

Visual Impact Assessment of Some Developments in South Australia

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ABSTRACT

A series of studies in South Australia have assessed the visual impacts upon scenic quality of a range of developments including wind farms, coastal development and development along the River Murray. In this paper the method employed, the scope and the findings of these studies are described. The approach is based on community assessments and provides a sound means for determining visual impacts. A key finding is that although scenic quality is a subjective quality, it is possible to objectively measure the effect of developments upon it. Planning policies to minimise such impacts are proposed.

Key words

Wind farms, visual impacts of developments, scenic quality, South Australia, planning policy, coastal developments, riverine developments, River Murray.

INTRODUCTION

The protection and enhancement of scenic quality is a key concern of planning policy. Comprising an important aspect of *amenity*, scenic quality is a significant environmental and community resource. The beauty of the landscape is an aesthetic quality and derives from human perception of the landscape. Aesthetics is an affective quality, it derives from our feelings as expressed in preferences, not from cognitive analysis.

Lip service has often been paid to the identification and protection of scenic quality, a situation which has arisen largely because planners have found it difficult to measure and map it. Moreover planners have found the assessment of visual impacts, the effect of developments upon scenic quality, fraught with subjectivity.

An issue in considering visual impacts is the contention by some that scenic amenity depends in part on the visibility of the area (Preston, 2001). An implication of this is that if an area cannot be seen then it does not matter if it is degraded. A quarry, wind farm or clear felling might be justified by the lack of a viewing public. Apart from the ever changing accessibility of areas which means that areas not accessible today may be tomorrow, this approach renders scenic quality a relative rather than absolute quality. If scenic amenity is dependent on the extent of its visibility then it is no longer solely derived from the perception of the combination of its features such as land forms, land cover, the presence of water, naturalness and so on. Rather the landscape preferences which derive from viewing the scene would, it is claimed, be conditioned by the area's

accessibility and visibility. I believe that the visibility of an area is irrelevant to the perceived scenic quality that is present and the presence of viewpoints and the number of people that view the area are not pertinent. Paradoxically an area can be of high scenic quality even though it may be difficult to access and view.

A method developed to measure and map scenic quality at a regional scale, based on community preferences, has also assessed the visual impacts of developments in a range of landscapes (Lothian 2000, 2005a & b, 2006, 2007). These developments have been potential wind farms in coastal and agricultural areas, and housing and other developments on the South Australian coast and along the River Murray. This paper describes the method and results of these studies. It includes the recommendations that were made to the clients regarding the possible solutions to minimise the visual impacts of such developments.

APPROACH

Two alternative methods were employed to assess visual impact:

1. Photographs with and without the developments were presented in random order and respondents rated the scenic quality of each scene on a 1 (low) to 10 (high) scale. The difference between the two ratings provided an indication of the significance of the visual impact. This method was used to assess coastal developments and wind farms.
2. Respondents rated photographs with the development on a bipolar like:dislike scale of 1 – 9 grades. The grades provided a direct indication of visual impact. This method was used for developments along the River Murray.

The results from the two approaches are not comparable as they use differing scales and approaches, the first being a continuous scale and the second a Likert bi-polar scale. Photographs of the subject areas were taken with 50 mm lens or equivalent (for digital camera). The author was responsible for the photography and the selection of photographs for the surveys. The survey photographs were selected to represent the range of landscapes present in each region and to provide an uncomplicated scene for rating purposes. Participants viewing the scenes via the Internet viewed the same image in terms of size, shape and colour.

Although both windfarms and developments on the coast and River Murray were occasionally covered in the media, none were particularly prevalent at the time of the surveys.

The attributes of the surveys are summarised by Table 1.

Table 1 Summary of visual impact surveys

Developments	Sites	Scenes	Instrument/date	Reponses
Potential wind	60 scenes without wind farm, 60	150	Continuous scale	Total 454

farms in coastal and agricultural locations	scenes with wind farm plus scenes to assess: distance (4), number of turbines (9), & colour of turbines (17)		Groups (137) CD (37) Internet (280) June – August 2003	Analysed 377 5% sample error
Actual and potential coastal developments	41 scenes without development & 41 scenes of housing (36), marinas (3), aquaculture (2).	82	Continuous scale Internet May 2005	Total 2413 Analysed 1659 2.4% sample error
Actual developments along River Murray	80 scenes of housing (35), waterfronts (17), houseboats (14), caravan & recreation parks (10), irrigation pumps (4)	80	Likert bi-polar scale Internet Nov – Dec 2006	Total 1427 Analysed 1259 2.76% sample error

Photoshop™ was used to insert images of developments in the wind farm and coastal development surveys. Care was taken to ensure the images were realistic, appropriately orientated for the site and scaled according to the distance.

