Abstract

The aesthetic quality of the South Australian landscape is examined through a range of studies the author conducted between 2000 – 2007 which measured and mapped scenic quality for various regions – coast, Barossa, River Murray, and the State at a broadscale. Studies also assessed the visual impact of wind farms and typical developments on the coast and River Murray. A further study which measured the visual amenity of scattered trees is described. The methodology employed, using photographs of the subjects and the Internet for preference surveys, is described. The key factors which generate scenic quality are identified and the case made for regional landscape quality, which underwrites tourism in many regions, to be considered by Natural Resource Management Boards and, nationally, by the Australian Government.

Introduction

Am I glad to be home again? I cannot tell you how glad. The Australian landscape has always seemed to me the most beautiful in the world as well as the most mysterious. When I first saw the brown, hot earth from the ship’s deck at Fremantle I cannot tell you the emotion it gave me – after all that confounded sappy English green (Smith, 1971, 141).

Sir John Longstaff, 1910.

There is an infinity of landscape here, caused by the purity of the atmosphere. It has been said that there is a lack of colour. It is not so obvious as the greenness of England, but it is infinitely more varied and more delicate in tone. The landscape is a pinky mauve, a lilac, and the reflection of the sun of the particles of the atmosphere is a warm amber. So I should say our colour scheme is amber and lilac (Moore, 1934, 86).

Sir Hans Heysen

Australians generally concur with Longstaff, an eminent artist, about the Australian landscape. It may not have the charm of the English countryside or the splendour of the Rockies or the heritage of the Tuscan or Provence landscapes but it has its own unique beauty, its own intrinsic qualities, including subtle colouring to which Heysen refers.

The beauty of the landscape is an aesthetic quality, derived from human perception of the landscape. It does not reside as a physical entity in the landscape but rather results from our viewing of the landscape (Lothian, 1999). As the geographer Meinig (of On the Margins of the Good Earth fame) remarked, “landscape is composed not only of what lies before our eyes but what lies within our heads” (1976, 47).
For many years, efforts were made in Australia to measure and map Australian landscape quality through measuring the landforms, land cover (vegetation), land use, waterforms, and so on, anticipating that from this analysis and knowledge, its scenic quality would emerge. However this did not occur; the gap between objective fact and subjective quality was too great. This is because aesthetics is an affective quality, not a cognitive quality: it derives from our feelings, not from our intellect and analysis. Aesthetic preferences are registered extremely quickly, without prior thought (Herzog, 1984, 1985, Zajonc, 1980). Landscape quality cannot be measured by objective measures of the landscape, rather as a quality resulting from human perception, measurement must involve humans.

Recognising this, the author has developed a methodology to measure and map perceived landscape quality based on human perceptions and preferences. The method has been applied in South Australia in a range of studies which are summarized in this paper.

**Methodology**

The methodology is summarized by Figure 1. The methodology involves photographing the area, classifying the area into units of similar characteristics, selecting photographs representative of its characteristics, having the photographs rated by participants, and applying the ratings to map areas of the region with similar characteristics.

![Figure 1 Landscape quality assessment methodology](image-url)
The methodology requires:

- Selection of scenes for rating
- A rating scale – e.g. 1 to 10
- A rating instrument – i.e. a means for showing scenes with a rating scale
- Participants to rate the scenes – a sufficient number of raters for statistical analysis

The method relies on the use of photographs to represent the landscape as it is impractical to take large groups of people into the field. Many studies have established that providing the photographs meet certain criteria, photographs provide a satisfactory surrogate for taking people out into the landscape to assess it (Stamps, 1990). Colour photographs are used, standardised in landscape format, with 50 mm lens, of non-artistic composition, sunny cloud-free conditions, with good lateral & foreground context to scenes, of a single landscape unit, and of typical representative scenes.

Traveling through the region and photographing it makes one very familiar with its characteristics and this experience, together with the use of maps of landform, vegetation and land use, are used to define landscape units for the region. These are areas of broadly similar physical characteristics. For example, five landscape units were defined for the South Australian coast: high cliffs, low cliffs & beaches, headlands & bays, beaches & dunes, and the samphire-mangrove formation. Photographs were then selected to sample these units together with the variations present within them.

