Coastal Scenic Evaluation of Gozo/Comino, Malta, as a tourism product

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Abstract

Coastal sites on the island of Gozo, Malta were investigated for their scenic quality by means of a 26 point checklist which incorporated weighted parameters and fuzzy logic mathematics. A five fold class division revealed that 2 sites occupied the top and bottom classes respectively whilst the rest were equally spaced in classes 2-4.

Key-words: Scenery, Fuzzy logic. Gozo, Malta.

Introduction

Tourism, the world’s largest growth industry, has had an average increase of 9% per annum since the mid 1980’s and is the world’s largest export earner (WTO 2001) with 30% of this industry taking place in the Mediterranean (Povh 2000). A coastal location is usually the preferred tourist destination centre and surveys have shown that tourists and locals appreciate magnificent beaches, e.g. Chivas Poll (2001). This trend will be exacerbated, as it is estimated that by 2025, 75% of the world’s population will live within 60 km of the sea (UNESCO, 2002). Therefore beaches are important to the economy of many coastal countries and surveys have shown that excellent scenery is a major component that tourists desire of a locality. Morgan and Williams (1995) in a beach study at Gower, Wales, UK, showed that >200 beach visitors rated scenic beauty as their number one parameter with respect to preferences and priorities for beach choice. Micallef et al., (1999), in a 266 Maltese beach users' study, found scenery ranking a close fourth (after clean water, clean sand and facilities). Unal and Williams (1999), after interviewing 120 beach users on the Cesme peninsula, Turkey, found that scenery ranked second after clean bathing water with regard to beach user’s preferences and choice.

Scenery is a section of any coastal landscape inventory available for managers or planners for coastal preservation, protection, development etc. Such an inventory provides baseline information to managers so that a sound scientific basis may be established for any subsequently envisaged management plans. Landscape management deals with heterogeneity in space, for example via type, shape etc. of elements, together with time, i.e. the disturbance regime, which may be either natural or anthropogenic (Turner 1987). Many different techniques exist, i.e. field-based objective replication studies (Linton 1968), statistical techniques obtained from site observations (Clamp 1976), and assessing public attitudes and landscape preferences (Penning-Rowsell 1982). Many models/rating schemes in this field have been in existence for circa 30 years (Sauer, 1969; Appleton, 1975; Briggs and France, 1980; Buyoff and Arndt, 1981; Williams, 1986; Kaplan and Kaplan, 1989; Eletheriadis et al., 1990). Amongst the more important evaluations, in chronological order, have been the works of Fines (1968), Linton (1968 1982), Leopold (1969), Robinson et al., (1976), Penning-Rowsell (1982 1989), the Countryside Commission (1987 1993), University of Ulster (1996), SCU (1997), the Countryside Council for Wales (CCW 1996, 2001), DEFRA (2001), CA/SNR (2002), Ergin et al.,(2003; 2004), GCDLVI (2003). Fines (1968) stressed photographs for identification of landscape units. Linton (1968 1982) obtained a landscape scenic assessment number from assessing landform parameters (six in total) together with usage (seven in total). A seminal paper by Leopold (1969), stressed scenic uniqueness based upon physical, human and biological parameters. Robinson et al., (1976) used the ‘best/worst’ case scores from 1 km square grids analysed by professionals in order to derive
landscape values. The Countryside Commission (1987, 1993) obtained a range of landscape types from assessing natural landscape, cultural and aesthetic associations. The CCW (1996, 2001) LANDMAP series was similar in its approach and emphasized GIS. However in evaluating coastal scenery, few have addressed the detailed specificities of coastal scenery. This paper utilizes a checklist approach, a methodology that is popular in several aspects of both the natural and socio-economic disciplines. Subjectivity can creep into any such checklist, as personal preferences (which are functions of age, sex etc.) play a large part in any scenic evaluation. Transient items will affect the equation, e.g. the smell of new-mown hay, sail boats on the sea, etc. but these are impossible to quantify. The resulting checklist plus weighting and a fuzzy logic systems approach, is put forward as a means of attaining an optimum semi-quantifiable analysis for coastal landscapes. A fuzzy logic approach enabled an expert group to quantify the uncertainties and subjective pronouncements that is inherent in most scientific studies (Ambala 2001).