Wind turbines were scaled on photographs according to their distance based on an formula derived from photographing a power station chimney from varying distances: $y = 33.46x^{-1.0446}$ where y = height as measured in mm on A4 size photograph and x = distance in km.

Participants for the wind farm survey were drawn from universities, State Government departments, professional groups and community groups, contacted via emailed invitations to participate.

The coastal and River Murray surveys used the Internet solely for the survey and participants were invited by email to log onto the website containing the surveys. The surveys aimed to gain participation from as wide a range of the community as was achievable with particular emphasis on the region. To this end, the coastal survey was sent to 284 groups and the River Murray survey to over 150 groups that had been identified in these regions. These groups included councils, regional groups, local action planning groups, land management groups, National Parks regional offices and Consultative Committees, Friends of Parks groups, commercial organisations, conservation and community bodies, schools and TAFEs, State-wide organisations, Economic Development Boards, Regional Tourism Associations and State Government departments. The range of bodies provided a broad representation of the community.

The wind farm and River Murray surveys included questions on respondent characteristics for comparison with the South Australian community. The respondents were generally somewhat older and more educated than the South Australian community, but comparison of the results indicated that the participant characteristics had a generally insignificant effect on the ratings.

RESULTS

Wind farm survey

The results were analysed separately for the coastal and inland scenes. In all coastal sites the presence of the wind farm diminished the rating of scenic quality. Figure 1 summarises the differences in descending order of rating differences. This indicates the rating of each scene without and with the wind farm. With few exceptions, the difference was largest where the scenic quality was high and narrowed as the rating decreased.

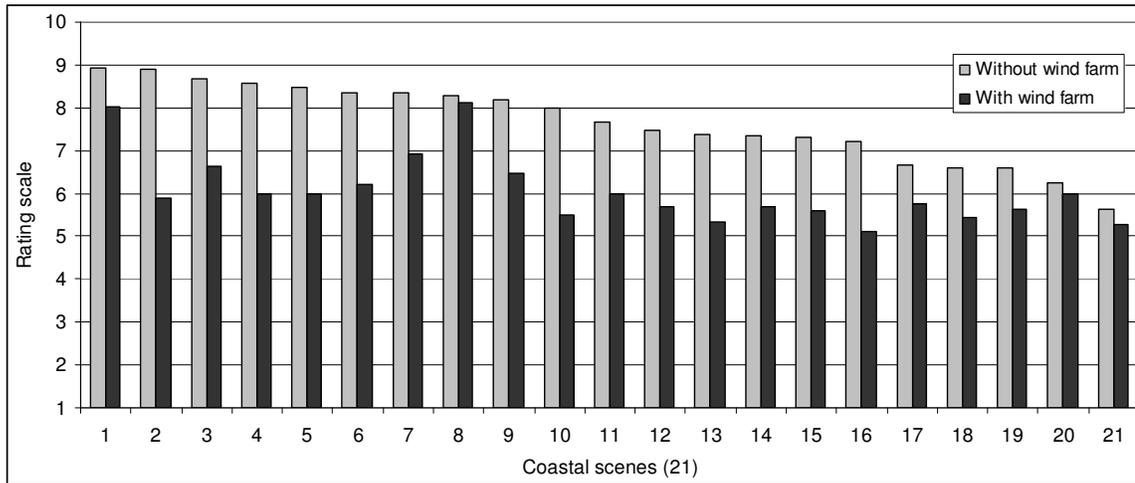


Figure 1 Coastal scenes – visual impact of wind farms on scenic quality



Rating 8.18



Rating 6.46

Coastal scene (#9) without and with wind farm

In agricultural landscapes the presence of wind farms affected areas of high scenic quality but in areas of lower scenic quality the presence of the wind farm actually enhanced scenic quality (Figure 2). This implied that in landscapes of low quality, below 5.1 rating, the presence of the wind farm added interest to an otherwise mediocre landscape and thus enhanced its perceived scenic quality.