A 1 to 10 (low-high) scale is used to rate the photographs. In addition to the photographs selected of the region, a small set of photographs showing other areas of South Australia are included to benchmark the ratings on a State-wide basis. Ratings within a region tend to be of a restricted range, e.g. in the Barossa Valley study they were from 4.5 to 6.5, only two units. The South Australian landscape range is much larger (5 units), from around 3 to 8. Inclusion of South Australian photographs provides a baseline to ensure the ratings of the region can be taken as reflecting State-based ratings and also enable the comparison of regions.

The survey generally comprises around 150 photographs, including 30 South Australian scenes. Many more than this and the results may be affected by the fatigue of participants; fewer makes it difficult to adequately represent the region’s landscapes.

The survey is prepared and placed on the Internet. The Internet is a key technology which enables a large number of people to participate in the survey over a relatively short time. Its availability has revolutionised surveys of this nature. Table 1 indicates the large numbers of people who participate. Generally the surveys run for four weeks.
Table 1 Participation in Internet surveys

<table>
<thead>
<tr>
<th>Survey</th>
<th>Participants</th>
<th>Useable</th>
</tr>
</thead>
<tbody>
<tr>
<td>S.A. Landscapes*</td>
<td>319</td>
<td>319</td>
</tr>
<tr>
<td>Windfarms</td>
<td>454</td>
<td>311</td>
</tr>
<tr>
<td>Tree amenity</td>
<td>619</td>
<td>440</td>
</tr>
<tr>
<td>Coastal viewscapes</td>
<td>3324</td>
<td>2200</td>
</tr>
<tr>
<td>Coastal development</td>
<td>2398</td>
<td>1659</td>
</tr>
<tr>
<td>Barossa landscapes</td>
<td>2260</td>
<td>1210</td>
</tr>
<tr>
<td>R. Murray landscape</td>
<td>2138</td>
<td>1673</td>
</tr>
<tr>
<td>R. Murray development</td>
<td>1427</td>
<td>1259</td>
</tr>
</tbody>
</table>

* Pre-internet survey, slides used

Obtaining large numbers of participants through other means would generally take months or even years. To obtain a 5% confidence interval, a sample of around 400 is required. Such a sample will provide, at a 95% confidence level, responses that will be +/- 5% of the true value. For larger samples the confidence interval is smaller; for the sample of 2200 useable responses in the coast survey it was 2.09. These surveys are believed to have gained the largest sample size of any landscape surveys conducted anywhere and reinforce the value of the Internet as a research tool.

The nature of the Internet surveys has been refined over successive surveys:

- Originally each scene was shown for a set time (e.g. 7 seconds). Scenes are now changed by the participant allowing them to proceed at their own pace. This prevents them being frustrated if the survey seems slow, or being anxious that the scene will change before they complete their rating. Ratings are automatically tallied on a data base as they are made.

- Originally the scenes were set in a single random order. Now after the participant rates one scene, the remaining scenes are randomised afresh. Randomising scenes overcomes the order of the scenes affecting the results – with attention waning towards the end, or the rating of a scene being affected by the previous scene.

- Participants can leave the survey and return to it (within 30 minutes) due to interruptions, phone calls etc. They can exit the survey at any point and provide comments before completing the survey.

- Originally participants were drawn from narrow backgrounds, now they reflect a wider variety. Participants are drawn from community groups, councils, government agencies, schools and other sources. Invitations to participate are emailed together with the Internet link, and participants are invited to forward it to others who may have an interest. Anyone over 18 years is eligible to participate.

- Demographic data on the participants is sought to enable comparison with the broader South Australian population. The four parameters used are age, gender, education and birthplace, these being easily compared with Census data.
While the survey is on the Internet, a separate scoring is conducted of landscape factors. These are attributes in the scenes which are considered likely to contribute to the quality of the scene. For example, in the Barossa survey these included: the significance in the landscape of trees, vines, water, and buildings & structures; the nature of the terrain; the naturalness of the landscape; and the visibility of the Barossa Ranges. Each factor was scored on a 1 – 5 scale by up to 20 participants. Scores of landscape factors, in combination with the ratings of the scene, are used in multiple regression analysis to provide predictive models of scenic quality for the region.

