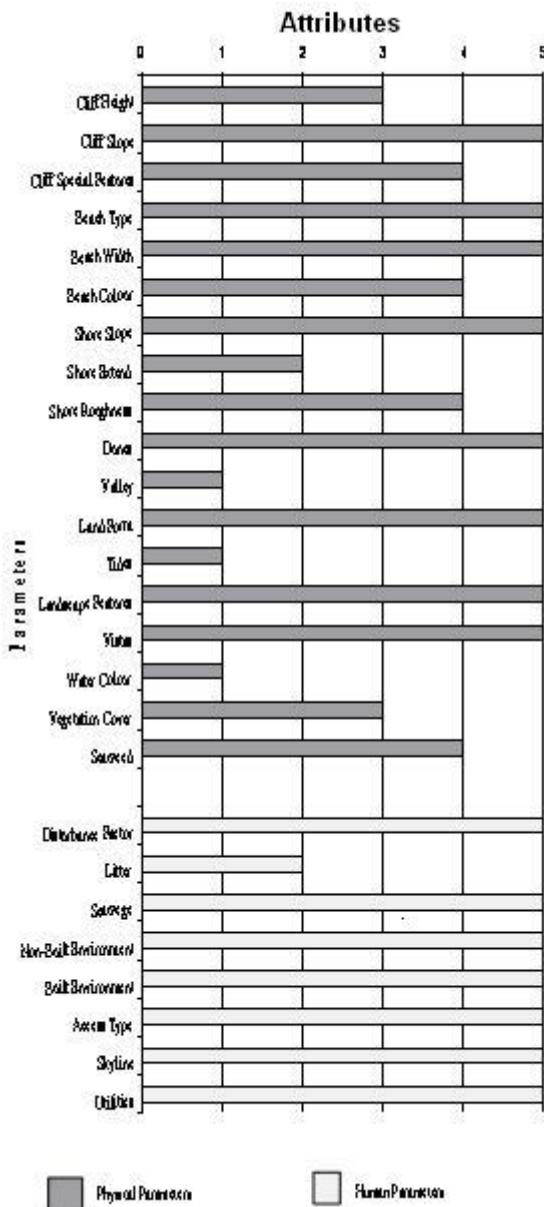


Figure 2. Histogram of the 26 parameters/attributes, Rhossili.

Break points based in the slope midpoint change, allowed an obvious division of sites into five classes based on D values. Class 1, $D > 0.85$; Class 2, D lies between 0.65 and 0.85; Class 3, D lies between 0.65 and 0.4; Class 4, D lies between 0.4 and zero; Class 5, $D < 0$.

Some Specific Site Analyses

Scenic assessment via the ERGIN *et al.*, (2004) technique, rated Rhossili as the highest, (D Value of 0.74); Coney Beach lowest (D Value of -0.98) - modal group was class 4 (Table 1).

Rhossili (Figures 2 and 3; Table 1).

Rhossili, with an isolated location distance from urban centres and undeveloped hinterland, had the highest scenic quality. It scored the maximum attribute grade 5 in the highest weighted human parameters; 'Sewage', 'Disturbance Factor', 'Built Environment', 'Skyline' and 'Utilities'. It also scored highly on high-weighted physical parameters, gaining a maximum grade 5 on 'Features', 'Vistas' and 'Landform', due to excellent cliff features of Worm's Head and Burry Holms.

Rhossili's poor score (grade 2) on 'Litter' prevented it from achieving a Class 1 rating (Figure 2). 'Litter' is the joint-highest weighted parameter (with 'Sewage') and therefore is very important to any overall rating. Large litter accumulations along the strandline including three fridge-freezers from a container ship break-up in the Bristol Channel two days prior to the survey date. Apart from these, litter appeared to be from a tourist/beach visitor source, as the access point is via a steep, very long set of steps. This probably discourages visitors from carrying litter from the beach and also limits beach cleaning machinery usage by the beach owners, the National Trust.