1. Methodology

Extensive details of the this work have been given in Ergin et al., (2004, 2006) Landscape values ‘can be assessed and described or illustrated in objective and subjective terms by landscape professionals, consulting with a wide range of interest groups and people and analysing all relevant information’ (LIIEA 1995, 19).

![Figure 1. Location map of Gozo](image)

Surveys of coastal users (n>700) enabled key scenic elements to be condensed down to 26 ‘coastal scenic assessment parameters’ which form the basis of the y axis of a 26 item checklist. (Ergin et al., 2003, 2004). The x axis represented a break down of the chosen parameters into 5 distinct attribute classes e.g. cliff height was either: absent, between 0-30m, 30-60m, 60-90m or >90m, in height These parameters were weighted via further user surveys and results subjected to fuzzy logic analysis to differentiate any ‘grey’ attribute areas, i.e. the wrong attribute being selected and placed in the checklist box. It is very unlikely that a jump of two attributes would occur, i.e. in the example above, placing the cliff height as lying between 39-60m when in fact it was >90m.
Attributes were subjected to fuzzy logic matrices and weightings to reflect the importance of the assessment parameters. The top five rated parameters obtained from perception studies, were: absence of sewage/litter, water colour/clarity, absence of noise, quality of the built environment and coastal landscape features (caves, water-falls etc.). Coastal scenic assessments of the sites and scenic evaluation carried out by using Fuzzy Logic Assessment matrices may be presented as graphs, an example being Crystal Bay (Figure 1), of ‘Weighted Averages of Physical and Human Factors’ (Figure 2) and ‘Membership Degree’ (Figure 3). When the Membership Degree graph is skewed to the right i.e. climbs steeply, then the scenic value increases; vice verse for the left skew (Ergin et al., 2004, 2006). A Site Evaluation Decision calculated Index value (D) enabled scenic values for any site to be categorized into five distinct classes which can give an indication of the ‘beauty’ of any particular site. D values are given for the investigated sites in Table 1.

\[ D = (-2.A_{12}) + (-1.A_{23}) + (1.A_{34}) + (2.A_{45}) \]

Total area under curve

where: \( A_{12} \) = total area under the curve between attributes 1 and 2. Similarly, areas under the curve may be calculated for \( A_{23}, A_{34}, A_{45} \).

**Class 1:** Extremely attractive natural sites with very high landscape values and an Evaluation Index \( >0.85 \).

**Class 2:** Attractive natural sites with high landscape value and an Evaluation Index, between 0.65 and 085.

**Class 3:** Mainly natural sites with little outstanding landscape features and an Evaluation Index, between 0.4 and 0.64.

**Class 4:** Mainly unattractive urban sites, with low landscape values and an Evaluation Index between, 0.0 and 0.39.

**Class 5:** Very unattractive urban sites, with intensive development, a low landscape value and an Evaluation Index <zero.

The resulting classification can be utilized by coastal managers, planners, academics, and governmental agencies, to improve human usage of the coastal areas and by visitors to better enjoy and appreciate coastal scenery.

### 2. Results and Discussion

Several coastal sites on the islands of Gozo and Comino, Malta, were identified as having high potential for offering coastal tourist panoramic vistas. Evaluation identified two sites, San Blas (Gozo) and Crystal Bay (Comino) as Class I sites. Seven sites: Blue Lagoon (Comino), Santa Maria Bay, (Comino), Fungus Rock, the Azure Window (Figure 2), Tat-Tocc cliff-side (overlooking Dahlet Qorrot Bay) and Wardija Point (overlooking Kercem Cliffs) rated Class 2. A further seven sites, Ta’ Cenc, Hekka point, Mgarr ix-Xini, Calypso’s cave, ix-Xatt l-Ahmar, Wied il-Ghasri and the Ta’ Xilep road leading down to Barbagani Rock near Qala, were classified as Class 3 sites. Seven coastal sites rated Class 4 (the sea cave below Kercem Cliffs, Hondq ir-Rummien, Wied il-Mielah, roadside vista above Kercem Cliffs, vista overlooking iz-Zewwieqa, Mgarr Harbour and Xwieni salt pans). Only two of the evaluated sites, Marsalforn and the cliff-side view of Xlendi Bay, rated as Class 5. Details of several sites are given below. The coastal features reflected an abundance of landforms, including sea cliffs, rock stacks, reefs, natural arches.