The windfarm, coast and River Murray surveys assessed the visual impact of developments. The first two surveys comprised photographs, arranged randomly, of the scene with and without the development and the scenes prepared digitally. For the coastal development survey the developments covered housing-type developments of various forms and scales, plus scenes of marinas and aquaculture.

Following conclusion of the Internet survey, the results are inspected for strategic bias – e.g. rating all scenes 1 or 10 (this happens!) and these surveys are discarded. Incomplete surveys are also discarded and the survey generally analyses only complete surveys. Frustration with slow Internet links is probably the main reason for drop out, but this will diminish as broadband access becomes more common.

Analysis of participant demographics reveals that invariably participants are better educated and older than the broader population. However analysis of the scenic quality ratings across age groups, gender, education and birthplace reveals that these factors have little influence in the aggregate on the ratings.

Analysis of the ratings provides new insights into the nature of the scenes that people find attractive and is always an exciting stage in the project. Analysis reveals new knowledge never before obtained. The analysis generally moves from the general to the particular, covering the overall regional findings, then breaking it down into sub-regions or areas. For example the River Murray project analysed the ratings for the entire study area, each region - River Murray, Lakes Alexandrina and Albert, and the Coorong, and each of the landscape factors.

The scores of landscape factors are compared with the ratings and further insights gained. An example is from the Barossa project where the ratings of scenes fell as the number of vines in the scenes increased. The reason for this was that the more the vines, the fewer the trees, and it was the trees, not the vines, which generated scenic quality (Figure 2).

Using the landscape scores together with the ratings of scenes, multiple regression analysis produced equations which indicated the contribution of each landscape factor to the ratings obtained. In the tree amenity study, for example, the model to predict the scenic quality produced by scattered and isolated trees was:

\[ Y = 2.98 + 0.40 \text{ health} + 0.35 \text{ number of trees} + 0.30 \text{ verticality} + 0.24 \text{ height} - 0.17 \text{ canopy density} - 0.21 \text{ species} \]
Note: Significance of trees and vines in scene scored out of a maximum of 5. Graph indicates that where trees were significant, there were few vines, and where vines were significant there were few trees.

**Figure 2 Vines vs trees, Barossa Valley**

The model was tested against the ratings obtained for each scene and found to be accurate to within 1%. Such models can be used to estimate the likely scenic quality of an area based on a simple grading of the landscape factors specified in the equation.

Mapping the scenic quality of the region is based on the ratings obtained and the understanding gained through the analysis of the ratings and landscape scores. Mapping scenic quality is generally undertaken in conjunction with GIS specialists in interpreting and applying results.

Each survey involves an immense amount of work, attention to detail and tight quality control in photographing the region, selecting photographs, preparing the survey, scoring landscape factors, analyzing the results and mapping scenic quality.

**Summary of studies**

The following eight projects have been completed:

- Landscape quality assessment of South Australia
- Visual impact of wind farms in South Australia
- Amenity value of scattered and isolated trees
- Coastal viewscapes project
- Coastal development survey
- Barossa and Light region landscape assessment study
- River Murray landscape assessment project
- River Murray development survey

Their findings of these studies are outlined below.

**Landscape quality assessment of South Australia**

The author’s PhD dissertation examined the interaction of humans with the landscape and developed the methodology to measure and map landscape quality.
Based on the findings, the landscape quality of South Australia was mapped. Table 2 and Figure 3 summarises the results.