The very low score on a high-weighted physical parameter, 'Water Color' was due to the murky brown/grey colour of the sea. Since effluent discharged around Gower Peninsula is treated to tertiary standard, this is more likely to be a physical response to the particular marine, geological and biological processes that operate around the peninsula. High-weighted averages on the highest attribute, grade 5, revealed the positive effect of low anthropogenic interference. The high-occurrence of the highest attributes (grade 5), i.e. a right-hand skewed graph, is indicative of Rhossili's high scenic value (Figure 3).

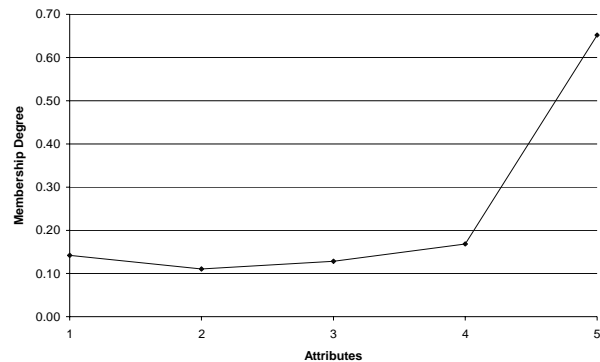


Figure 3. Membership degree curve for Rhossili.

Aberafan (Figure 4; Table 1).

Aberafan scored highly on three high-weighted human parameters, 'Disturbance Factor', 'Litter' and 'Sewage'. These are good scores for an urban beach and show the value of a buffer zone and local authority beach cleaning measures. The beach scored poorly on the other high-weighted human parameters - 'Skyline', 'Built Environment' and 'Utilities'. These scores are a direct result of Aberafan's urbanisation, especially its industrialised nature. A steelworks and a power station at either end dominate and seriously blight the beach panorama.

Undeveloped beaches tended to rate higher than developed ones in accord with STEERS' (1944) views. To achieve a maximum attribute grade (5) on some parameters requires an absence of

development (with the exception of historical ruins, lighthouse, etc). Since the highest weighted parameters are mainly those in the human subset, the extent of beach development is very important to its overall scenic rating. Therefore, beaches that are undeveloped (e.g. Rhossili, Oxwich, Horton, Southerndown) were rated higher than heavily urbanised beaches (e.g. Barry Island, Swansea Bay, Aberafan, Coney Beach).

The beach scored poorly on most physical parameters. Of the high-weighted physical parameters it obtained a grade 1 for 'Water Colour', 'Landscape Features' and 'Vegetation Cover', and grade 2 for 'Vistas'. The industrial environment greatly reduces scenic quality as for example, all natural vegetation has been removed. Industrial development has transformed the appearance of Aberafan and it retains virtually none of its original natural appearance. For a few unaltered physical features, it obtained some excellent scores - grade 5 on 'Beach Type' and 'Beach Width' and grade 4 for 'Beach Colour'.

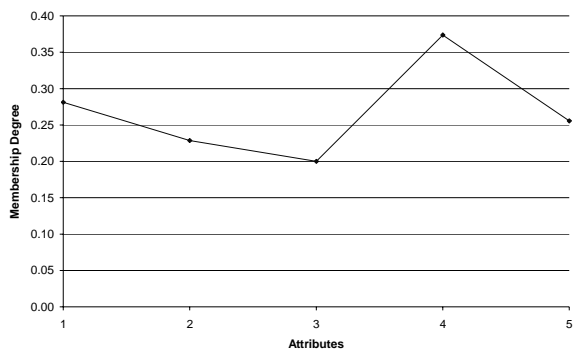


Figure 4. Membership degree curve for Aberafan.

High weighted averages on attributes 1 and 3 in the human subset, revealed the negative impact of intensive urban and industrial development on natural scenery. The left-hand skew of the weighted averages, suggested poor scenic quality (Figure 3).