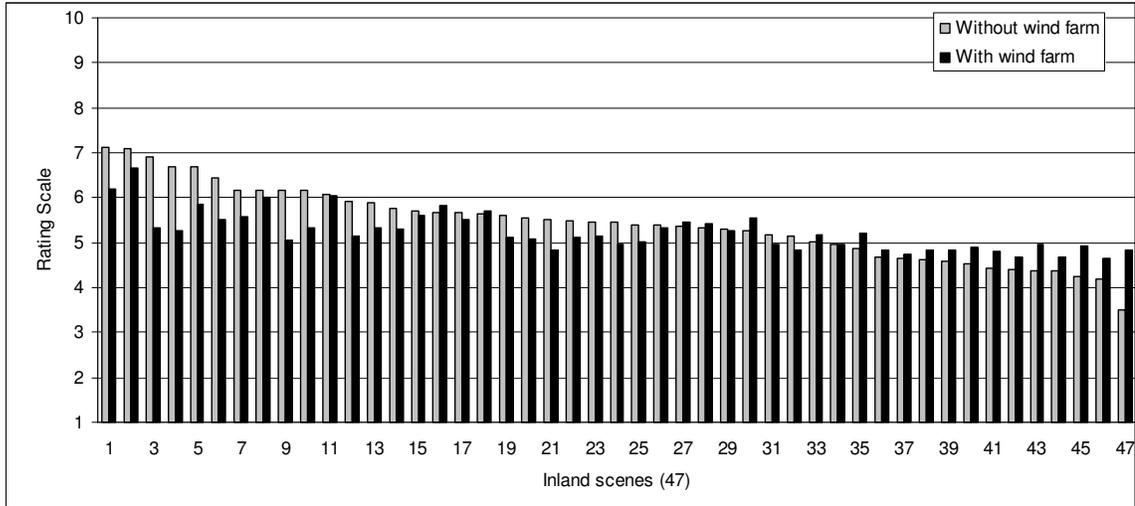


Figure 2 Agricultural scenes – visual impact of wind farms on scenic quality



Rating 3.51



Rating 4.84

Low scenic quality agricultural scene (#47) near Lake Bonney showing positive influence of wind farm

From trend lines derived from the data, Table 2 indicates the expected impact of a wind farm on coastal and agricultural landscapes. For example, the rating of a coastal landscape which rated 8 without a wind farm could be expected to decrease to a rating of 6.8 with the presence of a wind farm.

Table 2 Effect of wind farms on scenic quality rating (1 - 10 scale)

Landscape rating without wind farm	Coastal landscapes rating with wind farm	Agricultural landscapes rating with wind farm
10.0	7.3	
9.0	6.8	
8.0	6.2	
7.0	5.7	5.9
6.0	5.2	5.5
5.0	4.6	5.1
4.0		4.7

Overall this study found that wind farms generally had a negative effect on South Australian landscapes of moderate to high perceived scenic quality (i.e. rated approximately 5.1 – 10 on a 10 point rating scale) but had a positive effect on non-coastal landscapes of moderate to lower perceived scenic quality (i.e. approx. 0 – 5.1). Because ratings of scenic quality relate to the characteristics present and not to location, these findings may apply to similar landscapes elsewhere in Australia. Further studies would be required for this to be established.

Coastal Development

As part of a major study to measure and map scenic quality of South Australia's coastline (Lothian 2005a), an assessment was undertaken of the influence of development upon scenic quality. The study covered housing developments, marinas and structures such as pens associated with aquaculture. Existing developments were included in some scenes and photomontages of developments inserted in the remaining scenes. Housing developments covered shacks which are generally poor quality structures located close to the coast, holiday housing which are more conventional housing structures, and high rise housing developments with apartments.

Coastal scenic quality was diminished in all scenes by the presence of development (Figure 3).