**Crystal Bay, Comino**

Crystal Bay encompasses a small cove backed by 20-25m. sheer cliffs, that exhibit banding, tufa development (deposition of limestone by precipitation from water percolating through the cliff face), weathering pits/solution hollows (ubiquitous features in a karst terrain). The sea approach to the bay gives views of a highly irregular coastline exhibiting spectacular coastal...
landscape features, e.g. arches, windows, reefs, stacks and ledges representing past sea levels, together with a glimpse of the Blue Lagoon. The water in Crystal Bay is an amazing turquoise/blue colour contrasting markedly between the bare sea-bed and surrounding sea-grass (*Posedonia*) meadows. A striking dominant feature is a natural arch, which leads to a small cove, having an open top as a result of erosion and subsequent roof collapse. The cliff top describes a bare barren rocky landscape sustaining a garigue vegetation in which a watchtower / fort stands proud.

Table 1. D values of selected Gozo sites

<table>
<thead>
<tr>
<th>Name</th>
<th>D</th>
<th>Name</th>
<th>D</th>
<th>Name</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>San Blas</td>
<td>1.1</td>
<td>Ta' Cenc</td>
<td>0.64</td>
<td>Hondok ir Rhmmien</td>
<td>0.25</td>
</tr>
<tr>
<td>Crystal Bay, Comino</td>
<td>0.4</td>
<td>Hekka Point</td>
<td>0.6</td>
<td>Wied il-Mielah</td>
<td>0.17</td>
</tr>
<tr>
<td>Fungus Rock</td>
<td>0.72</td>
<td>Mgarr ix-Xini</td>
<td>0.54</td>
<td>Kercem cliff</td>
<td>0.16</td>
</tr>
<tr>
<td>Blue Lagoon, Comino</td>
<td>0.72</td>
<td>Calypso's Cave</td>
<td>0.48</td>
<td>Xlendi tower</td>
<td>0.06</td>
</tr>
<tr>
<td>St. Maria Bay, Comino</td>
<td>0.72</td>
<td>ix-Xatt I-Ahmar</td>
<td>0.42</td>
<td>Inland Sea</td>
<td>0.07</td>
</tr>
<tr>
<td>Azure Window</td>
<td>0.7</td>
<td>Wied il-Ghasri</td>
<td>0.41</td>
<td>Xwieni Salt Pans</td>
<td>0.02</td>
</tr>
<tr>
<td>Tat-Tocc</td>
<td>0.65</td>
<td>Ta' Xilep</td>
<td>0.4</td>
<td>Xlendi cliff view</td>
<td>-0.13</td>
</tr>
<tr>
<td>Wardija point</td>
<td>0.65</td>
<td>Sea cave – Kerchem</td>
<td>0.38</td>
<td>Marsalforn</td>
<td>-0.37</td>
</tr>
</tbody>
</table>