Horton (Figure 5, Table 1)

Horton scored highly on high-weighted human parameters gaining the maximum attribute grade 5 on 'Disturbance Factor', 'Litter' and 'Sewage' and grade 4 on 'Built Environment', 'Skyline' and 'Utilities', indicating that anthropogenic activity and intrusion has had minimal impact on scenic quality. This is probably because it is not accessible by car so does not have the usual negative visual impact of a beach car park. Furthermore, the car park absence probably discourages some people from visiting, which has probably contributed to its excellent 'Litter' score. Also, no tourist facilities such as a café and toilets occur, so no potentially negative visual impact of buildings and power lines exists. Despite scoring well on all the human parameters, its varied assessment with regard to physical parameters prevented Horton from gaining a higher rating, scoring poorly on the high-weighted physical parameters: 'Water Colour' (grade 1), 'Landscape Features' (grade 3), 'Vegetation Cover' (grade 4) and 'Seaweed' (grade 2). However, several lower-weighted physical parameters scored highly: 'Cliff Special Features', 'Beach Width' and 'Shore Extent' all scored attribute grade 5. In the human subset, high weighted averages on attributes 4 and 5 revealed the positive effect on scenic quality of low anthropogenic intrusion (Figure 5). However, in the physical subset, similar weighted averages of all attributes showed a mixed quality varying between very good to very poor. The high frequency of the highest attributes (Grades 4

and 5) on the membership curve was tempered by high frequencies of the lower grades.

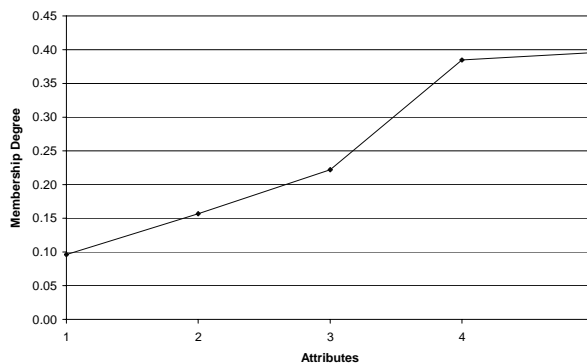


Figure 5 Membership degree curve for Horton.

Heritage coast evaluations

Undeveloped landscapes are not always of higher scenic quality than developed ones: Rest Bay and Llantwit Major are undeveloped, but were rated lower than Langland - an urbanised beach. This emphasises the importance of high quality natural features which can, in some cases, compensate for the negative effects of development. Caswell Bay was rated as having the third-best quality scenery in the study, despite the presence of several prominent buildings on its flanking cliffs. However, it still scored well on the human subset parameters, suggesting that development is sensitive to the natural landscape.

Because of the high-weighting of the 'Litter' parameter, litter presence detracts greatly from scenic quality, e.g. high litter amounts on Rhossili beach prevented it from gaining a class 1 rating. There appeared to be no correlation between litter amount and development level. For example, the two beaches with the highest amounts of litter, Coney Beach and Rest Bay (Figure 1), are heavily developed and undeveloped respectively. Similarly, no relationship between litter level amounts and level of beach use were found. For example, the two beaches used most for tourism, i.e. Barry Island and Coney Beach, respectively scored 5 for this parameter. These associations probably reflect differences in beach cleaning regimes (mechanical vs. handpicking) between individual sites:

- In frequency between heavily-used and lightly-used beaches, with the former probably cleaned more frequently.
- Between council ward policies. Some wards may have a policy to clean beaches, others may not.

They could also be a result of marine processes that cause the beach to act as a litter sink, poor access to the beach (e.g. Rhossili), or even the time when surveys were taken (late morning to afternoon) relative to when the beach was due to be cleaned. Emphasis should be given to assessing ways of improving the human environment, e.g. by adequate provision of litter bins and frequent beach cleaning. Additionally, steps could be taken to ensure that future development is designed to fit in with the natural landscape, which are crucially important in Heritage Coast regions.