Table 2 Landscape quality ratings (%) of South Australia

<table>
<thead>
<tr>
<th>Ratings</th>
<th>Southern Agricultural Province</th>
<th>Far North Arid Province</th>
<th>South Australia</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.9</td>
<td>4.3</td>
<td>3.8</td>
</tr>
<tr>
<td>2</td>
<td>83.1</td>
<td>40.0</td>
<td>46.0</td>
</tr>
<tr>
<td>3</td>
<td>12.0</td>
<td>49.3</td>
<td>44.1</td>
</tr>
<tr>
<td>4</td>
<td>2.2</td>
<td>2.2</td>
<td>2.2</td>
</tr>
<tr>
<td>5</td>
<td>0.3</td>
<td>0.5</td>
<td>0.45</td>
</tr>
<tr>
<td>6</td>
<td>0.04</td>
<td>0.03</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>1.5</td>
<td>3.7</td>
<td>3.4</td>
</tr>
<tr>
<td>Total</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Being largely flat, much of South Australia is of middle ranking landscape quality: 4 and 5 rated landscapes accounted for 90%. The extensive gibber plains, comprising flat plains with no variation in land form and devoid of any vegetation, rated 3. Interestingly, the Mount Lofty Ranges, beloved by Adelaideans for Sunday drives, rated only 5 except for the western escarpment, the Hills Face, which rated 6 and 7.

![Flat, featureless, barren gibber plains Rating 3.6](image1)

![Piccadilly Valley, Mt Lofty Ranges Rating 5.](image2)

The top rating areas, 7 and 8, are confined to parts of the Flinders Ranges, the north-west ranges and the Chowilla area of the River Murray. While these areas are of relatively small extent, South Australia’s coast has extensive lengths of high quality – over 37% rated 7 or 8. South Australia’s coast is its greatest scenic resource. High scenic quality is found in the west coast of Eyre Peninsula and Nullarbor with the Whalers Way section south of Port Lincoln being the highest rated section of coast overall. High rating coastline also occurs at the toe of Yorke Peninsula, parts of Fleurieu Peninsula and the South East, and the north and south-west coast of Kangaroo Island.
Figure 3 Scenic quality rating of South Australia
Visual impact of wind farms in South Australia

The survey explored the visual impact that wind farms are likely to present in South Australia based on sites where wind farms could potentially be located on account of good wind resources.

The survey comprised photographs of 21 coastal locations and 47 inland locations. Photomontages of wind farms were inserted into the photographs. Scenes were shown, arranged randomly, with and without the windfarm. The survey was conducted in 2003.

Coastal scene without wind farm Rating 8.2
Scene with wind farm Rating 6.0

The survey found that wind farms were perceived to have a negative effect in all coastal locations where scenic quality is high. In the inland locations, the wind farms had a negative effect in landscapes of high quality but for low quality landscapes, below 5.1, the wind farm actually enhanced landscape quality because they add interest to an otherwise dull scene.

Figure 4 Ratings of coastal scenes, with wind farm (blue) and without wind farm (red)
Figure 5 Ratings of inland scenes, with wind farm (blue) and without wind farm (red)

The distance to the wind farm did not appreciably reduce their visual effect. Varying the number of turbines indicated no clear trend. The colour of turbines slightly affected perceived scenic quality. The results have been presented to South Australian planners, a Parliamentary inquiry and to an international wind industry conference.

Amenity value of scattered and isolated trees

The project was commissioned by the South Australian Native Vegetation Council which has responsibility to consider amenity aspects in its decisions on applications to clear trees. Such applications are common for vineyard development and pivot irrigation.

Large scattered trees, Rating 6.2

The project involved photographing scattered and isolated trees in various regions including Eden and Barossa Valleys, Clare, Langhorne Creek and Coonawarra,
classifying the trees, and selecting 112 photographs for the Internet-based survey. The survey was conducted in 2004.

The trees were classified by nine tree characteristics (e.g. height, canopy form, species) and two context factors (terrain, land use) which were used to quantify the contribution of each to the ratings of scenes. It found that preferences increased markedly with the greater number and density of trees, healthier trees, and the height of trees. For the other characteristics however ratings did not change appreciably across them. There was some indication of a relationship between ecological health and landscape quality but it was not definitive. Multiple regression analysis compared the ratings and the tree characteristics and derived a predictive model of scenic amenity of scattered and isolated trees. This could be used to determine the scenic quality provided by these trees in the field. Based on this, a workbook was developed to calculate the scenic rating in the field.

**Coastal Viewscapes Project**

The project to measure and map the scenic quality of the South Australian coastline was commissioned by the Coastal Protection Branch of the Department for Environment and Heritage.