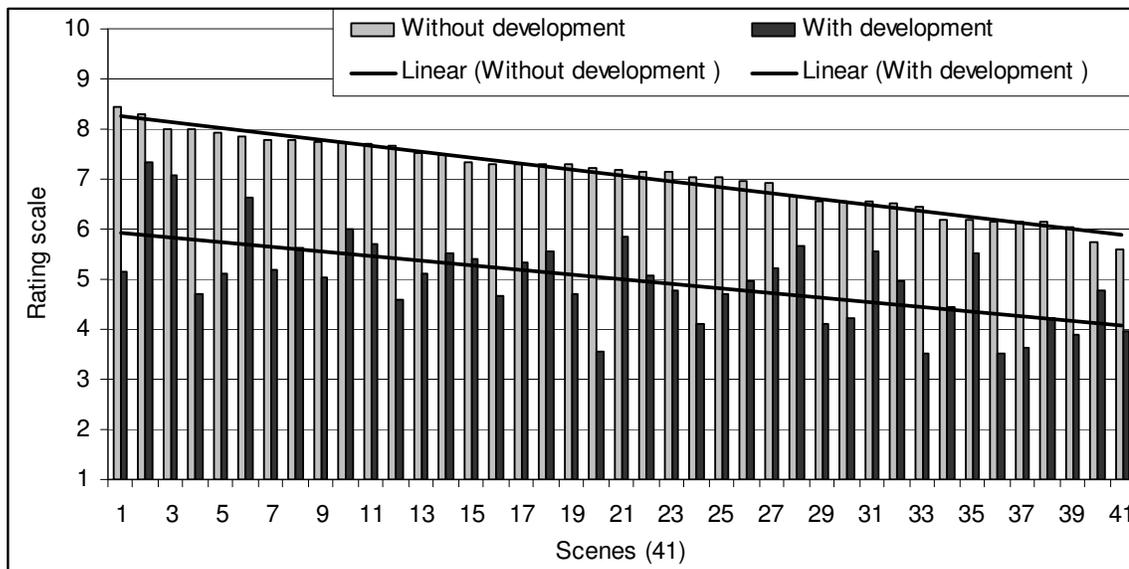


Figure 3 Visual impact of development on coastal scenic quality



Rating 7.99



Rating 4.72

Coastal scene (#4) without and with development – holiday housing

The trend lines of best fit were near parallel, indicating that the visual impact of development was independent of the particular level of scenic quality. The presence of development diminished scenic quality by around 2 (e.g. 8 reduced to 6; 7 to 5) regardless of whether the original scenic quality was 8 or 5.

Table 3 summarises the varying impacts of differing forms of development. Aquacultural structures had the smallest visual impact while the impact of housing overall was similar to that of marinas. However the impact of shacks was similar to that of high rise developments. The visual impact of housing sited on headlands and on dunes was similar.

Table 3 Impact of developments on coastal scenic quality (1 – 10 scale)

Development	Without	With	Difference	% Change
All housing (36 scenes)	7.13	4.98	-2.15	-30.2
Shacks (3)	6.59	4.02	-2.57	-39.0
Holiday housing (28)	7.25	5.22	-2.03	-27.9
High rise (5)	6.75	4.17	-2.58	-38.0
Aquacultural structures (2)	6.92	5.77	-1.15	-16.6
Marina (3)	6.70	4.74	-1.97	-29.3

Overall the impact of coastal development was independent of the level of scenic quality and occurred regardless of whether the area was of high or low scenic quality. Developments generally reduced scenic quality by around 2 (on a 1 – 10 scale). Housing and marinas had the largest impact, aquacultural structures less, although this was based on a small number of scenes of marinas, and aquacultural structures.

River Murray Developments

As part of a major study to measure and map scenic quality of the River Murray in South Australia (2007), an assessment was undertaken of the influence of development upon scenic quality. The study covered the location, form and

surrounds of houses, houseboats, waterfront treatments, caravan and recreation parks, and irrigation pumps. All scenes were of existing developments.



Grade 4.25



Grade 4.16

Shack development and houseboats along River Murray

The survey used a nine grade (1 – 9) rating scale based on bi-polar scaling similar to a Likert scale (Figure 4). Table 4 summarises the mean grades for groups of developments.

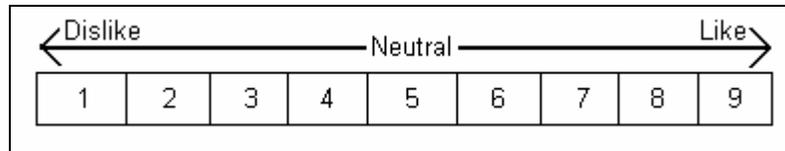


Figure 4 Grading of development impacts

Table 4 Summary of development ratings

Form	Category	No. of scenes	Mean
House location	Cliff top	2	4.5
	Above floodplain	2	4.7
	On floodplain	4	4.9
House form	Canal	4	4.2
	Dense housing	2	4.1
	Subdivision	4	4.6
	Setback from water	1	5.3
	Waterfront housing	6	4.6
House surrounds	Barren of trees	2	4.1
	Native trees	3	4.9
	Exotic trees	4	4.6
Waterfronts	Jetties	8	4.7
	Natural banks	6	5.1
	Retaining walls & wharves	9	4.1
	Sand beach	2	5.0
	Eroded river bank	1	2.8