Provision of facilities, i.e. car parks, wheel chair ramps, surf life saving stations, toilets is essential at 'honeypots', as they make the coastal area safe and accessible for disabled and able-bodied people alike. However, their design and location – usually directly on the beach front, e.g. Caswell, has frequently caused some areas to score poorly on many of the human subset parameters.

Since the boundary for Heritage/non-Heritage status lies between the 'Good' and 'Very Good' categories, which is the median of STEERS' (1944, 1946) scale, it is possible to locate the position of this boundary on the ERGIN *et al.*, (2004) rating scale. The median class was Class 3, with a midpoint of 0.53. Therefore, if the scenic assessment by STEERS (1944, 1946) was accurate all Heritage Coast beaches should have a D value > 0.53, and all non-Heritage beaches should have a D value < 0.53.

Table 1. D values and classes for the various localities

Class by value	Site	D Value
Class 2	Rhossili	0.74
	Oxwich	0.67
	Caswell	0.65
Class 3	Horton	0.64
	Southerndown	0.58
Class 4	Langland	0.39
	Port Eynon	0.37
	Ogmore-by-Sea	0.35
	Llantwit Major	0.18
Class 5	Rest Bay	0.07
	Barry Island	-0.20
	Swansea Bay	-0.29
	Aberafan	-0.39
	Coney Beach	-0.98

Comparing D values obtained for sites reported in this study with Heritage Coast status, it can be seen that three Heritage Coast beaches, Ogmore-by-Sea, Port Eynon and Llantwit Major had a D value < 0.53 and by this reasoning should *not* have Heritage status (Table 1). However, the crux of Heritage Coast selection is that *stretches* of coastline are chosen deemed to be of high scenic value, and it is unrealistic to have very small segments of a coastal stretch omitted if they fall from this standard. These three sites are *all* 'honeypots' in that they attract tourists and this helps other coastal segments retain a pristine nature. This philosophy is one of the main Heritage Coast tenets (WILLIAMS, 1987).

For the other 11 sites, Steers' (1944, 1946) rating was accurate: Rhossili, Oxwich, Caswell, Horton and Southerndown are *all* Heritage Coast beaches with D Values > 0.53. Conversely Langland, Rest Bay, Barry Island, Swansea Bay, Aberafan and Coney Beach, which are *not* part of any Heritage Coast, all have D values < 0.53 (Table 1).

On this basis it would seem that STEERS' (1944, 1946) ratings do, for the most part, correlate with results obtained via a new 21st Century technique. However, it must be remembered that the original surveys were conducted over sixty years ago and it is likely that areas originally excluded for being developed, have become even more developed during the interim period and some pristine areas have now been developed. In contrast, development within Heritage Coasts would have remained static due to strict planning and management strategies for such areas. Although this is not a statutory duty for Local Authorities, WILLIAMS (1992) indicated that such management strategies have been implemented in both Glamorgan and Gower Heritage Coasts.

When results for all 14 beaches were considered, STEERS' assumption appears valid; with the 4 heavily-developed beaches having the lowest D values. However, the assumption becomes less valid when some results are considered individually, especially those for Langland (non Heritage Coast) and Caswell. The area surrounding Langland is significantly developed, yet it was rated higher than the relatively undeveloped beaches of Port Eynon, Llantwit Major and Rest Bay. Similarly, Caswell, which is less developed than Langland but has several prominent buildings located on the surrounding cliffs, was evaluated to have the third-best quality scenery out of the 14 sites. Therefore, the stated divergence of opinion regarding the expert eye versus structured assessments *tends* to produce similar results but the objectivity of the fuzzy logic approach makes it a superior tool.

To further assess the fuzzy logic approach an independent t-test was carried out on the D values of the 8 Heritage Coast beaches and 6 non Heritage Coast beaches (Table 1). Analysis showed with 99% confidence, that Heritage Coast beaches had significantly higher D values ($t = 4.559$; $df = 12$; $p < 0.01$). Therefore, it could be argued that results validated both the objective fuzzy logic methodology of ERGIN *et al.*, (2004) and the subjective assessments of STEERS (1944, 1946).