The Branch recognised that increasing developmental pressures on the coast threatened the very qualities that the community value. Development pressures included housing and land division, marinas, aquaculture, wind farms and access roads and trails. The outcomes of the project were intended to assist in the development of planning policy and the assessment of development applications. The project was undertaken in 2005.

The highest rating region was Kangaroo Island (7.15) while the lowest were the northern extensive flats of the two Gulfs, St Vincent (4.6) and upper Spencer Gulf (4.6). Averages for other regions were: South East 6.8, Fleurieu Peninsula 6.7, Adelaide coast 5.9, Yorke Peninsula 6.2, Eastern Eyre Peninsula 5.9, Western Eyre Peninsula/Nullarbor 7.0. The ratings by landscape unit were: high cliffs 7.8, low cliffs 6.3, headlands & bays 7.0, dunes & beaches 6.3, samphires & mangroves 4.75.

Analysis of the ratings combined with the scores for the factors identified (e.g. naturalness, height) found that the strongest influences were diversity, tranquillity-aue, and naturalness. The presence of seaweed on beaches had a negative influence on ratings. The ratings of the coast are shown in Table 3 and Figure 6.

<table>
<thead>
<tr>
<th>Rating</th>
<th>Length km</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>na</td>
<td>38.8</td>
<td>0.8</td>
</tr>
<tr>
<td>3</td>
<td>31.4</td>
<td>0.7</td>
</tr>
<tr>
<td>4</td>
<td>402.8</td>
<td>8.4</td>
</tr>
<tr>
<td>5</td>
<td>813.5</td>
<td>17.0</td>
</tr>
<tr>
<td>6</td>
<td>1410.1</td>
<td>29.4</td>
</tr>
<tr>
<td>7</td>
<td>1987.9</td>
<td>41.5</td>
</tr>
<tr>
<td>8</td>
<td>107.5</td>
<td>2.2</td>
</tr>
<tr>
<td>Total</td>
<td>4792.1</td>
<td>100.0</td>
</tr>
</tbody>
</table>
The highest rated areas were, in order, Whalers Way – Shoal Point and Cape Catastrophe-Cape Tournefort areas south of Port Lincoln, Cape du Couedic-Kirkpatrick Point area on Kangaroo Island, and Cape Spencer at the toe of Yorke Peninsula. These areas rated 8 – 8.25. Other highly rated areas were in the South East (Cape Northumberland – Finger Point, McIntyre Beach – South End, and Beachport – Robe), the north-west and south-west coasts of Kangaroo Island, western Eyre Peninsula from Farm Beach through to Cape Bauer, and the Nullarbor cliffs. These all rated 7.75.

The project provided extensive recommendations for the incorporation of the results in the planning policy and development assessment processes. These were based on the findings of the Coastal Viewscapes Project and the Coastal Development Project (see below).
Coastal Development Project

This survey was conducted as an adjunct to the Coastal Viewscapes of South Australia study.

An Internet-based survey was conducted to ascertain the impact of development on scenic quality. The survey covered housing-type developments of various forms and scales, plus marinas and aquaculture. Scenes were prepared digitally with development included and the same scene without the development. The survey was held during 2005. The scenes without development averaged 7.1 and with development 5.0, a significant difference of over two units. Figure 7 summarises the impact of development for all 42 scenes.

Findings included:
- The largest impact was from housing and marina development while aquaculture appeared to have a lesser impact
- The impact was similar whether the development was on headlands or dunes
- The impacts were similar for shack development and high rise development and both were greater than for housing development
Barossa and Light Region Landscape Assessment Study

The project was commissioned by the Barossa and Light Councils and Planning SA to help define strategic directions for land use. It was undertaken during 2005. Fourteen landscape units were defined by reference to their land form, land cover, land use, water and any other significant features. In addition, photographs were selected to represent various key features such as cultural aspects, wineries, farm structures, trees along roads and streams, and industry. The survey comprised 120 Barossa scenes plus a further 30 benchmark scenes from South Australia.