Caravan & recreation	Formal, developed	6	6.4
	Informal, undeveloped	4	7.2
Houseboats	Linear moored	4	4.6
	Marina moored	7	4.7
	Permanent	3	3.7
Irrigation pumps		4	3.1

Out of the 22 classes of development, caravan and recreation parks were graded the highest, well into the “liked” category. Three other classes were neutral: housing setback from the river, natural waterfronts, and sand beaches. The remaining 18 classes of development were in the “disliked” category. A scene of an eroded river bank was the most disliked scene and irrigation pumps were not much better.

For each form of development, the ratings provided an indication of preferences. In many cases these preferences coincided with good practice as widely accepted by the environmental and planning professions. However, in some cases they did not.

The following summarises the findings for each form of development.

- House location was favoured on the floodplain whereas it would be good practice for houses to be located off the floodplain. However the cliff top location which is not environmentally sound on account of its visual prominence and potential risk issues was least favoured.
- Houses set back from the waterfront were favoured over those along the waterfront. Again this accords with good environmental and planning practice in that it reduces impacts and, depending on land tenure, can allow for public access.
- The low rating of canal developments may be because they are fairly dense forms of development and these were not favoured in a fairly natural, non-urban setting. Canal developments involve major changes to the natural environment and the housing tends to be not well integrated with the environment compared with some shack developments. These developments are often gated communities which is not very egalitarian. There is possibly antipathy towards excluding others from the area, and also towards the presumably wealthy people who own the housing. These factors may underlie the negative view of canal developments.
- Any trees around houses were preferred over barren surrounds, with native trees preferred over introduced species. The use of indigenous species accords with good environmental practice.
- Natural banks which represent low impact were preferred over retaining walls, wharves and jetties.

- The preference for undeveloped sites for caravans and recreation corresponded with an overall preference for naturalness as opposed to development in the riverine environment.
- The ratings of moored houseboats along the river decreased inversely with the number of houseboats, indicating recognition of their visual impact. Houseboats moored in marinas were slightly preferred over those moored along the river bank.
- Irrigation pumps were perceived to have significant visual impacts, particularly where the pipes were cut through and up the cliffs.

The results indicate both awareness and ignorance of environmental impacts and planning principles.

POLICY IMPLICATIONS

Based on the findings of these three studies, policy implications have been derived and recommendations made to the respective clients of the studies. The recommendations included the following.

Wind farms

Wind farms should:

1. Not be located in areas of high scenic quality (say ≥ 7.5)
2. Avoid coastal locations where they are visible from the water's edge or from key viewpoints
3. Be located inland in areas of lower scenic quality

Although these recommendations may seem to be stating the obvious, the early windfarms in South Australia were located in coastal areas, including Starfish Hill, Wattle Point and, more recently, Cathedral Rocks near Port Lincoln, a coastline of very high scenic quality.

Locating wind farms inland from the coast is likely to reduce available wind velocities and hence affect project viability. However achieving a balance between scenic amenity and commercial viability is the responsibility of the local or State governments which issue the development approval. High quality landscapes are significant environmental and community resources and yield economic benefits from the tourism and recreation they support, benefits which should last well beyond the life of a wind farm.

In South Australia there are extensive areas of low to moderate scenic quality which have excellent wind resources; the south east of the State is an example. Locating

wind farms in such areas would gain the environmental benefits they provide without compromising the landscape resources. Care would still need to be taken to minimize their effect on the landscape, even if it is of lesser quality.

Planners need to take the lead in planning for wind farms. Three requirements are:

1. A map of wind resources, preferably at the State scale and with sufficient detail for the identification of areas with sufficient wind for viable wind farms;
2. A map of regional scenic quality, such as at the State scale;
3. Knowledge of the community's evaluation of the visual impact of wind farms from which guidelines for their location can be derived.

While some States have some of these, only South Australia has all three, albeit at a preliminary level. States should aim to measure and map scenic quality which, as well as documenting this significant environmental and social resource, would assist in locating wind farms.