Figure 2, the Azure window, Gozo, Malta
Blue Lagoon, Comino
This site is so named after the brilliant turquoise water colour seen in this cove, which describes a semi-circular outline imprinted into the eastern arm of Comino island. The depth of the crystal clear water in this bay varies from 1-5m and the lagoon is frequented with boats of all types and sizes, as it is a very popular tourist destination. The islands' periphery comprises low (25m) cliffs formed of Lower Coralline limestone, and the bulk of the island stands out as a plateau.
Mgarr ix-Xini harbour, Gozo.
The ‘hub’ of Gozo island it is the first site that one views on arrival at Gozo by ferry. To the south-east are Comino and Malta and of course of the harbour and marina are clearly delineated to the south-west. The landscape is dominated southwards by what the Maltese term ‘Rdum’, (a boulder strewn area) and several carob groves and abandoned fields lead down to the coast. To the west lies the imposing bastion of Fort Chambrey, which tends to dominate views on this side of the island. On looking eastwards, many river interfluves can be observed in which a few scattered houses stand on the hilltops. The view to the north is mainly obscured by housing developments.

Xlendi, Gozo
Is a small village clustered around the edge of an inlet, easily approached by road, which runs alongside the edge of a steep limestone gorge, carved by rivers in a more pluvial period and the old river valley continues through the inlet to the sea. The vista is open to the west and the inlet usually has several boats (diving and fishing) within its boundaries. West of the inlet and accessible only by boat lies Ulysses’ cave. The beach is composed of small cobbles and to the east is an interesting watch tower accessed by a pathway running alongside the inlet. Traversing this pathway is another small gorge cut into the limestone and very good rocky shore development is evident. Terraced fields occupy the nearby hillside.

Azure window, Gozo
This is a natural arch rather than a window and has formed by growth of an initial cave, developed along a line of rock weakness, which has cut through the limestone, resulting in the arch being formed. Ultimately the roof will collapse and the westerly remnant will form a stack, analogous to Fungus rock (see below).

Fungus rock, Gozo
This is a stack that forms the seaward edge of a collapsed doline structure (underground solution features giving rise to caverns in which roof collapse occurs with time). It is surrounded by spectacular shear cliffs which rise vertically for >90m in height. The rock takes its name from a phallic-shaped plant (in the past mistakenly thought to be a fungus) which has been protected since the 15th century when it was then considered by the Hospitalier Military Order of the Knights of St. John of Jerusalem to have strong aphrodisiac and medicinal properties, and was much sought after.

The Inland Sea, Gozo
This lies adjacent to the Azure window and represents another collapsed doline. Unlike the circular embayment behind Fungus Rock, the Inland sea is completely surrounded by shear cliffs (circa 50m) forming an enclosed embayment linked to the open ocean via a deep natural arch. The Inland Sea forms a natural seawater lagoon popular for recreational purposes especially SCUBA divers and forms a safe haven for small fishing craft. It boasts a bleached cobble beach subdivided into short segments by boat slipways. A semi circle of boathouses fringes the bay, a relic of the days when it supported a fishing community.

Conclusions
Assessment of coastal scenery via a 26 item checklist, were obtained via consultation between coastal users and experts in the field. A five scale attribute rating system was developed as part of the coastal scenic evaluation system. Parameters were then weighted as to their priorities and application of Fuzzy logic techniques addressed the largely subjective nature of coastal scenic evaluation. This enabled identification of a Coastal Scenic Evaluation Index (D) determined by evaluation of individual site strength and weaknesses. Sites on the island of Gozo, Malta, were classified as Class 1 to Class 5. The five-class evaluation system developed comprised:

CLASS 1; Extremely attractive natural sites with a very high landscape value, having a D value >0.85.
CLASS 2; Attractive natural sites with high landscape value, having a D value between 0.65 and 0.85.

CLASS 3; Mainly natural with little outstanding landscape features or urban sites with exceptional scenic characteristics. The D value lies between 0.35 and 0.65.

CLASS 4; Mainly unattractive urban sites with a low landscape value, and a D value between 0 and 0.35.

CLASS 5; Very unattractive urban sites, intensive development with a low landscape value and a D value <0.

Analysis provided an evaluation of physical and human parameters which can be an effective planning and management tool. It is an objective evaluation to coastal scenery which may identify those (mainly human) parameters that can be better managed in order to improve overall scenic assessment. Two sites fell into the first class and two into the class 5 category. The remainder was equally proportioned between classes 2-4 inclusively.

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