The majority of ratings of individual scenes were in the 4.5 – 6.5 range (Figure 8). Overall the northern and western areas were low rating, 5 – 5.25, while the eastern area (Collingrove - Eden Valley) was higher 5.5 – 5.75. The core viticulture areas had generally moderate ratings, 5.5. The higher rated Barossa Ranges overlooking the area with most of the Ranges rating 5.5 to 6.5.

It may be considered surprising that the landscape of this popular tourist area does not rate higher, but this and other studies have established that naturalness, water, trees and rugged terrain are key generators of high landscape quality, features generally lacking in the Barossa. The presence of vines and buildings & structures actually had a negative influence on ratings. However churches and ruins attracted higher ratings than farm sheds and winery buildings.

Predictive models using multiple regression analysis were derived for all 120 scenes and some of the landscape units. The model for the entire region used all seven factors. The model was as follows:

\[ Y = 2.79 + 0.43 \text{ Natural} + 0.26 \text{ Water} + 0.26 \text{ Trees} + 0.17 \text{ Vines} + 0.11 \text{ Terrain} + 0.08 \text{ Barossa Ranges} - 0.01 \text{ Building} \]

Mapping the region’s scenic rating was based on the landscape unit ratings, equivalent scenes from other landscape units, special analyses of sets of scenes (e.g. scenes with vines), and the predictive models.
Recommendations were made relating to the planning, development and management of the Barossa Study Region’s scenic quality.

Figure 8 Scenic quality rating of Barossa Region

**River Murray Landscape Assessment Project**

The project was commissioned by the Department of Water, Land and Biodiversity Conservation and the South Australian Murray Darling Basin Natural Resources Management Board. It was undertaken during 2006 - 7.

The objective was to undertake a valuation of landscape value associated with the River Murray Floodplain Protection Area in South Australia established under the *River Murray Act 2003*. The region covered the River Murray, Lakes and the Coorong.

The outcomes were intended to contribute to the development of policies, in particular a Landscape & Amenity Policy, to assist in achieving the *Objects* and *Objectives for a Healthy River Murray* as contained in the Act.

The project involved two surveys of community preferences, the first survey of scenic quality and the second, a survey of developments along the River Murray. Scenic quality was mapped for the region. Leaving aside the ‘5’ rating which lay mainly outside the River valley, Table 4 and Figure 9 summarises the ratings.
Overall the scenic quality was high in the Riverland and the trench section of the River until the dairy flats below Mannum where it diminished abruptly and remained relatively low around Lakes Alexandrina and Albert, rising slightly along the Coorong. The average ratings of the River Murray (6.2) and Coorong (6.0) were similar and higher than the Lakes (5.4).

Key features and qualities which enhanced landscape quality were found to be the presence of water, high dense red gums, and high sheer cliffs. River reflections, evening sunlight on cliffs and wildlife added to the ratings. Diversity and cliffs were key factors in the River Murray scenes. Naturalness was important in the Lakes and Coorong scenes.
Dairy flats on the lower Murray rated fairly low (3.9) and scalded and barren flats rated even lower. Dead, dying and drowned trees reduced ratings significantly. Without further flooding of the floodplain, the stress on trees will increase and the scenic quality of the River will be affected.
Models were developed for the entire region and for the River Murray, Lakes and Coorong separately. The model for the River Murray was:

\[ Y = 1.81 + 0.47 \text{ cliffs} + 0.46 \text{ diversity} + 0.30 \text{ tree health} + 0.26 \text{ natural} + 0.25 \text{ water} + 0.17 \text{ trees} - 0.44 \text{ tranquillity} \]

**River Murray Development Survey**

The survey was conducted as an adjunct to the River Murray scenic quality survey. The survey comprised 80 scenes and covered houseboats, housing location, form and surrounds, waterfront treatments, caravan and recreation parks, and irrigation pumps.

In place of scenes with and without the developments, a 1 – 9 grade bipolar (dislike – like) scale was used. Participants were asked to rate, in the context of the surroundings, whether they liked or disliked the visual appearance of the development shown in the scene.

Houses on the floodplain rated the highest followed by those above the floodplain with cliff top houses being the least preferred.