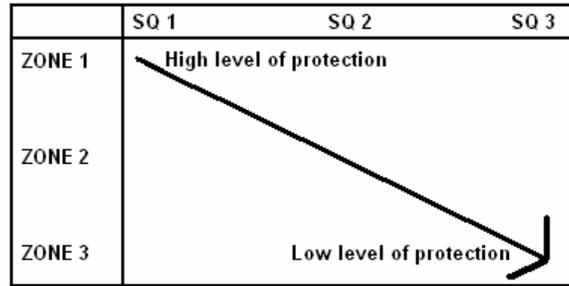
Planners should define, on the basis of their high scenic quality, those areas in which wind farms should not be located, thereby providing the wind farm industry with greater certainty and leaving the choice of suitable alternative sites to the industry to define, subject to the usual environmental and technical requirements, for example consideration of other factors such as heritage and biodiversity.

Based on the author's experience in measuring and mapping scenic quality in South Australia, areas rated 7.5 and over should definitely exclude wind farms. Below a rating of 7.5 there will be areas which, because of their special character, should also be avoided. An example is the Hills Face Zone overlooking Adelaide which, although it rates below 7.5, is of such prominence adjacent to the city that it should not have wind farms located along its ridge. The opposition which occurred regarding a proposed windfarm at Sellicks Hill at the southern end of the Hills Face Zone supports this position.

Coastal Development

As part of the project, recommendations were prepared covering coastal development for the client, the Coast Protection Branch of the South Australian Department for Environment and Heritage.

A strategic framework was defined covering development on the coast, comprising three coastal zones and three levels of coastal scenic quality (Figure 5). This provided for high levels of protection for Zone 1/SQ1 which diminished for SQ2 and SQ3 and for Zones 2 and 3, allowing progressively greater levels of access, structures and developments consistent with maintaining the scenic values as well as other environmental values (e.g. wetlands in SQ3). Within the strategic framework, detailed development issues such as mass and height were considered.



Note: SQ is scenic quality grades 1 (highest) – 3 (lowest). Zones are distance inland: 1 is up to 100 m from sea, 2 is land with sea view, 3 is land up to 5 km inland without sea view

Figure 5 Strategic framework for coastal scenic quality protection

Within this framework, specific provisions were derived covering:

- Access
- Visitor facilities
- Structures and infrastructure
- Commercial developments
- Tourist resort developments
- Housing developments
- Mining and extractive industries
- Wind farms
- Aquaculture
- Marinas
- Marine Infrastructure

Table 4 illustrates the application of the strategic framework for housing developments in coastal areas.

Table 4 Application of strategic framework for coastal housing development

	SQ 1	SQ 2	SQ 3
Zone 1	No tourist resort developments	Sensitively designed and located tourist resort developments. Low scale. Vegetative screening.	Sensitively designed and located tourist resort developments. Vegetative screening.
Zone 2	No tourist resort developments within 1 km. Beyond 1 km, sensitively designed and located tourist resort developments. No multistorey buildings. Vegetative screening.	Sensitively designed and located tourist resort developments. Vegetative screening.	Sensitively designed and located tourist resort developments. Vegetative screening.
Zone 3	No tourist resort developments within 1 km. Beyond 1 km, carefully designed and located tourist resort developments. Ensure buildings & associated structures are not visible from the sea.	Carefully designed and located tourist resort developments. Vegetative screening.	Carefully designed and located tourist resort developments

River Murray Development

Recommendations were made to the Department of Water, Land and Biodiversity Conservation covering a range of developments on the River Murray including housing, houseboats, caravan & recreation parks and also developments sited on cliffs. The recommendations sought to protect the floodplain environment and also the view of the banks and the adjacent floodplain when viewed from the river. The recommendations covered screening, colours, planting of trees, location of houseboats off river when not hired, and the location of marinas to minimize the loss of scenic quality.

CONCLUSIONS

The three examples of measuring the community's assessment of visual impact demonstrate the utility and value of such a methodology. It provides an objective, replicable assessment of visual impact, not reliant on an individual's opinion but rather on the aggregated view of the community. The assessment should thus be highly defensible in an appeal situation. The results provide a sound basis on which policies to protect and manage scenic quality can be developed.

NOTES

1. Dr Andrew Lothian won the 2006 PIA National Award for Planning Excellence in the environmental planning or conservation category for his report, *Coastal Viewscapes of South Australia*, which included the study of coastal development.
2. The studies on which these three reports of the development aspects were derived are available on the author's website: www.scenicsolutions.com.au . The three reports are: *Visual Effects of Wind Farms in South Australia*, *Coastal Viewscapes of South Australia*, and *South Australian River Murray Landscape Project*.
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