One of the main aims of the Heritage Coast Scheme is '*to preserve the most scenic coastlines of England and Wales*' (WILLIAMS, 1992, p151). Essentially, all development in this region since the inception of the Glamorgan Heritage Coasts in 1972/73, has taken place along coastlines that lie outside the zones' protection. This is evident from the Swansea Bay Shoreline Management Plan, which indicates the areas of land around Swansea Bay, Aberafan and Porthcawl are currently available for development (SBSMP, 1999).

The coastline of South Wales (and worldwide) will come under increasing pressure from anthropogenic squeeze in future years and will likely see an increase in the amount of coastline given over to development. Of the 14 localities studied there is perhaps room for development at some of the currently undeveloped/developed beaches especially the 'honeypots' e.g. Llantwit Major (WILLIAMS, 1992). Development in and around Heritage Coast zones is limited by other conservation measures such as AONB, SSSI, and NNR designations.

The Gower coastline is an AONB, although this designation is based on the same surveys by STEERS (1944). Much of it is also protected by SSSI and NNR status. Gower beaches are therefore of high conservation importance, which coupled with their high scenic ratings, suggests that development along the peninsula's coastline should remain limited. However, Port Eynon beach has no protection orders placed upon it (SBSMP, 1999) and this, combined with its low scenic rating, suggests that conservation around this beach is not required. However, Port Eynon beach lies in the same bay as Horton beach and so development at the former might impact negatively on the scenic quality of the latter. Glamorgan Heritage Coast beaches are also protected in many places by SSSI and NNR status. Llantwit Major however, is not protected and has a low scenic rating suggesting restrictions on development at this beach are not required. Currently a large scale revetment extends along half of the beach, which is the subject of much controversy. Anthropogenic structures in a Heritage Coast area whose ethos is *natural* scenery, is a curious anomaly.

CONCLUSIONS

Scenery at 14 areas in South Wales was investigated to compare two approaches to coastal landscape evolution i.e. using a fuzzy logic checklist analysis technique established by ERGIN *et al.*, (2004) and the expert eye of STEERS (1944) and hence the

appropriateness of delineation of the Gower and Glamorgan Heritage Coasts. Scenic quality was found to range from very good (e.g. Rhossili, Oxwich, Caswell), to very poor (e.g. Barry Island, Swansea Bay, Aberafan, Coney Beach).

Several physical characteristics limited scenic quality e.g. the high sediment load of the Bristol Channel which makes the water turbid and contributed to its poor colour. Undeveloped beaches generally had higher scenic quality than developed ones. Scenic value was detracted greatly by beach litter (e.g. Rhossili). Checklist results were compared with those of STEERS (1944, 1946). His assumption that all developed coastlines had unattractive scenery; was found to be questionable, when:

- A coast had outstanding natural landscape then scenic quality could still be high even if it was significantly developed.
- Sensitive development detracted less from scenic quality than non-sensitively designed development.

By completely excluding *developed* coastlines from his surveys, STEERS (1944, 1946) failed to appreciate these subtleties. Three Heritage Coast locations (Ogmore-by-Sea, Port Eynon, Llantwit Major) had low scenic values. However, it is naïve to think that *in situ* variations will *not* occur between fixed coastal end points and this is a matter of scale. Both approaches tended to agree at the regional scale. Furthermore, Heritage Coast beach D values, were significantly higher than non-Heritage Coast beaches ($t = 4.559$; $df = 12$; $p < 0.01$).

In attempting to improve tourist appeal, managers can unintentionally reduce scenic quality. This suggests that the negative impact of these structures needs to be addressed if tourism potential at these sites is to be maximised. This problem could be solved by designing sensitive structures and/or positioning them so they are not visible from the beach front e.g. tree screening or building traditional structures e.g. dry stone walls so the negative visual impact is lessened.

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