Housing that was set back from the water was preferred over housing along the waterfront or dense housing. Surprisingly, canal developments rated among the lowest due possibly due to their lack of integration with the existing environment.

Houses surrounded by native trees were preferred over exotic trees or barren surrounds.

![Houses on floodplain Rating 3.6](image)

The highest rated waterfront scenes were those with a natural bank. Sand beaches and jetties were not particularly liked while the presence of retaining walls and wharves were disliked and eroded riverbanks disliked even more. People preferred the waterfront to be left in a natural condition, jetties were tolerated but retaining walls and wharves less so.
Both formal and informal areas for caravans and recreation appealed, particularly the informal areas.

People regarded a few houseboats moored along the river bank positively but this turned negative with more houseboats.

Marinas were regarded somewhat negatively, possibly because they involved greater change to the River than mooring along the bank.

Permanently occupied houseboats with their urban like fences, gardens, lawns were perceived as inappropriate in the River setting and quite disliked.

Irrigation pumps were seen as essential form of infrastructure but their visual impact was regarded as quite severe.

The strength of the opinions given on some of the individual scenes was striking – participants felt strongly about what they regarded as desecration of the riverine environment.
Resulting from the scenic survey and the development survey, recommendations were presented covering the management of scenic resources and the management of development covering housing, the waterfront, houseboats, caravan and recreation parks, infrastructure, and the dairy flats.

**Discussion**

The studies summarised in this paper provide a glimpse into the measurement and mapping of scenic quality, a subjective quality which can be objectively assessed.

The ratings used in the studies are indicators of scenic quality: they do not comprise scenic quality. While people do not normally express their opinion about a scene in terms of a number, the rating scale forces the individual to compare the scene with a standard of beauty that is held in their mind.

The ratings focus only on the aesthetic value of a landscape, its visual quality, not on the range of historic, cultural, botanical or other values that might be present in a scene. While these are objective features which are amenable to assessment, scenic quality is a subjective quality.

Based on the studies undertaken, the factors which generate high scenic quality are:

- **Naturalness**: highly natural landscapes through the presence of native trees and vegetation, the ruggedness of the terrain, and the presence of water including lakes, rivers and the sea;
- **Diversity**: diverse (i.e. busyness) landscapes with a mixture of varying land forms, land cover, land uses, waterforms etc. Scenes with variety of features have a greater appeal than featureless landscapes;
- **Land forms**: steep, high and awe-inspiring landscapes;
- **Water**: landscapes with extensive water area and long length of land/water edge. Water always enhances scenic quality, the exceptions being polluted or coloured water;
- **Land cover**: landscapes with tall, dense and healthy native trees; trees symbolise naturalness and, through providing a vertical element of incredible variety of appearance, help generate scenic diversity;
- **Land use**: diverse land uses, not monocultures, plus trees amidst land uses.

From the ratings derived from over 700 photographs covering South Australia, generic ratings for its landscapes may be derived. All the photographs were rated on the same 1 – 10 rating scale by many hundreds of participants. Table 5 summarises the generic form of landscape for each level of rating based on South Australian landscapes.

The presence of the following features adds to the rating of the scene compared with the scene without the feature: water 1.4, trees 1.5, ephemeral water reflections 1.0 and wildlife 0.9.

The retention, management and establishment of trees and water in the landscape are the two actions that would most enhance scenic quality in regional South
Australia and probably for much of Australia. The more natural their appearance, the greater will be the effect.

Table 5 Generic rating of South Australian landscape quality

<table>
<thead>
<tr>
<th>Rating</th>
<th>Presence of water</th>
<th>No water present</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>High, sheer coastal cliffs, indented coast, offshore islands &amp; reefs, waves, beaches backed by high steep land. Whalers Way, Eyre Peninsula</td>
<td>High sheer cliffs Wilpena ranges and Elders Range Extremely diverse landscapes</td>
</tr>
<tr>
<td>7</td>
<td>Coastal headlands, long wide beaches, sloping cliffs, dunes, waves, some reefs &amp; islands - Cape Spencer, Yorke Peninsula; Cape Torrens, Kangaroo Island High steep cliffs along River Murray, Large lake - Blue Lake Musgrave &amp; Mann Ranges, NW SA</td>
<td>High rocky isolated peaks in north Flinders – McKinlay Bluff &amp; the Armchair Heysen Range in Flinders Ranges Very diverse landscapes</td>
</tr>
<tr>
<td>6</td>
<td>Beaches, low hinterland, low or no cliffs, dunes – Yorke Peninsula. Moderately high sloping cliffs and low steep cliffs along River Murray. Moderate to extensive area of water. Rivers, anabranches and lagoons on floodplain. Rivers and creeks in agricultural areas.</td>
<td>High naturalness Moderately diverse landscape Breakaways, mesas and large dunes inland. Moderately high ranges and valleys in Flinders Ranges. Outliers of main ranges. Extensive tall &amp; moderately high red gum forests - Chowilla Dense eucalypt woodland – Mt Lofty Ranges Market gardens &amp; orchards on hilly/steep land – Piccadilly Valley Dense tall roadside trees</td>
</tr>
<tr>
<td>4</td>
<td>Samphires and mangrove association</td>
<td>Low naturalness Extensive chenopods without trees, grasslands inland. Cropping and pastures on flat land. Dairy flats – lower River Murray Pine plantations – South East Roads without trees Dead trees</td>
</tr>
<tr>
<td>3</td>
<td>Bare samphire flats</td>
<td>Gibber plains inland Scalded and bald areas</td>
</tr>
</tbody>
</table>

In South Australia, the regional Natural Resource Management Boards have a responsibility to ensure the sustainability of their regions. While their focus has tended to be on the physical attributes of the landscape – soils, water, vegetation, coast and marine, biodiversity, etc, the qualitative aspects including landscape quality, should
also be considered. In the preparation of their strategic plans, the NRM Boards should include assessment of the scenic quality of their regions.

Nationally, Australia should conduct an assessment of its scenic resources as has been completed for another subjective resource, wilderness qualities (Lesslie & Maslen, 2001). The Register of the National Estate and the National Heritage List include a criterion relating to aesthetic values which embraces scenic quality. The former Australian Heritage Commission was reluctant to include sites on the Register purely on the basis of their landscape quality for lack of a defensible means of measuring and mapping it. The methodology described here is considered to fulfil this need.

Conclusions

Scenic quality is a community resource of considerable significance. A century ago it was estimated that Switzerland gained between US$10,000 – $40,000 per square mile from its scenery per year (Runte, 1979). Residential land with a view fetches higher prices than those without a view. A view of Sydney Harbor may add 50% to the value of land (Correy, 1984). A Barossa wine industry survey found that “beautiful countryside and scenery” are among the top attractions identified by visitors. With visitation worth around $150/km²/day, the Barossa landscape is worth millions of dollars to the community. Landscape quality sells; it adds to the well-being, not to say, the quality of life of people.

But landscape quality is also a resource under pressure. Sea-change development of the coast, the siting of wind farms in scenic areas, and marina developments on coast and River are examples of significant pressures on scenic quality. By measuring and mapping scenic quality, the community is better placed to decide the best location for developments, developments which will provide economic benefits while not ruining the visual qualities which also provide benefits. Wind farms for example, should not be located adjacent to coasts of high scenic quality; there exist extensive inland areas which are suitable.

The studies summarised here demonstrate that landscape quality can be measured and mapped, and the visual impact of developments can be assessed in an objective way.

It is hoped that the methodology employed and the insights gained of the underlying factors which generate scenic quality, will inform and educate planning, environmental and land management professionals and the community generally.

Endnotes

1. Director, Scenic Solutions, PO Box 3158, Unley, South Australia, 5061. lothian.andrew@gmail.com
2. Details of each of the studies are available on the Scenic Solutions website: www.scenicsolutions.com.au. All studies are available at the Barr Smith Library, University of Adelaide.
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Lothian, 2007, South Australian River Murray Landscape Assessment Project. Report for the Department of Water, Land and Biodiversity Conservation and the
South Australian Murray Darling Basin Natural Resources Management Board. Adelaide.


